



The Production and Comprehension of Expletive Negation across Languages

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Introduction

- Expletive negation (EN):** a negator in a complement clause of a selecting word (**EN trigger**) does not change the meaning of the proposition that contains it.

(1) Catalan (Espinal, 2000: 54)

<i>Em</i>	<i>temo</i>	<i>que</i>	<i>no</i>	<i>escullin</i>	<i>nou</i>	<i>director.</i>
me	I.fear	that	NEG	elect.SBJV	new	director

'I'm afraid that a new director would be elected.' (*no*: EN, *temo*: EN trigger)

- Jin & Koenig (in press) investigated EN in a 722 language (250 genera) sample:
 - EN occurs in 74 languages (37 genera) (probably many more).
 - EN triggers overlap across languages
 - All triggers found in the 74 languages are listed in Jin & Koenig's (2019) study of EN triggers in French and Mandarin
- Research question:** What explains the widespread occurrence of EN and similarity of triggers, when EN is "illogical"?

A production model of EN and its predictions

- Jin & Koenig's (2019, in press) proposed a production model of EN:
 - An EN trigger entails the opposite of its complement proposition (e.g., *fear* in 'I fear it will rain' entails 'I want it **not** to rain').
 - There is a concurrent activation of the intended proposition p and its dual $\neg p$.
 - Because the activation of p competes with that of $\neg p$, EN sometimes is erroneously produced.
 - EN starts as a speech error, but can get highly entrenched and even grammaticalized.
 - Degree of entrenchment is both trigger-dependent and language-dependent.

Predictions from the model:

- The same range of EN-triggers collected from French and Mandarin should trigger EN across languages (including in languages where EN is believed not to exist, e.g., English).
- Speakers can understand a negator in the scope of an EN-trigger expletively because EN-triggers activate both p and $\neg p$;
- The more frequent a negator is produced expletively in the scope of an EN-trigger, the more likely a speaker is to interpret expletively a new occurrence of that negator for that trigger.

A corpus study of English EN: testing Prediction 1

- We conducted a detailed corpus study of unrehearsed English speech data via Google searches as Horn (2010) pointed out that EN sporadically occurs in English *parole*. We used consistent but limited search patterns (see Table 1).

Results:

- The same range of EN-triggers trigger EN in English as in French and Mandarin. The percentage of EN interpretation varies from 0% to 100% with a mean of 28.34%
- This result confirms Jin & Koenig's claim that entrenchment is a property of individual triggers for particular languages.
- No EN examples for ALMOST, DIFFICULT, IMPOSSIBLE, HIDE and DELAY for the search patterns we used, but with other search patterns, examples of EN could be found for all English translations of French and Mandarin triggers. Prediction 1 is confirmed.

Table 1: Search strings used for each potential English EN-trigger

Trigger	Search string	# of relevant hits	# of EN uses	% of EN uses
ALMOST	"almost don't"	204	0	0.00%
DIFFICULT	"difficult not to"	210	0	0.00%
HIDE	"hide that <i>pronoun</i> don't"	133	0	0.00%
IMPOSSIBLE	"impossible that <i>pronoun</i> don't"	134	0	0.00%
UNLESS	"unless <i>pronoun</i> don't"	670	17	2.54%
TOO...TO	"too exhausted/short/happy/thrilled/scared to not"	252	11	4.37%
FEAR	"fear that <i>pronoun</i> don't"	151	7	4.64%
FORGET	"forget not to"	137	10	7.30%
REFUSE	"refuse not"	144	12	8.33%
BEFORE	"before <i>pronoun</i> don't"	35	3	8.57%
AVOID	"avoid not"	45	9	20.00%
RARELY	"rarely don't"	110	22	20.00%
CANNOT WAIT	"cannot wait not to"	87	18	20.69%
ADVISE AGAINST	"advise against not"	113	26	23.01%
PREVENT	"prevent <i>pronoun</i> from not"	490	187	38.16%
STOP	"stop/stops/stopped not"	13	5	38.46%
DENY	"deny that <i>pronoun</i> don't"	52	29	55.77%
SINCE	"since <i>pronoun</i> haven't"	25	16	64.00%
WITHOUT	"without <i>pronoun</i> not"	29	19	65.52%
THAN	"than <i>pronoun</i> never"	36	29	80.56%
REGRET	"regret that <i>pronoun</i> shouldn't"	21	21	100.00%
COMPLAIN	"complain that <i>pronoun</i> shouldn't"	323	323	100.00%
BARELY	"couldn't barely"	181	181	100.00%
DESPAIR	"despair/despairs/despaired of not"	103	103	100.00%
DELAY	"delay/delays/delayed not"	0	0	NA

A comprehension experiment on English EN: testing Predictions 2 & 3

- We designed a semantic Stroop-like comprehension experiment for EN in English.
- Participants:** 280 participants who are native speakers of English were recruited from Amazon Mechanical Turk and finished the experiment on Ibex Farm.
- Procedures:** Participants read 60 2-3 sentence paragraphs and their 1 sentence continuations (target sentences) and judged whether the continuation was logically consistent with the paragraph they just read (see stimulus set in Table 2). Whether a continuation that contained an EN-trigger was judged consistent or not depended on whether the negator was interpreted logically or expletively. Both participants' accuracy and decision latencies were measured.
- Prediction:** If a negator in the scope of EN-triggers is only interpreted logically, people should be equally fast and make the same number of "logical errors" in the EN-trigger and non-EN-trigger conditions. But if the negator in the scope of EN-triggers can be interpreted both expletively and logically, people should be slower and make more "logical errors" in the EN-trigger than non-EN-trigger conditions since the expletive interpretation of *not* should interfere with its logical interpretation.

Table 2. A stimulus set

Condition	Paragraph	Continuation
Non-EN-trigger + logically inconsistent negation	I used to be a strict vegetarian. Last year, I was diagnosed with iron-deficiency anemia, a disease caused by not eating enough meat. My doctor strongly recommended that I eat meat.	So I started not eating meat.
EN-trigger + logically inconsistent negation	After learning that being vegan can prevent the exploitation of animals and promote a greener life on our planet, I decided to become vegan.	So I quit not eating meat.
Non-EN-trigger + logically consistent negation	After learning that being vegan can prevent the exploitation of animals and promote a greener life on our planet, I decided to become vegan.	So I started not eating meat.
EN-trigger + logically consistent negation	I used to be a strict vegetarian. Last year, I was diagnosed with iron-deficiency anemia, a disease caused by not eating enough meat. My doctor strongly recommended that I eat meat.	So I quit not eating meat.

Results:

- Participants made more logical errors in the EN-trigger conditions than the non-EN-trigger conditions (77.5% vs. 92.6%) (significant effect of Trigger; $\beta = -1.48$, $SE = 0.26$, $p < .001$).

- Participants took longer to respond in the EN-trigger conditions than the non-EN-trigger conditions (5673 ms vs. 3930 ms) (significant effect of Trigger; $\beta = 1796.53$, $SE = 296.27$, $p < .001$).
- Native speakers of English understand a negator in the scope of an EN-trigger both expletively and logically: Prediction 2 is confirmed.
- A correlation test showed that the more times a negator is produced expletively for a particular trigger, the more likely a participant was to make logical errors when judging target sentences ($r = .66$, $p < .01$). Prediction 3 is confirmed.

A comprehension experiment on Mandarin EN

- We translated the English stimuli to Mandarin and ran the same experiment in Mandarin.
- Participants: 202 participants who are native speakers of Mandarin were recruited from a Chinese crowdsourcing company Basic Finder and finished the experiment on Ibex Farm.
- We predicted Mandarin speakers would interpret negators more expletively after EN triggers than English speakers, as EN is more entrenched in Mandarin.

Results:

- Mandarin participants made more logical errors in the EN-trigger conditions than the non-EN-trigger conditions (41.5% vs. 90.3%) (significant effect of Trigger, $\beta = -2.88$, $SE = 0.35$, $p < .001$, as well as Consistency ($\beta = -0.45$, $SE = 0.09$, $p < .001$).
- Participants took marginally longer time to respond in the EN-trigger conditions than the non-EN-trigger conditions (5972 ms vs. 5163 ms) (marginal effect of Trigger, $\beta = 788.77$, $SE = 422.08$, $p = .07$, and a significant effect of Consistency, $\beta = -452.26$, $SE = 219.30$, $p = .04$).
- Mandarin speakers interpret expletively negators in the complement of EN triggers more frequently than English speakers did (significant interaction between language and triggering conditions for both logical accuracy, $\beta = -1.42$, $SE = 0.15$, $p < .001$, and response time, $\beta = -834.11$, $SE = 260.41$, $p = .001$).
- Our prediction that if expletive negation is more entrenched in a language, comprehenders will more frequently interpret expletively negators in the complement of EN triggers is confirmed.
- A correlation test showed that Prediction 3 also holds in Mandarin: the more times a negator is produced expletively for a particular trigger, the more likely a participant was to make logical errors when judging target sentences ($r = .75$, $p < .01$).

Discussion

- There is indeed some "universality" to the occurrence of expletive negation across languages: EN occurs in the same contexts in English (as well as Arabic, Burmese, and Zarma-Sonrai) as they do in French or Mandarin.
- The studies we report on support Jin & Koenig's overall hypothesis that recurring "illogism" in natural languages must be rooted in some universal properties (semantic properties of EN triggers and language production mechanisms).
- Comprehension of EN mirrors its production: comprehenders' expletive interpretation of a negator correlates with its frequency of occurrence in our English and Mandarin corpora.
- Results cannot be due to the difficulty of processing double negation sentences as (1) our results remain unchanged if the three triggers whose lexical meaning include a negation (IMPOSSIBLE, UNLESS, WITHOUT) are removed and (2) a double negation explanation does not account for differences in accuracy and RT across triggers as well as the correlation between logical accuracy in comprehension and percentage of EN occurrence in corpus.

References

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