

Agreement attraction in a mixed agreement system: Evidence from Hindi

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Hindi shows verb agreement with subjects (like English) and objects, but in complementary structural contexts: subject agreement occurs when the subject is not marked for case, object agreement occurs when the subject has overt case but the object does not. We use this unique property of Hindi to test the claim that agreement processing relies on cue-based retrieval of the agreement controller from memory [1]. According to this view, the process of selecting an agreement controller is subject to similarity-based interference: morphosyntactic similarity between an agreement controller and a distractor noun will increase the probability of agreement errors [1,2,3]. In Hindi, this predicts that what makes an attractor noun likely to cause attraction will differ for subject agreement and object agreement. For subject agreement, the subject cues used to retrieve the agreement controller should create greater interference from subject attractors than object attractors. For object agreement, the opposite is predicted: greater interference from object attractors than subjects. To test this hypothesis, we examined agreement attraction in Hindi in subject agreement and object agreement contexts.

Experiment 1: Subject Agreement: Items were presented word by word in centered RSVP format followed by a speeded binary choice decision task (timeout=3s) where participants selected a singular verb or a plural verb as the appropriate completion using a button-press [4] ($N_{\text{Participants}}=60$, $N_{\text{Items}}=36$). Attraction was expected to manifest as an increased error rate in *Mismatch* conditions. (1) provides a sample stimulus set. The singular subject is the agreement controller; the main clause object and the relative clause subject are potential attractors. The attractor role and features were manipulated jointly. In the *Match* condition all nouns had the same number feature (singular). In the *Subject mismatch* condition the attractor subject had a mismatching specification (plural). In the *Object mismatch* condition the object attractor had a mismatching specification (plural). The proportion of correct responses is in Figure 1A. Accuracy in this experiment was high, with the greatest error rate in the *Subject mismatch* condition. We coded our conditions using Helmert coding, and fit a maximal logistic regression model to the probability of an error. The effect of attractor role (*Subject mismatch* vs. *Object mismatch*) was modest but significant ($p = 0.04$), as predicted by cue-based memory retrieval. The effect of feature mismatch (*Match* vs. both *mismatch* conditions) was also significant ($p=0.045$), but this seemed to be driven by the errors in the *Subject mismatch* condition.

Experiment 2: Object Agreement: We next tested for interference in object agreement. In (2) the main clause object is the agreement controller because the subject has overt case-marking (*ne*). Attractor role and Features were manipulated in a 2x2 design: we varied the grammatical role of the attractor (*Subject* vs *Object*) and the number features of the attractor (*Match* (singular) vs. *Mismatch* (plural)). The experimental method was identical to E1 ($N_{\text{Participants}}=60$, $N_{\text{Items}}=36$). The proportion of correct responses is in Figure 1B. We observed robust agreement attraction in object agreement: Hindi speakers made a substantial number of errors in the *Mismatch* conditions. However, error rates were similar for subject attractors and object attractors. Correspondingly, we saw only a significant effect of attractor number in a logistic regression model ($p<0.001$), but no interaction of grammatical role and feature match.

Overall, we observed clear agreement attraction effects for object agreement in Hindi, and modest effects for subject agreement. Our results thus provide further evidence that object agreement, like subject agreement, is susceptible to attraction [5]. We found some evidence in support of the retrieval hypothesis for subject agreement (E1), but not object agreement (E2). Overall, the attractor's grammatical role did not appear to consistently modulate the rate of attraction. We saw a contrast in error profiles in subject agreement (E1), with a low rate of attraction, and object agreement (E2), with a higher rate of attraction. This contrast may be due to different structural properties of the sentences across experiments: the attractor appears inside a modifier of the grammatical agreement controller in E2, but not in E1.

Experiment 1: Subject Agreement

Item template ('{...}' = response options)

- | | | |
|----------------------|--|--|
| 1. (a) Match | S O _{SINGULAR} [RC...RC-S _{SINGULAR} ...] | V {AUX _{SINGULAR} }{AUX _{PLURAL} } |
| (b) Subject mismatch | S O _{SINGULAR} [RC... RC-S_{PLURAL} ...] | V {AUX _{SINGULAR} }{AUX _{PLURAL} } |
| (c) Object mismatch | S O _{PLURAL} [RC...RC-S _{SINGULAR} ...] | V {AUX _{SINGULAR} }{AUX _{PLURAL} } |

Sample Item

Mira (a) vah billi [jise vah raanii DhuundDh rahi thi] pakaR {rahii hai}{rahe hain}
 Mira.SING that cat who-ACC that queen search -ing had catch -ing was -ing were
 (b) vah billi [jise **kuchh raajaa** DhuundDh rahe the]
 that cat who-ACC some kings search -ing had
 (c) **ve kutte** [jise vah raanii DhuundDh rahi thi]
 the dogs who-ACC that queen search -ing had

'Mira {was}{were} catching the cat/dogs that the queen/kings had been searching for.'

Experiment 2: Object Agreement

Item template ('{...}' = response options)

- | | | |
|---------------------------------|---|--|
| 2. (a) Subject attractor, Match | S-ne O [RC...RC-S _{SING} ...] | V {AUX _{SING} }{AUX _{PLUR} } |
| (b) Subject attractor, Mismatch | S-ne O [RC... RC-S_{PLUR} ...] | V {AUX _{SING} }{AUX _{PLUR} } |
| (c) Object attractor, Match | S-ne O [RC...RC-O _{SING} ...] | V {AUX _{SING} }{AUX _{PLUR} } |
| (d) Object attractor, Mismatch | S-ne O [RC... RC-O_{PLUR} ...] | V {AUX _{SING} }{AUX _{PLUR} } |

Sample Item

Mira-ne vah billi (a) [jise ek chuhiyaa dekh rahi thi] pakaR {lii } {liye}
 Mira-ERG that cat who-ACC one rat see -ing had catch took.SING took.PLUR
 (b) [jise **kai chuhe** dekh rahe the]
 who-ACC many rats see -ing had
 (c) [jis-ne ek chuhiyaa DhuundDh nikali thi]
 who-ERG one rat found out had
 (d) [jis-ne **kai chuhe** DhuundDh nikale the]
 who-ERG many rats found out had

'Mira {had_{SING}}{had_{PLUR}} caught the cat that the rat(s) had been staring at / had found the rat(s).'

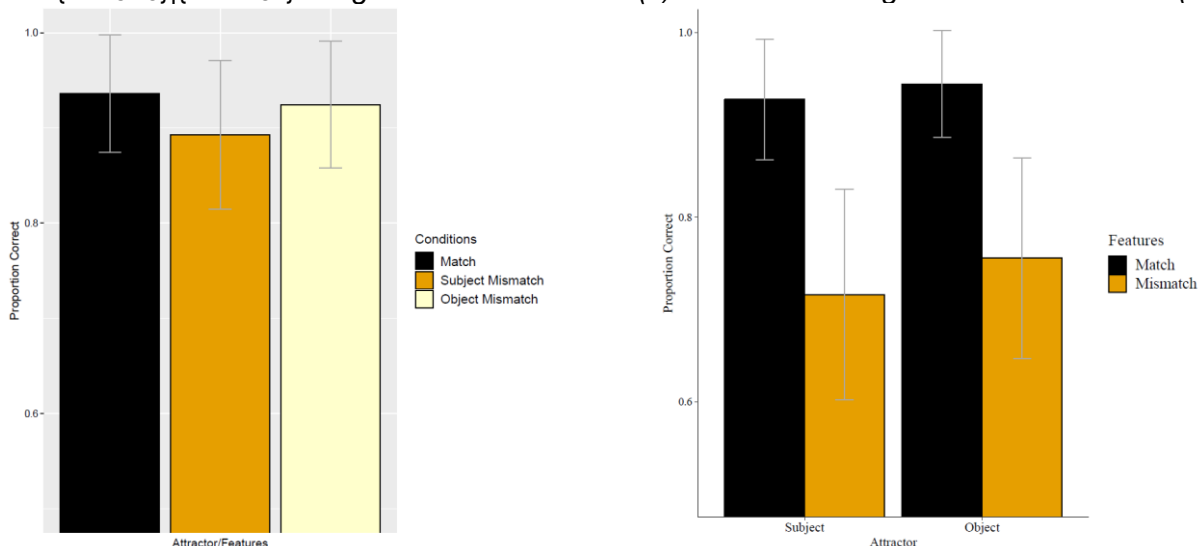


Fig. 1A/B. Proportion of correct responses (E1 on left, E2 on right). Error bars plot 95% Cis.

[1] Badecker & Lewis. (2007). *CUNY*. [2] Badecker & Kuminiak. (2007). *Journal of Memory and Language*. [3] Slioussar. (2018). *Journal of Memory and Language*. [4] Staub. (2009). *Journal of Memory and Language*. [5] Santesteban, Pickering & Branigan. (2013). *Journal of Memory and Language*.