

Implicit causality: A comparison between English and Vietnamese verbs

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Implicit causality (IC, Garvey/Caramazza'74) is an effect of verbs influencing the bias of pronoun interpretation. In 'because' sequences such as (1), *she* is interpreted as the subject in (1a) and the object in (1b), which marks the cause of the event depicting by the verbs.

Implicit causality plays a key role in reference resolution (e.g. Caramazza et al.'77; Kehler/Rohde'13; Hartshorne/Snedeker'13). Consequently, an understanding of the extent and generalizability of IC effects is necessary for models of reference resolution. IC effects are also used in interdisciplinary research on cognitive and socio-cultural topics (Rudolph/ Försterling'97). Crucially, all of these studies require *access to pre-existing information about the subject vs. object IC biases of individual verbs*. However, (i) the number of large-scale studies on verb implicit causality is limited, and (ii) most existing publicly available datasets are for English (Ferstl et al.'11; Hartshorne/Snedeker'13) or other widely-spoken European languages (e.g. Dutch: Sernin/Marsman'94; German: Rudolph'97; Spanish: Goikoetxea et al.'08). The lack of large public datasets of IC patterns for typologically diverse languages (i) poses severe challenges for experiments on languages without accessible IC norms, and (ii) it limits our ability to understand the crosslinguistic generalizability IC effects (but see Hartshorne et al.'13). To address this, we conducted a large-scale study of 149 verbs in Vietnamese (an Austroasiatic language).

Data collection: Following the methodology of Hartshorne/Snedeker'13 on English, we used frames like ex.(2) with nonce words to avoid additional semantic biases. Ninety-eight Vietnamese native speakers (in Vietnam) read sentences and answered questions (2a-b). Each person saw multiple items but only saw each verb once. Since Vietnamese pronouns are derived from *kinterms* (e.g. *anh* lit. 'older brother'/he; *cô* lit. 'father's sister'/she), we tested both *young and old* pronominal forms. Each sentence consists of two male or two female names, so both subject and object are possible antecedents for the pronoun.

In addition to database creation, we test the crosslinguistic generalizability of IC effects, in particular their relation to verb class. Prior work suggests that IC bias can be predicted by verb class (e.g. Ferstl et al.'11; Goikoetxea et al.'08; cf. Hartshorne/Snedeker'13). We test whether IC verbs in Vietnamese and English (Ferstl et al.'11) behave similarly relative to verb class (Agent-Patient, Agent-Evocator, Stimulus-Experiencer, Experiencer-Stimulus). (Vietnamese *kinterm* pronouns carry information about age and gender, but we do not expect pronoun type effects, because we purposefully used gender-matched names that do not reflect age or social standing.)

Results: Table 2 shows percentages of subject responses for Vietnamese and English, by verb class. Collapsing across verb classes, we find a correlation between the strength of the subject bias of individual Vietnamese and English IC verbs ($p < 0.001$), though the overall subject bias is stronger in English. **By verb class:** The subject biases of Agent-Patient, Agent-Evocator and Exp-Stim verbs in English and Vietnamese are correlated (Pearson correlation: $p's < 0.05$, Fig.1). However, there is no correlation with Stim-Exp verbs (Eng 65% subj; Vnm 55.6% obj). (Vietnamese Exp-Stim verbs have a stronger object bias than Stim-Exp, $p < 0.01$; these classes are still distinct). Thus, although both languages are sensitive to the presence of the Stimulus, the IC bias differs crosslinguistically for the Stim-Exp class, to the point of flipping from a subject preference (Eng) to an object preference (Vnm). These findings diverge from Hartshorne et al.'13 who found a crosslinguistically-consistent subject preference in this verb class. Our results suggest that semantic verb class does relate to a verb's IC bias, but we also identify previously overlooked crosslinguistic variation in the behavior of the Stim-Exp verbs in particular. (As expected, age and gender of *kinterm* pronouns have no effect on subject bias, $p's > 0.2$).

Our work highlights the importance of language-specific IC norms—rather than assuming crosslinguistic generalizability—and provides a database for future experiments. Given our findings that Stimulus-Experiencer verbs vary across languages, these results also open the door for future work on potential socio-cultural effects on implicit causality.

Examples		
(1)	(a) Lisa <u>frightened</u> Kate because she _{Lisa} (b) Lisa <u>blamed</u> Kate because she _{Kate} ...	[to frighten: subject bias] [to blame: object bias]
(2)	(a) <i>Trúc la Hằng vì cô ấy dẫn tuê</i> Trúc scolded Hằng because she is dẫn tuê. (b) QUESTION: Who is <u>dẫn tuê</u> ? _____	[<i>dẫn tuê</i> is a nonce word] [write down a name]

Table 1. Example sentences.

verb class	% subject responses	
	Vietnamese	English
Agent_Patient (e.g. debate, fight)	43.88	52.41
Agent_Evocator (e.g. compliment, criticize)	35.88	34.78
Stimulus_Experiencer (e.g. console, insult)	44.38	65.13
Experiencer_Stimulus (e.g. trust, cherish)	31.77	18.49
Overall average	38.97	42.7

Table 2. Mean % of subject responses for English and Vietnamese verbs in the four classes.

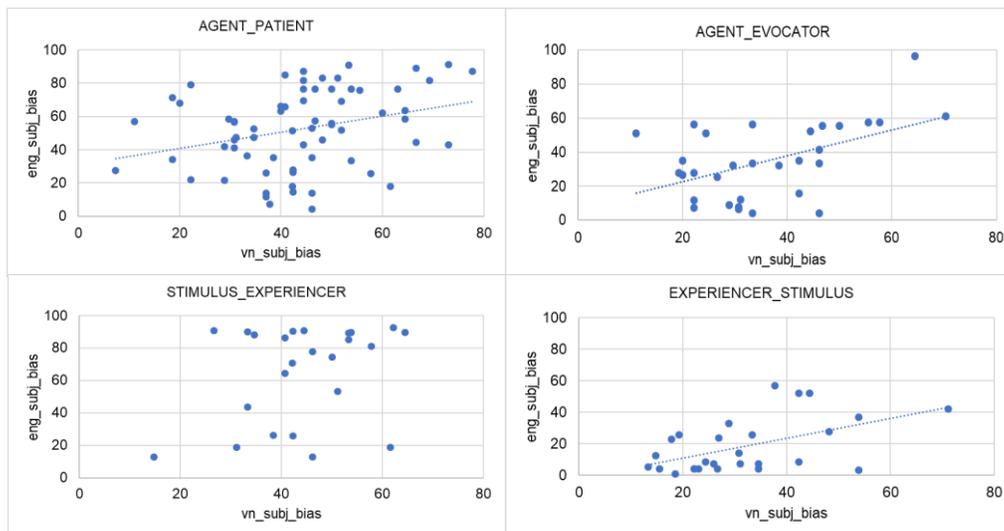


Figure 1. Scatterplots showing the relation between the strength of the subject bias of Vietnamese (vn, x-axis) verbs and English (eng, y-axis) verbs in each verb class. (Each dot represents one verb. Vietnamese verbs are matched with the closest English translation equivalents from in Ferstl et al.'11).

References: Garvey/Caramazza. (1974). Implicit causality in verbs. || Caramazza et al. (1977). Comprehension of anaphoric pronouns. || Ferstl et al. (2011). Implicit causality bias in English: A corpus of 300 verbs. || Goikoetxea et al. (2008). Normative study of the implicit causality of 100 interpersonal verbs in Spanish. || Hartshorne et al. (2013). Are implicit causality pronoun resolution biases consistent across languages and cultures? || Hartshorne/Snedeker. (2013). Verb argument structure predicts implicit causality: The advantages of finer-grained semantics. || Kehler/Rohde (2013). A probabilistic reconciliation of coherence-driven and centering-driven theories of pronoun interpretation. || Rudolph. (1997). Implicit Verb Causality: Verbal Schemas and Covariation Information. || Rudolph/Försterling. (1997). The psychological causality implicit in verbs: a review. || Semin/Marsman. (1994). Multiple inference-inviting properties of interpersonal verbs: Event instigation, dispositional inference, & implicit causality. ||