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# **Exhaustive movement, exhaustive tone: a syntactic–prosodic investigation of Gujarati**

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**(Formal) Approaches to South Asian Languages 11**

University of Minnesota

27 March 2021

# The Puzzle

Exhaustive movement,  
exhaustive tone:  
a syntactic-prosodic  
investigation of  
Gujarati

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- (1) **Context:** The doctor had asked Shahrukh to eat pineapples and bananas frequently during the day. So he brought both pineapples and bananas from the market.
- (2) šāhrukh-e (ananas) vāramvār (ananas) khādhū L\*L%  
Shahrukh.M.SG-ERG pineapple frequently pineapple eat.PFV.N.SG  
'Shahrukh (**only**) ate pineapple frequently.'
- (3) šāhrukh-e ananas vāramvār khādhū (H\*LH%) paṇ  
Shahrukh.M.SG-ERG pineapple frequently eat.PFV.N.SG but  
keḷā nahi khādhā  
banana.N.PL NEG eat.PFV.N.PL  
'Shahrukh (**only**) ate pineapple frequently, but he did not eat bananas.'

# Questions based on the puzzle

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- ▶ Do exhaustivity and narrow focus have the same effect on the syntactic position and prosody of an argument?
  - ▶ When under narrow focus, does the exhaustivity reading of an object affect its likelihood to be raised or in situ? Or does the use of raising for narrow focus make it impossible to convey (non-)exhaustivity?
  - ▶ Does the exhaustivity reading of an object affect the final contour of the clause? Can the use of e.g. L% (declarative, completeness) vs. LH% (interrogative, incompleteness) be leveraged for this purpose?
  - ▶ Are these effects seen in forced choices between syntactic options, lab-style production of prosody, or in ratings of recorded speech?
- ▶ To answer these questions, we designed and carried out two experiments:
  - ▶ Experiment 1: Forced-choice task + production task
  - ▶ Experiment 2: Listening task

# Roadmap

- ▶ Preview of main claims
- ▶ Background on Gujarati Prosody
- ▶ Syntactic diagnostics for narrow focus and exhaustivity
- ▶ Methods
  - ▶ Forced choice task + Production task
  - ▶ Listening task
- ▶ Results
  - ▶ Forced choice task
  - ▶ Production task
  - ▶ Listening task
  - ▶ Synthesis of results
- ▶ Return to our questions
- ▶ Conclusions & Future directions

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## Preview: Main claims

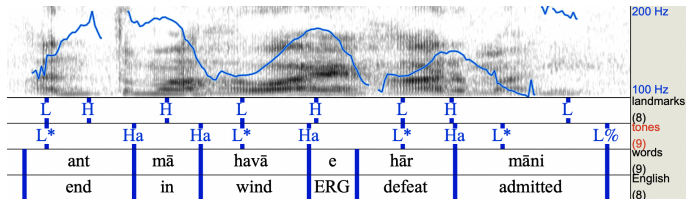
- ▶ New-information focus in Gujarati is interpreted *ex situ* immediately above *vP* (Joshi 2020) and we will show that Exhaustive focus can be interpreted *ex situ*, immediately above *vP* or *in situ* in Gujarati.<sup>1</sup>
- ▶ ***Prosody seems to help in system optimization:*** Exhaustivity can be interpreted *in situ* by prosodic cues (by using L% boundary tone) or by overt syntactic movement to a designated focus position (immediately above *vP*), as narrow focus *via* overt movement is exhaustively interpreted in Gujarati.
- ▶ **Monoclausal contexts:** L% boundary tone feeds exhaustive interpretation.
- ▶ **Biclausal contexts:** The boundary tone for the first clause is LH% (to mark continuation, irrespective of exhaustivity). As a result, in such cases overt movement is slightly more preferred to convey Exhaustive meaning.

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<sup>1</sup>Kidwai (2000) and Jayaseelan (2008) argue for a lower focus position in Hindi/Urdu and Malayalam, respectively.

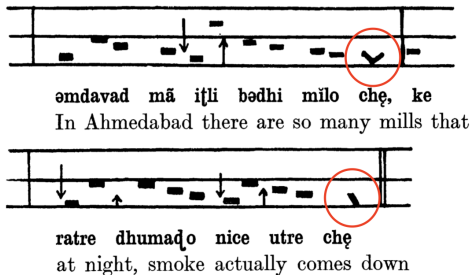
## Background on Gujarati Prosody

- ▶ Like most other South Asian languages (Khan 2020), Gujarati canonically assigns a **rising contour onto every AP** (Accentual Phrase, roughly a word-sized prosodic unit)
- ▶ Rising APs are composed of a low pitch accent (L\*) on the stressed syllable and high boundary tone (Ha) at the AP edge.
- ▶ Gujarati also assigns a **final contour** on the Intonation Phrase (IP)-final AP, incl. boundary tone that **conveys sentence type, information structure**, etc.



## Background on Gujarati Prosody

- ▶ For example, Firth (1957) described a **low-falling final contour** (L\* L%) at the ends of **declaratives**, and a **low-rising final contour** (L\* LH%) as **continuation rises**, although he does not use this terminology or labeling.
- ▶ These prosodic patterns match those of Hindi, Urdu, Bengali, Tamil, etc.
- ▶ To our knowledge, there has been no published work on Gujarati prosody since Firth's (1957) hand-drawn pitch tracks.



# Diagnostics for narrow focus

- ▶ Here, following Hamblin (1973) we use the *question-answer congruence test* to make the lower focus position more explicit.

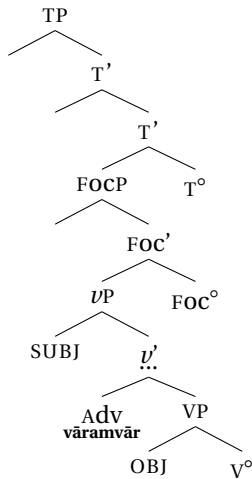
## Narrow (wh-answer) focus on the object

- (4) priyankā-e [ko-ne]<sub>F</sub> vāramvār pel-i gāḍi āp-i?  
Priyanka.F.SG-ERG who-DAT frequently that-F.SG car.F.SG give-PFV.F.SG  
'Whom did Priyanka frequently give the car to?' (LH%)
- (5) priyankā-e ([vidyā-ne]<sub>F</sub>) vāramvār (?[vidyā-ne]<sub>F</sub>) pel-i  
Priyanka.F.SG-ERG Vidya.F.SG-DAT frequently Vidya.F.SG-DAT that-F.SG  
gāḍi āp-i  
car.F.SG give-PFV.F.SG  
'Priyanka frequently gave that car (*only*) to [Vidya]<sub>F</sub>.' (L%)



# Structural representation

(6)



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# Diagnostics for exhaustivity

- ▶ Following Kiss (2006c), we use the *at least-n* test to determine the structural position of the exhaustive interpretation.
- ▶ A scalar element *n*, interpretable as '*at least n*', can only mean '*exactly n*' in the preverbal focus slot (immediately above *vP*), which is derived from the exhaustivity of structural focus, involving the exclusion of all alternatives but that denoted by the focused constituent.

**Context:** At a music concert, where members of the audience are rewarded if they listen to two boys on the stage.

(7)    jeṇe        **be chokrāone** vāramvār sām̐bhlyā haṣe    eṇe        inām malše  
who.ERG two boy.PL.DAT frequently hear        be.FUT 3.SG.ERG reward get.3.SG.FUT  
'Whoever has heard (**exactly**) two boys will get the reward.' (**exhaustive**)

(8)    jeṇe        vāramvār **be chokrāone** sām̐bhlyā haṣe    eṇe        inām malše  
who.ERG frequently two boy.PL.DAT hear        be.FUT 3.SG.ERG reward get.3.SG.FUT  
'Whoever has heard (**at least**) two boys will get the reward.' (**non-exhaustive**)

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# Forced choice task + Production task: Methods

- ▶ These tasks were conducted with 5 native Gujarati speakers over a Zoom call, recorded with prior consent.
- ▶ Recordings were annotated using InTraSAL (Khan 2020).
- ▶ 6 target sentences: 4 *biclausal*, 2 *monoclausal*
- ▶ Each target sentence was preceded by a context paragraph.
- ▶ **Forced-choice:** Participants read the contexts in silence, and chose 1 of 2 options for the target sentence's object position: *in-situ*, *raised/ex-situ*
- ▶ **Production:** They then read the context + their selected option out loud.
- ▶ Distractors: initial reading task + 3 interspersed fillers.

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# Listening task: Methods

- ▶ 5 native Gujarati speakers (distinct from production task participants).
- ▶ Conducted over Zoom calls, responses collected in GoogleForms.
- ▶ Used the same 6 target sentences+contexts from the Production task.
- ▶ We provided 8 possible options (randomized) for each target sentence:
  1. In-situ Object + H\* LH%
  2. Raised Object + H\* LH%
  3. In-situ Object + L\* LH%
  4. Raised Object + L\* LH%
  5. In-situ Object + L\* L%
  6. Raised Object + L\* L%
  7. In-situ Object + H\* H%
  8. Raised Object + H\* H%
- ▶ Participants heard recordings of the context paired with each of the 8 options.
- ▶ The task was to rate each combination on a 1-7 Likert scale.

## Forced-choice task: Syntax results

- ▶ We first report syntactic results in forced-choice responses, followed by prosodic results in their productions.
- ▶ In the forced-choice task, participants chose between two options where the only variation was in the position of an object under narrow focus.
- ▶ Participants did not appear to take exhaustivity into account.
- ▶ **Participants overwhelmingly chose the option with raised objects for all target sentences**, regardless of exhaustivity established in the context.
- ▶ Suggests participants were primarily **motivated by focus considerations**.

### Total productions (10 per row)

Context		Object in situ	Object raised
Monocl.	Exh.	3	7
Biclausal		3	7
	Non-exh.	2	9



## Overview of listening task results

- ▶ Overall, mean ratings in the listening task are rather high (5+) for almost all possible syntax + prosody combinations
- ▶ **Ratings** appear to vary across **prosodic contours**, but apparently based on completeness, **not based on exhaustivity**.
- ▶ The variation in ratings across **syntactic options within each contour category**, however, appear to **subtly reflect exhaustivity**.
- ▶ We first report prosodic factors, followed by syntactic factors.

### Mean ratings (1–7)

Context		Object in situ				Object raised			
		L* L%	L* LH%	H* H%	H* LH%	L* L%	L* LH%	H* H%	H* LH%
Monocl.	Exh.	6.3	2.9	2.3	3.1	5.9	4.5	1.9	3.1
Biclausal		5.6	5.1	4.3	5.9	5.3	5.9	4.7	6.4
	Non-exh.	5.1	5.5	4.7	6.3	5.7	5.4	4.9	6.1

- ▶ Since ratings are overall very high for almost all options, we focus on what is the **highest-rated option** per exhaustivity context:
- ▶ In both **exhaustive** and **non-exhaustive** contexts for **biclausal** declaratives, participants gave the **highest ratings to the H\* LH% contour**, similar to the L\* LH% "continuation rise" seen in the production task.
- ▶ In **monoclausal** declaratives, participants **uniformly preferred the declarative-final L\* L%**, matching the universal pattern in the production task.
- ▶ The prosodic preferences suggest that participants are paying attention to the completeness of a declarative, even if not directly considering exhaustivity.

Context		Object in situ				Object raised			
		L* L%	L* LH%	H* H%	H* LH%	L* L%	L* LH%	H* H%	H* LH%
Monocl.	Exh.	6.3	2.9	2.3	3.1	5.9	4.5	1.9	3.1
Biclausal		5.6	5.1	4.3	5.9	5.3	5.9	4.7	6.4
	Non-exh.	5.1	5.5	4.7	6.3	5.7	5.4	4.9	6.1





# Synthesis of results

- ▶ Participants in the **forced-choice task** seem to **ignore exhaustivity** concerns, and **raised almost all objects**, presumably to mark them with narrow focus.
- ▶ In their subsequent recordings, however, **exhaustivity played a role in the final contours** they produced.
- ▶ In the **listening task**, where all stimulus recordings had been carefully produced with focus prosody on the item under narrow focus, listeners were **generally satisfied with almost all options**.
- ▶ Still, listeners gave the **highest ratings** to final contours that correctly conveyed **monoclausal-finality** (L\* L%) vs. **biclausal-mediality** (H\* LH%)...
- ▶ ...and among these recordings, the **highest ratings** went to those with **raising in an exhaustive context**, and vice versa.

# Back to our questions from the puzzle

- ▶ When under narrow focus, does the exhaustivity reading of an object affect its likelihood to be raised or in situ? Or does the use of raising for narrow focus make it impossible to convey (non-)exhaustivity?
- ▶ **Participants are primarily concerned with making sure the object sounded narrowly focused. In the forced-choice task, when prompted to consider syntax, they achieved this through movement, and did not appear to consider how exhaustivity might be interpreted.**
- ▶ **In listening, they were satisfied with the focus prosody produced on the object, and were apparently able to consider syntactic variation as a marker of exhaustivity, not just focus.**

# Back to our questions from the puzzle

- ▶ Does the exhaustivity reading of an object affect the final contour of the clause?  
Can the use of e.g. L% (declarative, completeness) vs. LH% (interrogative, incompleteness) be leveraged for this purpose?
- ▶ **In production, yes: LH% was the dominant final tone for non-exhaustive contexts, and not for exhaustive contexts.**
- ▶ **In listening, no: participants rated LH% on top regardless of exhaustivity.**

# Back to our questions from the puzzle

- ▶ Are these effects seen in forced choices between syntactic options, lab-style production of prosody, or in ratings of recorded speech?
- ▶ **Based on the task, participants attended differently to syntax vs. prosody, and to the related concepts of exhaustivity vs. focus vs. utterance-finality.**
- ▶ **In the forced-choice syntax task, participants seemed to only consider narrow focus in raising objects.**
- ▶ **In the production task, participants varied their prosody based on exhaustivity.**
- ▶ **In the listening task, where focus prosody was provided in the recordings, participants slightly preferred when raising reflected exhaustivity.**

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# Conclusions

- ▶ Gujarati speakers take at least these factors into consideration when producing and rating syntax and prosody:
  - ▶ Finality: monoclausal-declarative-final vs. biclausal-declarative-medial
  - ▶ Narrow focus
  - ▶ Exhaustivity interpretation
- ▶ However, there is ambiguity in what a particular word order or intonational contour is conveying, leading to variability
  - ▶ Raising can convey narrow focus and/or exhaustivity
  - ▶ Final falls (L%) can convey monoclausal-declarative-finality and/or exhaustivity
- ▶ These results are based on just 5 speakers per task, and thus remain tentative until tested across a wider pool.
- ▶ More work will need to be done to further tease apart these intersecting factors.

# References

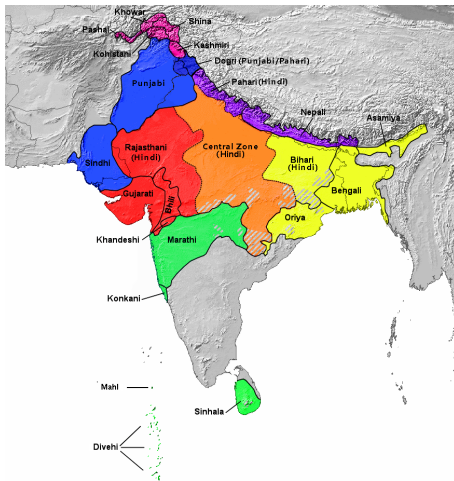
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# Background

- ▶ Gujarati is an Indo-European language (Indo-Aryan branch) primarily spoken in Gujarat state and Mumbai, in western India.
- ▶ Like most other South Asian languages, Gujarati is an **SOV language** with relatively **flexible word order**



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## Appendix-II: Differences *Vis-à-vis* Hungarian

- ▶ It has often been argued that *ex situ* foci in Hungarian must be interpreted exhaustively (Szabolcsi 1981, 1994, É. Kiss 1998), whereas *in situ* foci are not.

- ▶ **Exhaustive focus interpretation** (Onea 2011:23)

- (11) A padlón [Péter]<sub>FOC</sub> aludt  
on the-floor Peter slept  
'Peter slept on the floor, and no one else.'

- ▶ **New-info. focus interpretation** (Onea 2011:23)

- (12) A padlón aludt [Péter]<sub>FOC</sub>  
on the-floor slept Peter  
'Peter slept on the floor, and possibly someone else too'

## Structural position of *vāramvār* (frequently)

The other type of non-agreeing adverbs are adverbs like *vāramvār* ('frequently') that adjoin to the vP-adjunct position.

- (13) **(??vāramvār)** rām lagbhag **(vāramvār)** ghare **(??vāramvār)** vhello  
frequently Ram probably frequently house.OBL frequently early  
āv-yo **(\*vāramvār)**  
come-M.SG frequently  
'Ram probably frequently came home early.'

- (14)
- 
- ```

graph TD
    vP --> Adjunct[ ]
    vP --> v_prime[v']
    v_prime --> vāramvār[vāramvār]
    v_prime --> VP[VP]
    VP --> Triangle[ ]
    Triangle --> vhello[vhello]
    Triangle --> ghare[ghare]
    Triangle --> āvyo[āvyo]
  
```
- vhello ghare āvyo

# Empirical landscape

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## Narrow (wh-answer) focus on the subject

- (15) vidyā-ne ([**koṇ-e**]<sub>F</sub>) vāramvār (?[**koṇ-e**]<sub>F</sub>) pel-i gāḍi  
Vidya.F.SG-DAT who-ERG frequently who-ERG that-F.SG car.F.SG  
āp-i?  
give-PFV.F.SG  
'Who frequently gave that car to Vidya?' (LH%)
- (16) vidyā-ne ([**priyankā-e**]<sub>F</sub>) vāramvār (?[**priyankā-e**]<sub>F</sub>) pel-i  
Vidya.F.SG-DAT Priyanka.F.SG-ERG frequently Priyanka.F.SG-ERG that-F.SG  
gāḍi āp-i  
car.F.SG give-PFV.F.SG  
'(**Only**) [Priyanka]<sub>F</sub> frequently gave that car to Vidya.' (L%)

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રાજ અને શીએબ વચ્ચે દલીલ થઈ હતી કે શાહરૂખે તેના કેરિયરમા કયા ફિલ્મના પુરસ્કારો જીત્યા છે. રાજ શાહરૂખનો સૌથી મોટો ચાહક હોવાથી, તેનો જવાબ તે જાણતો હતો અને તેણે કહ્યું હતું કે:

☐ I have read the paragraph silently

Next, choose the best option for the final sentence to complete the paragraph: \*

○ શાહરૂખે ફિલ્મફેર વારંવાર જીત્યું છે.

○ શાહરૂખે વારંવાર ફિલ્મફેર જીત્યું છે.

Now read the whole paragraph out loud, including the sentence that you chose to complete the paragraph.

☐ I have read the entire paragraph out loud, including my choice for the last sentence.

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## Listening task: Snapshot

## Paragraph 1 / 6

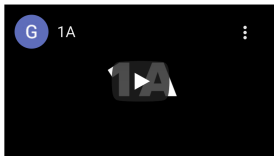
Listen to the following 8 recordings, which are the same paragraph, with only the last part slightly changed each time.

After listening to all 8 recordings, rate each one on a scale of 1 (awful) to 7 (perfectly natural), in terms of how natural the ending feels in the overall paragraph.

Consider the words in the sentences, as well as *how* they are said.

You can listen to the recordings as many times as you like.

Option 1A



How would you rate option 1A (above)? \*

1      2      3      4      5      6      7

એકદમ ખરાબ છે

○ ○ ○ ○ ○ ○ ○

એકદમ સારું છે

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