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A PERSPECTIVE-FREE PRAGMATIC INTERPRETATION OF NEGATION

Edmundo Kronmüller

(Escuela de Psicología Universidad Católica, Santiago, Chile)

Ira Noveck, Mohamed Krarzia, & Rawan Charafeddine

(Laboratoire sur le langage, le cerveau et la cognition – CNRS, Lyon, France)

This study investigates the time-course of perspective taking during reference resolution (Keysar et al. 2000; Hanna et al., 2003; Barr, 2008), but here, instead of an utterance containing a direct reference to an object (e.g. “*click on the upside-down funnel*”), speakers refer to objects using an utterance containing a negation (e.g. “*click on the one that is not the shiny cylinder*”). Because listeners hear a negation, the process of recognizing the intended referent is free from the influence of bottom-up processes that can bias the interpretation toward one referent in the domain, like priming or some other automatic activation of speaker-specific word representations. These bottom-up processes have been proposed as the main mechanisms for early speaker-specific effects in interpreting referential expressions (Brennan & Hanna, 2009; Brown-Schmidt, 2009).

In order to carry out this investigation, participants played the role of listeners in a referential communication game and followed directions from two speakers. One of the speakers was a confederate who interacted live with the participant; the participant-listener and the live speaker sat facing one other, each with her own computer screen. The other speaker was a virtual partner from whom the participants heard pre-recorded directions. The task consisted of selecting pictures depicting unfamiliar objects with no conventional names. While the listener’s screen showed three pictures, participants believed that the live speaker’s screen had just two of the three objects they themselves were seeing and that the speaker had come up with the names or expressions for the objects at that exact moment. In fact, the confederate’s screen showed only the “target” picture plus the exact expression the confederate speaker was required to utter. Participants did not know which object was missing from the speaker’s view.

In the test trial, three objects appeared on the listener’s screen. One object was the *negated object* that had been referred to twice before by the live speaker in earlier filler trials, allowing for earlier entrainment (Garrod & Anderson, 1987). Another object was the *unmentioned object*, that hadn’t been referred to directly before, leaving it nameless. The third object was the *competitor object*, through which we introduced the experimental manipulation. In the Same Speaker condition, the live speaker entrained the competitor object by referring to it twice before (as with the negated object). In the Different Speaker condition, it was the pre-recorded speaker who entrained the competitor object. Critically, only the listener knew about the name the virtual speaker gave to this object because the instructions from this speaker were provided through headphones, leaving the other speaker—the live speaker—unaware of the existence of an entrained expression for the competitor object, and even unaware of the identity of the objects the virtual speaker asked the participant to select. Finally, in the None condition, the competitor object was never referred to, leaving it without a name (just like the unmentioned object) and thus leaving the participant with a genuinely ambiguous referential situation.

In these test trials, the live speaker asks the participant to select an object by contrasting it with another object in the screen (the negated object): “*click on the one that is not the shiny cylinder*”. In the None condition, either the competitor or the unmentioned object could be the potential referents, given that both didn’t have a name. In the Same condition, only the unmentioned object was a potential referent given that the competitor was referred to twice by the live speaker. Finally, in the Different condition, and assuming that participants consider their partner’s perspective, both objects -- the unmentioned and the

competitor objects -- were possible referents (remember, the competitor object didn't have a name for the live speaker either). Note that the speaker's expressions are thoroughly cooperative given that listeners believed that the live speaker saw only two objects.

Twenty-four French speakers participated in the experiment. Participants selected the unmentioned object in the Same Speaker condition in 90% of the trials and in 52% of trials in the None condition. This indicates that participants interpreted the object referred to by the negation of one object as the object without a name. Interestingly, in the Different Speaker condition, the selection rate for the unmentioned object was 61%, revealing that perspective information was considered for final referent assignment (Different vs None: $p = .064$; Different vs Same: $p < .001$). Indeed, from the perspective of the live speaker, neither the unmentioned object nor the competitor object had a name, so both are potential referents.

We looked at time course data on the interpretation process. Eye-tracking reveals that 1 and 2 seconds after negation on-set, *interference* produced by the competitor object—measured as the proportion of time looking at the unmentioned object minus the proportion of time looking at the competitor—is equal for the Same and Different conditions ($p = .438$), but stronger for the None condition (Different vs None: $p = .028$)(see figure). This shows that participants have not yet realized that from the point of view of the live speaker, the competitor object is also a potential referent for the utterance, as they looked directly at the unmentioned object in the Same and Different conditions. In the None condition, however, because the competitor object has not been named, it is equally good as a referent for the utterance as the unmentioned object. In between 2 and 3 seconds after the on-set of negation, the interference of the competitor object is stronger in the Different than in the Same condition ($p = .037$), showing that only at this moment and not earlier, do participants begin to integrate speaker's perspective information and realize that in the Different speaker condition, the competitor object was unnamed for the live speaker.

These results suggest that listeners make a fast pragmatic interpretation of negation that does not necessarily rely on perspective information, not even partially, but that relies on pragmatic expectations. Specifically, listeners assume the speaker would refer to an already named object with that same name and not with a negation. Following this expectation of cooperativeness, if the speaker used a negation, then the referent should be a nameless object. Only after this perspective-free interpretation, participants restrict their domain of reference by considering the partner's knowledge. These results are relevant because when referring to something by using negation, listeners can not fast-map a referent to an expression, having to always use information that is not in the linguistic code. This study shows that early on in a first interpretation, pragmatic expectations are already deployed but perspective taking has not yet taking place.

