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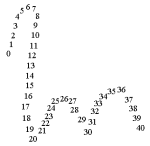
PSYC-1092 Cross-cultural psychology

Numbers and culture

(part 2)



Dr. Anna Samara

Lecture 5, 16/2/2021

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Q & A ON PRE-RECODED LECTURE

- Please go to Menti.com
- The digit code **94 84 69 5**

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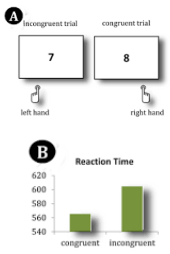
In the previous lecture…..

- We saw that participants from Western cultures, smaller magnitudes are associated faster with the left side of space and larger magnitudes are associated with the right side of space (SNARC)
- Taken to suggest that participants have a spatialised mental number line oriented from left-to-right.
- **However: Readers in Western cultures progress through each line of text from left to right. Is the SNARC a "spillover" of directional reading habits?**



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Is the left-to-right orientation universal?

- Zebian (2005): Investigated the spatial orientation of the mental number line in the following groups:
  1. Arabic monoliterates (right-left writing system)
  2. Arabic-English biliterates
  3. Illiterate Arabic speakers who only read numerals
  4. English controls
- "Reverse association" between numbers and space in (1) and much smaller effect in (2)
- However, verbal naming task used that may have been less sensitive (e.g. no "SNARC" effect in group 4)

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Is the left-to-right orientation universal?

- Rashidi-Ranjbar et al. (2014). Head turning/random number generation paradigm administered to Iranian subjects (Farsi is read right-to-left but numbers are read left-to-right)
  - Key finding: No evidence for more small numbers after right relative to left head turns
  - Congruency between reading habits for words and numbers is required to induce significant horizontal spatial-numerical associations.
- However, effect emerges even among pre-schoolers (Shaki et al. 2012)
  - Early biologically driven preference further shaped culturally?

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- Cultural shaping hypothesis: Cultural conventions such as the orientation of writing, mathematic axes etc. shapes spatial numerical interactions
- Gobel et al. (2018): What kind of cultural experience may alter the association between numbers and space at such a young age?
  - Story reading: pervasive activity in the homes, preschools, and day-care centers of literate societies
  - E.g., 30–50% of parents of preliterate children read to their children at least once a day (Raikes et al., 2006)
  - Directionality in shared parent/child reading activities?

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Gobel et al. (2018)

- **Exp1 (spatial layout of books):** English vs. Hebrew books with a targeted reader age range of infancy to 8 year
- Key finding: English-language books portray actions going from left to right on the page, whereas Hebrew- language books portray events developing from right to left

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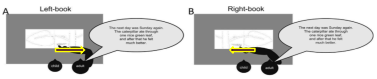
Gobel et al. (2018)

- Exps. 2/3 (observation of adults' interactions with books)
- 2 version of the " Very Hungry Caterpillar" book created and read by parents to preliterate British and Arab children. Children asked to count before and after



- Led to changes in counting direction. Suggests that (even brief) reading observation is a driver of spatial directionality

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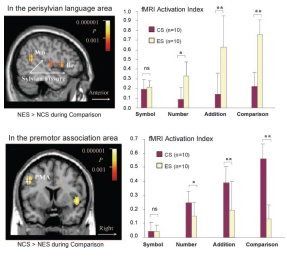
Extra study slide

Differences in brain representation by culture

- Tang et al. (2006). Are digits processed the same way in Eastern vs. Western cultures?
  - Direct contrasts in the fMRI signal between native Chinese and English speakers
  - **Digits** (shared across cultures): Allows to study effect on language and cultural (rather than different task demands btw languages)
  - Tasks: addition; magnitude comparisons
  - Regions of interest: (a) perisylvian ***language*** area; (b) pre-***motor*** association area



Differences due to either language (brevity of the Chinese language for numbers) or culture (use of abacus, experience of reading spatially complex characters)

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Part 1: Summary and conclusions

- Three systems used to deal with numbers
  1. Large approximate numerosities: System for representing approximate numerical magnitudes subject to Weber's Law
  2. Very small numbers: Subitizing system- up to 4
  3. Large exact numerosities: combination of the systems above, plus, language.
- Behavioural evidence for an association between numbers and space in a variety of cultures - > Spatial mapping of numbers is a universal cognitive strategy
  - Cultural characteristics may affect the strength of the association, including new spatial habits (e.g., via learning a second language), or brief reading experience
- Many interesting questions await future research!

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Part 1 reading

- Göbel, Shaki, & Fischer (2011). The Cultural Number Line: A Review of Cultural and Linguistic Influences on the Development of Number Processing. Journal of Cross-Cultural Psychology, 42(4), 543-565.
- Göbel, McCrink, Fischer, & Shaki (2018). Observation of directional storybook reading influences young children's counting direction. *Journal of Experimental Child Psychology, 166*, 49-66.
- Tang, Y., Zhang, W., Chen, K., Feng, S., Ji, Y., Shen, J., et al. (2006). Arithmetic processing in the brain shaped by cultures. PNAS, 103(28), 10775-10780.

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