Examining the bridge/non-bridge verb distinction in Mandarin Chinese

Jiayi Lu, Julie Anne Legate, Charles Yang University of Pennsylvania

English contrasts bridge verbs, which allow *wh*-movement out of their CP complement, with non-bridge verbs which do not (Erteschik-Shir 1973, Chomsky 1977). For wh-in-situ languages, it has been suggested that the bridge/non-bridge contrast may be weaker or lacking (Goldberg 2006), or may only appear with in-situ wh-adjuncts (e.g. *why*) but not wh-arguments (e.g. *who*) (Tsai 1994). In this study, we examine the bridge/non-bridge distinction in Mandarin, a wh-in-situ language, with a corpus analysis of child-directed speech, and a formal acceptability judgment experiment. We demonstrate that there is no evidence for a bridge/non-bridge contrast in Mandarin for arguments or adjuncts.

Corpus Analysis: We collected the 20 most frequent verbs attested with CP complements (a reasonable estimate of vocabulary size (Diessel & Tomasello, 2001)) in Mandarin CHILDES (Table 1), and searched for uses in long-distance wh-questions. Assuming the Tolerance Principle (Yang 2016), a rule that applies to N items is productive with a maximum of N/ln(N) exceptions; hence, 20 CP-embedding verbs permit 6 unattested exceptions (20/ln(20)=6.67). We found cross-clausal wh-dependencies attested for 19/20 CP-embedding verbs for wh-arguments, and 14/20 for wh-adjuncts, clearing the threshold of productivity for both. Therefore, the corpus analysis predicts no bridge/non-bridge distinction in Mandarin.

Experiment (*Prolific*; N=240): Methods: We tested experimentally the islandhood of CP complements in Mandarin for 14 verbs: 3 labeled as bridge verbs in Tsai (1994) (*shuo* 'say', *cai* 'guess', *renwei* 'think'), and 11 unclassified verbs from the corpus analysis that are compatible with a matrix *why*-question. Dependency length (short/mono-clausal vs. long/cross-clausal) and wh-type (argument/who vs. adjunct/why) were manipulated. Example stimuli are shown in (1). Each participant was tested on 8 verbs (2 bridges, 6 unclassified, randomly sampled). Each participant rated 32 critical items and 32 fillers. **Analysis and Results***:* Figures 1 and 2 show the acceptability rating results. We fitted an LMER model predicting the bridge verb sentence acceptability with dependency length, wh-type, and their interaction, and the maximum random effect structure. There is a significant length*wh-type interaction (β=0.050, p<0.001), suggesting a larger length penalty for wh-adjunct than wh-argument. For each unclassified verb and wh-type pair, we fitted an LMER model predicting acceptability with verb type (unclassified vs. bridge), dependency length, their interaction, and the maximal random effect structure allowing convergence. Table 2 shows the interaction term estimates. Negative estimates suggest larger length effects for the unclassified verbs (i.e., a bridge effect). We found no bridge effect except for wh-argument crossing *jide* 'remember', contrary to Tsai's (1994) claim that non-brdige verbs restrict wh-adjuncts. A Bayes Factor analysis (Morey & Rouder 2023) confirmed the null results. This suggests no clear bridge/non-bridge distinction among the tested verbs.

Discussion: We first conducted a corpus analysis of CP-embedding verbs in the Mandarin CHILDES corpus, which suggested that children should have enough input to generalize that all CP-embedding verbs are bridge verbs. We then verified this prediction with an experiment that shows no evidence for bridge/non-bridge distinction in Mandarin. The argument-adjunct asymmetry reported in Tsai (1994) is observed even for bridge verbs, and thus reflects a general penalty on long-distance wh-adjunct questions. Our results render the theoretical machinery that Tsai (1994) introduced to capture bridge effects and the argument-adjunct asymmetry (e.g. the distinction between nominal and non-nominal CPs) unnecessary.

Table 1. Distribution of the 20 most frequent Mandarin CP-embedding verbs in CHILDES

Cross-clausal wh-	Clause-embedding verbs in Mandarin Chinese
Both wh-argument and wh-adjunct attested	*kan* ‘see’, *shuo* ‘say’, *zhidao* ‘know’, *juede* ‘feel/think’, *gaosu* ‘tell’, *jiang* ‘speak’, *xiwang* ‘hope’, *tingshuo* ‘hear’, *xiang* ‘think’, *pa* ‘worry’, *jide* ‘remember’, *jiandao* ‘see’, *cai* ‘guess’, *ganjue* ‘feel’
Only wh-argument	*shuoming* ‘explain’, *faxian* ‘discover’, *xihuan* ‘like’, *haipa* ‘fear’, *xie* ‘write’
Neither	*jiazhuang* ‘pretend’

(1) a. wh-adjunct, short/long dependency, verb = *shuo* ‘say’

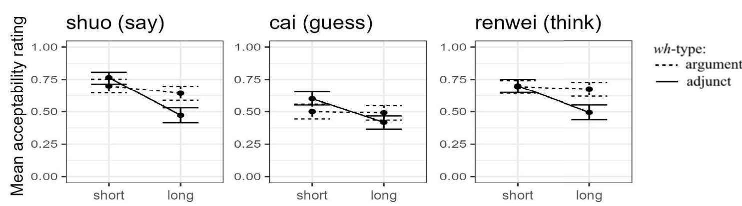
zhushou xiangzhidao junguan (weishenme) **shuo** laoshi (weishenme) chumaile shuishou
assistant wonders officer (why) **say** teacher (why) betrayed sailor
Short: "The assistant wonders why the officer ___ said that the teacher betrayed the sailor"
Long: "The assistant wonders why the officer said that the teacher ___ betrayed the sailor"

b. wh-argument, short/long dependency, verb = *shuo* ‘say’

zhushou xiangzhidao (shei/junguan) **shuo** laoshi chumaile (shuishou/shei)
assistant wonders (who/officer) **say** teacher betrayed (sailor/who)
Short: "The assistant wonders who ___ said that the teacher betrayed the sailor"
Long: "The assistant wonders who the officer said that the teacher betrayed __"

Figure 1 (right). Ratings for the three bridge verbs.

Figure 2 (bottom). Comparisons between the unclassified verbs and the bridge verbs.



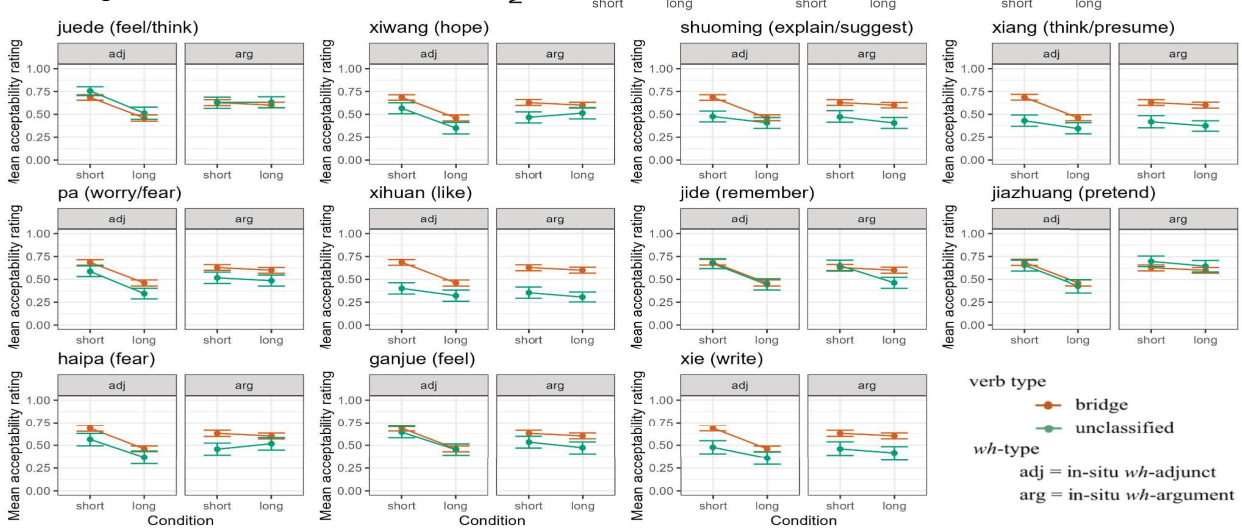


*Table 2. Regression model outputs and Bayes Factor estimates for the verb type*length term*

Verbs		*juede*	*xiwang*	*shuoming*	*xiang*	*pa*	*xihuan*	*jide*	*jiazhuang*	*haipa*	*ganjue*	*xie*
Argument	β	0.0099	0.021	-0.010	-0.0023	0.00028	-0.0074	-0.039	-0.008	0.020	-0.0069	-0.0069
	SE	0.012	0.012	0.010	0.012	0.011	0.012	0.012	0.013	0.011	0.012	0.014
	p	0.42	0.094	0.34	0.85	0.98	0.53	<0.01	0.53	0.086	0.55	0.63
	BF	0.12	0.35	0.15	0.12	0.11	0.13		0.14		0.15	0.15
Adjunct	β	-0.0044	0.00068	0.040	0.036	-9.8E-05	0.037	-0.001	-0.0019	0.0069	0.0085	0.022
	SE	0.01	0.0098	0.0099	0.011	0.0094	0.011	0.013	0.012	0.013	0.013	0.012
	p	0.67	0.95	<0.001	<0.01	0.99	<0.001	0.94	0.88	0.58	0.50	0.082
	BF	0.11	0.12			0.12		0.12	0.13	0.16	0.18	