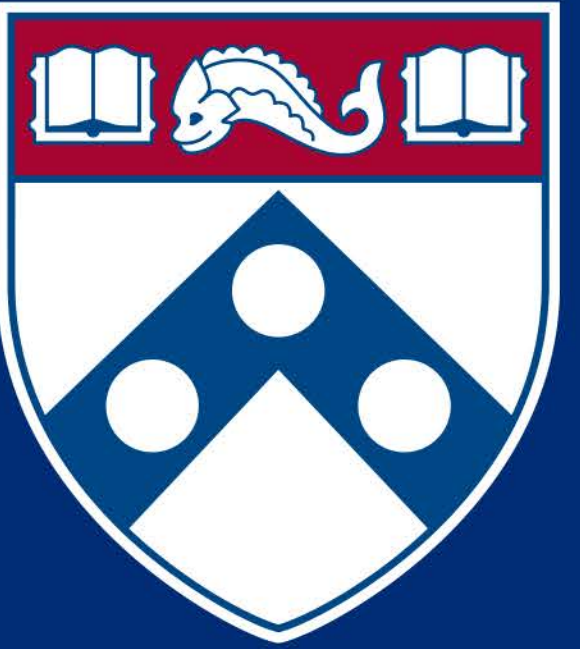
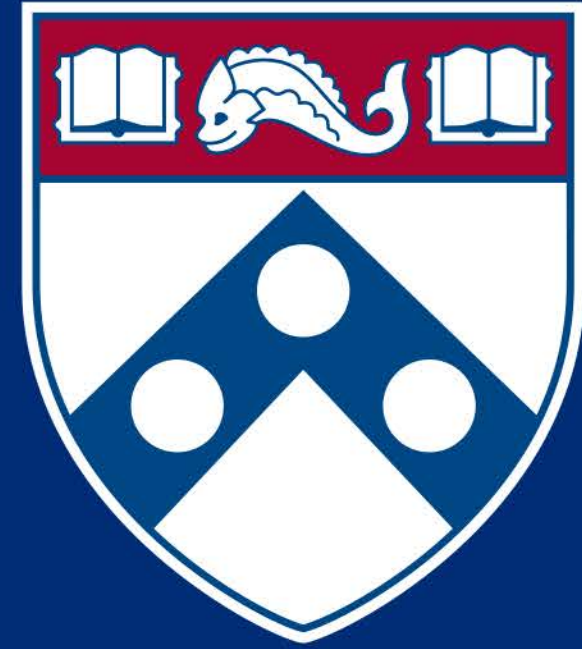


Syntactic bootstrapping mental verbs and perception verbs with limited morphosyntactic cues



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Introduction

- Learning word meanings is hard, especially for words that are abstract and lack reliable real-world correlates, such as mental verbs and perception verbs (e.g. Gillette et al. 1999, Medina et al. 2010).
- Syntactic bootstrapping has proven to be a helpful strategy (Gleitman 1990, Fisher et al. 1991, Gleitman et al. 2005), e.g. mental verbs are associated with sentential complements (Papafragou et al. 2007, Harrigan et al. 2019, Harrigan 2020).
- But what if different types of verbs overlap in their syntactic frames?
 - Cross-linguistically, both mental verbs and perception verbs are associated with CP and NP complements (e.g. Landau & Gleitman 1985, Fisher et al. 1991, Whitt 2009):
 - a. John *knew* that it rained. b. John *saw* that it rained.
 - a. John *knew* the answer. b. John *saw* the answer.
- Question: How do children learn the distinction between mental verbs and perception verbs?

Syntax and semantics of mental and perception verbs

- We focus on Mandarin, a language with minimal morphosyntax, to test the limit of syntactic bootstrapping.

Verb type	CP	Embedded subjects, modals, aspects	NP	Epistemically neutral
Belief verbs (e.g. <i>xiangxin</i> 'believe')	Yes	Yes	Yes	No
Desire verbs (e.g. <i>xiangyao</i> 'want')	Yes	Usually no	Yes	No
Perceptual exploration verbs (e.g. <i>kan</i> 'watch')	Yes	Yes	Yes	Yes, but <i>kan</i> 'watch' is often used non-neutrally
Perceptual achievement verbs (e.g. <i>kandao</i> 'see')	Yes	Yes	Yes	Yes

Table 1

- Complements of belief verbs and perception verbs are superficially identical:
 - a. wo *zhidao* ta lai. [belief] b. wo *tingdao* ta lai. [perception]
I know 3s come I hear 3s come
'I know s/he will come.' 'I hear her/him come.'
- Are there sufficient distributional cues to distinguish between belief verbs and perception verbs in Mandarin input?

Methods

- Eight Mandarin corpora from CHILDES (MacWhinney 2000): naturalistic interactions between caregivers and children 0;8 - 6 years of age.
- Extracted all caregivers' utterances containing belief or perception verbs in Table 2; coded for each token the syntactic category of the verb complement (null, NP, CP) and the aspect marker in the matrix clause.

Methods

- Possible cues:

1. Frequency of CP complements

- Only perception verbs have epistemically neutral use
- CP complements are associated with epistemically non-neutral use
- Belief verbs are predicted to take CP complements more frequently

Class	Verb	Count
Belief verb	<i>zhidao</i> 'know'	998
	<i>juede</i> 'think'	239
	<i>cai</i> 'guess'	73
Perception verb	<i>jide</i> 'remember'	53
	<i>kan</i> 'look, watch'	5961
	<i>kandao</i> 'see'	784
	<i>ting</i> 'listen'	432
	<i>tingdao</i> 'hear'	243

2. Overt embedded subjects

- "Mary *knew* *she* left." vs. "Mary *saw* *her* leave."
- Mandarin: old information is more likely to appear at the beginning of a sentence and more likely to be omitted (Li & Thompson 1976)
- Belief verbs may have fewer overt embedded subjects

3. Type and frequency of aspect markers

- Event property theories: mental verbs and perceptual achievement verbs are "states"; perceptual exploration verbs are "activities"
- "Activities" but not "states" can occur with imperfective aspects (Vendler 1957)
- Perception verbs, especially perceptual exploration verbs, are predicted to occur with aspect markers more, especially with imperfective aspect markers

Results

Frequency of CP complements

Percentages (%)

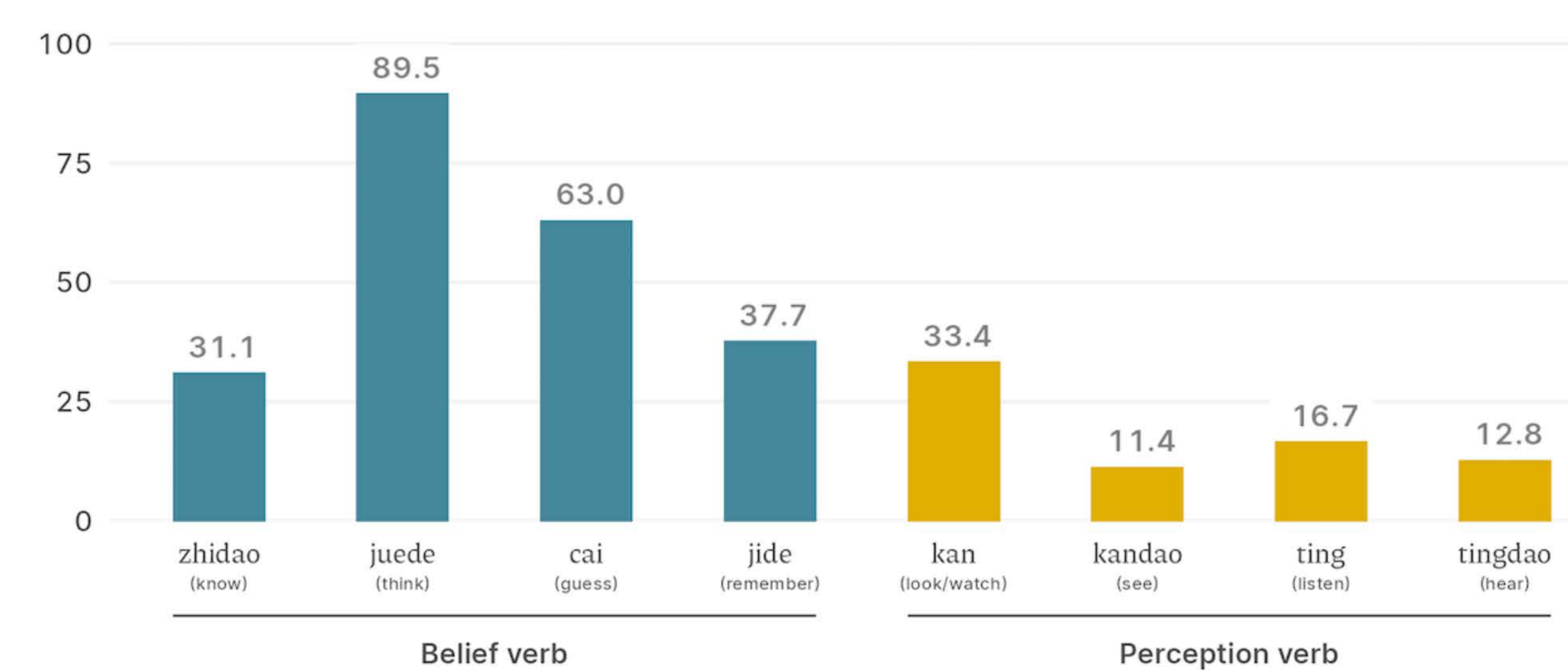


Figure 1

Frequency of overt embedded subjects

Percentages (%)

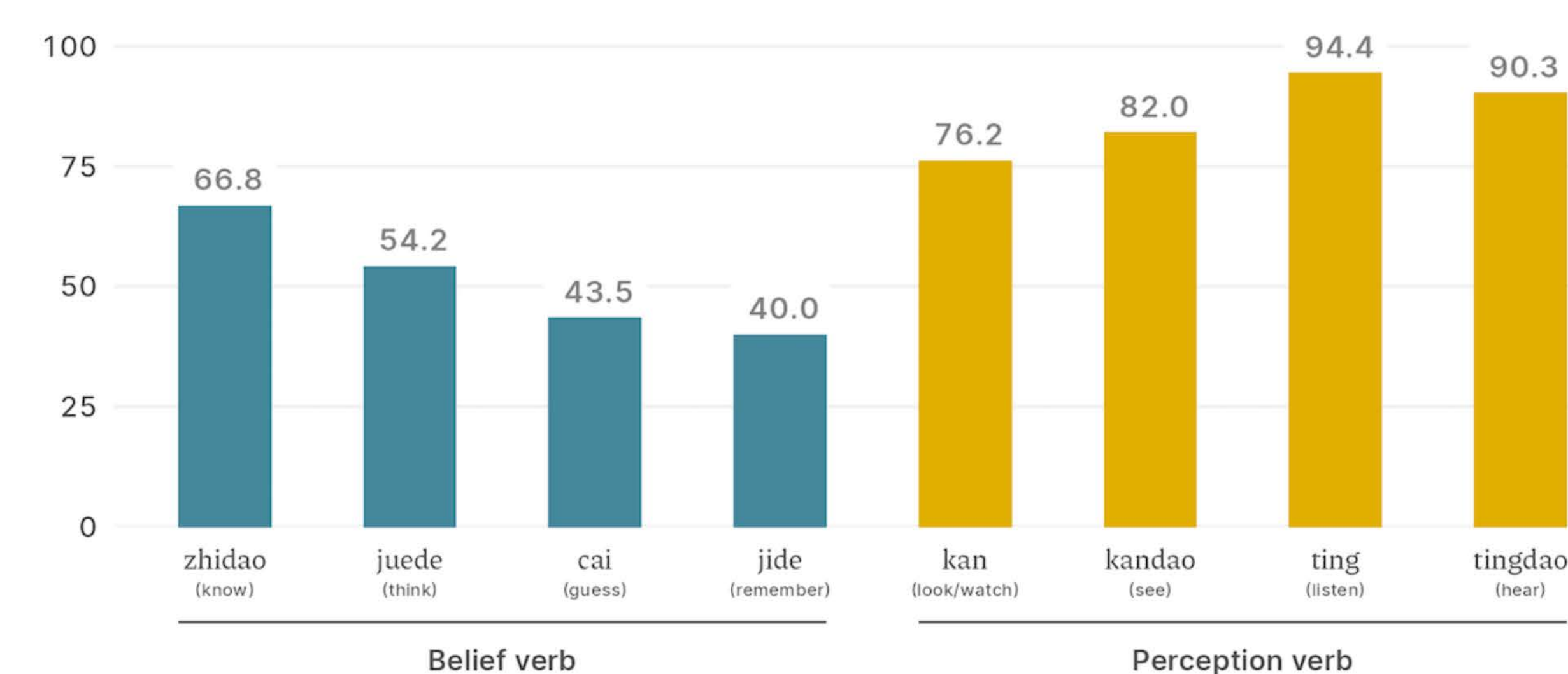


Figure 2

Results

Frequency of aspect markers

Percentages (%)

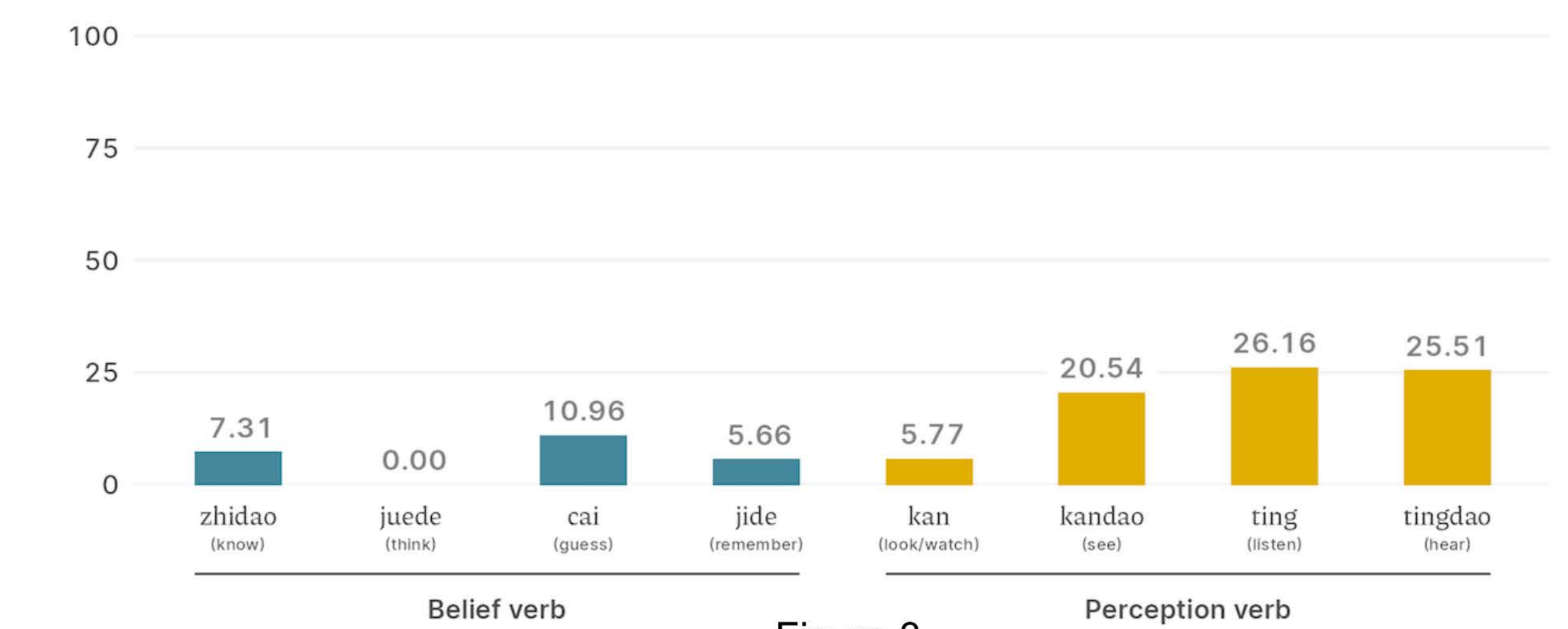


Figure 3

Frequency of *le* among all aspect markers

Percentages (%)

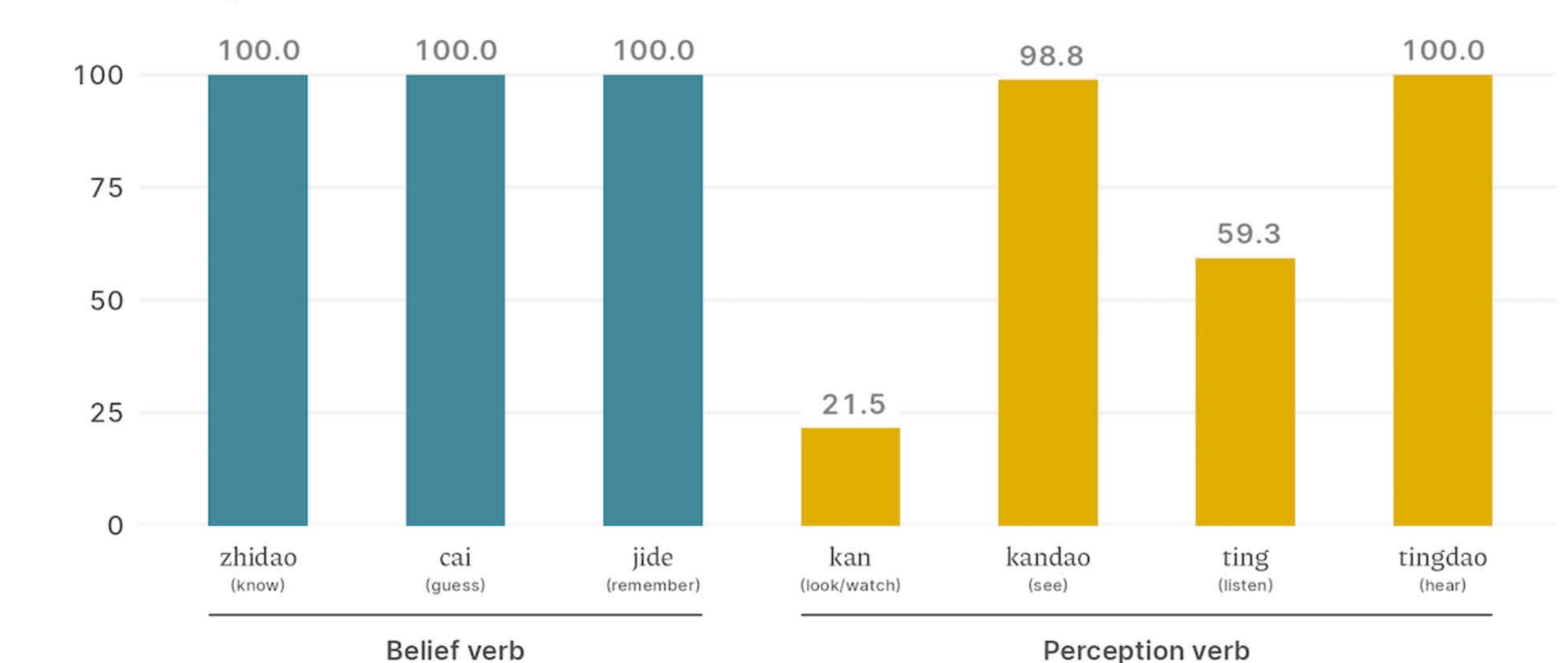


Figure 4

Conclusion & Future Directions

- Conclusion:
 - There is reliable distributional information in Mandarin input to distinguish between belief verbs and perception verbs.
 - Syntactic bootstrapping could be a universal learning strategy.
- Remaining questions:
 - Can children actually detect and use such morphosyntactic cues?
 - How do children integrate distributional information and other types of information during word learning?

Selected References

- Fisher, C., H. Gleitman, & L. R. Gleitman. 1991. On the Semantic content of subcategorization frames. *Cognitive Psychology* 23: 331-392. Gleitman, L., K. Cassidy, R. Nappa, A. Papafragou, & J. C. Trueswell. 2005. Hard words. *Language Learning and Development* 1:23-64.

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