

## **Do Mandarin Speakers Think about Time More Vertically?: A Revisit of Boroditsky (2001) with New Findings**

### **Abstract**

How mandarin speakers conceptualize *time*? It is generally agreed that Mandarin speakers have two mental timelines (i.e., vertical and horizontal). As Boroditsky (2001) suggested, Mandarin speakers also have a vertical bias in the conceptualization of time due to the frequent use of vertical spatiotemporal metaphors. The present study further investigates this question with corpus-based analysis and a non-linguistic temporal sequence judgment task. Corpus analysis reveals that Mandarin speakers frequently use both horizontal and vertical expressions of time. But the spatial expressions of time are not biased to the vertical axis. Rather, both type and token frequencies of horizontal metaphors are higher than that of vertical ones, indicating that horizontal expressions of time are prevalent in Mandarin speakers' daily communication (see table 1. for detailed results). Further, the frequent use of horizontal metaphors does not imply a horizontal bias in the conceptualization of time. 24 native Mandarin speakers were recruited to do a non-linguistic temporal sequence judgment task. In this task, two pictures describing the progression of an event were shuffled and presented for participants to judge the temporal sequence. Participants were required to judge the sequence of two pictures by pressing two keys either horizontally or vertically adjacent. Reaction time in the vertical session did slightly shorter than that in the horizontal session. Nevertheless, linear mixed-effects analysis showed that the difference between two sessions were not statistically significant, suggesting that there is no vertical bias as such (see table 2-3. for detailed results). Surprisingly, congruency effect was absent in both horizontal and vertical session, i.e., participants did not respond significantly faster when the layout of two keys were consistent with their left-to-right (horizontal) or top-to-bottom (vertical) writing direction. This study provides counter-evidence to Boroditsky (2001). Furthermore, the absence of congruency effect shows that incongruency did not result in significant interference, suggesting that the effect of writing direction may play a less significant role as predicated, at least in Mandarin speakers.

Table 1. Frequency of horizontal and vertical spatiotemporal metaphors in Centre for Chinese Linguistics Corpus.

Spatiotemporal metaphor		Token freq.	Total freq.	Pct.(%)
Horizontal	前 (qian2) – <i>in front of</i>	569,184	1,119,252	78.91%
	后 (hou4) – <i>back</i>	550,068		
Vertical	上 (shang4) – <i>up</i>	193,033	299,110	21.09%
	下 (xia4) – <i>down</i>	106,077		

Table 2. Liner mixed-effects analysis of congruent trials.

Random effects		Variance	SD
Trial	Intercept	0.004696	0.06852
Participant	Intercept	0.028844	0.16983
Previous accuracy	Intercept	0.004077	0.06385
Residual		0.104282	0.32293
Fixed effects	Estimate	t-value	Pr (> t )
Intercept	7.55275	105.063	3.2e-12 ***
Session (vertical)	-0.06798	-0.905	0.375

Table 3. Liner mixed-effects analysis of incongruent trials.

Random effects		Variance	SD
Trial	Intercept	0.0014133	0.037593
Participant	Intercept	0.0503442	0.224375
Previous accuracy	Intercept	0.0000357	0.005975
Residual		0.1129115	0.336023
Fixed effects	Estimate	t-value	Pr (> t )
Intercept	7.52927	109.5	<2e-16 ***
Session (vertical)	-0.13537	-1.4	0.174

## Reference

Boroditsky, L. (2001). Does language shape thought?: Mandarin and English speakers' conceptions of time. *Cognitive Psychology*, 43(1), 1-22.