Spanish Neg-raising: Always in the mood for Neg-raising, sometimes in the mood for NPIs

BACKGROUND. So-called Neg-Raising (NR) predicates like *creer* 'believe', when negated, give rise to two interesting effects: **(a)** they can be interpreted as if negation were in the embedded clause (**NR inference**) and **(b)** they license strict NPIs like *en meses* 'in months' and punctual *hasta las siete* 'until seven' in the embedded clause (**NPI-licensing**), as in (1) (Lakoff, 1969; Horn, 1978; Gajewski, 2007). Non-NR predicates like *asegurar* 'assure' do not give rise to these effects.

(1) María no cree [que el tren llegue hasta las siete]
Mary not believe that the train arrives$_{SUBJ}$ until the seven
$\rightsquigarrow$ 'Mary believes the train won't arrive until seven' (NR)

However, there is a debate in the literature on how the mood of the embedded complement impacts these two effects in Spanish. On the one hand, it has been long observed that indicative (IND) blocks the licensing of strict NPIs, and this has been used as evidence for the claim that the NR inference is blocked too (Rivero, 1971; Harrington & Pérez-Leroux, 2016; a.o.), see (2). On the other hand, a few have claimed that the NR inference is still available with IND mood (Bolinger, 1968; Fignoni, 1982; Siegel, 2009); but, to the best of our knowledge, they make no mention of whether, in those cases, strict NPIs are also licensed. In fact, given that certain interveners disrupt the licensing of NPIs in general (Homer, 2008; Gajewski, 2011), it might be that IND mood in Spanish disrupts strict NPI-licensing even when the NR inference obtains. This leads to the three alternative hypotheses in (3):

(2) *?María no cree [que el tren llega hasta las siete] (?NR)
Mary not believe that the train arrives$_{IND}$ until the seven

(3) a. **Hyp A**: IND blocks both the NR inference and the licensing of strict NPIs.
b. **Hyp B**: IND allows both for the NR inference and for the licensing of strict NPIs.
c. **Hyp C**: IND allows for the NR inference but blocks the licensing of strict NPIs.

In this paper, we experimentally test these hypotheses, leading to evidence for **Hyp C**.

EXPERIMENTAL DESIGN. We ran a 2x3 study with two simultaneous experiments comparing indicative to subjunctive mood (IND vs. SUBJ) in three sentence types: with a non-NR predicate, with a NR predicate, and with a NR predicate and a strict NPI (NNR vs. NR vs. NR+NPI), see (4). We tested their acceptability on a 1-7 Likert scale (**exp1**) and their ability to convey a NR interpretation (**exp2**). Participants were first asked how acceptable they found the sentence, and, if they rated the sentence as 4 or higher, they were asked whether or not the sentence communicated the NR interpretation ("yes"/"no" response). The materials included 36 critical items using two strict NPIs, *until* and *in years/months*, and six NNR and six NR predicates, all split equally among the predicates and counterbalanced across participants following a Latin Square Design. There were 12 filler items as well as four attention check trials spaced evenly throughout the experimental items. Native Spanish speakers of Peninsular Spanish (n=48) were recruited in Prolific to participate in the experiment, which was implemented using PCIbex (Zehr and Schwarz, 2018).

(4) (Translated version of an example item set)
a. John didn't know that Valeria had(IND/SUBJ) visited the museum that year. (NNR)
b. John didn't believe that Valeria had(IND/SUBJ) visited the museum that year. (NR)
c. John didn't believe that Valeria had(IND/SUBJ) visited the museum in years. (NR+NPI)

Q: *On a scale of 1 to 7, how acceptable does this sentence sound to you?*
Q: *To the extent that the sentence is acceptable, can it have the following interpretation?*
Interpretation: John (knew/believed) that Valeria didn't visit the museum (that year/in years).

RESULTS. For experiment 1, a linear-mixed effects regression model with Acceptability Rating (1-7) as dependent variable and Mood and Sentence Type as independent variables was run in R using the packages lme4 and lmerTest. Participants and items were added as crossed random effects. The model indicated a main effect of both Mood ($p<.0001$) and Sentence Type ($p<.0001$) and, importantly, an interaction between the two (χ^2=31.48, $p<.0001$). Additional post-hoc analysis was conducted using the emmeans()-function to investigate the nature of the interaction. The overall results showed that **(i)** although constructions with NPIs were generally less grammatical than those without NPIs in both IND ($p<.0001$) and SUBJ ($p<.0001$), the effect was larger within IND, and crucially that **(ii) strict NPIs with IND were less grammatical than with SUBJ** ("4"vs."6", $p<.0001$). The raw data are plotted in the box-plot in Fig 1.

For experiment 2, a mixed-effects logistic regression model was run with "yes"/"no" response as dependent variable with the same independent variables Mood and Sentence Type (reference level: NR). The model indicated a main effect of Sentence Type ($p<0.0001$) but no effect of Mood ($p=0.52$) and no interaction ($p=0.29$), thus indicating that **(iii) IND does not block the NR inference**. We then removed Mood as a main effect and reran the model with only Sentence Type. The results indicated that **(iv)**, though the NR constructions were indeed usually interpreted with NR interpretations, the constructions with NPIs produced slightly fewer NR interpretations than those without NPIs. These data are shown in Fig 2 with corresponding confidence intervals.

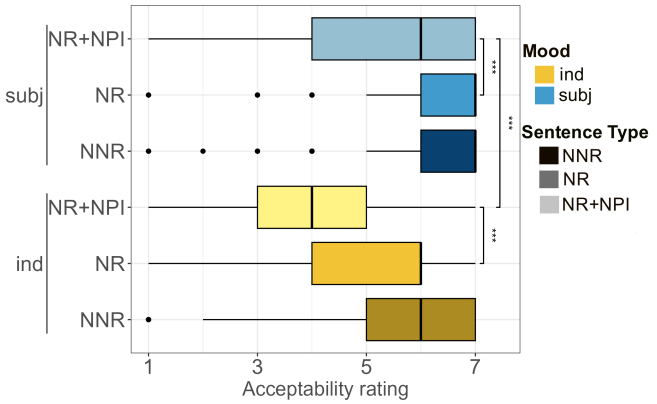

Figure 1: Median acceptability ratings.

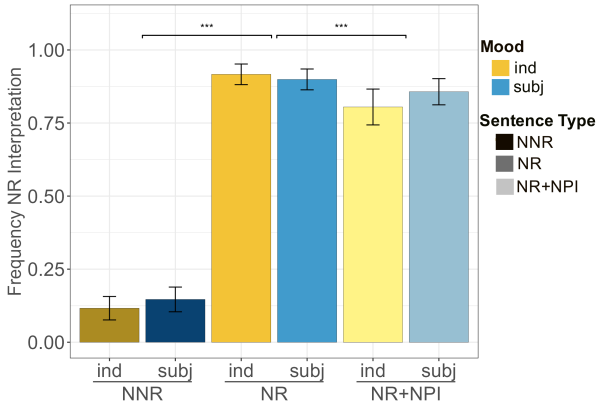

Figure 2: Mean frequency of NR interpretations.

DISCUSSION. Result **(iii)** that IND does not block the NR inference excludes **Hyp A**. Further, result **(ii)** that strict NPIs are less grammatical with IND than with SUBJ argues against **Hyp B**. Result **(i)** also militates against **Hyp B**: while sentences containing a strict NPI seem to involve an extra "tax" compared to their non-NPI counterparts, this "tax" is more substantial with IND (2-pt median difference) than with SUBJ (1-pt median difference). Finally, **Hyp C** correctly predicts the combined results from experiments 1 and 2. Two other results are of interest. Result **(i)** on the additional "tax" of strict NPIs might indicate a potential processing cost from the licensing of NPIs which could be further explored. Result **(iv)** that NR constructions with NPIs produced fewer NR interpretations, even if only slightly, is surprising for all current analyses of NR and strict NPIs and calls for additional investigation.

CONCLUSION. Our results controlling for mood in Spanish show that, contra common practice, the (un)grammaticality of strict NPIs should not be used as an indication of the NR inference.

SELECTED REFS. Bolinger, D. 1968. Postposed main phrases: an English rule for the Romance subjunctive. *CJL*14. • Gajewski, J. R. 2011. Licensing strong NPIs. *NLS*19. • Homer, V. 2008. Disruption of NPI licensing: The case of presupposition. *SALT*18. • Horn, L. R. 1978. Remarks on neg-raising. In *Pragmatics*. • Lakoff, R. 1969. A syntactic argument for negative transportation. *CLS*5. • Rivero, M.-L. 1971. Mood and presupposition in spanish. *FoL*. • Zehr, J. and Schwarz, F. 2018. Penncontroller for Internet Based Experiments (IBEX).