

Experimenting Free Choice through palm up gestures and prosody

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Abstract

In the present experimental studies, we investigated the interaction of co-speech palm up gestures and prosody in sentences typically triggering free choice (FC) interpretation. Results show that multimodal sentences boost the exclusive interpretation compared to utterances displayed only in the spoken modality, which only received the FC interpretation (inclusive reading). On the basis of this evidence, we suggest that visual cues should more systematically be used as a tool to shed light on linguistic theories, and enrich experimental methods.

Keywords: co-speech gestures, palm up, multimodality, Free Choice, semantics.

Background

Sentences containing disjunction in the scope of a possibility modal give rise to the FC interpretation (Meyer, 2018). Therefore, a sentence like *Alex can have ice cream or cake* implies that Alex can freely choose to have one of the two options or both. It is still under debate which theory would best account for such data. Tieu et al. (2019) used a ternary judgment task involving pictures and a colour code representing the available choices to empirically investigate which of the two main approaches – the implicature (Bar-Lev & Fox, 2017) vs. the homogeneity approach (Goldstein, 2018) – makes the best predictions.

In addition, it is well-known that prosody plays a role in the interpretation of disjunctive sentences: Pruitt & Roelofsen (2013) have shown that final contour and pitch accents allow to disambiguate between alternative and yes-no questions. Similarly, in the context of coordinated names such as ‘Nino or Willi or Mila’, phrasing variations mirror the syntactic parsing (Kentner & Féry, 2013).

Moreover, recent studies, looking at sign languages and/or gestures, show that visual cues, like prosodic cues, affect the interpretation and argue that theoretical accounts of disambiguation and enrichment should consider the semantic and pragmatic impact of the visual modality. More specifically, iconicity and alignment of speech and gestures (Schlenker, 2023; Ebert & Ebert, 2014) could provide interesting insight to such topic. Nonetheless, there is still an open question regarding the extent to which visual information can impact the interpretation of disjunctive utterances. Following Cooperrider et al.

(2018), the resort to palm up gestures to express possibility is widely attested in sign languages and gestures accompanying speech. One interesting question in our context is therefore whether the standard FC interpretation could be modified when visual information and phrasing suggest a different reading?

Methods

We investigated the contribution of palm up co-speech gestures to German FC sentences in three experiments. We used a picture selection task and a colour code (as in Tieu et al. 2019) targeting the two classical interpretations at stake: inclusive (FC) vs. exclusive reading. Four answers were available, each represented by a set of two pictures in which each disjunct is either framed in green (allowed) or red (not allowed) (*Picture 1*). It resulted in the four following choices: both disjuncts are allowed (inclusive reading), no disjunct is allowed (dual prohibition), only disjunct 1 is allowed (exclusive reading), only disjunct 2 is allowed (exclusive reading). Crucially, we paid attention to the items we created so that the two disjunct were not mutually exclusive based on common knowledge and logic

Experiment 1 used audio only items and served as a baseline, verifying the FC effect and testing two phrasing patterns, adapted from Pruitt and Roelofsen (2013). The first pattern, “disjunctive phrasing” separates the disjuncts by a short break before the word *oder* (‘or’), and displays the main pitch accent on the first disjunct. The second pattern, “conjunctive phrasing”, does not show any pause and bears the main accent on the second disjunct.

We then implemented two multimodal experiments testing four gesture conditions: three types of palm up gestures, differing in the alignment between the hands’ movements and the disjuncts (*Picture 2*) and a no gesture condition. Audio and video were recorded separately and then merged. Experiment 2 used the disjunctive phrasing pattern and Experiment 3 the conjunctive pattern.



Picture 1. Screenshot of the task item “Alex can wear a scarf or a beany”.



Picture 2. Illustrations of the four gesture conditions.

Results

Results from Experiment 1 (audio only) verify the FC effect since nearly 100% of the items were interpreted with the inclusive (FC) reading. No significant difference appears between the two phrasing patterns in this experiment (Figure 1).

Experiment 2 (multimodal items combined with the disjunctive phrasing) presents notably different results. Target items received the exclusive reading in more than 50% of the trials. The type of palm up gesture does not create a significant difference in the interpretation and more surprisingly, the no gesture condition behaves like the other gesture conditions, that is boosting the exclusive reading (p-value = 0.03887) (Figure 2).

Finally, Experiment 3 (multimodal items combined with the conjunctive phrasing) present results very similar to Experiment 2. Target items received the exclusive reading in more than half percent of the trials. There is no significant difference between the no gesture, the alternating palm up and the holding palm up conditions. However, although it is a minor difference, the both hands palm up triggers slightly more inclusive reading compared to the other three conditions (p-value = 0.03345) (Figure 2).

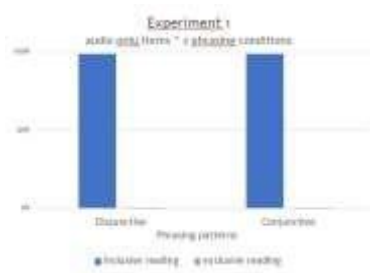


Figure 1. Interpretation of audio only items per phrasing pattern.



Figure 2. Left: multimodal items interpretation per gesture condition, combined with the disjunctive phrasing (exp. 2). Right: multimodal items interpretation per gesture condition, combined with the conjunctive phrasing (exp. 3).

Discussion

As expected, the FC interpretation appears very robust, but only when the sentences are displayed in the audio only condition. The difference between the audio only and the multimodal items suggests that visual cues tend to nuance the interpretation across participants. Surprisingly, it does not seem to be the gestures per se that boost the exclusive reading but rather the overall multimodal setting since the no gesture condition gives rise to similar results as any other gesture conditions. One possible explanation could be that participants presented with a multimodal input throughout the experiment were expecting a gesture. At a more formal level, as in Tieu et al. (2019), our results do not clearly disentangle between the two main approaches but they seem to be more straightforwardly favouring the homogeneity approach. We believe that experimental studies involving gestures could be a promising tool for shedding light on this debate. Finally, we propose to analyse multimodal disjunctive sentences as complex disjunctions (Spector, 2014) in which the visual component can nuance the FC interpretation. We conclude that experimental linguistics could greatly benefit from multimodal research and give rise to a boomerang effect whereby the study of multimodality / visual modality would profit from more frequent experimentation.

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