

## What is the processing cost of (im)precision? Camilo R. Ronderos, Ira Noveck, Ingrid Lossius Falkum

Semantically, a line is only *straight* when it has the maximal degree of 'straightness' (Kennedy, 2007; Syrett et al 2010; Aparicio, 2015, i.a). Thus, when such a *Maximum Standard Absolute Adjective* (MSAA) is used to express imprecision (e.g., 'almost straight'), it is assumed to require a threshold-oriented contextual adjustment (see Lasersohn, 1999; Leffel, 2016).

Two proposals regarding the relationship between (im)precise MSAs and sentence processing have been put forth. Syrett et al., (2010) argue that imprecision, as a pragmatic adjustment, necessarily adds processing cost to sentence processing compared to precision. Aparicio et al. (2016) speculate that *precise* MSAs are costlier to process than imprecise expressions because, in general, more contexts support imprecise interpretations. In the current study we test a third hypothesis, namely that processing cost will be mediated by contextual expectations of precision (see Van der Henst et al., 2002, Gibbs & Bryant, 2008, for a related account on number processing). Further, we investigate how distance of a visual referent from the maximum standard can act as a further influencing factor of processing cost.

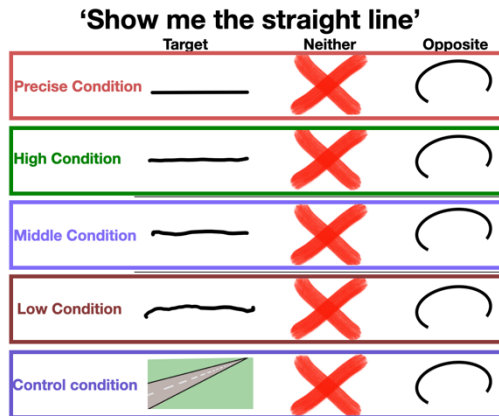
**DESIGN** We adopted Syrett et al's (2010) task (Figure 1) in two web-based experiments in order to investigate participants' judgements and reaction times when understanding (im)precision. Experiment 1 (200 participants) included 12 critical trials with 6 different MSAs (*straight, closed, empty, full, round, clean*), plus 18 filler trials. In each trial, participants read a sentence and saw three images (See Figure 1): a target image that corresponds to an MSA, an 'opposite' image (that's always incorrect), and an image indicating that neither of the previous two was satisfactory. Their task was to select the image that best matched the sentence. Importantly, the target image had 5 levels of (im)precision: 'precise', 'high' (i.e., slightly imprecise), 'middle', 'low' (i.e., very imprecise), and control (factor: PICTURE TYPE). Levels of imprecision were normed in a pre-test. Experiment 2 (360 participants) was identical except that each trial was preceded by one of two 1-sentence contexts meant to elicit different expectations of precision: loose vs. strict (factor: CONTEXT). Contexts were also normed.

**PREDICTIONS** In Experiment 1, we expected participants to accept imprecise pictures in the 'high' condition, but at a cost relative to accepting pictures in the 'precise' condition (measured in acceptance-time differences), in line with Syrett et al. (2010). 'Middle' and 'low' conditions should be accepted at rates below chance while the 'control' condition should be rejected. However, for Experiment 2, we predicted context to have a key mediating role. Only precise interpretations would be accepted following the 'strict' contexts, whereas 'precise' and 'high' interpretations would be equally accepted following the 'loose' contexts. In terms of processing time, accepting a precise picture after the 'strict' context should be fastest, but, following 'loose' contexts, there should not be a difference between acceptance-times in the 'precise' and 'high' conditions. These predictions were pre-registered on the project's OSF page.

**ANALYSIS** We fitted mixed-effects logistic (for picture selection, 1=Target and 0='neither') and linear (for BoxCox-transformed picture acceptance-times) regression models. In Experiment 1, the 'high' condition was indeed accepted significantly less often than the 'precise' condition (~90% vs. ~100%, respectively). The 'middle' (~50%) and the 'low' (~19%) followed. The 'precise' condition showed the significantly shortest acceptance-times (see Figure 2). In Experiment 2, context significantly mediated both acceptance rate and time. Critically, there was a significant interaction in both picture acceptance rate and time between CONTEXT and the 'precise' and 'high' conditions (see Figure 2). Interestingly, the reverse pattern appeared in the rejection times for Experiment 1 and for the 'loose' conditions of Experiment 2: The smaller the degree of imprecision, the longer it took participants to reject it as an appropriate referent of an MSA.

**CONCLUSION** Our study shows that without context, processing precision is less effortful relative to imprecision, similar to Syrett et al. (2010). However, once context is taken into account (Experiment 2), this cost can disappear, but only when a visual referent is close to the precise standard ('high' Picture condition). Overall, our findings highlight the pivotal role played by contextual expectations during language processing, as well as how different factors interact during processing to mediate processing effort. We see these results as being broadly in line with constraint-based accounts of pragmatic processing (Degen & Tanenhaus, 2019).

**Figure 1:** Example image grids (Experiment 1 & 2) and example context (Experiment 2 only). Image grids are color-coded representing the same conditions depicted in Figure 2.



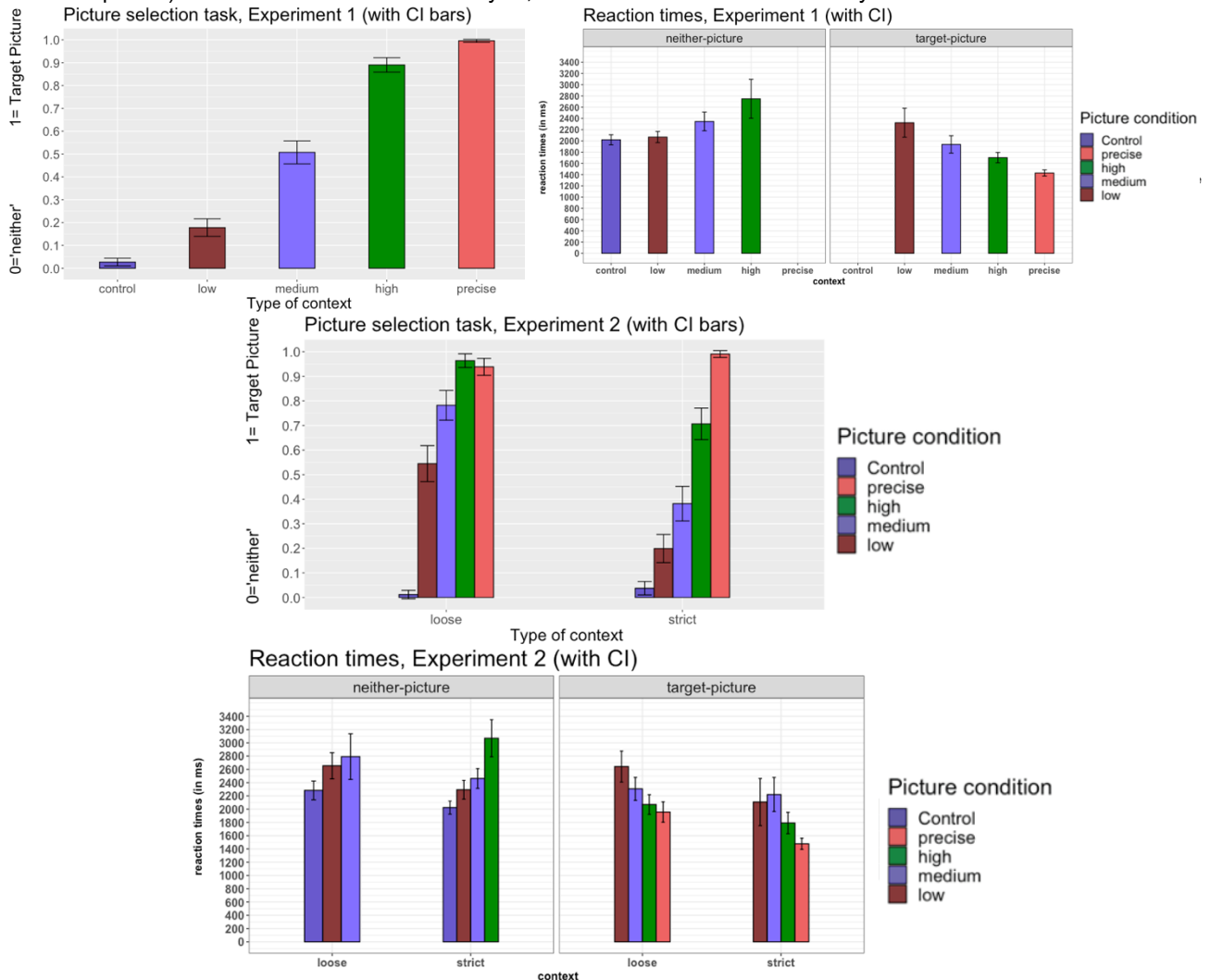
Each rectangle shows the three images that participants saw in a given trial for each condition. The target utterance was identical across conditions.

**CONTEXT SENTENCES (Exp. 2)**

**Strict condition:** *Jasmine carefully drew a line with a ruler on a piece of paper.*

**Loose condition:** *Jasmine rashly drew a line with her eyes closed on a piece of paper.*

**Figure 2:** Results of Experiments. 1 (top panel) & 2 (middle and bottom panels). RTs were transformed for analysis, shown here as raw-RTs for clarity.



**References**

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