

INTRODUCTION

- ▶ The goal of the study is to investigate the interaction between expectation and locality through Hindi (a verb-final Indo-European language)
- ▶ Previous related work on Hindi (Vasishth and Lewis, 2006) has shown that
 - ▶ longer dependency length between a relative clause verb and its arguments leads to speed-up at the RC verb,
 - ▶ such speed-ups can be neutralized by similarity-based interference
- ▶ More recent work investigating locality and expectation has shown
 - ▶ locality effects in Russian relative clause constructions (Levy et al., 2012),
 - ▶ locality effects in German relative clause constructions (along with expectation effects in first-pass regression probability) (Vasishth and Drenhaus, 2011) (cf. Levy and Keller, 2013)
- ▶ Here we explore two kinds of expectation (syntactic expectation in Exp 1, and collocational/semantic expectation in Exp 2) and the influence of dependency length
 - ▶ We conducted two more experiments but do not discuss them here (but see abstract)

TASK AND PARTICIPANTS

- ▶ Participants read experimental sentences following the self paced reading (SPR) paradigm
- ▶ 60 Hindi native speakers from University of Allahabad, India participated in the experiment

EXPERIMENT I

- ▶ Experiment 1 investigated subject and object relatives, which are head-final in Hindi
- ▶ We varied the word order inside the relative clause such that the verb was either in its canonical (clause final) position or in a non-canonical (clause medial) position. Long condition corresponds to canonical order, while short condition corresponds to non-canonical order
- ▶ The ergative case on the relative pronoun in SR raises a strong expectation for a transitive verb (with perfective morphology)

Design

- ▶ 24 experimental items
- ▶ 2 (Relative clause type) × 2 (Distance)

Subject relatives	Long
Object relatives	Short

Items

- Subject relative, Long (verb final/canonical)
NP [rel.pron-erg N.obj Adv V] ...
 - Subject relative, Short (verb non-final/non-canonical)
NP [rel.pron-erg Adv V N.obj] ...
 - Object relative, Long (verb final/canonical)
NP [rel.pron-acc N.subj Adv V] ...
 - Object relative, Short (verb non-final/non-canonical)
NP [rel.pron-acc Adv V N.subj] ...

EXPERIMENT II

- ▶ Experiment 2 examined expectation vs distance in complex predicates (CPs).
- ▶ In Hindi, Noun-Verb compounds either have a highly predictable verb (e.g., khayaal rakhnaa, 'thought keep/put'; 'to take care of') or are merely object-verb sequences (e.g., guitar rakhnaa, 'guitar keep/put'; 'to put down or keep a guitar'); in both cases, the verb is superficially the same
- ▶ The nominal predicates/objects were selected after a sentence completion study to ensure that nominal predicates strongly predict a light verb and objects don't predict any verbal predicate consistently. The frequencies of objects and nominal predicates were also controlled

Design

- ▶ 16 experimental items
- ▶ 2 (Expectation) × 2 (Distance)

Strong expectation	Long
Weak expectation	Short

Items

- Strong expectation (Complex predicate), Long
... thought Adv (more Advs) keep ...
 - Strong expectation (Complex predicate), Short
... thought Adv keep ...
 - Weak expectation (Simple predicate), Long
... guitar Adv (more Advs) keep ...
 - Weak expectation (Simple predicate), Short
... guitar Adv keep ...

PREDICTIONS AND ANALYSIS

Prediction (Experiment 1)

- ▶ In Hindi, subjects can be elided more easily than objects
- ▶ This has the consequence that in SRs, the presence of the verb where an object would occur (condition b) is surprising because an overt object is expected
- ▶ In ORs, the presence of a verb where a subject would occur is not as surprising because subjects are relatively easier to elide.
- ▶ This predicts greater surprise at the verb in (b) vs (a), compared to ORs (d vs c)

Prediction (Experiment 2)

- ▶ Expectation predicts that in CPs the verb should be more predictable if distance is increased, and locality accounts predict that increasing distance should increase difficulty at the verb

Analysis

- ▶ Linear mixed-effects models were used to analyse the reading time data, logistic mixed-effects models were used to analyse question-answering data
- ▶ The reading time data was log transformed before fitting the model

RESULTS: EXPERIMENT I

	coef.	SE	t-value
Distance	-0.06	0.01	-4.92
RC Type	-0.05	0.01	-4.33
Distance × RC Type	0.04	0.01	3.25

Table 1: The main effect of distance, of RC type, and their interaction on reading times at the RC verb.

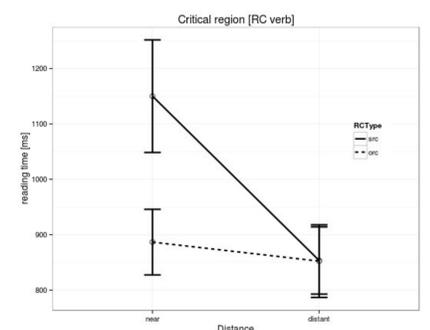


Figure 1: Reading times in ms at the critical region (RC verb) for the four conditions.

- ▶ Greater surprise at the verb in (b) vs (a) was found compared to ORs (d vs c). The interaction was also significant ($t=3.25$)
- ▶ Results consistent with Staub (2010), but not with Levy et al. (2013) who find locality effects using similar material in Russian

RESULTS: EXPERIMENT II

	Critical region			Post-critical region		
	coef.	SE	t-value	coef.	SE	t-value
Distance	0.01	0.02	0.63	0.01	0.01	0.89
Expectation	-0.06	0.02	-2.59*	0.01	0.01	0.55
Dist × Exp	0.03	0.02	1.25	0.01	0.01	1.50

Table 2: The main effect of distance, of expectation, and their interaction on reading times at the main/light verb and the post-critical region.

	coef.	SE	t-value
Distance (Strong Exp)	0.02	0.01	1.53
Distance (Weak Exp)	-0.01	0.01	-0.50
Exp	0.01	0.01	0.50

Table 3: The main effect of distance within the strong and weak expectation conditions, and the effect of expectation on reading times at the post-critical region.

- ▶ Strong effect of expectation in the strong expectation (complex predicate) condition ($t=-2.59$); no effect of distance
- ▶ Interaction was marginally significant at the post-critical region ($t=1.50$)
- ▶ Effect of distance in the strong expectation condition marginally significant at post-critical region ($t=1.53$), no effect of distance in the weak expectation condition
- ▶ cf. Piñango et al. (2006); Wittenberg and Piñango (2011)

CONCLUSIONS

- ▶ New evidence for expectation-based processing benefits due to syntactic and collocational/semantic prediction
- ▶ Strong expectation when not met has processing costs (this can sometimes offset locality/adjacency benefits)
- ▶ Strong expectation strength remains unaffected under low memory load (1-3 nominal/adverbial phrases)