Testing a rational account of fragment usage with pseudo-interactive experiments

Robin Lemke (Saarland University)

`robin.lemke@uni-saarland.de`

Fragments like (1a) (Morgan, 1973) can often be used to perform the same speech act as complete sentences (1b). Previous research (e.g. Merchant 2004, Reich 2007, Bergen & Goodman 2015) focuses on the usage of fragments, but does not explain when speakers use them.

(1)   [Passenger to conductor before entering the train:]
   a.   To Paris?
   b.   Does this train go to Paris?

I present an experimental design investigating when speakers prefer fragments over complete sentences. I hypothesize that speakers trade-off the reduced production cost for fragments (compared to sentences) with a higher risk of being misunderstood (for instance, (1a)) could also be interpreted as (2)), which is formalized in a game-theoretic framework (Franke, 2009).

(2)   How long does it take to travel to Paris?

Model   The speaker has to communicate a message $m \in M$ to the listener and selects the most appropriate utterance $u \in U$ to do so. The listener infers the meaning of u and if they coordinate, both receive a reward. Therefore, the listener goes for the most likely interpretation (maximize $p(m|u)$): For instance, if (1b) is more likely than (2) given the context in (1), selecting the interpretation in (1b) increases the likelihood of correctly guessing the meaning intended by the speaker. Longer utterances (sentences) are unambiguous, but they have a higher production cost, so the speaker will prefer fragments are preferred when $p(m|u)$ is relatively high.

Method   The experiment investigates production preferences with an pseudo-interactive utterance selection task (similar to Rohde et al., 2012). Participants ($n = 60$) read a context story ($n = 15$) and select one out of six utterances to communicate one out of three messages (the one to be communicated is determined by the experiment) (Fig. 1). The listener is simulated by a computer behaving according to model predictions and subjects receive feedback on the interpretation after sending each utterance. The materials are based on a corpus of production data by Lemke (2021), from which M, U and the likelihood of each message were estimated to generate model predictions. The critical utterance is a fragment ambiguous between two messages: the *target* having a higher $p(m|u)$ than the *competitor*. There are 3 experimental conditions, which differ in whether the target, the competitor, or the third message (which is *unambiguous*ly encoded by the second fragment utterance) is highlighted. The third fragment is a control incompatible with the messages. Sending utterances cost virtual coins, sentences (100) being more expensive than fragments (30). Successful communication is rewarded 120 coins. E.g., a fragment with a likelihood of 0.75 of success, pays off $120 \times 0.75 - 30 = 60$, and an unambiguous sentence yields $120 \times 1 - 100 = 20$. Therefore, subjects should use fragments most frequently in the *unambiguous* condition and more often in the *target* than in the *competitor* condition.

Results   The data (Fig. 2) were analyzed with mixed effects logistic regressions (Bates et al. 2015), which predict the likelihood of fragment usage from the likelihood of getting the intended message across using a fragment. The analysis of the complete data set shows that fragment ratio increases with the likelihood of communicative success ($z = 5.16, p < .05$). This effect seems to be driven by the unambiguous condition, because in an analysis of only the target and competitor conditions, there is no such effect ($z = -.03, p > .9$). Currently, a follow-up investigates whether this might be due to the overall low fragments rate, which might be boosted by setting the payoffs/cost as being more favorable to fragment use.

Today, you Laura want to cook yourselves some pasta. Laura put a pot filled with water on the stove. Then, Laura turned the stove on. After a few minutes, the water started to boil.

You want to communicate this to Laura:

You tell Laura to pour the pasta into the water.

You tell Laura to pour salt into the water.

You tell Laura to put the plates on the table.

Laura is not sure.

What do you tell Laura?

„On the table!" **(Cost: 30 coins)**

„The recipe!" **(Cost: 30 coins)**

„Pour salt into the water!" **(Cost: 100 coins)**

„Put the plates on the table!" **(Cost: 100 coins)**

„Into the water!" **(Cost: 30 coins)**

„Pour the pasta into the water!" **(Cost: 100 coins)**

Send

Figure 1 Screenshot of the experiment, translated to English for convenience.
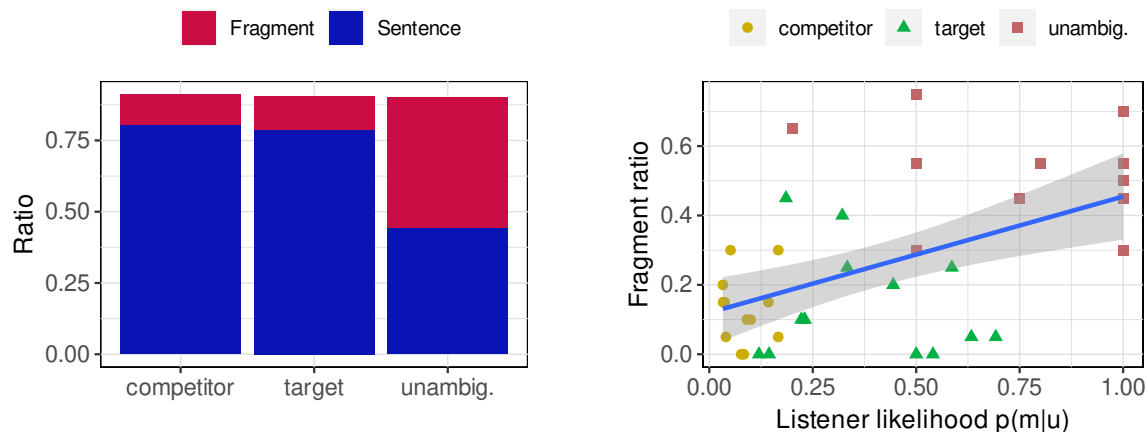

Figure 2 Left panel: Ratio of fragments and sentences (errors excluded) across the experimental conditions. Right panel: Fragment ratio as a function of the predicted listener behavior.

Selected references   ●Lemke, R. (2021). Experimental Investigations on the Syntax and Usage of Fragments. Number 1 in Open Germanic Linguistics. Language Science Press, Berlin. ●Morgan, J. (1973). Sentence fragments and the notion 'sentence'. In Kachru, B. B., Lees, R., Malkiel, Y., Pietrangeli, A., and Saporta, S., editors, Issues in Linguistics. Papers in Honor of Henry and Renée Kahane, 719–751. University of Illionois Press, Urbana. ● Rohde, H., Seyfarth, S., Clark, B., Jaeger, G., and Kaufmann, S. (2012). Communicating with cost-based implicature: A game-theoretic approach to ambiguity. In Proceedings of the 16th Workshop on the Semantics and Pragmatics of Dialogue, 107–116.