Are Implicit Causality Pronoun Resolution Biases Consistent Across Languages and Cultures?

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Abstract. The referent of a nonreflexive pronoun depends on context, but the nature of these contextual restrictions is controversial. For instance, in causal dependent clauses, the preferred referent of a pronoun varies systematically with the verb in the main clause (*Sally frightens Mary because she* . . . vs. *Sally loves Mary because she* . . .). Several theories claim that verbs with similar meanings across languages should show similar pronoun resolution effects, but these claims run contrary to recent analyses on which much of linguistic and nonlinguistic cognition is susceptible to cross-cultural variation, and in fact there is little data in the literature to decide the question one way or another. Analysis of data in eight languages representing four historically unrelated language families reveals consistent pronoun resolution biases for emotion verbs, suggesting that the information upon which implicit causality pronoun resolution biases are derived is stable across languages and cultures.

Keywords: psychology, linguistics, language understanding, causal reasoning, pragmatics, semantics, cross-linguistic analysis, human experimentation

Most English speakers resolve the pronoun to Sally in (1) but to Mary in (2).

(1) $Sally_1$ frightened $Mary_2$ because she_1. . .
(2) $Sally_1$ loved $Mary_2$ because she_2. . .

Many verbs like *frighten* lead to subject interpretations ("subject-biased verbs") whereas many others such as *love* lead to object interpretations ("object-biased verbs"). This effect is not driven by subject-biased verbs (*frighten*) making their subjects more prominent (and thus better referents for a pronoun) and object-biased verbs (*love*) making their objects more prominent: The result changes if the relationship between the two clauses changes (Crinean & Garnham, 2006; Pickering & Majid, 2007; Stewart & Pickering, 1998; see also Stevenson, Crawley, & Kleinman, 1994).

(3) Because $Sally_1$ frightened $Mary_2$, she_2...
(4) Because $Sally_1$ loved $Mary_2$, she_1...

Thus the effect in (1–2), dubbed "implicit causality," seems to be related to the fact that the clause containing the pronoun offers an explanation of the just-mentioned event (Pickering & Majid, 2007), and explanations typically refer to causes (for discussion: Kehler, 2002; Kehler, Kertz, Rohde, & Elman, 2008).

Brown and Fish (1983a, 1983b) developed the first comprehensive account of implicit causality. Crucial to our present focus, they argued that implicit causality biases constitute a cognitive universal: The same verb/event will elicit the same pronoun interpretation regardless of language or culture (for now, we interpret "the same verb/event" intuitively; the notion will be developed throughout this Introduction). Surprisingly, although this claim has been much repeated (Ferstl, Garnham, & Manouilidou, 2011; Goikoetxea, Pascual, & Acha, 2008; Kasof & Lee, 1993; Rudolph, 2008; Rudolph & Forsterling, 1997a; Van Kleeck, Hillger, & Brown, 1988) and has not, to our knowledge, been challenged, the literature provides little to bear on the question (see below).

The truth of Brown and Fish's conjecture has important implications not only for implicit causality but for psychological theory in general. Brown and Fish put forward their conjecture as part of a broader argument that there are cognitive universals in how people perceive and reason about causality, particularly in the interpersonal domain. As reviewed below, the primary competitors to Brown and Fish's account of implicit causality explain it in terms of linguistic structure, and thus invariance across languages would indicate that these structures are universal across languages.

Thus, invariance in implicit causality across languages and cultures would be interpreted as evidence for either a cognitive universal or a linguistic universal. Neither result would be trivial. The notion that perception and understanding of causality is invariant across cultures is currently controversial (for review: Nisbett, 2003), as is the notion that there are linguistic universals (Christiansen & Chater, 2008, 2009; Cowie, 1999; Evans & Levinson, 2009; Everett, 2005; McMurray & Wasserman, 2009; Prinz, 2012; Tomasello, 2009).

Given the above, although the claim that implicit causality is invariant across languages and cultures has been made over and over again, it should in fact be highly controversial. In the remainder of this Introduction, we first review evidence relevant to the question of whether implicit causality biases are consistent across languages and the methodological complications that prevent them from deciding the issue. We then describe the updated version of the methodology that will be employed in the present study. Finally, we discuss why one would or would not expect stability under different accounts of implicit causality.

Implicit Causality Across Languages

Several studies compare the implicit causality biases of English verbs with translations of those verbs in other languages. Brown (1986) translated the 36 verbs from Brown and Fish (1983b) into Cantonese and Japanese, finding that 29 of the Cantonese verbs and 30 of the Japanese verbs showed the same numerical bias as in English.[1] Only 25 of the verbs (69%) showed the same bias in all three languages. Natsopoulos and colleagues (1993) translated four verbs from Caramazza et al. (1977) into Greek and found equivalent biases.

One difficulty with translation studies is determining what counts as the right translation (e.g., does the Russian *nenavidet'* mean *hate, detest,* or *despise*?). Thus, most studies (Brown, 1986; Brown & Fish, 1983a; Goikoetxea et al., 2008; Mannetti & de Grada, 1991; Rudolph & Forsterling, 1997a, 1997b; Semin & Marsman, 1994; Vorster, 1984) have bypassed this problem by looking at classes of verbs, all of which are – under a particular theory – expected to have the same bias. For instance, Brown (1986) argued, based on previous research (Brown & Fish, 1983b), that all action verbs in English are subject-biased, and thus asked whether all action verbs in Japanese and Cantonese are similarly subject-biased. They are not, but subsequent research found that many action verbs in *English* are not subject-biased either, complicating interpretation. While several other taxonomies have been proposed (for review, see Rudolph & Forsterling, 1997a) and used in cross-linguistic research, Hartshorne and Snedeker (in press) demonstrated that none of these predict implicit causality pronoun interpretation biases at a rate much above chance when tested against a representative sample of English verbs, and thus few conclusions can be drawn from findings that these taxonomies do not perfectly predict biases in other languages (see especially Brown, 1986; Goikoetxea et al. 2008; Vorster, 1984).

The safest conclusion would be to draw no conclusions from previous cross-linguistic studies. However, if one were to take them at face value, ignoring the methodological problems, most reveal cross-linguistic variation in implicit causality pronoun resolution biases.
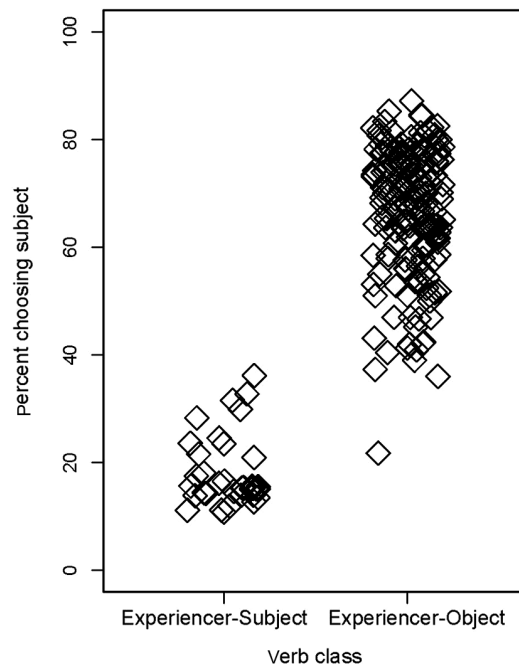

Figure 1. Degree of subject-bias for monosemic English emotion verbs in Hartshorne and Snedeker (in press).

Emotion Verbs

In the present paper, we adopt the strategy of comparing classes of verbs across languages but employ a taxonomy that is on solid empirical footing. Hartshorne and Snedeker (in press), in a comprehensive study of English, found that many syntactically-defined classes of verbs show consistent within-class implicit causality biases. The largest of the classes investigated consisted of transitive emotion verbs, which come in two varieties: Some (*frighten, surprise, anger*) describe an emotion elicited by the verb's subject and experienced by the verb's object, while others (*like, hate, admire*) describe an emotion experienced by the verb's subject and elicited by its object. Hartshorne and Snedeker found that in both cases, people resolve the pronoun to the stimulus of the emotion rather than the experiencer: Figure 1 shows the percentage of participants resolving the pronoun to the subject of the verb, which is greater for experiencer-object verbs (*frighten, surprise, anger*) than experiencer-subject verbs (*like, hate, admire*).

Note that graphing results in terms of subject-bias highlights the distinction of interest: the implicit causality-driven difference between experiencer-subject and experiencer-object verbs. There are many other factors that affect pronoun interpretation. For instance, in a variety of contexts, people prefer to resolve pronouns to the previous subject (Corbett & Chang, 1983). While this effect is interesting

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[1]   The Cantonese study appears to be a new analysis, perhaps with additional data, of the one reported in Brown and Fish (1983a), which likewise found that 29 of the same 36 verbs translated into Cantonese showed the same numerical bias as in English, though the two analyses disagree as to *which* 29 verbs show the same bias as in English.

in its own right – as is whether it varies across languages, which is unknown – it is orthogonal to present purposes. Our interest is in the implicit causality-driven difference between experiencer-subject and experiencer-object verbs.

Note that this is a conservative test of the cross-linguistic stability hypothesis. While Hartshorne and Snedeker (in press) identify these verbs as experiencer-subject and experiencer-object verbs – which allow for easy identification of the verbs of interest and is our working definition here – it is possible that the crucial factor determining implicit causality is something else, in which case we will not necessarily be comparing the right verbs to one another across languages. Moreover, even if all extant emotion verbs in English are stimulus-biased, our test assumes that all *possible* emotion verbs are stimulus-biased in English, which does not necessarily follow.

Implications of Theories of Implicit Causality for Cross-Linguistic Stability

When considering the question of cross-linguistic consistency in biases, different considerations are relevant to different accounts of implicit causality. This section lays out these considerations for several of the more prominent accounts. Because each of these theories would be, given certain assumptions, consistent with either cross-linguistic consistency or variability, the present study cannot and is not intended to tease these proposals apart. It is intended instead to place important constraints on these theories (and, by extension, theories of language and/or cognition).

Implicit Causality as an Arbitrary Feature

Garvey and colleagues (Garvey & Caramazza, 1974; Garvey, Caramazza, & Yates, 1974) argued that a verb's implicit causality bias is not predictable from the meaning of the verb or the type of event that it refers to. While this account clearly allows cross-linguistic variation, it does not require it, and it would have to be explained by reference to some additional factor (common historical descent, constraints of communicability, etc.; see General Discussion).

Implicit Causality as a Cognitive Bias

Brown and Fish (1983a, 1983b) argued that the implicit cause of an event is the event participant whose participation is most informative. Consider *Sally loved Mary*. Everyone is capable of feeling love, so Sally's experience of love says little about Sally. Not everyone is lovable, and thus the fact that Mary is loved (rather than, say, Beatrice) tells us a great deal about Mary. Thus, Mary is the implicit cause. Whether lovees are *in fact* more informative than lovers was never investigated, and indeed was orthogonal to Brown and Fish's account: Their claim was simply that people believe this to be true.

Whether the cognitive bias account is consistent with implicit causality invariance across languages/cultures depends on whether the cognitive biases are themselves universal. Brown and Fish proposed that they were innate. In contrast, Rudolph (2008) proposed that these biases are learned, and thus – though not discussed by Rudolph – in principle variable across cultures.

The literature does not decide the issue. A proponent of universal cognitive biases might cite the finding that core aspects of causal cognition are in place by 6 months of age (Saxe & Carey, 2006). However, many studies report cross-cultural differences in certain causal judgments, such as the degree to which individuals believe that events and circumstances in their lives are caused by themselves or external influences (Hui, 1982; McGinnies, Nordholm, Ward, & Bhanthumnavin, 1974; Parsons & Schneider, 1974; Smith, Trompenaars, & Dugan, 1995). Similarly, Chinese participants are more likely to attribute behavior of another individual to situational factors than to the dispositions of the individual, whereas the reverse is true for American participants (Morris & Peng, 1994; see also Miller, 1984). Particularly relevant for our present study of emotion verbs Scherer (1997; see also Matsumoto, Kudoh, Scherer, & Wallbott, 1988) asked participants in 37 countries to recall recent events evoking each of seven emotions and found significant differences in who they judged to be responsible (e.g., themselves or a third party) for the precipitating event. More generally, the notion that there are any cognitive universals is frequently challenged and thus deserves direct testing (Cowie, 1999; Prinz, 2012; for discussion of causal cognition in particular, see Nisbett, 2003).

Implicit Causality as Encoded Linguistic Semantics

Consider:

(5) Sally loved Mary.
(6) Sally feared Mary.
(7) Sally believed Mary.
(8) Sally hit Mary.
(9) Sally kicked Mary.

What roles do Sally and Mary play in these events? One might be tempted to say that Sally is the Lover, Fearer, Believer, Hitter, and Kicker in (6–10), respectively, while Mary is the Lovee, Fearee, Believee, Hittee, and Kickee. Many semanticists argue that more abstract "semantic roles" may be usefully postulated: Sally is the Experiencer in (6–8) and the Agent in (9–10), whereas Mary is the Stimulus in (6–8) and Patient in (9–10).

Many grammatical rules are said to depend on the exact semantic roles of the noun phrases involved (for review, see Levin & Rappaport Hovav, 2005). Many semantic roles are explicitly causal in nature (such as AGENT and STIMULUS), leading several authors (Crinean & Garnham, 2006; Hartshorne & Snedeker, in press; see also

Arnold, 2001; Stevenson et al., 1994)[2] to propose that implicit causality might not be a separate phenomenon but in fact a function of these roles. *Love, fear,* and *believe* are object-biased precisely because their object is a Stimulus, and a stimulus is by definition causal; *love* is object-biased because what it means for Sally to love Mary is in part that Mary is causally responsible for the love. Likewise, *hit* and *kick* are subject-biased because their subjects are Agents; what it means for Sally to hit Mary is in part that Sally caused the hitting. Crinean and Garnham (2006) present perhaps the most extensive defense of this position.[3]

Whether semantic role accounts predict implicit causality bias to be cross-linguistically invariant depends on whether semantic roles themselves are universal. Interestingly, many researchers argue that they are (for review, see Levin & Rappaport Hovav, 2005). Emotion verbs make a particularly useful test case because many authors argue that emotion verbs in many or all languages do in fact involve the same semantic roles, though they may vary along other dimensions (Belletti & Rizzi, 1988; Dowty, 1991; Grimshaw, 1990; Jackendoff, 1990; Pesetsky, 1995; Pinker, 1989).

Other authors, however, argue that semantic roles – to the extent they exist at all – are empirically learned generalizations over known verbs (Goldberg, 1995, 2006; McClure, Pine, & Lieven, 2006; Tomasello, 1992, 2003; for review, see Ambridge & Lieven, 2011). This opens the door for cross-linguistic variation in implicit causality. More broadly, many authors in this empiricist tradition have argued that little if any linguistic structure is universal (Christiansen & Chater, 2008, 2009; Cowie, 1999; Evans & Levinson, 2009; Everett, 2005; McMurray & Wasserman, 2009; Prinz, 2012; Tomasello, 2009), in which case not only might implicit causality vary across languages, it should. Note similarly that to make this discussion even intelligible, one must assume that verbs in different languages can be meaningfully said to refer to the same (or aspects of the same) events, which may not be the case (cf Gentner & Boroditsky, 2001).

The Present Study

Below, we present new data on emotion verbs in Japanese, Mandarin, and Russian, and compare them to Hartshorne and Snedeker's (in press) English data. We additionally reanalyze published data from Dutch, Italian, Spanish, and Finnish, as well as an additional study of English. These eight datasets represent considerable linguistic and cultural diversity: four unrelated families of languages – Japonic (Japanese), Sino-Tibetan (Mandarin), Finno-Ugric (Finnish), and three subfamilies of Indo-European (Germanic [English, Dutch], Romance [Spanish, Italian], and Balto-Slavic [Russian]) – as well as a range of North American, European, and East Asian cultures. While by no means a complete survey of the world's languages and cultures, it is a relatively large one.

Experiments

The three studies in Japanese, Mandarin, and Russian used roughly the same methodology – based on Hartshorne and Snedeker (in press) – facilitating comparison of the results. Participants were presented with sentences of the form:

(10) Sally frightened Mary because she is a dax. Who is the dax? Sally Mary.

The novel phrase "is a dax" was used to minimize the effects of lexical material beyond the verb itself, as was the decision to use common names such as "Sally" and "Mary." These stimuli (the novel words and the names) were adapted to the language in question as described in each method section. The Mandarin and Russian experiments targeted a variety of mental state verbs – these experiments were conducted prior to Hartshorne and Snedeker's (in press) discovery that emotion verbs show systematic biases in English. Below we discuss only the results for emotion verbs; the results for all verbs are included in the appendices. The Japanese study tested emotion verbs only.

The languages and cultures in these datasets differ in relevant ways. In Japanese, experiencer-object emotion verbs are typically constructed from experiencer-subject emotion verbs by adding the productive morpheme -(s)ase- (Hartshorne, O'Donnell, Sudo, Uruwashi, & Snedeker, 2010; Pesetsky, 1995). Thus the Japanese verb *kowagaraseru* (*frighten*) is constructed by inserting -ase- into *kowagaru* (*fear*). This morpheme is typically analyzed as a causative: that is, when attached to a verb *X*, the result is a verb which means *cause-to-X*. While this analysis has not been fully tested, it suggests that for these verbs, causality is not implicit but actually explicit, and one may expect clearer implicit causality biases in Japanese.

As noted in the Introduction, studies find that East Asians are more likely than Russians or Americans to attribute causality to circumstances than to the participants in an event (Hui, 1982; McGinnies et al., 1974; Morris & Peng, 1994; Parsons & Schneider, 1974; Sastry & Ross, 1998; Smith et al., 1995). Moreover, a range of findings have suggested that East Asians' experiences with emotions – or at least beliefs about their experiences with emotions – differ from those of Americans and Europeans (Bagozzi, Wong, & Yi, 1999; Borke & Su, 1972; Jack, Garrod, Yu, Caldara & Schyns, 2012; Kitayama, Markus, & Kurokawa, 2000; Kitayama, Mesquita, & Karasawa, 2006; Leu et al., 2010; Mauro, Sato, & Tucker, 1992; Schimmack, Oishi, & Diener, 2002; Scollon, Diener, Oishi, & Biswas-Diener, 2005; Solomon, 1978).

Because of primary interest in the comparison across the datasets, results are presented below with minimal discussion, and full discussion of the pattern of results is deferred to the General Discussion.

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[2]   Semantic roles were first discussed in the implicit causality literature by Brown and Fish (1983b), but play a larger role in the cited papers.
[3]   Note that Hartshorne and Snedeker (in press) invoke predicate decomposition rather than semantic roles. The differences are not relevant here.

Experiment 1: Japanese

This study compared experiencer-subject emotion verbs with their -(s)ase-affixed, experiencer-object counterparts. As discussed above, nearly all Japanese experiencer-object verbs are formed by adding the causative affix -(s)ase- to an experiencer-subject verb.

Method

Participants

Fifteen native Japanese speakers (20–46 years old, $M = 31$; 10 female) were recruited and completed the experiment via the Internet at gameswithwords.org. Ten concurrently resided in Japan. One additional participant was excluded for chance performance on fillers (see below).

Materials and Procedure

Participants were presented with sentences like (11).

(11) Miki-wa   Naomi-o   sonotoki   kowagar-ase-ta
     nazenara kanojo-wa tosu-datta kara.
     Miki-TOP Naomi-ACC then fear-CAUSE-PAST
     because she-TOP tos-was because.
     Miki frightened Naomi because she was a tos.

The participant indicated to whom the novel word referred by selecting either the subject or object from a list. Whether the subject was listed first or second was determined randomly for each participant but was consistent across trials for that participant in order to avoid confusion.

Critical verbs consisted of 12 pairs of experiencer-subject verbs and their -(s)ase-affixed experiencer-object counterparts. A sentence was created for each pair. For half the sentences, both characters were male; for the other half, both were female. A different set of names and a different novel word was used for each sentence. Eight filler sentences that were disambiguated by the gender of the pronoun (one character was male and one was female) were created using nonemotion verbs. Half unambiguously referred to the subject and half unambiguously referred to the object. Which character was male or female was balanced across the eight items.

Two lists were constructed such that half the verbs appeared in Experiencer-Subject form on one list and in Experiencer-Object form on the other list, and vice versa for the other half. The order of each list was pseudorandomized such that there were never three verbs of the same type in a row. Participants were randomly assigned to a list resulting in nine completing List 1 and six, List 2. During runtime, the software randomly assigned participants to
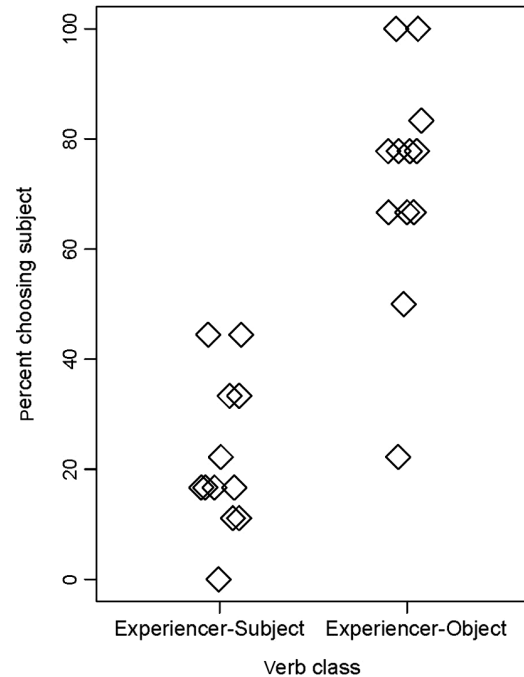

Figure 2. Degree of subject-bias for Japanese emotion verbs in Experiment 1.

see the sentences either in forward order or backward order.

Results and Discussion

Verb-by-verb results are shown in Figure 2 (see also Appendix A). All but one of the experiencer-object verbs was more subject-biased ($M = 72\%$, $SE = 6\%$) than all of the experiencer-subject verbs ($M = 22\%$, $SE = 4\%$; $t(22) = 6.88$, $p < .001$; $d = 1.7$).[4] Note that throughout effect size (d) is calculated based on log odds in order to correct for the binomial nature of the data. Within each pair of verbs, the experiencer-object verb was always numerically more subject-biased than the experiencer-subject verb ($t(11) = 5.99$, $p < .001$), and the correlation across pairs between the log-odds probability of choosing the subject was significantly negative ($r = -.65$, $p < .001$), indicating that verbs which were more stimulus-biased in their experiencer-subject form were also more stimulus-biased in their experiencer-object form. This intriguing finding could suggest that the strength of bias varies according to the emotional state. This bears further investigation in other languages that contain causal morphemes and so allow such comparison.

Note that just as in the English data (Figure 1), one verb did not match the overall pattern. In the General Discussion,

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[4]   Because only verb-by-verb means are available for the reanalyses of published data discussed below, and because it is generalization across verbs that is of primary interest, for consistency only items analyses are reported throughout. However, all effects that are significant by items and which could be analyzed by subjects were significant by subjects as well.

we review all such cases in the present data and suggest that these are most likely explained by chance measurement error: some of the many verbs tested will be outliers simply by chance. We defer further discussion to the General Discussion.

Experiment 2: Mandarin

This study was originally constructed to elicit implicit causality pronoun resolution biases for a variety of mental state verbs. Analyses below are restricted to emotion verbs listed in Mandarin VerbNet. Note that while Mandarin VerbNet's coverage is incomplete (several apparent emotion verbs in our sample are not included in Mandarin VerbNet), it is based on meticulous study of syntactic frames and other linguistic criteria and thus is ideal for present purposes. Results for all verbs are given in Appendix H.

Method

Participants

Fifty-nine Mandarin-speaking students (39 female; 18–23 years old, $M = 20$, $SD = 1$, with 1 no-response) at a Taiwanese university participated in class and were compensated with a small souvenir. Sixteen participants completed booklet 1, 15 booklet 2, 14 booklet 3, and 14 booklet 4.[5] One additional (excluded) participant was unable to complete the task.

Materials and Procedure

Fifty mental state verbs were tested, drawn from a comprehensive list of such verbs. Of these, 20 were identified by Mandarin VerbNet (Liu, 2010; Liu & Hong, 2008) as emotion verbs: 9 experiencer-subject and 11 experiencer-object. All participants judged all verbs. Participants were tested on sentences highly similar to those in Experiment 1:

(12) Xiaobai xihuan Xiaoling, yinwei ta shi huabaian-ren.
Xiaobai likes Xiaoling because she is a Huabaian-ian.

The high degree of homophony in Mandarin complicates designing nonce words; thus, the nonce words were designed to sound like nationalities. The character names for each sentence were unique, as was the nonce nationality. While some given names in Mandarin are strongly gendered, many are not. To avoid any potential confounds, all names were formed from a last name plus a diminutive (a common form of salutation) and thus were gender-ambiguous. The female pronoun, which is homophonous with the male pronoun
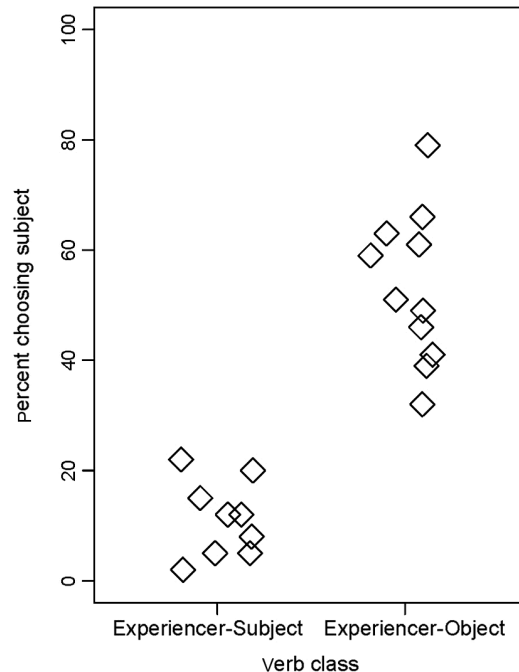

Figure 3. Degree of subject-bias for Mandarin emotion verbs in Experiment 2.

but distinguishable in written form, was used. There were never more than four verbs of the same type in a row. Below each sentence the names of both characters were listed and the participants were asked to circle the one who is of the nationality described (e.g., Huabaian-ian). For half the items, the subject was listed first; for the other half, the object. Four different lists were used, counterbalancing the order of the character names and varying the order of the sentences.

Results

The results for all verbs are listed in Appendix B. As expected, the experiencer-object verbs were more subject-biased ($M = 53\%$, $SE = 4\%$) than the experiencer-subject verbs ($M = 11\%$, $SE = 2\%$; $t(18) = 8.32$, $p < .001$, $d = 3.6$) (Figure 3).

Experiment 3: Russian

Experiment 3a was designed to collect implicit causality pronoun resolution biases for a range of Russian mental state verbs, all of which were imperfective verbs. One salient feature of Slavic languages is that verbs come in aspectual pairs. That is, each verb is lexically specified as

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5   One participant skipped a page and thus four questions from booklet 3.

either perfective or imperfective. Though the details are complex, this can be glossed as stating that each verb must refer to completed or uncompleted events. No previously-proposed accounts predict that perfectivity should interact with implicit causality bias. Nonetheless, it is not inconceivable, and so Experiment 3b compared pairs of perfective and imperfective verbs.

Experiment 3a contained 17 experiencer-subject and 23 experiencer-object emotion verbs among the total set of mental state verbs tested; Experiment 3b contained 12 experiencer-object verbs only (6 perfective, 6 imperfective).

Method

Participants

Participants were recruited and tested online at http://coglanglab.org. One hundred sixty-three native Russian speakers (82 female; ages 11–49 years old; $M = 25$, $SD = 8$) completed Experiment 3a. Twenty-seven native Russian speakers (10 female; ages 14–57 years old; $M = 32$, $SD = 14$) completed Experiment 3b.

Materials and Procedure

Items were presented individually in past-tense sentences (13) and participants were asked to determine which character was the "sliktopoz."

(13) Маша любила Аню, потому что она сликтопоз.

Masha ljubila Anju, potomu chto ona sliktopoz.

Masha loved Anya because she was a sliktopoz.

Sliktopoz is a nonce Russian word; participants were told it describes a type of person. Names were all common female Russian names, chosen randomly without replacement for each trial for each participant.

Stimuli in both Experiments 3a and 3b were drawn from a comprehensive list of mental state verbs compiled by the first author in collaboration with several native speakers. This larger set was based on Spencer and Zaretskaya (2003) and supplemented by translations of English psych verbs and their synonyms. Experiment 3a tested 50 mental state verbs, half of which had an experiencer as a subject and half of which had an experiencer as an object. Of these,
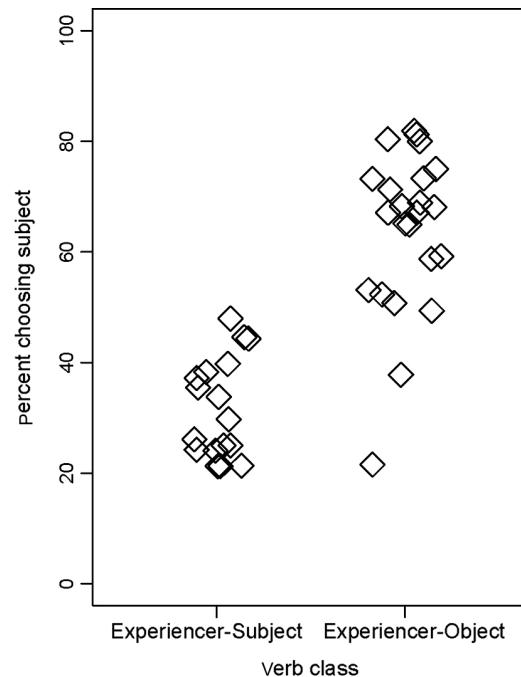

Figure 4. Degree of subject-bias for Russian emotion verbs in Experiment 3a.

40 were emotion verbs (17 experiencer-subject) and only these are analyzed below.[6] Each participant judged 24 verbs, sampled randomly without replacement from the set of 50, equally balanced between verbs with experiencers as subjects and objects. This method allowed each participant to judge a relatively small number of verbs while nonetheless testing a larger set. Partway through testing, it was discovered that two experiencer-object verbs had been mislabeled as "experiencer-subject" (one was listed as both types). Due to paucity of experiencer-subject verbs in Russian, only one of these could be replaced during subsequent testing. Thus data were collected on 26 experiencer-object verbs and 25 experiencer-subject verbs.

Experiment 3b tested 15 perfective and 15 imperfective mental state verbs. Of these, 6 pairs – 12 verbs – were experiencer-object verbs, one of which (*stidila*) appeared in Experiment 1. Given the smaller number of verbs in the set, all participants judged all verbs.

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[6] One otherwise experiencer-subject emotion verb – "*revnovat*" – is not included in this list because, unlike the English equivalent, the direct object is neither the cause nor target of the emotion (Wheeler, Unbegaun, & Falla, 1995, p. 442):

(9) Она ревновала мужа к его работе.

Ona revnovala muzha k ego rabote.

She-NOM jealous-PAST husband-ACC to his work-DAT.

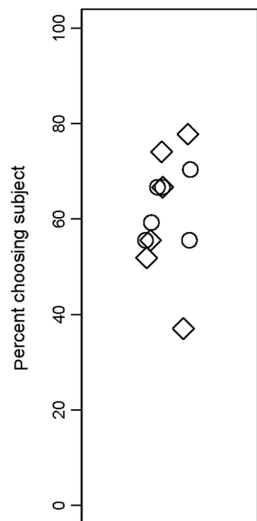She was jealous of her husband's work.

Figure 5. Degree of subject-bias for Russian experiencer-object emotion verbs in Experiment 3b. Imperfective verbs are represented by diamonds; perfective verbs by circles.

Results

Experiment 3a

Results for all verbs are given in Appendix C. As expected, the experiencer-object verbs were more subject-biased ($M = 64\%$, $SE = 3\%$) than the experiencer-subject verbs ($M = 32\%$, $SE = 2\%$; $t(39) = 8.52$, $p < .001$, $d = 2.5$) (Figure 4).

Experiment 3b

Results for all verbs are given in Appendix D. As expected, numeric subject-biases were evident for both the perfective verbs ($M = 62\%$, $SE = 3\%$) and imperfective verbs ($M = 61\%$, $SE = 6\%$), and there was no difference between the two aspectual types ($t(5) = 0.40$, $p = .71$) (Figure 5). Thus, the two sets of verbs were combined, and the combined 12 verbs – all experiencer-object – were significantly subject-biased ($t(11) = 3.53$, $p = .005$). Only one verb was not numerically subject-biased. Thus these results confirm that the stimulus-bias is seen for both perfective and imperfective verbs in Russian, at least among experiencer-object verbs.

Reanalysis of Published Studies

Several published studies have reported verb-by-verb implicit causality pronoun resolution biases, most of which contain a significant proportion of emotion verbs (mental state verbs have long been of interest in the implicit causality

literature, and most transitive mental state verbs are emotion verbs). Thus we were able to further test the generality of the above findings by reanalyzing data for Spanish, Finnish, Dutch, and Italian, adding a range of European cultures (all four experiments were conducted in Europe) as well as an additional language group (Finno-Ugric).

Unlike the experiments discussed above, these studies employed a wide range of methods, described below. To the extent that diversity in method may affect the results, any consistency seen across the studies is that much more compelling. One difference, however, is worth discussing in detail: The Spanish and Finnish studies are more properly re-mention studies rather than pronoun studies: participants completed sentences of the form "Sally frightened Mary because …", and verbal bias was based on the percentage of continuations that invoked the subject (Sally) as opposed to the object (Mary), regardless of whether this was done by using an overt pronoun, a null pronoun, or her name. Much of the implicit causality literature treats this as equivalent to assessing pronoun biases, and in fact Kehler (2002; Kehler et al., 2008) has argued for this claim on theoretical grounds. Nonetheless, in order to ascertain the degree to which results from such a task compare with results from a task more like the one used in the three experiments reported above, we additionally reanalyze English data from Ferstl et al. (2011), which employed the same method as the Spanish and Finnish studies.

In addition, two features of the languages deserve particular mention. First, Finnish, like Japanese, forms experiencer-object emotion verbs through the addition of the morpheme *-tta*, which is typically analyzed as a causative. Thus, the Finnish verb *raivostutta* (*infuriate*) is constructed by adding the causal morpheme *-tta* to *raivostu* (*become furious*).

Second, of the languages discussed in this paper, all but English and Dutch allow null pronouns. For example, in Spanish, one may utter any variant of the following if who did the frightening is clear from context:

(14) a. Ana asustó a María.
          Ana frightened Maria.
      b. Ella asustó a María.
          She frightened Maria.
      c. Asustó a María.
          [She] frightened Maria.

The experiments reported above used overt pronouns, as does the Dutch study (Dutch does not allow null pronouns). The Italian study, however, employs null pronouns. The Spanish and Finnish studies allow the participant to choose the referring phrase, and thus it is not known for sure what form was used. However, in such contexts, the use of null pronouns is typically preferred. Goikoetxea recently tested 60 native Spanish-speaking undergraduates (49 female) on 16 verbs in a paradigm similar to that used in Goikoetxea et al. (2008) and provided us with the raw data. Ninety-seven percent of the responses began with null pronouns, three percent with overt pronouns, and 0.1% with demonstratives.

Thus, although we do not have data comparing overt and null pronouns in the same language, these reanalyzed studies
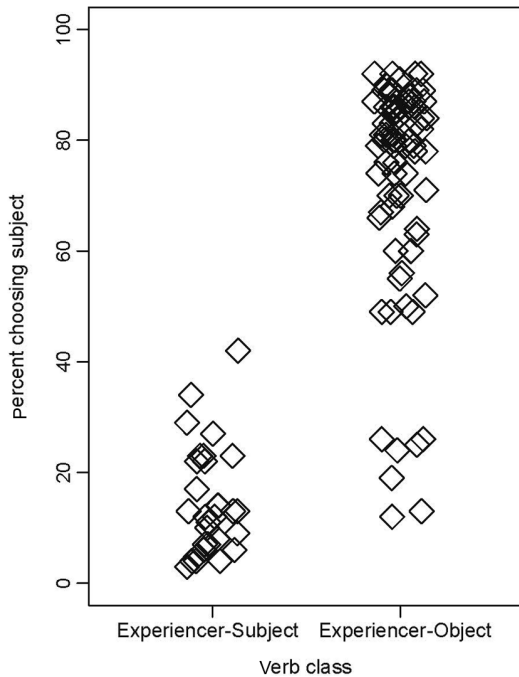
Figure 6. Degree of subject-bias for English emotion verbs reported in Ferstl, Granham, Manouilidou (in press).
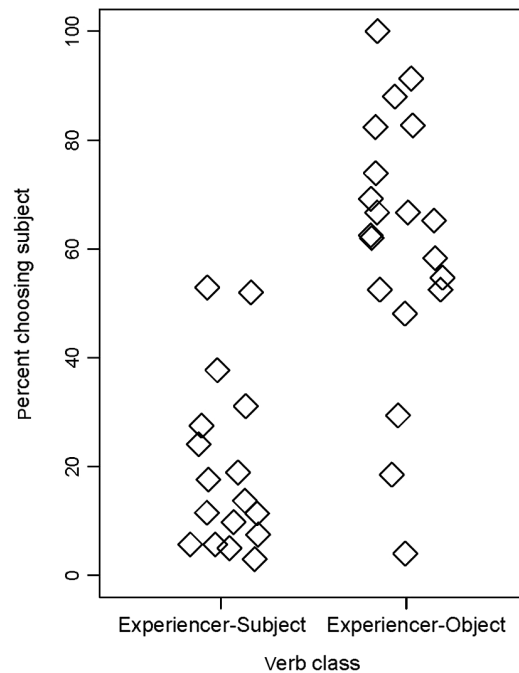

Figure 7. Degree of subject-bias for emotion verbs in Spanish as reported by Goikoetxea et al. (2008).

do provide us with a first-pass investigation into whether this distinction in referential form interacts with implicit causality.

Reanalysis of English Data in Ferstl et al. (2011)

We first reanalyze data from Ferstl et al. (2011), who used a method similar to those of the Spanish and Finnish studies. The authors asked 96 participants to complete sentences (*Sally* frightened *John because ...*), and IC bias was calculated based on who the continuations referred to (Sally or John). A total of 305 verbs were tested. Verb-by-verb results were made available through online supplementary materials. We identified experiencer-subject and experiencer-object verbs using VerbNet (Kipper, Korhonen, Ryant, & Palmer, 2008). Excluding verbs that appear in multiple classes and thus have multiple meanings, 110 emotion verbs were analyzed: 80 experiencer-object verbs and 30 experiencer-subject verbs (Appendix E).

The experiencer-object emotion verbs were significantly more subject-biased ($M = 73\%$, $SE = 2\%$) than the experiencer-subject emotion verbs ($M = 15\%$, $SE = 2\%$; $t(35) = 6.15$, $p < .001$, $d = 3.3$; see Figure 6), replicating the results of Hartshorne and Snedeker (in press), and suggesting that this sentence-continuation method provides results comparable to a pronoun resolution bias task, increasing our confidence in our ability to interpret the Spanish and Finnish data described below.

Reanalysis of Spanish Data in Goikoetxea et al. (2008)

Goikoetxea et al. (2008) asked 105 adults to complete Spanish-language sentences of the form *María VERBED Jose because...* Participants were not forced to use a pronoun in the continuation, and in such contexts Spanish speakers typically use null pronouns (see above). However they continued the sentence, participants were asked to circle the intended referent. As with Ferstl et al. (2011), the genders of the subject and object were contrasting and balanced within and between participants. There was no effect of this gender manipulation.

The authors tested 100 Spanish verbs, which were chosen from translations of German verbs used in a previous study. These included 50 verbs of psychological state, of which 37 were emotion verbs (Appendix F). As expected, experiencer-object emotion verbs were significantly more subject-biased (20 verbs, $M = 61\%$, $SE = 5\%$) than the experiencer-object emotion verbs (17 verbs, $M = 20\%$, $SE = 4\%$; $t(35) = 6.15$, $p < .001$, $d = 1.6$) (Figure 7).

Reanalysis of Finnish Data From Pyykkönen and Järvikivi (2010)

Fifteen participants completed sentences of the form "Sally frightened Mary because..." Ninety verbs were tested. The authors selected and reported 16 of the most subject-biased and 16 of the most object-biased verbs (all 32 verbs had
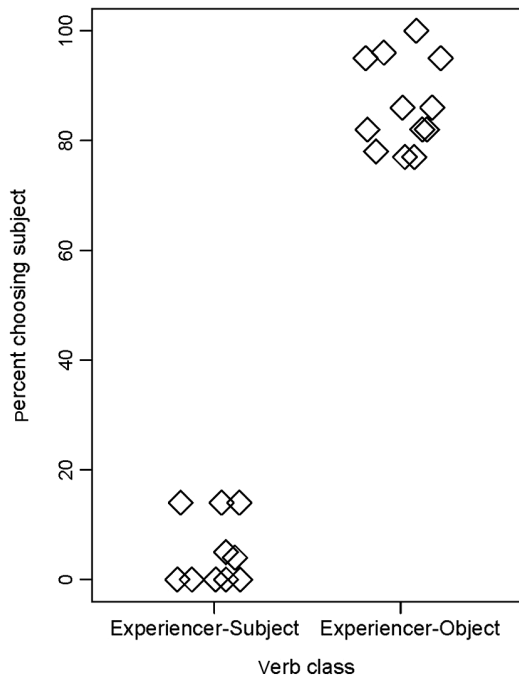
Figure 8. Degree of subject-bias for Dutch emotion verbs reported by Koornneef and van Berkum (2006).

Figure 9. Degree of subject-bias for emotion verbs in Italian as reported by Mannetti and de Grada (1991).

biases of at least 62.5% in the appropriate direction). Of these, 17 were experiencer-object verbs (all but one subject-biased) and 15 were experiencer-subject verbs (all object-biased; See Appendix G). This difference was significant (Fisher's Exact Test $\chi^2 = 24.6$, $p < .001$), and in the expected direction (note that the numeric biases for these verbs are not available).

Reanalysis of Dutch Data in Koornneef and van Berkum (2006)

Koornneef and van Berkum (2006) prepared an initial set of 116 Dutch verbs based on translations of English verbs used in previous research. Forty-five native speakers of Dutch (18–16 years old, $M = 22$; 23 female) completed sentence fragments of the form "John disappointed Paul because he…" in Dutch and then indicated to whom the pronoun *he* referred. The authors report 20 strongly subject-biased verbs and 20 strongly object-biased verbs derived from this set. Of these, 22 are emotion verbs: 12 experiencer-object and 10 experiencer-subject (Appendix H). This includes two verbs that take oblique objects and thus are not strictly transitive (*houden van*, *teleurstellen*).

All the experiencer-object verbs were more subject-biased ($M = 86\%$, $SE = 2\%$) than all of the experiencer-sub-
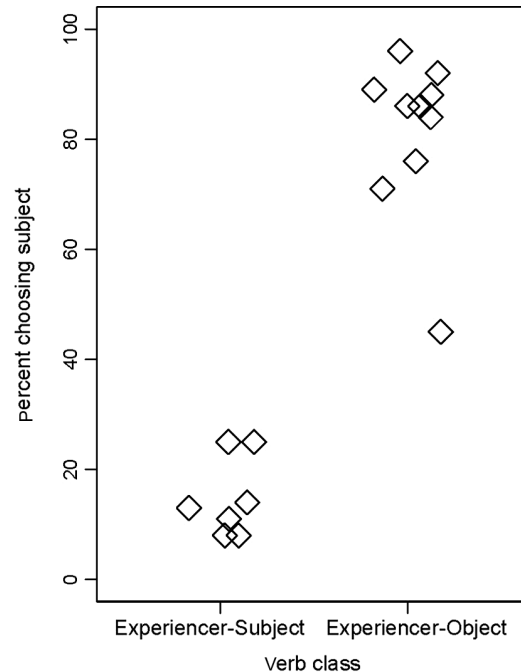
ject verbs ($M = 5\%$, $SE = 2\%$; $t(20) = 26.17$, $p < .001$; $d = 3.6$) (Figure 8), consistent with the pattern in the other languages.

Reanalysis of Italian Data in Mannetti and de Grada (1991)

Mannetti and de Grada (1991) selected 40 Italian verbs based on Semin & Fiedler's (1988) taxonomy, with 10 verbs in each category. Eighty participants (40 female) read the sentences of the form "John feared Michael because of the kind of person [he] is" and judged to whom the (null) pronoun referred. As in the Spanish study, the genders of the characters were manipulated within and between participants, and again there was no effect of this manipulation on judgments.

The authors present verb-by-verb results for a subset of the data: specifically the most-biased verbs in each category and all negatively or positively valenced verbs. These included 17 emotion verbs: 7 experiencer-subject and 10 experiencer-object (Appendix I).[7] All of the experiencer-object verbs were more subject-biased ($M = 81\%$, $SE = 5\%$) than all of the experiencer-subject verbs ($M = 15\%$, $SE = 3\%$; $t = 12.31$, $p < .001$, $d = 4.7$) (Figure 9), consistent with the pattern in the other languages.

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[7] One of the experiencer-object verbs – *piace a* – is arguably a dative-subject verb. This paper focuses primarily on canonically transitive verbs, but was included for completeness.

General Discussion

In English, Dutch, Spanish, Italian, Finnish, Russian, Japanese, and Mandarin, we find that experiencer-object emotion verbs (*frighten, surprise, anger*) are as a group consistently more subject-biased than experiencer-subject verbs (*like, hate, fear*). That is, in all these languages, there is a bias to resolve pronouns to the stimulus of the emotion, all else equal. This was found despite considerable linguistic and cultural diversity in the datasets, as well as methodological diversity in terms of how the data were collected.

Before considering the implications of this cross-linguistic consistency in implicit causality pronoun resolution biases for theories of implicit causality as well as for theories of language and cognition more generally, we first consider limitations in the dataset.

Limitations

The limitations come in several forms. We first address limitations that affect generalization and then address possible signs of variation between and within languages.

Limitations on Generalization

Only emotion verbs were investigated, and these were only investigated exhaustively in English. It does not necessarily follow that biases would be consistent for all verbs of all types. Expanding to other verbs requires either a systematic survey identifying cross-linguistic synonyms or the delineation of other verb classes. Hartshorne and Snedeker (in press) identify several such candidate verb classes in English; however, none of these have been as extensively studied by linguists and so the relevant criteria for identifying them are not yet as well developed. Similarly, although the eight languages profiled here represent a relatively broad first-pass investigation, they do not exhaust the range of existing (or possible) languages or cultures of Euroasia, much less Africa, the Americas, or Australia.

One should be careful, however, not to miss the forest for the caveatic trees. While the sample is not exhaustive, it is sufficiently large enough that the consistency observed is unlikely to be due to coincidence. Whether these findings generalize fully, there is a phenomenon here in need of explanation.

Inconsistencies in the Data

The careful reader will nonetheless notice that only in the smallest datasets – Dutch, Italian, and Mandarin – was there no overlap in the distributions. In the other five languages

there was at least one experiencer-object verb well within the range of object-biased experiencer-subject verbs, with 14–15 such verbs (approximately 5%) across the datasets.

While these apparent exceptions might weaken our claims about cross-linguistic consistency, there are several reasons not to take them at face value. At least some of these outliers are likely to be statistical aberrations due to chance; the fact that the outliers were nearly exclusively experiencer-object verbs – by far the more common of the two verb classes – is consistent with this possibility. Comparison of the Hartshorne and Snedeker (in press) and Ferstl et al. (2011) English data is also illustrative. The former had exactly one experiencer-object verb (*alienate*) that was less subject-biased than the most subject-biased experiencer-subject verb. In the Ferstl et al. results, it nonetheless displayed a reasonably strong subject-bias (70%). Similarly, none of the outlying experiencer-object verbs in the Ferstl et al. data were outliers in Hartshorne and Snedeker's data.

Second, at least some apparent variability may be due to polysemous verbs (verbs with two meanings): Consider that the bias for *Mary beat Sally because she...* may depend on whether the beating was at chess or with a stick. Exhaustive surveys of verb polysemy have been published for English only, and even in English the procedure eliminating such verbs was imperfect (see Hartshorne & Snedeker, in press, for a detailed discussion of the procedure).

Finally, it is possible and even likely that some verbs were simply misclassified; only in the case of English and Mandarin were the verb classifications based on extensive, independent research. For instance, in the case of Russian, one informant suggested that the two object-biased experiencer-object verbs (*stydila/humiliated, unizhala/shamed*) are true experiencer-object emotion verbs in perfective only; in the imperfective, they describe public actions on that do not necessarily result in psychological states on the part of the object, making them more like "judgment" verbs (*criticize, condemn*, etc.), which at least in English are object-biased (Greene & McKoon, 1995; Hartshorne & Snedeker, in press). Thus one might predict that these two verbs are object-biased in imperfective form but subject-biased in perfective form. Consultation with three native speakers was consistent with this possibility, but more systematic investigation of the type characterized by the English and Mandarin VerbNets is needed.[8]

Thus, while the few apparent exceptions prevent complete confidence that *all* experiencer-object verbs are more subject-biased than all experiencer-subject verbs, neither should they cast too much doubt on the proposition, either.

Does Strength of Bias Vary Across Languages?

In the data presented, some languages show a stronger dissociation between experiencer-subject and experiencer-object

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[8] It is interesting to note that six of the seven outlying verbs in the Ferstl et al. (2011) dataset were synonyms of *calm*. Likewise, one Spanish outlier was *calmar*. A Dutch synonym (*troosten*) appeared in the Dutch dataset and was object-biased but was not included in the present analyses because our informant declared it to not be an emotion verb. As previously noted, the English verbs were not as strongly object-biased when tested by Hartshorne and Snedeker (in press, Experiment 2), though some were borderline: *calm* (76% chose subject), *cheer* (47%), *comfort* (54%), *console* (51%), *pacify* (58%), and *reassures* (64%).

emotion verbs. In many cases, however, these are precisely those languages where the verbs were preselected for having strong biases (e.g., Italian and Dutch), complicating analyses. More systematic work will be needed in order to investigate possible subtle effects across languages.

Theoretical Implications

Below we consider the implications of these findings for theories of implicit causality, language, and cognition.

Implications for Implicit Causality Theory

The implications of the present results depend on the account of implicit causality.

Implicit Causality as an Arbitrary Feature

Garvey and colleagues' account, on which implicit causality bias is not tied to features of either the event or the verb itself, but rather is an independent lexical feature (Caramazza, Grober, Garvey, & Yates, 1977; Garvey & Caramazza, 1974; Garvey et al., 1974),[9] might be able to explain cross-linguistic consistency in implicit causality by reference to a design feature. Perhaps the linguistic system has no hard constraints on what may be the implicit cause of a given verb, but it happens that the world does. Though someone may coin a verb *gorp* where the implicit cause is the gorper, if it is the case that in the world it is in fact usually the gorpee that caused the event, the verb *gorp* will likely either die out or change meaning in order to better align language with reality.

Implicit Causality as a Cognitive Bias

If implicit causality is derived from biases in causal cognition (Brown, 1986; Brown & Fish, 1983a, 1983b; Rudolph, 2008), then the present results imply that these biases are themselves universal. The prediction, then, is that if one were to repeat the present study using nonlinguistic tests of cognitive biases, one would obtain the same results. This would constrain a recent line of work (see Nisbett, 2003), which suggests significant cross-cultural variation and causal cognition (the biases under consideration here have not been tested in this work).

This leaves the question of where these cognitive biases come from. Brown and Fish argue that they are innate, and so in principle could be detected in young infants. In contrast, Rudolph (2008) argues that the cognitive biases are learned: Children must notice, for each event type, whose participation is more distinctive (e.g., is it more unlikely for someone to frighten or be frightened?). This makes two predictions: the cognitive biases are learnable (for novel event-type *gorp*, show that it is the gorper's participation that is most distinctive, and people will develop the bias to assign causality to the gorper), and that the relevant statistics are the same in all cultures. While neither has been tested, we give an illustration of the type of data that would contradict the latter prediction: Stearns (2012) quotes a modern Russian adage that "a person who smiles a lot is either a fool or an American" (in fact, as Stearns notes, when McDonald's opened in Russia, it had to train its employees to smile). For Rudolph (2008) to be consistent with cross-cultural consistency in implicit causality biases, this type of situation should never be found, since taking these "data" at face value, Rudolph (2008) should conclude that a smiling event provides more information about the smiler in Russia and more information about the one smiled at in America, resulting in different cognitive biases.

Implicit Causality as Encoded Linguistic Semantics

If implicit causality pronoun resolution biases are derived from linguistic structures such as semantic roles (Crinean & Garnham, 2006; see also Arnold, 2001; Stevenson et al., 1994), then cross-linguistic consistency suggests that these semantic roles are universal, and that, more specifically, emotion verbs employ the same semantic roles across languages. This is consistent with a range of approaches on which semantic roles and many other linguistic structures are universal (for review, see Levin & Rappaport Hovav, 2005), and would provide a strong challenge to theories on which they are not (Evans & Levinson, 2009; Tomasello, 1992).

Null Pronouns

Several recent studies have suggested that in pro-drop languages there is a division of labor between overt and null (dropped) pronouns, with only the latter referring to the most salient/topical entity in the discourse – that is, null pronouns in pro-drop languages act like overt pronouns in languages which do not allow pro-drop (Alonso-Ovalle, Fernandez-Solera, Frazier, & Clifton, 2002; Carminati, 2002; Christianson & Cho, 2008; but see Ueno & Kehler, 2010). In contrast, overt pronouns in these languages refer to less salient entities. One would thus expect languages such as Spanish to show the opposite pronoun resolution biases for overt and null pronouns. Although we do not have data for overt and null pronouns in the same language, we do have data across languages, with the same results for null pronouns in Italian, Spanish, and Finnish and overt pronouns in Japanese, Mandarin, and Russian.[10]

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9   In an exploratory analysis they note some potential correlations between the implicit cause feature and a few other features but make no strong conclusions.

10   Carminati (personal communication) reports an unpublished self-paced study of implicit causality in Italian which did compare null and overt pronouns directly and found no difference.

In an interesting contrast, Ueno and Kehler (2010) asked Japanese participants to continue stories involving transfer-of-possession verbs (e.g., *John handed a book to Bill...*) When participants used overt pronouns, reference depended on the verb used – as it does in English (Ferretti, Rohde, Kehler, & Crutchley, 2009) – whereas null pronouns overwhelmingly referred to the subject (*John*). This, combined with the present results, suggests that the relationship between overt and null pronouns may be more complex than previously suspected.

Conclusion

Research on implicit causality has not resolved the question of what is the nature of the underlying causal representations: Proposals that the causal information is linguistically encoded or that it derives from biases in causal cognition have both proven sufficiently flexible to account for the main findings in the literature. This is perhaps because, as first noted by Rudolph and Forsterling (Rudolph & Forsterling, 1997a), research has focused on a small number of verbs in a small number of languages, and thus theories are under-constrained. Recently, this narrow focus has begun to broaden (Ferstl et al., 2011; Goikoetxea et al., 2008; Hartshorne & Snedeker, in press). The present paper follows this line, expanding not only the range of data but also the range of *phenomena* that must be accounted for: namely, cross-linguistic stability. These new findings, along with recent developments in other aspects of implicit causality, such as its time course in online processing (Cozjin, Commandeur, Vonk, & Noordman, 2011; Featherstone & Sturt, 2010; Pyykkönen & Järvikivi, 2010; Stewart, Pickering, & Sanford, 2000; Van Berkum, Koornneef, Otten, & Nieuwland, 2007) and the role of discourse structure (Crinean & Garnham, 2006; Kehler et al., 2008; Stevenson, Knott, Oberlander, & McDonald, 2000; Stevenson et al., 1994), should eventually help resolve questions about the underlying nature of the phenomenon. In the meantime, it puts increasingly tight constraints on existing theories – both theories of implicit causality and theories of language and cognition more broadly.

Acknowledgments

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Appendix A

Implicit Causality Biases for Japanese (Experiment 1)

Class	Verb	Translation	Subj%
exp-subj	shimapisu-ru	worry about	17%
exp-subj	kowagar-u	fear	17%
exp-subj	iyagar-u	get annoyed	17%
exp-subj	utagaw-u	doubt	33%
exp-subj	urayamashigar-u	envy	17%
exp-subj	omoshirogar-u	enjoy	33%
exp-subj	ayashim-u	suspect	0%
exp-subj	anado-ru	look down on	11%
exp-subj	higam-u	envy	44%
exp-subj	shoosansu-ru	praise	11%
exp-subj	anji-ru	be concerned about	44%
exp-subj	netam-u	envy	22%
exp-obj	shimpai-saseru	worry	78%
exp-obj	kowagar-aseru	frighten	78%
exp-obj	iyagar-aseru	annoy	22%
exp-obj	utagaw-aseru	make doubt	78%
exp-obj	urayamashigar-aseru	make envy	78%
exp-obj	omoshirogar-aseru	entertain	67%
exp-obj	ayashim-aseru	make suspicious	100%
exp-obj	anado-aseru	make look down on	67%
exp-obj	higam-aseru	make jealous	67%
exp-obj	shosan-saseru	make praise	83%
exp-obj	anji-saseru	concern	50%
exp-obj	netam-aseru	make jealous	100%

Appendix B

Implicit Causality Biases for Mandarin (Experiment 2)

Class	Verb	Translation	Subj%
exp-subj	xianmu	envy	2%
exp-subj	jidu	jealous of	5%
exp-subj	kelian	pity	5%
exp-subj	haipa	fear	8%
exp-subj	tongqing	sympathize with	12%
exp-subj	taoyan	loathe	12%
exp-subj	danxin	worry about	15%
exp-subj	danyou	concerned about	20%
exp-subj	guanxin	concerned about	22%
exp-obj	ciji	motivate	32%
exp-obj	anwei	console	39%
exp-obj	anfu	appease	41%
exp-obj	jinu	infuriate	46%
exp-obj	guli	encourage	49%
exp-obj	youhuo	tempt	51%
exp-obj	chunu	enrage	59%
exp-obj	jili	encourage	61%
exp-obj	kunrao	perplex	63%
exp-obj	guwu	encourage	66%
exp-obj	xiyin	attract	79%
other	xinren	trust	2%
other	zunjing	respect	2%
other	peifu	admire	5%
other	zenghen	hate	5%
other	chongbai	worship	7%
other	xinteng	adore	7%
other	choushi	view as hostile	12%
other	jingwei	revere	12%
other	huaiyi	suspect	14%
other	zunzhong	respect	14%
other	anlian	love secretly	16%
other	xiangnian	miss	24%
other	daonian	mourn	29%
other	ganji	appreciate	29%
other	huainian	think about	29%
other	baorong	forgive	37%
other	xiuru	humiliate	7%
other	biandi	devalue	8%
other	wuru	humiliate	10%
other	qifu	bully	12%
other	zanyang	exalt	15%
other	zhichi	support	17%
other	chaoxiao	ridicule	19%
other	weixie	threaten	22%
other	saorao	harass	29%
other	gouyin	tempt	49%
other	gufu	disappoint	61%
other	qipian	deceive	66%
other	shuofu	convince	73%
other	qifa	enlighten	83%

Appendix C

Implicit Causality Biases for Russian (Experiment 3a)

Class	Verb	Translation	Subj%
exp-subj	bojalas'	feared	21%
exp-subj	uvazhala	respected	21%
exp-subj	chtila	honored	21%
exp-subj	opasalas'	feared	24%
exp-subj	zhalela	regretted	24%
exp-subj	pochitala	esteemed	25%
exp-subj	prezirala	despised	25%
exp-subj	nedoljublivala	disliked	26%
exp-subj	nenavidela	hated	30%
exp-subj	sudila	judged	34%
exp-subj	obozhala	adored	35%
exp-subj	podozrevala	suspected	37%
exp-subj	idealizirovala	idealized	38%
exp-subj	ljubila	loved	40%
exp-subj	terpela	suffered	44%
exp-subj	hotela	wanted	45%
exp-subj	zhelala	wished	48%
exp-obj	stydila	shamed	22%
exp-obj	unizhala	humiliated	38%
exp-obj	uleshhala	buttered up	49%
exp-obj	muchila	tortured	51%
exp-obj	umilostivida	mollified	52%
exp-obj	zamuchivala	tortured	53%
exp-obj	zapugivala	intimidated	59%
exp-obj	pugala	frightened	59%
exp-obj	ogorchala	afflicted	65%
exp-obj	trevozhila	disturbed	65%
exp-obj	bespokoila	disturbed	67%
exp-obj	pechalila	saddened	67%
exp-obj	udruchala	depressed	68%
exp-obj	uzhasala	horrified	68%
exp-obj	voshishhala	admired	69%
exp-obj	interesovala	interested	71%
exp-obj	intrigovala	intrigued	73%
exp-obj	radovala	pleased	73%
exp-obj	ustrashala	frightened	75%
exp-obj	obeskurazhila	discouraged	80%
exp-obj	vdohnovljal	inspired	80%
exp-obj	udivljala	surprised	81%
exp-obj	oshelomljala	stunned	82%
other	vrazumljala	made listen to reason	52%
other	razubezhdala	dissuaded	58%
other	priznavala	recognized	32%
other	izvinjala	excused	33%
other	ozhidala	expected	47%
other	pomnila	remembered	47%
other	ponimala	understood	60%
other	revnovala	was jealous of	61%
other	zabyvala	forgot	64%
other	prevoshodila	surpassed	77%
other	ubezhdala	convinced	74%

Appendix D

Implicit Causality Biases for Russian (Experiment 3b)

Class	Verb	Translation	Subj%
exp-subj	obizhala	hurt	67%
exp-subj	pugala	frighten	78%
exp-subj	razvlekala	entertain	52%
exp-subj	stydila	shame	37%
exp-subj	uspokaivala	reassure	74%
exp-subj	uteshala	calm	56%
exp-obj	obidila	hurt	59%
exp-obj	napugala	frighten	67%
exp-obj	razvlekla	entertain	56%
exp-obj	pristydila	shame	56%
exp-obj	uspokoila	reassure	70%
exp-obj	uteshila	calm	67%
other	pouchala	teach	67%
other	preduprezhdala	warn	56%
other	prouchivala	teach	56%
other	ubezhdala	convince	78%
other	ugovarivala	persuade	67%
other	nezhila	pamper	48%
other	otvlekala	distract	63%
other	podkupala	corrupt	67%
other	donimala	weary	67%
other	pouchila	teach	41%
other	predupredila	warn	67%
other	ubedila	convince	67%
other	ugovarila	persuade	48%
other	razubedila	unconvince	74%
other	iznezhila	pamper	56%
other	otvlekla	distract	63%
other	podkupila	corrupt	63%
other	donjala	weary	70%

Appendix E

English Emotion Verbs from Ferstl et al. (2011)

Experiencer-Subject: abhorred, admired, adored, appreciated, believed, despised, detested, disdained, disliked, distrusted, dreaded, envied, esteemed, favoured, feared, forgot, hated, idolized, loathed, loved, mourned, pitied, prized, relished, resented, respected, revered, treasured, venerated, worshipped

Experiencer-Object: abashed, affected, affronted, aggravated, agitated, alarmed, alienated, amazed, amused, angered, appalled, appeased, astonished, astounded, baffled, beguiled, bewildered, bugged, calmed, captivated, charmed, cheered, comforted, confused, consoled, daunted, delighted, disappointed, discouraged, disgruntled, distracted, distressed, dumbfounded, enlightened, enlivened, enraged, enthralled, entranced, exasperated, excited, exhausted, exhilarated, fascinated, flabbergasted, frustrated, grieved,

haunted, incensed, infuriated, inspired, intimidated, intrigued, invigorated, irritated, jollified, maddened, mesmerised, mollified, nettled, pacified, peeved, plagued, reassured, relaxed, repelled, revitalized, scared, spooked, startled, surprised, tantalized, troubled, unnerved, unsettled, uplifted, upset, vexed, wearied, worried, wowed

Appendix F

Spanish Emotion Verbs from Goikoetxea et al. (2008)

Experiencer-Subject: admirar, agradecer, aguantar, confiar, considerar, despreciar, enamorar, envidiar, estimar, molestar, preferir, preocupar, querer, respetar, soportar, temer, valorar
Experiencer-Object: aburrir, afectar, alegrar, alterar, amenazar, animar, asombrar, asustar, calmar, conmover, desesperar, desmentir, distraer, entretener, estimular, fascinar, impresionar, inspirar, satisfacer, sorprender

Appendix G

Finnish Emotion Verbs from Pyykkönen and Järvikivi (2010)

Experiencer-Subject: epäillä, hämmästellä, ihailla, ihmetellä, inhota, kauhistella, kavahtaa, kummastella, oudoksua, pelätä, sääliä, surra, vihata, äimistellä, ällistellä
Experiencer-Object: hätkähtää, epäilyttää, hämmästyttää, hätkähdyttää, ihastuttaa, ihametyttää, inhottaa, kauhistuttaa, kavahduttaa, kummastuttaa, oudoksuttaa, pelottaa, säälittää, surettaa, vihastuttaa, äimistyttää, ällistyttää

Appendix H

Dutch Emotion Verbs from Koornneef and van Berkum (2006)

Experiencer-Subject: aanbidden, benijden, bewonderen, haten, houden van, minachten, respecteren, verafschuwen, vrezen, waarderen
Experiencer-Object: ergeren, fascineren, inspire, intimidate, irriteren, kwellen, storen, teleurstellen, verbazen, verontrusten, vervelen

Appendix I

Italian Emotion Verbs from Mannetti and de Grada (1991)

Experiencer-Subject: detesta, invidia, odia, rispetta, si fida, stima, teme
Experiencer-Object: affascina, annoia, delude, diverte, fa male, incoraggia, infastidisce, piace a, spaventa, stupisce