Mental simulation of the illusory and the factual in negation processing

Imagine a fish not jumping out of the water. How do comprehenders process negative statements? Opinions vary. Some argue that a negative statement is more difficult to process than its positive counterpart because comprehenders start off with the representation of the positive state of affairs [fish jumping out of water] and then proceed to the (f)actual one (Kaup et al., 2007; Dale & Duran, 2011). This processing route is known as the two-step model. An alternative account, the one-step model, proposes that the negative/factual state of affairs [fish not jumping out] is computed directly (Orenes et al., 2014). This debate is additionally complicated by factors that are known to cause processing differences, such as language-specific structural cues (Zhang & Vanek, in press). One such cue is negative concord, a type of negation that is formed differently in English and Croatian. English only allows one negated lexeme per clause, while Croatian allows double negation (Zovko Dinković, 2013). Ćoso and Bogunović (2019) studied English-Croatian bilinguals and found no differences in how they process negation in the two languages, but reported processing differences for types of negation. To date, however, no studies have compared processing consequences of different negation types in English vs. Croatian native speakers.

This ongoing study builds on the assumption that linguistic structure can facilitate or hinder negation processing and thereby affect mental simulations amongst speakers. We address this claim by manipulating the factual and the illusory in negation to directly explore native speakers’ mental simulations. Our intention is to observe whether differences in sentential negation lead to differences in negation processing between languages, as well as between negation types within languages. For this purpose, we designed an eye-tracking experiment, using a combination of pictures and audio recordings (N=42/group; see Fig. 1). We manipulated Negation type and Language, and measured: anticipatory fixations (first fixations to indicate early mental simulation of factual vs. illusory & proportions of looks during auditory processing in the absence of pictures to indicate the strength of mental simulations) and integratory fixations (proportions of looks after reappearance of pictures). To our knowledge, this is the first negation processing study (pre-registered on the OSF) utilising the anticipatory eye-tracking paradigm (Kamide et al., 2003).

We test two sets of predictions. First, crosslinguistically, we expect the greatest between-language difference in the processing of negative concord in Croatian vs the corresponding null quantifier negation in English. Specifically, we expect double negation to provide a comparative processing advantage manifested as more, and faster, anticipatory eye fixations on the factual state of affairs in Croatian than in English. The mechanism we test is whether negative concord provides an additional cue making the factual more salient, thus reducing the illusory effect more than the null quantifier in English does. Second, negation-wise, we expect the lowest processing costs and the earliest anticipation of the factual in sentential negation, followed by null quantifier/negative concord. Within languages, we expect smaller processing differences across negation types in English (single vs single cue) than in Croatian (single vs double cue). We find this approach informative on two levels, not only for its potential to disentangle early/anticipatory from late/integratory comprehension processes in response to the one/two-step debate, but also for the time-sensitive insights it offers to test the relative impact that various negation types across and within languages have on supporting inferences of the factual over the illusory.
Figure 1. Experiment design. (a) Picture pairs representing the positive/illusory vs. negative/factual state of affairs were used as visual stimuli. (b) Audio-presented linguistic input varied between sentential negation, negated quantifier (English), negative concord (Croatian) and affirmative sentences as the control condition (20 sentences/type). (c) One trial consisted of a fixation cross, picture preview, blank screen with audio input, followed by pictures reappearing in their original positions and shown until button press.

References


