

The collective bias?

Using eye movements to examine collective vs. distributive interpretations of plural sets

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Introduction: In this study, we recorded eye movements of listeners in order to investigate the representation of collective vs. distributive interpretations of plural sets. In an eye-tracking study of reading times, Frazier et al. (1999) found evidence for increased processing load associated with distributive sentences and concluded that the processor initially pursues a collective interpretation in sentences ambiguous for collectivity/distributivity. However, increased reading time at the point of distributive (vs. collective) disambiguation does not itself provide information about when, or in fact whether, listeners commit to a distributive or collective reading. To test the hypothesis that subjects converge on one interpretation even in the absence of disambiguating information, we utilized the visual world paradigm to test whether predicates undetermined for collectivity/distributivity would nonetheless prompt listeners to converge immediately on the collective interpretation.

Method: We employed the visual world paradigm to track which representations subjects considered over the course of hearing a sentence. The eye movements of 24 participants were recorded as they listened to explicitly collective/distributive sentences and locally indeterminate sentences that resolved to either a collective or distributive reading at the end of the sentence; while listening, subjects considered collective and distributive acts depicted on a computer screen. E.g., a subject would hear sentence (1), (2), or (3) while viewing two side-by-side scenes, one of a collective action on one object ("ball"/"box"), and one of a distributive action on another object (e.g. "box"/"ball"). For a sentence like (1), the only disambiguating information is the final word of the sentence, e.g. the object "ball." Unless participants have committed to a collective or distributive reading, they should not have a preference for either of the two images until they hear the sentence-final word ("ball"). An earlier switch in gaze to one of the two images would indicate a processing preference for one interpretation over the other.

Results: Explicitly collective sentences prompted looks to the collective scenario at the point of disambiguation (i.e. at "together"), as did explicitly distributive sentences (at "each") to the distributive scenario. Crucially, the indeterminate (null) sentences patterned with the explicit "together" sentences at the predicate: the predicate immediately prompted looks to the collective.

We also compared the proportion of looks averaged across two time windows: an 800-ms interval before the predicate onset and an 800-ms interval after the predicate onset. In an ANOVA of proportion of looks to collective/distributive scenes, we found significant interactions between disambiguator ("together"/"each"/null) and time window. In a targeted analysis of disambiguator effects in each time window, we found significant differences for both "together" vs. "each" and for null vs. "each" after predicate onset but not before. The "together" sentences did not significantly differ from the null form.

Conclusion: Despite a lack of explicit disambiguating information, the indeterminate, null-disambiguator sentences prompted looks to the collective scenario almost immediately upon hearing the predicate, and this time course was reliably different from that of distributive-directed "each" sentences. This provides evidence that the listener has committed to the collective interpretation even in the absence of disambiguating information.

Examples

John and Bill are carrying a red ball. (accompanied by a distributive ball-carrying scene and a collective box-carrying scene)

John and Bill each are carrying a red ball. (accompanied by a distributive ball-carrying scene and a collective box-carrying scene)

John and Bill together are carrying a red ball. (accompanied by a collective ball-carrying scene and a distributive box-carrying scene)

Reference

Frazier, L., Pacht, J., Rayner, K., 1999. Taking on semantic commitments II: collective vs. distributive readings. *Cognition* 70, 87 – 104.