Remention Biases Affect the Choice of Anaphoric Form

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The choice of anaphoric forms (e.g. *Mary* vs. *she*) depends on a number of factors such as grammatical function, order of mention or topicality (Arnold 2008). For semantic-pragmatic re-mention biases however, which also impact referent salience, recent research has found conflicting results. Thus, Implicit Causality verbs of Stimulus-Experiencer (e.g., *fascinate*) and Experiencer-Stimulus type (e.g., *admire*) display strong preferences for subsequent explanations about the Stimulus argument (Ferstl et al. 2011). Yet, Fukumura & van Gompel (2010) and Rohde & Kehler (2014) found no effect of Implicit Causality on anaphoric form. Kehler & Rohde (2013) a.o. thus claim that the production of anaphoric form is dissociated from the likelihood of mention. On the other hand, Rosa & Arnold (2017) found that Transfer of Possession verbs, with a re-mention bias for goal arguments (e.g., the indirect object of *give* or the subject of *get*) do influence the choice of anaphoric form. Rosa & Arnold 2017 speculate that differences in argument structure are behind this discrepancy.

However, the discrepancy in the results could also be due to the fact that crucial experimental conditions have yet to be tested for IC verbs. Thus, Rohde & Kehler (2014), improving on Fukumura & van Gompel's (2010) paradigm, point out that the choice of anaphoric form is especially important in contexts with two same-gender referents as a strategy to avoid ambiguity (cf. Levinson's (1987) m-implicatures). However, unlike Fukumura & van Gompel 2010 and Rosa & Arnold 2017, Rohde & Kehler did not use a forced-reference paradigm, in which participants are prompted to provide continuations for one particular referent. This is of particular importance when comparing bias-congruent and bias-incongruent continuations, though.

The present study presents a direct comparison of the effects of the two re-mention biases across a total of four experiments, applying a combination of the forced-reference paradigm with both same-gender and different-gender conditions. We ran the experiments in German, as opposed to the just reviewed ones, which all tested for influences of pragmatic biases on anaphor production in English. Whereas English has a rather restricted inventory of anaphoric forms available for coreference (Gundel et al. 1993), German has both personal (e.g., *er/sie* 'he/she') and demonstrative pronoun (e.g., *dieser/diese* 'this one' and *jener/jene* 'that one') paradigms and we hypothesized that this richness in forms could facilitate the elicitation of form-based effects.

The four experiments were as follows: *Experiment 1* tested form-effects for Implicit Causality verbs. As follow-up studies, *Experiment 2a and 2b* tested Implicit Causality verbs and Transfer of Possession verbs (within subjects). Finally, in *Experiment 3* we extended the investigation to involve Agent-Evocator verbs (Au 1986), a class of Implicit Causality verbs that hasn't been tested systematically with regard to anaphoric form effects.

We pretested (N=24) the remention biases of three types of Implicit Causality items: **i)** 20 Stimulus-Experiencer verbs (subject bias, e.g., *fascinate*): 91.7% subject continuations, **ii)** 20 Experiencer-Stimulus verbs (object bias, e.g., *admire*): 94.1% object continuations, and **iii)** 20 Agent-Evocator verbs (object bias, e.g., *thank*): 87.9% object continuations. In another pretest (N=24), we tested the remention biases of 24 pairs of Transfer of Possession verbs (subject or object bias, e.g., *get* vs. *give*). Subject goal verbs such as *get* triggered 92.5% subject continuations, whereas object goal verbs such as *give* triggered 39.7% objects continuations. These latter results are comparable to the results presented for Transfer of Possession verbs in Rosa & Arnold (2017).

For **Experiment 1** (N=32)**,** German items with (the pretested) 20 Stimulus-Experiencer verbs and 20 Experiencer-Stimulus verbs (+ 40 fillers) were constructed in a 2 (*verb type*) x 2 (*gender ambiguity: same vs. different-gender referents*) design (e.g., *Mary/John admired/fascinated Peter/Jane because…*). Experiment 1 employed the same method as Fukumura & van Gompel (2010) and Rosa & Arnold (2017, Experiment 3), highlighting the continuation's designated referent (factor *referent focus*: *subject* vs. *object*). Anaphoric forms more complex than personal pronouns (i.e., demonstrative pronouns such as *dieser* 'this one' or *jener* 'that one') were restricted to object focus continuations (all subject focus conditions ≥ 95% personal pronouns). In the object focus conditions we observed a strong effect of *ambiguity* and a marginal interaction *ambiguity* by *verb type* (GLMER model comparisons: *ambiguity* $\chi^2(1) = 15.2$; $p < .001$; interaction $\chi^2(1) = 3.4$; $p = .07$). In conditions with different-gender referents, personal pronoun continuations were produced 93.5% of the time for Stimulus-Experiencer (subject bias) items and 89.5% for Experiencer-Stimulus (object bias) items. In the same-gender conditions,

Stimulus-Experiencer items received 51.7% personal pronouns for (bias-incongruent) object continuations as compared to 66.4% personal pronouns for (bias-congruent) object continuations for the Experiencer-Stimulus items.

Experiment 2a (N = 42) examined this marginal *verb type* effect by testing the Implicit Causality items in *object focus conditions only* (with 40 subject focus fillers). Within the same participants, **Experiment 2b** tested the 24 Transfer of Possession items in a 2 (*referent focus*) x 2 (*verb type: subject-goal* vs. *object-goal*) x 2 (*gender ambiguity*) design. **Experiment 2a** revealed clear form effects of *gender ambiguity* ($\chi^2(1) = 23.1$; $p < .001$) and an effect of Implicit Causality *verb type* ($\chi^2(1) = 6.5$; $p < .05$): In the different-gender conditions, personal pronouns were produced 86.3% in bias-congruent Experiencer-Stimulus items and 78.0% for bias-incongruent Stimulus-Experiencer items. In the ambiguous same-gender conditions, bias-congruent Experiencer-Stimulus items received 62.1% personal pronoun continuations as opposed to only 48.9% personal pronouns for bias-incongruent Stimulus-Experiencer items. The same pattern of effects appeared in the object focus conditions of Transfer of Possession verbs in **Experiment 2b** (subject focus > 95% personal pronouns; as in Experiment 1). Both *ambiguity* ($\chi^2(1) = 14.4$; $p < .001$) and *verb type* ($\chi^2(1) = 8.60$; $p < .01$) contributed significantly to the regression analysis with personal pronoun continuations at 75.5% (congruent object-goal) and 73.3% (incongruent subject-goal) in the different-gender conditions and 56.9% (congruent object-goal) relative to only 38.8% (incongruent subject-goal) in the same-gender conditions.

Finally, in **Experiment 3** (N=60) the 20 + 20 psychological verbs from Exp. 2a were tested together with the 20 Agent-Evocator verbs from the pretest in a 3 (*verb type*) x 2 (*gender ambiguity*) design. Again, only the *object focus conditions* were included (+ 40 subject focus fillers). The experiment revealed a clear effect of *gender ambiguity* ($\chi^2(1) = 326.0$; $p < .001$). However, *verb type* had no effect on the likelihood of producing a personal pronoun ($\chi^2(4) = 2.6$; $p = .63$). To our surprise, it did affect the rate of coreference with a proper name, though: Bias incongruent continuations after Stimulus-Experiencer verbs displayed 30 and 12% repeated names, respectively. By contrast, bias-congruent continuations after Experiencer-Stimulus verbs gave rise to only 17% and 5% names, respectively. Similarly for Agent-Evocator verbs, which had only 13% and 7% repeated names. GLMER analyses confirmed a reliable fixed effect of *verb type* on the production of repeated names ($\chi^2(2) = 41.5$; $p < .001$), which was significant both for the comparison of Stimulus-Experiencer and Experiencer-Stimulus ($\chi^2(1) = 27.8$) as well as between Stimulus-Experiencer and Agent-Evocator verbs ($\chi^2(1) = 33.0$). These results can be accounted for if we take into consideration that in Experiment 3 participants were majorly forced to refer back to the object referent, which could have resulted in making demonstrative pronouns ineffective for disambiguation.

In sum, the results of our experiments 1, 2a and 2b show that – modulated by well-known effects of audience design – referential biases affect reference form production across verb classes, including Implicit Causality verbs. This finding adds to the evidence in Rosa & Arnold 2017 and speaks against proposals assuming a general dissociation between likelihood of mention and choice of anaphoric form (Kehler & Rohde 2013). However, given the conflicting evidence from Experiment 2a (Implicit Causality verbs of Stimulus-Experiencer and Experiencer-Stimulus type) and Experiment 3 (Implicit Causality verbs of Agent-Evocator type) with respect to the anaphoric category targeted by remention biases, our experiments call for a pragmatic explanation taking into account not only audience design but also the broader pragmatic context created by the experiment.

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