Agreement attraction in Hindi: Object agreement parallels Subject agreement

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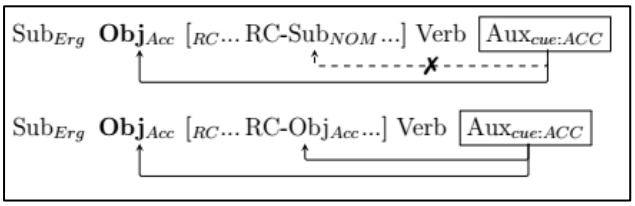
Hindi shows verb agreement with subjects and objects, but in complementary structural contexts. Subject agreement occurs when the subject lacks overt case (=*unmarked*). Object agreement occurs when the subject has overt case, but the object does not (Pandharipande & Kachru, 1977). We use this property of Hindi to test the claim that agreement processing relies on cue-based retrieval of the agreement controller from memory (Badecker & Lewis, 2007). Previous psycholinguistic work on agreement (starting with Bock & Miller, 1991) has shown that grammatically illicit items can interfere with agreement processes and lead to *agreement attraction* errors. Speakers may produce agreement errors – **the key to the* ***cabinets*** *are rusty* – due to an attractor noun (here, *cabinets*) which mismatches with the grammatical controller (here, *key*) in its number feature. One potential explanation for agreement attraction is that it is the result of an error-prone search through working memory for a controller noun. According to this cue-based retrieval view of agreement attraction, the process of selecting an agreement controller is subject to *similarity-based interference*: morphosyntactic similarity between an agreement controller and an attractor noun, for example, in terms of case-morphology, will *increase the probability of agreement errors* (Badecker & Kuminiak, 2007; Slioussar, 2018).

For Hindi, this view further predicts that what makes an attractor noun likely to cause agreement errors will be a function of the agreement type. For <u>object agreement</u>, where the ergative case-marking on the subject, as well as the presence of perfective aspect on the verb, signals the impossibility of subject agreement and the possibility of object agreement, object cues should be used to retrieve the controller from memory. The morphologically unmarked structural accusative case may be one such cue (not to be confused with the differential object marker *-ko*). This hypothesis predicts that we should see greater interference from object attractors than subjects, since objects may be misretrieved on account of matching the retrieval cue. For <u>subject agreement</u>, the opposite is predicted – subject cues should be used to retrieve the agreement controller. This predicts greater interference from subject attractors than object attractors. To evaluate this hypothesis, we tested for agreement attraction in Hindi in object agreement and subject agreement contexts using sentence fragments with mismatching attractors.



<u>Experiment 1: Object Agreement</u> Items (N=36) were presented word by word in centered RSVP format (425 milliseconds per word) followed by a speeded binary choice decision task (timeout=3 seconds) where participants (N=60) selected a singular auxiliary verb or a plural auxiliary verb as the appropriate completion using a button-press (Staub, 2009). The singular object is the agreement controller. Attractor role and Features were manipulated in a 2x2 design: we varied the grammatical role of the attractor in the relative clause (*Subject* vs *Object)* and the number features of the attractor (*Match*=singular *vs. Mismatch*=plural). Interference was expected to manifest as an increased error rate in *Mismatch* conditions.

(1) <u>Sample Item</u> ('{…}|{…}' =response options, **bold**=plural attractor, the O is singular)

Mira-ne	vo billi	(a) [jise	ek chuhiyaa	dekh rahii thii]	pakaR	{lii}	| {liye}
Mira-ERG	that cat.SG	who-DOM	one rat	see -ing had.SG	catch	took.SG	took.PL
		(b) [jise	**kai chuuhe**	dekh rahe the]			
		who-DOM	many rats	see -ing had.PL			
		(c) [jis-ne	ek chuhiyaa	DhuunDh nikaali thii]			
		who-ERG	one rat	found out had.SG			
		(d) [jis-ne	**kai chuuhe**	DhuunDh nikaale the]			
		who-ERG	many rats	found out had.PL			

'Mira {had.SG} | {had.PL} caught the cat that (a,b=) the rat/rats had been staring at.'
(c,d=) had found the rat/rats.'

The proportion of correct responses is plotted in Figure 1. We observed robust agreement attraction in object agreement – Hindi speakers chose the incorrect continuation on a substantial number of trials 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 not for attractor role or their interaction.

Experiment 2: Subject Agreement An identical 2 x 2 design was tested for subject agreement using intransitive non-perfective matrix verbs. $N_{item}=36$, $N_{participants}=59$.

(2) Template: S_{SG} [$_{RC}$…Attractor …] V {AUX_{SG}}|{AUX_{PL}} (item omitted for space).

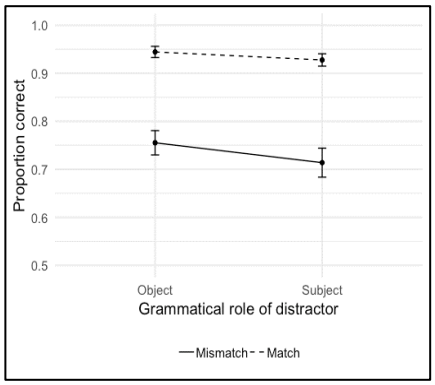


Figure 1. Object Agreement

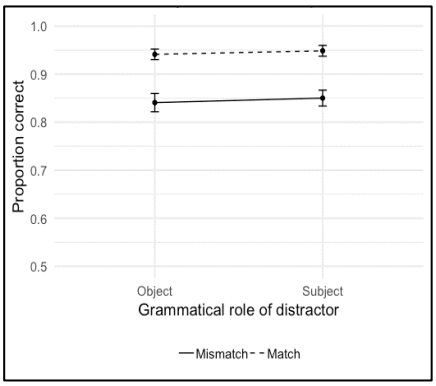


Figure 2. Subject Agreement

We observed robust attraction in subject agreement (Figure 2). Error rates were similar for subject and object attractors. Only the effect of attractor number was statistically significant in a logistic regression model ($p<0.001$).

Overall, we observed clear agreement attraction effects for object agreement and subject agreement in Hindi. Our results thus provide further evidence that object agreement is susceptible to attraction (See Santesteban, Pickering & Branigan, 2013 for results from Basque) just like subject agreement. Furthermore, we did not find evidence in support of the retrieval hypothesis for object agreement or subject agreement – the attractor's grammatical role did not appear to modulate the rate of attraction.

We believe that an alternative model of agreement errors, where errors are attributed to a corrupted representation of the agreement controller due to the presence of a mismatching attractor (see Eberhard et al., 2005), is also insufficient. This is motivated by the results of a related Hindi study in the same series as the experiments reported here where a key design difference was that, unlike the present studies, relative-clause internal agreement was not with the attractor noun and absolutely no agreement attraction obtained in *Mismatch* conditions.

We speculate that agreement attraction in Hindi (and the absence of differential error rates based on attractor role across object and subject agreement) can be attributed to similarity-based interference between the relative clause verb and the matrix verb. This could give rise to feature over-writing or feature migration from the relative clause verb to the matrix verb during planning and lead to the selection of the incorrect agreement form of the matrix auxiliary verb. Furthermore, such interference could arise quite early in the processing of the sentences due to the interplay of predictions about the upcoming verbs generated at each of the unmarked nouns in the structure. For example, in the *Mismatch* condition in object agreement, a prediction for a singular matrix verb would be generated at the unmarked matrix object noun, and a prediction for a plural relative clause verb would be generated at the unmarked attractor. The opposing featural specifications of these predictions could give rise to feature migration/ over-writing even prior to encountering any of the actual verb forms.