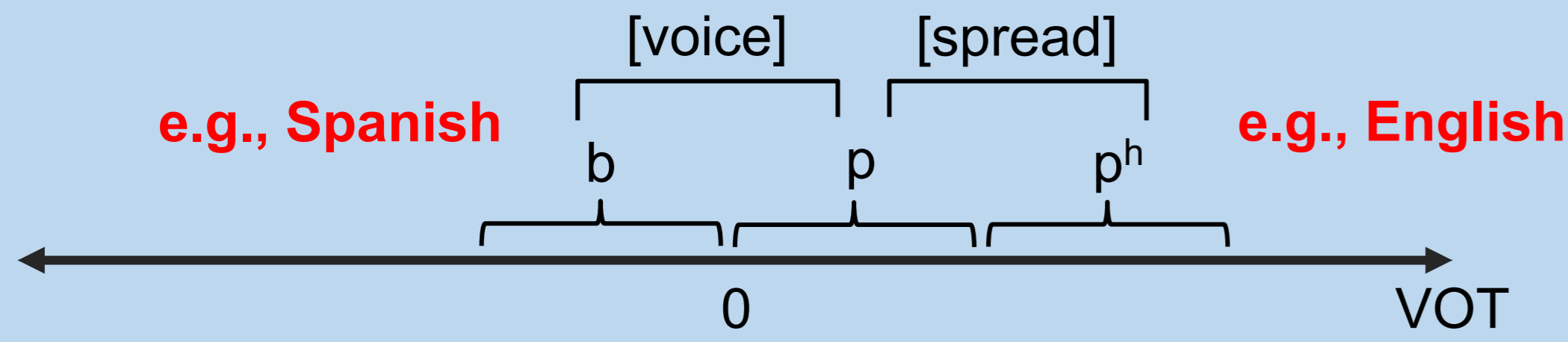


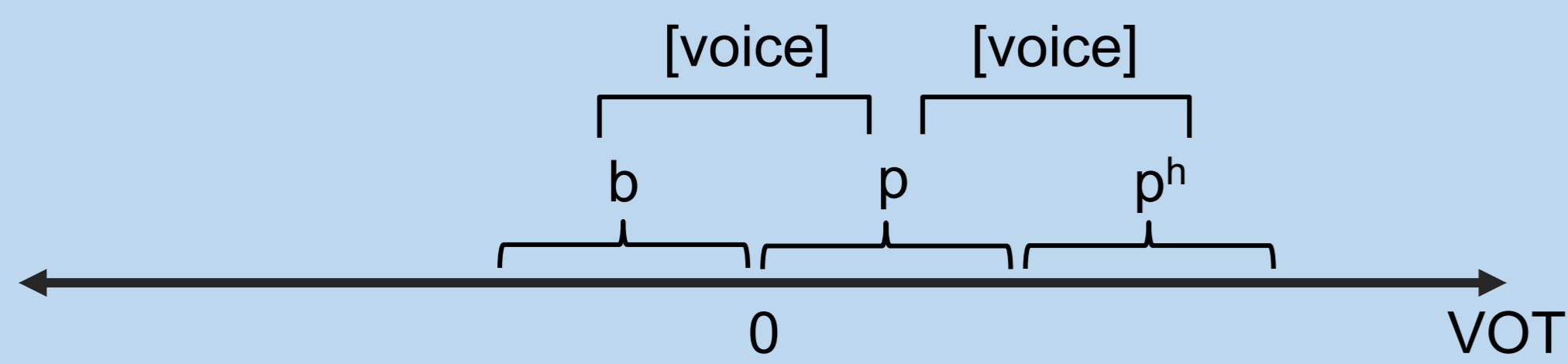
BACKGROUND

• How are laryngeal contrasts represented?

1. Realist (e.g., Iverson & Salmons, 1995; Honeybone, 2005)



2. Abstract (e.g., Chomsky and Halle, 1968; Keating, 1984)



• Case study – Bengali (Indic) four-way contrast

category	example	realist	abstract (Islam, 2019)
T	ṭana drawn	[]	[]
Th	ṭhana police station	[spread]	[spread]
D	ḍana grain	[voice]	[voice]
Dh	ḍhana paddy	[voice], [spread]	[breathy]

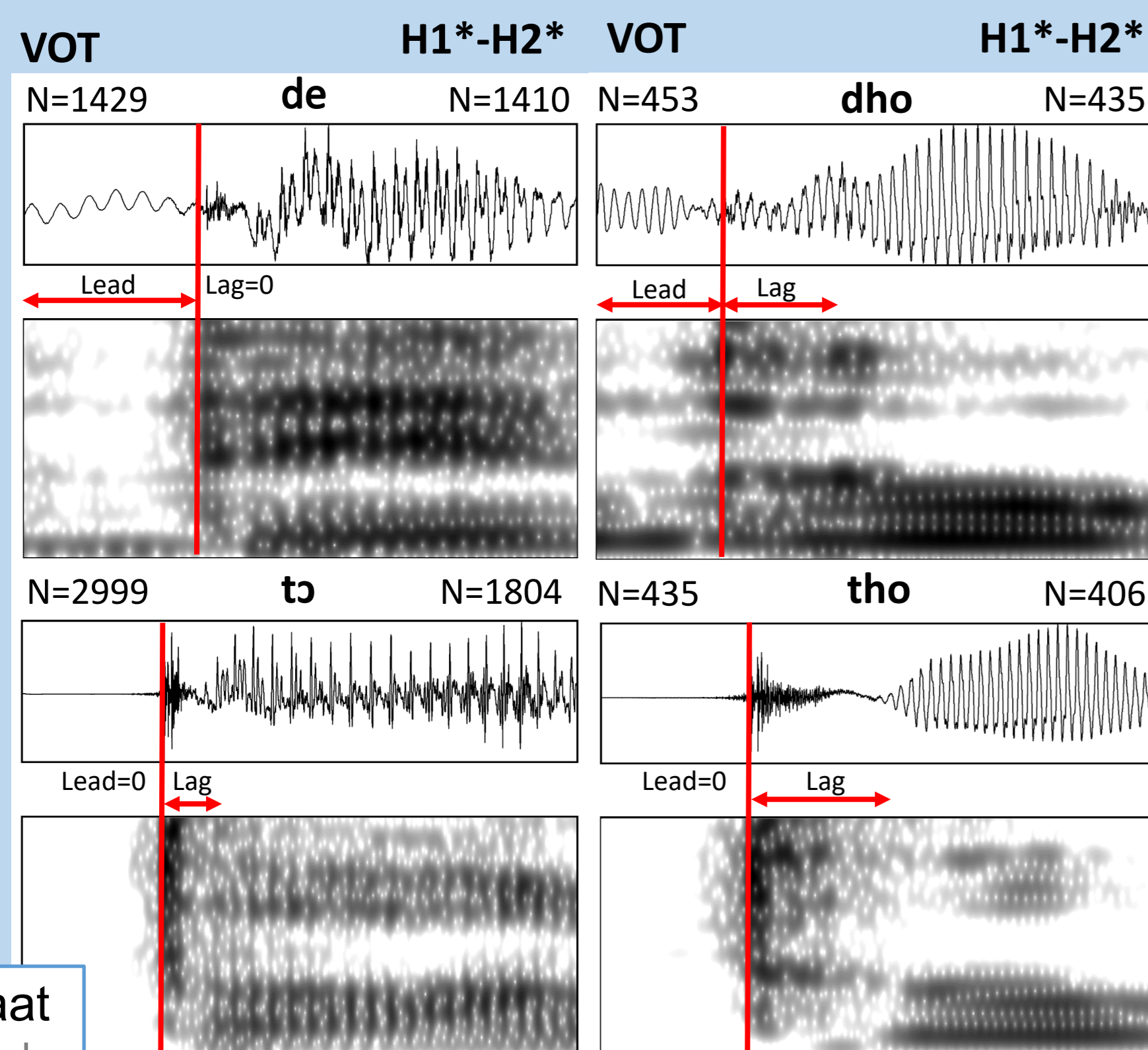
Feature	Phonetic cue
[voice]	(negative) lead VOT
[spread]	(positive) lag VOT
[breathy]	H1*-H2*

METHOD

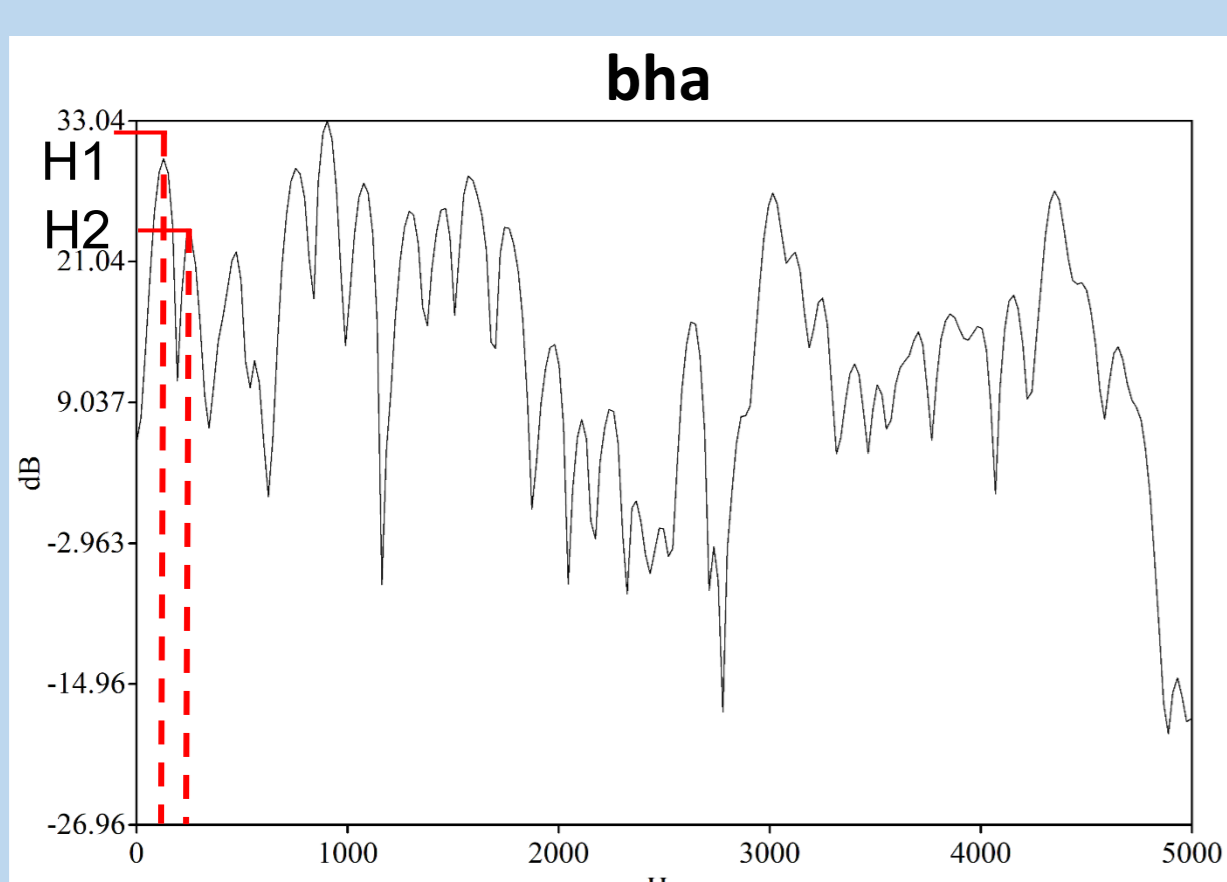
- Infant vs adult-directed speech (IDS vs ADS)
 - Slower (longer lead and lag VOT) (Cox et al., 2022)
 - Hyper-articulated, breathier (greater H1*-H2*) (Kuhl et al., 1997; Miyazawa et al., 2017)
- Can help tease apart [voice]+[spread] vs [breathy]
- If phonetic cues associated with specified features are exaggerated in IDS (Beckman et al., 2013), for Dh -

ADS	Realist IDS	Abstract IDS
x lead	x+ lead	x lead
y lag	y+ lag	y lag
z h1h2	z h1h2	z+ h1h2

• Recordings of 10 native speakers of Bangladeshi Bengali (Yu et al., 2014)



VOT in Praat (Boersma and Weenink, 2022)



H1-H2 in Voicesauce (Shue et al., 2011)

RESULTS

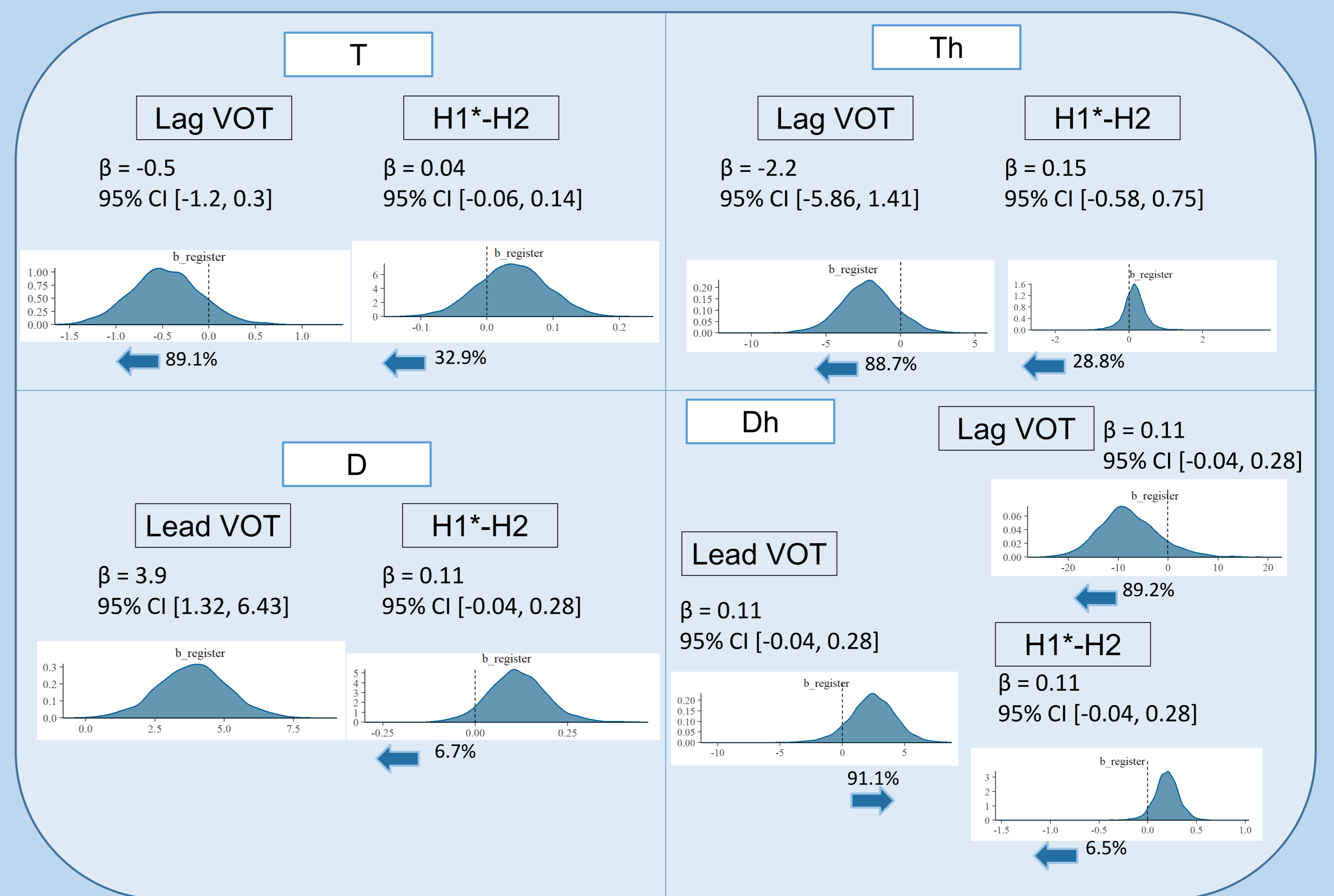
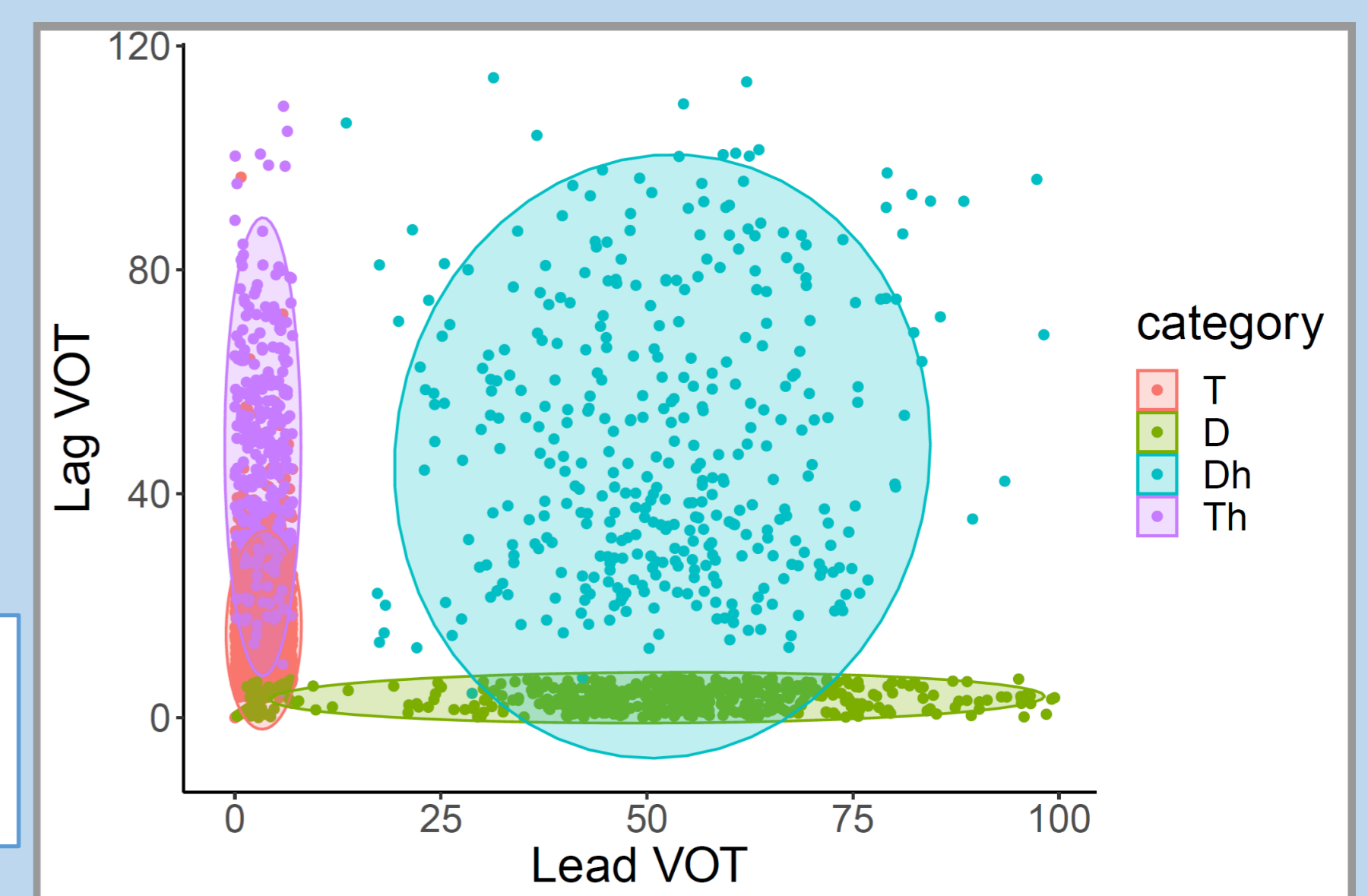
H1H2 does not help predict category, but lead and lag VOT do.

model	register	accuracy
category ~ lead + lag + h1h2	IDS	93.4%
	ADS	92.03%
category ~ lead + lag	IDS	93.4%
	ADS	92.2%
category ~ lead + h1h2	IDS	77.01% !
	ADS	73.7% !
category ~ lag + h1h2	IDS	76.9% !
	ADS	79.9% !

	β	Lead VOT	Lag VOT
Th/T	-6.07 *	0.06 *	0.15 *
D/T	-0.59 *	0.14 *	-0.4 *
Dh/T	-8.3 *	0.18 *	0.16 *

* 95% CI excludes 0

- Th by longer lag VOT [spread]
- D by longer lead VOT [voice]
- Dh by longer lead and lag VOT [voice], [spread]



CONCLUSIONS

- Bengali “voiced aspirates” are just that – specified by [voice] and [spread].
- Some asymmetry between the realization of Th and Dh versus D.
- Does not necessarily mean features are asymmetric (Schwarz et al., 2019).
- Phonetic realization - phonological specification relationship mediated by language specific-phonetic grammars.
- Robust evidence for featural representations must be *phonological* (e.g., Honeybone, 2005), not just phonetic.

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