

B07: Shaping Negation - Spatial-Numerical Associations in Negative Numbers

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BACKGROUND

Space- and size associations with positive numbers (pos. #) (Bulf et al., 2014)

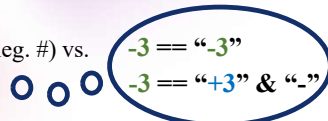
Spatial-numerical associations in pos. # stronger in vertical than in horizontal domain (Sixtus et al., 2019)

Negative numbers (neg.#):

holistic processing (own representation for neg. #) vs.

rule-based (rules applied to pos. #)

(Fischer, 2003; Shaki & Petrusic, 2005)



Remove spatial bias of task → Ensure holistic processing

(Fischer & Shaki 2016; 2017; Shaki & Fischer, 2018)

HYPOTHESES

H1: Associations of space and size in positive numbers congruent to their magnitude

H2: Test associations in neg. #

IF assumed congruent conditions facilitated: holistic processing assumed

$-3 = "-3"$

ANALYSIS AND RESULTS

Analysis
rmANOVA:

magnitude (large, small) x congruency (cong., incong.)

separately for arrows (direction inducers) / rectangles (size inducers)

| POS # | NEG # |
|--|--|
| all congruent conditions facilitated (faster RT) | <p>small neg. # ↑↓</p> <p>(-9; -8; -7; -6)</p> <p>when positive distractor numbers were present</p> <p>as expected (mean difference = 14.79 ms, p .017)</p> |
| as expected (mean difference = 122.48 ms, p < .05) | <p>large neg. # </p> <p>(-4; -3; -2; -1)</p> <p>when positive distractor numbers were present</p> <p>Reverse (mean difference = 7.38 ms, p < .001)</p> |

MATERIALS AND METHODS

Online RT-experiment (on Gorilla, N = 100)

Task

- "compare to -5 / +5"
- centered presentation
- single response-button
- go – nogo -task
- measure of reaction time

Instruction (example):

"press the spacebar IF the number is larger than -5 OR if the arrow is facing up" (assumed as congruent)



Figure adapted from Shaki and Fischer (2018, S. 11; Source: Anna Matheja).

Stimuli

- positive numbers ("compare" to +5): +1; +2; +3; +4; +6; +7; +8; +9; (-9; -8; -7; -6) negative distractor numbers
- negative numbers ("compare" to -5): -9; -8; -7; -6; -4; -3; -2; -1; (+6; +7; +8; +9) positive distractor numbers
- shapes: arrows ↑↓, rectangles ||

Assumed Congruency

- small neg # congruent to ↑ ||
- (+1; +2; +3; +4 / -9; -8; -7; -6)
- large neg # ↓ ||
- (+6; +7; +8; +9 / -4; -3; -2; -1)

DISCUSSION

POS. # ↑↓ || expected associations (compatibility effect) **H1** ✓

SMALL NEG. # ↑↓ holistic processing (compatibility effect) **H2** ✓ (partly)
→ holistic processing ensured through pos. distractor #

LARGE NEG. # || no holistic processing (reverse compatibility effect in large neg. #: -4; -3; -2; -1 facilitated with small rectangle)
→ linguistic coding (word "small" in instruction)

→ **HYBRID processing in neg. # (both holistic & rule-based), depending on number size, rule and inducer**

REFS

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