The Force of Numbers: Conceptual Processing of Numbers Activates the Motor System

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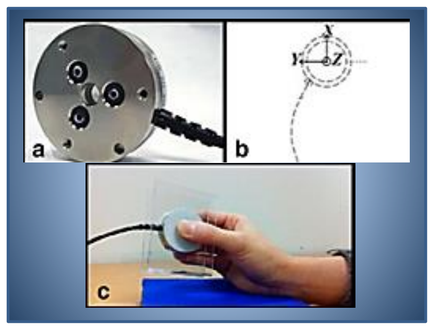
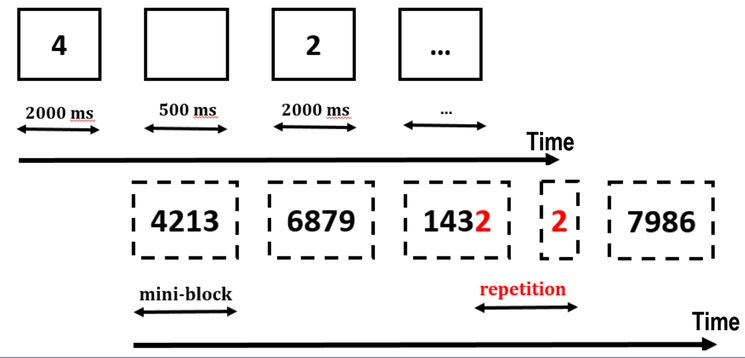
Background

In previous studies, spontaneous motor activity of the hands during conceptual processing of action-related words was found with a grip force sensor (Aravena et al., 2012; Nazir et al., 2015). Other studies showed a role of spatial associations in number processing (SNARC Effect, see Winter et al., 2015 for review) that is mediated by finger counting (left- vs. right-starters, see Fischer, 2008) and grasping behavior (Andres et al., 2004). Krause et al. (2014) demonstrated an interference effect between number processing and force production: participants responded faster with a forceful button press to large numbers (6-9), and faster with a weak response to small numbers (1-4). It is an open question whether number processing and force production interfere when participants are not explicitly instructed to respond with a particular force (incidental measurement of force production).

Method



The motor force with which right-handed adults (12 right-starters and 12 left-starters) held grip force sensors in their left and right hand during number processing was recorded with the help of grip force sensors. Single numbers were presented on the screen and participants detected repetitions.



Hypotheses

- H1: small (1-4) vs. large (6-9) numbers → higher force in SNARC-congruent conditions
- H2: left-starters vs. right starters → modulation of SNARC effect (finger counting habits)

Results

Conclusion

Overall, large numbers cause stronger grip force than small numbers in left-starters (in both hands). The opposite pattern was found for right-starters. Grip force is modulated by number magnitude and counting preference, suggesting automatic and unconscious embodied number processing.

Literature

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