

"Save the date" - Eye movements during calendar date processing reflect pre-articulatory self-monitoring

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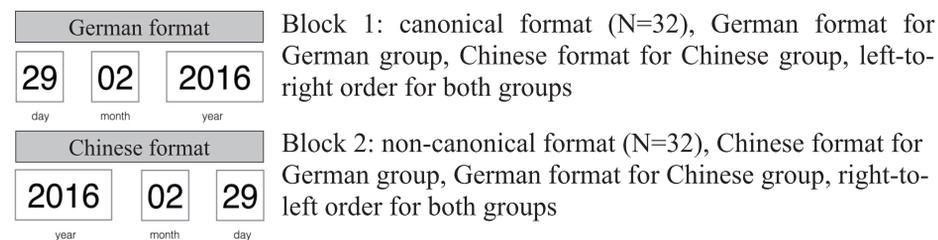
Background

Previous speech production studies suggest that our viewing behavior is guided by the need for specific information relevant during conceptualization and encoding processes^[1]. However, to what extent viewing behavior may also reflect information processing during pre-articulatory self-monitoring is still an open question^[2].

Experiment

Participants and materials

German and Mandarin Chinese participants (N=15 in each group)



Procedure

Calculation screen: adding a given number of days to a given calendar date (Fig. 1)

Answer screen: participants did not articulate the result but verified whether the calendar date they calculated matched the calendar date presented on the answer screen (Fig. 1)

Decision screen: Participants fixated "yes" or "no" to decide whether presented screen matched result or not

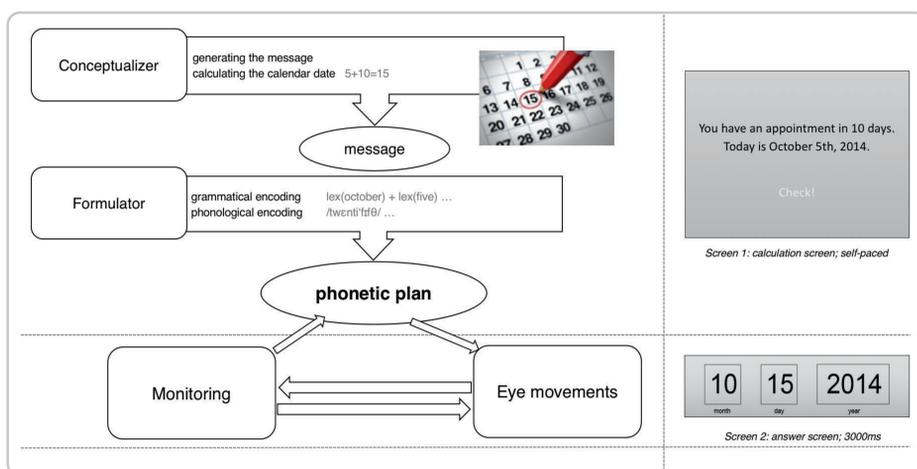


Figure 1: Scheme of cognitive processes during phases of one trial

Hypotheses

- 1) The fixation sequence in canonical condition (GE = German format; CH = Chinese format) is left-to-right
- 2) The fixation sequence in non-canonical condition (GE = Chinese format; CH = German format) is right-to-left

Results

First Fixation Location

	German format	Chinese format	
German group	canonical	non-canonical	
	761 (31)	846 (62)	($t=-12.3$)***
Chinese group	non-canonical	canonical	
	812 (44)	830 (38)	($t=-2.5$)*
	($t=-7.5$)***	($t=1.3$)	

Table 1: Mean x-coordinate values in px of first fixations (sd); center of screen is 840 px

Results (continued)

all further analyses were conducted on a "cleaned" dataset; first fixations with a value in the range of $\pm 2 \cdot SD$ of the mean first fixation location were excluded

Sequence of looks: Comparing gaze index for Day-AOI vs. Year-AOI

	German format	Chinese format
German group	canonical	non-canonical
	Day: 1.51, Year: 2.14 ($t=9.85$)	Day: 1.71, Year: 2.18 ($t=5.10$)
Chinese group	non-canonical	canonical
	Day: 1.91, Year: 1.63 ($t=-2.61$)	Day: 1.91, Year: 1.72 ($t=-3.05$)

Table 2: Mean gaze index: first gaze index=1, second gaze index = 2, third gaze index = 3

Attention allocation over progression of trial

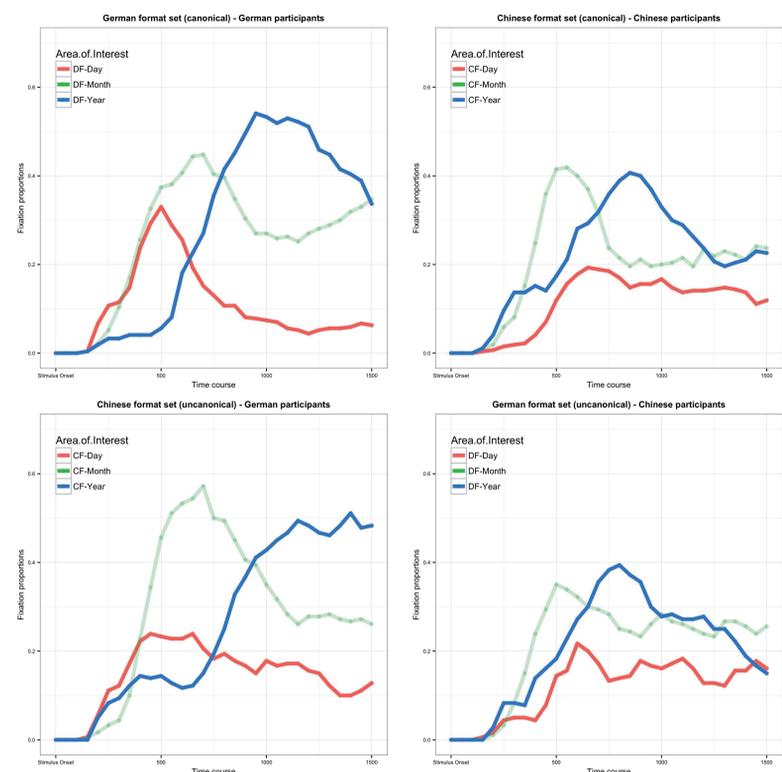


Figure 2: Mean fixation proportions over time in all 4 conditions

Discussion

Apprehension phase: in German group, already first fixation locations are affected by location of day information on the stimulus - starting point further left in canonical format than in non-canonical format

Sequence of looks: German - Day before Year, Chinese - Year before Day (canonical format); German Day before Year, Chinese - Year before Day (non-canonical format); sequence of units in the pre-articulatory representation drives sequence of looks, irrespective of location of visual information on the screen

Attention allocation: analysis confirms results from sequence of looks analysis in general; patterns within groups are similar, irrespective of presentation format; data more heterogeneous in Chinese group

Differences between participant groups: in Chinese, the date format is more digit-oriented (two-zero-one-six instead of two thousand sixteen); furthermore, no names for, but numbering of months; Chinese participants were students in Germany, and may be more accommodated to their non-canonical format

Conclusion

The findings suggest that **visual attention allocation can be driven by an internal phonetic representation held in memory for articulation** (internal speech).

The method introduced here can be used to study psycholinguistic phenomena that relate to the presence, linear order, and possibly size of units available for articulation at specific points in time during a given task.

References

- [1] Bock, Kathryn, Levelt, Willem J. M., Irwin, D., & Davidson, D. (2003): Minding the clock. In Journal of Memory and Language (48), 653-685.
- [2] Griffin, Z. M. (2004). Why look? Reasons for eye movements related to language production. In J. Henderson & F. Ferreira (Eds.), The integration of language, vision, and action: Eye movements and the visual world. New York: Psychology Press, 213-247.