



# MORPHOLOGICAL PROCESSES AND READING DIRECTIONS



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## ① Background

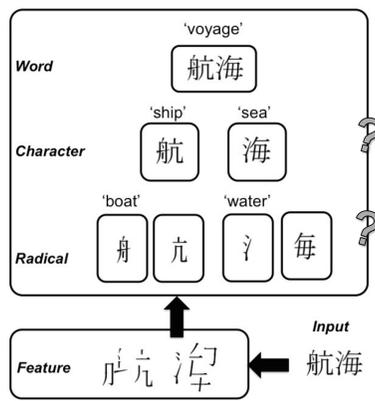
### Horizontal vs. vertical reading

- Past studies reported processing advantage of horizontal reading over vertical reading (Huey, 1898; Tinker, 1955), and this may be attributed to the different visual span sizes (Yu, Park, Gerold, & Legge, 2010).
- However, it is not clear whether lexical processes differ between the two reading directions.
- Japanese provides a fair test ground for this issue because vertical texts are seen everywhere (e.g., novels, newspapers)



### Japanese morphological processes

- There is an on-going discussion regarding whether compound words written in logographic characters are processed from radicals (Saito, 1997; Taft, Zhu, & Peng, 1999) or from characters (Miwa, Libben, Dijkstra, & Baayen, 2014).



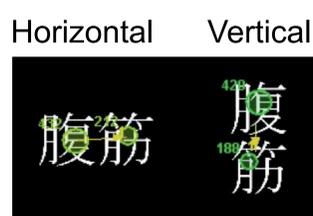
### Research question

- Does vertical reading induce a different pattern of processing? (quantitatively and/or qualitatively)
- Is the character-driven processing pattern observed in horizontal reading (Miwa et al., 2014) generalizable to vertical reading?

## ② Experiment

### Method

- **Participants:** 21 Japanese speakers for horizontal reading (Miwa et al., 2014) and 20 readers for vertical reading (the present study).
- **Materials:** Randomly selected 200 Japanese compound words and 200 nonwords.
- **Procedure:** Participants' eye movements were measured while they did lexical decision.
- The following measures were recorded.
  - Response times (RT)
  - First fixation duration
  - Second fixation duration
  - Number of fixations
  - Saccade amplitude



## ③ Results

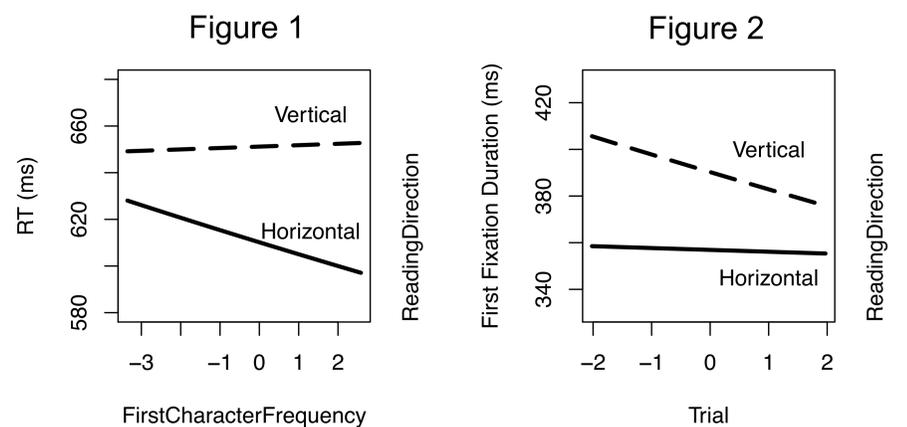
- The following predictors were included in mixed-effects analyses in R.
  - Reading direction (levels: horizontal, vertical)
  - Whole compound frequency
  - First character frequency
  - Second character frequency
  - First character radical frequency
  - Second character radical frequency

### RT analysis

- There was overall horizontal reading advantage.
- This horizontal reading advantage was observed for words with high *first character frequency*, but not for words with low first character frequency (Figure 1).

### Eye movement analyses

- At the first fixation, character frequency effects were stronger than compound and radical frequency effects in both horizontal and vertical reading.
- In vertical reading, first fixation durations became shorter as the experiment went by (Figure 2).



## ④ Summary

- An overall processing advantage for horizontal reading was observed early at the 1<sup>st</sup> fixation (when the first character was processed).
- Interestingly, the first character's contribution was qualitatively different depending on reading directions.
- However, most of the recognition process was direction-independent: Japanese compounds were consistently processed from characters.

