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Implicit Causality: A Comparison of English and Vietnamese Verbs

Abstract

In sequences like 'Lisa frightened/blamed Kate because she...', verbs influence the likelihood of subsequent pronouns referring to subjects or objects, an effect called implicit causality. In addition to its significance for theories of reference resolution, this effect is important for cognitive and socio-cultural research. A fundamental question has to do with the source of implicit causality effects and how they relate to verb classes (e.g. Stimulus-Experiencer). Furthermore, many researchers use implicit causality as a tool to investigate other aspects of pronoun interpretation. Crucially, this work requires access to pre-existing information about the subject-vs.-object biases of individual verbs. Large-scale studies provide public datasets for English and Spanish. However, lack of large public datasets for typologically-diverse languages is a serious limitation. It is problematic for practical reasons (it poses challenges for experiments on languages without accessible implicit causality norms) and theoretical reasons (it limits our ability to understand implicit causality effects). To address this, we conducted a large-scale study of 149 verbs in Vietnamese and provide a comparison between these Vietnamese verbs and their English equivalents revealing intriguing variations in their implicit causality biases. Crucially, this work creates a database which can serve as a tool for theoretical and practical applications of crosslinguistic research relating to implicit causality.

Implicit Causality: A Comparison of English and Vietnamese Verbs

Binh Ngo and Elsi Kaiser

1 Introduction

In everyday communication, language users are often confronted by the presence of multiple competing linguistic choices. The production and interpretation of different kind of referring expressions (e.g. *she, Mary, that girl*), for example, is a puzzle that has attracted much attention from both linguists and psychologists. In an example such as ‘Mary criticized Sally because she was rude’, the pronoun ‘she’ is ambiguous between ‘Mary’ and ‘Sally’. Why does the speaker choose to use ‘she’ instead of an unambiguous form (e.g. ‘Mary’, ‘Sally’)? How does the listener recognize the speaker’s intention despite the ambiguity?

Prior work has identified a number of factors that guide the production and interpretation of pronouns. These factors include the general notion of prominence/salience/accessibility (e.g. Givón 1983, Ariel 1990, Gundel, Hedberg, and Zacharski 1993) and more specific notions such as the grammatical and linear position of potential antecedents (e.g. Chafe 1976, Crawley and Stevenson 1990, Crawley, Stevenson and Kleinman 1994, Carminati 2002), structural parallelism (e.g. Smyth 1994, Chambers and Smyth 1998), thematic preference (e.g. Stevenson, Crawley and Kleinman 1994), and discourse coherence (e.g. Hobbs 1979, Kehler et al. 2008)

In the present paper, we focus specifically on how the semantics of preceding verbs influences the interpretation of subsequent pronouns, in particular a phenomenon called *implicit causality* (see Section 2). We report the results of a large-scale study on the effects of semantic verb biases in pronoun resolution in Vietnamese, a language whose pronoun resolution properties are under-researched. In addition to its significance for theories of reference resolution (e.g. Caramazza et al. 1977), the notion of implicit causality effect is also important for cognitive and socio-cultural research (e.g. Rudolph and Försterling 1997). A fundamental question has to do with the source of implicit causality effects (e.g. Hartshorne and Snedeker 2013) and how they relate to verb classes (e.g. Stimulus-Experiencer verbs, Agent-Patient verbs and so on). Furthermore, many researchers also use implicit causality as a tool to investigate other aspects of pronoun interpretation (e.g. Kehler et al. 2008, Fukumura and Van Gompel 2010).

Crucially, all this work requires access to pre-existing information about the particular referential biases of individual verbs. Large-scale studies provide public datasets for some languages, such as English (Ferstl et al. 2011; Hartshorne and Snedeker 2013) and Spanish (Goikoetxea et al. 2008). However, lack of large public datasets for typologically-diverse languages is a serious limitation for work on pronoun resolution in a broader typological context. This is problematic for practical as well as for theoretical reasons: It poses challenges for designing and analyzing experiments on languages without accessible implicit causality norms and it can potentially limit our ability to understand the source and nature of effects. To address these concerns, we conducted a large-scale study of over 100 different verbs in Vietnamese. The resulting database can serve as a tool for crosslinguistic research relating to implicit causality.

2 Implicit causality

It has been pointed out that when encountering sentences such as (1), English speakers have a strong preference to interpret the pronoun *she* in (1a) as Lisa and as Kate in (1b) (e.g. Caramazza et al. 1977, Garvey and Caramazza 1974). In other words, the verb plays a key role in guiding people’s interpretation of the pronoun in this kind of causal (‘X because Y’) frame. This phenomenon is called *implicit causality*.

- (1) a. Lisa frightened Kate because she... (she = Lisa)
 b. Lisa blamed Kate because she... (she = Kate)

It is worth noting that we are focusing here on clauses linked by a causal relation (signaled by *because* in (1)) – in other words, the pronoun refers to the cause of the frightening event or the

blaming event. Verbs' causal attributions guide pronoun assignment to the cause of the event (e.g. Ehrlich 1980).

Verbs' implicit causality is often described in terms of whether the verb biases a subsequent pronoun to be interpreted as referring to the preceding subject (subject bias) or preceding object (object bias). For instance, in the causal frame shown in (1), the verb *frighten* in (1a) tends result in the pronoun being interpreted as referring to the subject of the preceding main clause, Lisa. In contrast, *blame* in (1b) tends to result in the pronoun being interpreted as referring to Kate, the object of the main clause. Thus, *frighten* is a subject-biased verb (sometimes referred to as an IC-1 verb) and *blame* is an object-biased verb (sometimes referred to as an IC-2 verb).

It should be noted that even though implicit causality is often described in these terms, the bias itself should be thought of as a continuum rather than in absolute terms. Thus, verbs' implicit causality varies from strongly subject/object-biased to equi-biased (i.e. not strongly biased toward either subject nor object).

2.1 Taxonomies of implicit causality verbs

Since different verbs may differ drastically on their implicit causality biases, researchers have been very interested in finding a way to categorize them in order to help with predicting their biases. Two prominent taxonomies proposed in the literature are the *Revised Action-State Distinction* (Brown and Fish 1983b, Au 1986) and the *Linguistic Category Model* (Semin and Fiedler 1991). A detailed comparison of these two taxonomies and their implications is provided in Rudolph and Försterling (1997). In short, Rudolph and Försterling found that the Revised Action-State Distinction is a more straightforward taxonomy and it is also better than the Linguistic Category Model in capturing variance in causal attributions in verbs. In our work, we also use the Revised Action-State Distinction for verb categorization. Another advantage of using this taxonomy is that it is widely used in a large body of work and thus, it can help in drawing more direct comparisons between verbs in Vietnamese and in other languages.

To illustrate the four verb categories in the Revised Action-State Distinction, consider the examples in (2). As we can see in these examples, Agent-Patient (2a) and Experiencer-Stimulus (2c) verbs have a subject bias. In contrast, Agent-Evocator (2b) and Stimulus-Experiencer (2d) verbs exhibit an object bias.

- (2) a. *Agent-Patient*
Sally hit Mary because she... (subject bias: she = Sally)
- b. *Agent-Evocator*
Sally punished Mary because she... (object bias: she = Mary)
- c. *Experiencer-Stimulus*
Sally impressed Mary because she... (subject bias: she = Sally)
- d. *Stimulus-Experiencer*
Sally liked Mary because she... (object bias: she = Mary)

In the following sections, the Vietnamese verbs that we tested in the present work are also discussed with respect to these four verb categories.

One may wonder about the following: If verbs' implicit causality biases can be predicted using this taxonomy, why would we need to conduct an experiment to confirm these biases? There are at least three reasons that motivate this:

First, even though the taxonomy can help us predict the biases of a good number of verbs, it is not always the case that verbs' biases follow directly from the category membership. Let us take a look at example (3):

- (3) *Agent-Evocator*
- a. Sally praised Mary because she... (object bias: she = Mary)
- b. Sally apologized to Mary because she... (subject bias: she = Sally)

Despite the fact that both *praise* and *apologize* are Agent-Evocator verbs, they exhibit opposite biases: *Praise* is object-biased while *apologize* is subject-biased. Consequently, it is important to

examine individual verbs' behavior rather than assuming the bias from the taxonomy.

Second, even though studies have examined implicit causality in a number of languages, they have mostly focused on European languages (German: Fiedler 1978, Rudolph 1997, Spanish: Goikoetxea et al. 2008, Dutch: Sernin and Marsman 1994, Italian: Manetti and De Grada 1991), though there is some work on Chinese by Brown and Fish (1983a), as well as crosslinguistic work on emotion verbs in eight different languages by Hartshorne et al. (2013). In fact, Hartshorne et al. (2013) is one of the very few papers to investigate implicit causality from a broader crosslinguistic angle.

Third, there are very few existing studies that test a large number of verbs (e.g. English: Ferstl et al. 2011, Hartshorne and Snedeker 2013, Spanish: Goikoetxea et al. 2000), which limits the generalizations that can be drawn, and poses a challenge for designing experiments in languages without publicly accessible implicit-causality norms. For these reasons, it is important to create large databases about the implicit causality biases in typologically-diverse languages.

3 Experiment on Vietnamese implicit causality biases

In the current study, we tested over a hundred different verbs in Vietnamese to obtain information about each individual verbs' implicit causality bias. To examine the subject-/object-biased predictions with respect to verb class, we categorized the Vietnamese verb based on the Revised Action-State Distinction. Most importantly, we are interested in the crosslinguistic differences between English and Vietnamese verbs' implicit causality biases.

When presenting results comparing our data from Vietnamese to English implicit causality patterns, we use the English results from Ferstl et al. (2011). Since our study was designed with this kind of crosslinguistic comparison in mind, we only included those Vietnamese verbs that have direct English translation equivalents. Thus, although it may be the case that a verb in one language differs in some nuanced way from the 'same' verb in another language, we explicitly aimed to select a set of verbs with maximally similar translation equivalents in English and Vietnamese.

3.1 Participants

One hundred and sixty-three adult native speakers of Vietnamese participated in the experiment. None of the participants had lived outside Vietnam for more than six months.

3.2 Materials and design

Our design is based on the one used in Hartshorne and Snedeker's study (2013). Each target item consisted of two clauses connected with *vì* 'because', as shown in example (4). The first clause contained the implicit causality verb and two names (in subject and object position). The second clause started with a pronoun. The names in the first clause were both male or both female; thus, the pronoun at the start of the second clause is ambiguous. The lengths of the names in each item were matched so that they only differ by a maximum of one letter. Similar to Hartshorne and Snedeker' use of the nonce word *dax* (e.g. 'Sally frightens Mary because she is a dax'), we used the nonce word *đần tuê* in all of the items. Similar to *dax* in the original study by Hartshorne and Snedeker, *đần tuê* does not provide any semantic information and thus does not have any influence on how participants interpret the cause of the event. Since Vietnamese pronouns are derived from kinship terms denoting not only gender but also age, both old (4a) and young pronouns (4b) were used.

- (4) a. TrúC la HằNG vì bà áY/cô áY đắN tuê.
 TrúC scold HằNG because she_{OLD}/she_{YOUNG} đắN tuê
 'TrúC scolded HằNG because she is đắN tuê.'
 b. CôNG la NHậT vì ông áY/anh áY đắN tuê.
 CôNG scold NHậT because he_{OLD}/he_{YOUNG} đắN tuê
 'CôNG scolded NHậT because he was đắN tuê'

The verbs were divided into three lists. Each participant completed only one list of verbs. The presentation order of the verbs was pseudo-randomized so that no more than three verbs of the same

category (e.g. Agent-Patient) occurred in a row. Two pseudo-randomizations were used for each list. Eight catch trials were also added into each list. The catch trials used different gendered names (i.e. one male, one female); thus, the pronouns in the catch trials unambiguously indicated what the referent should be. An example of a catch trial is shown in (5) in which the pronoun *cô ấy* ‘she’ is unambiguously referred to the female noun *Thắm*.

- (5) Nghĩa quý mến Thắm vì cô ấy dẫn tuê.
 Nghĩa_{MALE} cherish Thắm_{FEMALE} because she_{YOUNG} dẫn tuê
 ‘Nghĩa cherished Thắm because she is dẫn tuê.’

3.3 Procedure

Participants were instructed to read sentences and answer questions that probed the referent of the pronoun, as exemplified in (6). Participants answered the questions in (6b) by writing in the answer. We did not provide pre-specified multiple-choice answers, in order to encourage careful reading of the sentences in the study. Participants’ answers indicate how they interpreted the critical pronoun. In what follows, we report the data in terms of the proportion of subject responses (i.e., on what percentage of trials did participants choose the subject of the preceding clause as the answer to the question/as the referent of the pronoun).

- (6) a. Trúc la Hằng vì cô ấy dẫn tuê.
 Trúc scold Hằng because she_{YOUNG} dẫn tuê
 ‘Trúc scolded Hằng because she is dẫn tuê.’
 b. QUESTION: Who is dẫn tuê? _____ [write down a name]

4 Results

In this section, we present the results for 149 Vietnamese verbs with regards to the four verb categories and the biases of their English equivalents from Ferstl et al.’s (2011) study.

4.1 Steps prior to data analysis

Prior to data analysis, we eliminated participants based on two criteria: (i) lack of variation (i.e. always replying with a subject name or always replying with an object name – which indicates that they were not paying attention to the semantics of the test items) and/or (ii) their performance on catch trials (i.e. whether they provided correct answers for at least 5 out of 8 catch trials). This process left us with a total of ninety-eight participants.

4.2 Results by verb class

Figure 1 below shows the percentages of subject responses for Vietnamese (from our experiment) and English (from Ferstl et al.), grouped by verb class. If we look at the overall averages (rightmost bars), collapsing across verb classes, we see that the average number of subject responses is very similar in English (42.7% subject choices) and Vietnamese (38.97% subject choices) – though numerically slightly higher in English. We used a Pearson correlation to assess the relationship between the verbs in the two languages, and find that, overall, the strength of the subject biases exhibited by English verbs and their Vietnamese counterparts are strongly correlated ($p < 0.001$).

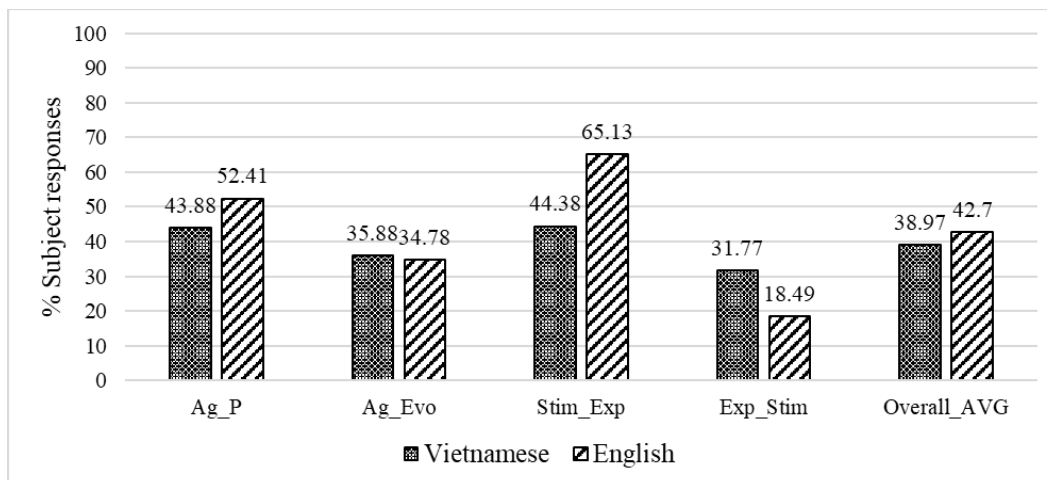


Figure 1. Percentages of subject responses for Vietnamese verbs (from our experiment) and English verbs (from Ferstl et al. 2011), grouped by verb class (n = 149 verbs).

But what happens once we look more closely at the four verb classes? Figure 1 shows that the overall average subject-bias strengths in Vietnamese and English are very similar for Agent-Evocator verbs (35.88% in Vietnamese vs. 34.87% in English, i.e., just over 1% difference between the two languages) and quite similar for Agent-Patient verbs as well (43.88% vs. 52.41%, i.e., less than 10% difference). The difference is a bit larger with Experiencer-Stimulus verbs (31.77% vs. 18.49%, less than 14% difference), and largest with Stimulus-Experiencer verbs, which differ by 20% between English and Vietnamese (44.38% vs. 65.13%).

4.3 Looking more closely at individual verbs within each class

To assess these differences more closely, on the level of individual verbs, in Figure 2, we have plotted, for each verb, the strength of that verb’s subject bias in Vietnamese (between 0 and 100%) on the x-axis, and the strength of each verb’s subject bias in English (between 0 and 100%) on the y-axis. This allows us to look at the relative subject bias strengths for each individual verb in each of the four verb groups in the two languages.

As can be seen in Figure 2, individual verbs in the Agent-Evocator, Agent-Patient and Experiencer-Stimulus classes in the two languages pattern quite similarly: Although the correlation is not perfect, we nevertheless see that often, when a verb has a strong (or weak) subject bias in one language, it also has a strong (or weak) subject bias in the other language. These observations are confirmed by Pearson correlations (Agent-Evocator: $p < 0.01$, Agent-Patient: $p < 0.05$, Experiencer-Stimulus: $p < 0.01$).

However, no clear correlation is found with Stimulus-Experiencer verbs ($p > 0.1$), which fits with the visual pattern observable in the scatterplot in Figure 2. Overall, English verbs in this class tend to be clustered fairly high (on the y-axis) – indicating a subject preference, whereas Vietnamese verbs tend to cluster more in the middle (on the x-axis) – indicating absence of a clear subject or object preference. Indeed, as we saw in Figure 1, English Stimulus-Experiencer verbs elicit 65% *subject* responses on average, whereas Vietnamese Stimulus-Experiencer verbs elicit 55.6% *object* responses (and 44.38% subject responses).

In sum, then, it appears that while three out of the four verb classes pattern quite similarly in English and Vietnamese in terms of the strength of their subject preference in implicit causality contexts, many Stimulus-Experiencer verbs in English have a stronger subject bias than their Vietnamese counterparts.

Given this observation, one may start to wonder whether the Stimulus-Experiencer and Experiencer-Stimulus verb groups in Vietnamese are distinct, if neither has a clear subject preference. Further analyses show that the object bias is nevertheless stronger with Vietnamese Experiencer-Stimulus verbs than Stimulus-Experiencer verbs ($p < 0.01$), suggesting that these categories are still

distinct in Vietnamese.

4.4 Age and gender information marked on pronouns

As discussed in Section 3.2, we tested both male and female pronouns. In addition, because Vietnamese marks age on pronouns, we tested both pronouns used to refer to old people and pronouns used to refer to young people. As expected, results from paired t-tests show that information about age and gender encoded on kinterm pronouns has no effect on subject preference strength.

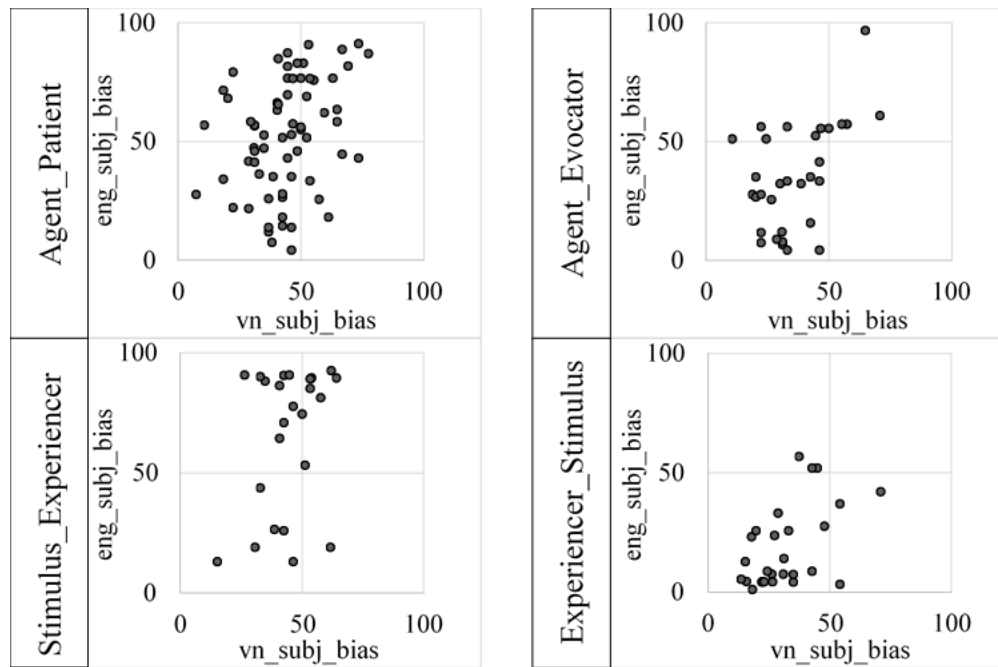


Figure 2. Correlations between English and Vietnamese verbs by verb class based on the percentage of subject responses.

5 Discussion and conclusion

We conducted a large-scale study on 149 verbs in Vietnamese, in order to obtain information about verb-specific implicit causality biases in a language where pronoun resolution is under-researched. Information about the resulting database is available from the first author.

Our study yields three main results. First, for the most part, our results suggest that English and Vietnamese implicit causality verbs are similar in terms of the referential biases that they elicit. In this regard, our work is compatible with Hartshorne et al.'s (2013) eight-language study on experiencer verbs in different languages. Although Hartshorne et al. did not look at Vietnamese and only considered experiencer verbs, both their results and our results point to overarching crosslinguistic similarities.

Second, despite these overarching similarities, both Hartshorne et al (2013)'s data and our data suggest that languages *can* differ in terms of how strongly subject-position experiencers and object-position experiencers influence implicit causality biases. In our dataset, once we look closely at each verb category and at individual verbs within each category, we see that even though Agent-Patient, Agent-Evocator and Experiencer-Stimulus verbs in English and Vietnamese behave quite similarly, Stimulus-Experiencer verbs appear to be more divergent: Stimulus-Experiencer verbs in English (based on data from Ferstl et al.) exhibit a stronger subject bias than Stimulus-Experiencer verbs in Vietnamese – which are more split between subject and object choices. Numerically, both Stimulus-Experiencer and Experiencer-Stimulus verbs in Vietnamese have an object bias, but the object bias

with Experiencer-Stimulus is significantly stronger. A deeper understanding of the reasons for this crosslinguistic difference is an important question for future work.

Third, our results – when compared to the data from Ferstl et al. (2011) – suggest that overall, English implicit causality verbs exhibit a stronger subject bias than their Vietnamese counterparts. (Recall that we focused on using verbs that have maximally similar translation equivalents). This is intriguing given earlier results by Ngo (2019, see also Ngo and Kaiser 2018) showing that Vietnamese pronouns appear to exhibit a stronger object bias (in other words, a weaker subject bias) than might be expected given prior crosslinguistic work. As a whole, these results highlight the importance of broadening the empirical basis of psycholinguistic work on reference resolution to a broader set of languages.

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