Active expectation in the processing of Urdu & Hindi correlative structures

Urwa Ali, Sanvi Dubey, Ishita Kumar, Hayah Siddiqui, Dave Kush
University of Toronto, Scarborough

Comprehenders generate active expectations about how a sentence will unfold when resolving long-distance dependencies such as filler-gap and cataphoric dependencies (Stowe 1986, Van Gompel & Liversedge 2003), which has lead some authors to propose that the same anticipatory mechanisms subserve the processing of all long-distance dependencies (Kazanina et al 2007; Giskes & Kush 2021). In two self-paced reading (SPR) experiments we tested whether comprehenders pursue a similarly active strategy when resolving *correlative* structures in Urdu (Experiment 1) and Hindi (Experiment 2). Past experimental studies on correlatives in Hindi (Kothari 2010, Husain & Vasishth 2016) and Georgian (Foley 2020) investigated how factors like dependency length impact the processing and resolution of correlatives, but none have directly addressed the basic question of whether the incremental processing of correlatives is active.

Correlative structures are composed of two clauses: a correlative clause followed by a matrix clause. The correlative clause contains a *correlative pronoun* (*jo* in 1). The subsequent matrix clause must contain a demonstrative pronoun (*vo* in 1) associated with the correlative pronoun (Srivastav 1991; Bhatt 2003). Although the matrix clause must contain a demonstrative, the linear position of the demonstrative is not grammatically fixed. The demonstrative can be clause-initial as in (1) or not (*us-se* in 2). We reasoned that comprehenders would predictively posit the demonstrative in clause-initial position if they pursue an active resolution strategy.

Design. 24 test items were created. The structure of the items and most of the words used were identical in both languages. In some items we changed nouns and proper names, reflecting cross-cultural differences in vocabulary (e.g. Hindi *adhyaapak* 'teacher' replaced Urdu *ustaad* 'teacher'). Items followed a 2×2 factorial design manipulating ClauseType × DemonstrativePosition illustrated in (3). ClauseType controlled whether the first clause was an *Argument correlative* (headed by *jo* 'which'), or a *Temporal Adjunct* (headed by *jab,* 'when'). DemonstrativePosition manipulated whether the subject of the second clause was the demonstrative *us* (*First*) or a proper name (*NotFirst*). We reasoned that if participants actively expect a demonstrative in clause-initial position after *jo* but not *jab*, then they should be surprised to encounter a proper name (*Ahsan*) in the *Argument-NotFirst* condition compared to the *Adjunct-NotFirst* condition. No such difference is expected when the demonstrative is the first phrase in the clause.

Results. Statistical analysis used maximal LMEMs on log-transformed RTs. **Experiment 1 – Urdu (N=44):** Analysis revealed a significant ClauseType × Demonstrative interaction (t = 2.53) at the critical Name region. Planned comparisons revealed that RTs on the clause-initial proper name were longer (t = 2.28) after *jo* than after *jab*, but no difference was observed when the main subject was a demonstrative (t = -1.28). **Experiment 2 – Hindi (N = 50, collection ongoing):** We observed a significant ClauseType × Demonstrative interaction in the spillover region immediately following the proper name (t = 2.03). Planned comparisons showed the same surprise effect as in Experiment 1 (t = 2.02).

Our results suggest that after seeing the individual-denoting correlative pronoun *jo,* comprehenders expect a coreferential demonstrative in sentence-initial position in the second clause. They further suggest that the dependencies are processed actively, similar to other forward-looking dependency constructions. The results do not determine how fine-grained comprehenders' expectations are during correlative resolution. Future work will address this question.

(1) jo bacca dudh pii rahaa thaa, *(vo) Ali-se baDaa thaa.
who child milk drink PROG aux.PAST.3sg DEM Ali-from big be-PAST.3sg
`Which child was drinking milk, he was bigger than Ali.'

(2) jo bacca dudh pii rahaa thaa, Ali us-se baDaa thaa.
who child milk drink PROG aux.PAST.3sg Ali DEM-from big be-PAST.3sg
`Which child was drinking milk, Ali was bigger than him.'

(3) a. *Argument-NotFirst*

Jo /ustaad / qalam ko / jeb me / Daal / rahaa thaa,/ Ahsan ne/ klas me/ us se
CORR teacher pen ACC pocket in put PROG AUX Ahsan ERG class in DEM from
/sawaal/ puchaa.
question asked
'*Which teacher* was putting the pen in his pocket, *Ahsan* asked him a question in class.'

b. *Adjunct-NotFirst*

Jab /ustaad / qalam ko / jeb me / Daal / rahaa thaa,/ Ahsan ne/ klas me/ us se
WHEN teacher pen ACC pocket in put PROG AUX Ahsan ERG class in Ahsan from
/sawaal/ puchaa.
question asked
'*When* the teacher was putting the pen in his pocket, *Ahsan* asked him a question in class.'

c. *Argument-First*

Jo /ustaad / qalam ko / jeb me / Daal / rahaa thaa,/ us ne/ klas me/ Ahsan se
CORR teacher pen ACC pocket in put PROG AUX DEM ERG class in Ahsan from
/sawaal/ puchaa.
question asked
'*Which teacher* was putting the pen in his pocket, *he* asked Ahsan a question in class.'

d. *Adjunct-First*

Jab /ustaad / qalam ko / jeb me / Daal / rahaa thaa,/ us ne/ klas me/ Ahsan se
WHEN teacher pen ACC pocket in put PROG AUX DEM ERG class in Ahsan from
/sawaal/ puchaa.
question asked
'*When* the teacher was putting the pen in his pocket, *he* asked Ahsan a question in class.'

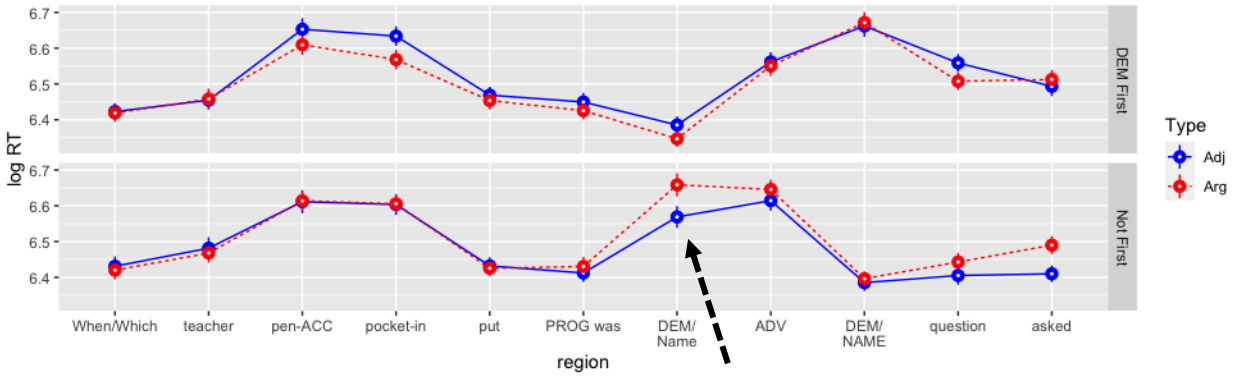

Figure 1. Average region-by-region log-transformed RTs from Experiment 1 (Urdu) split by DemonstrativePosition.