Modifying cognitive control through implicit attention training

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Introduction

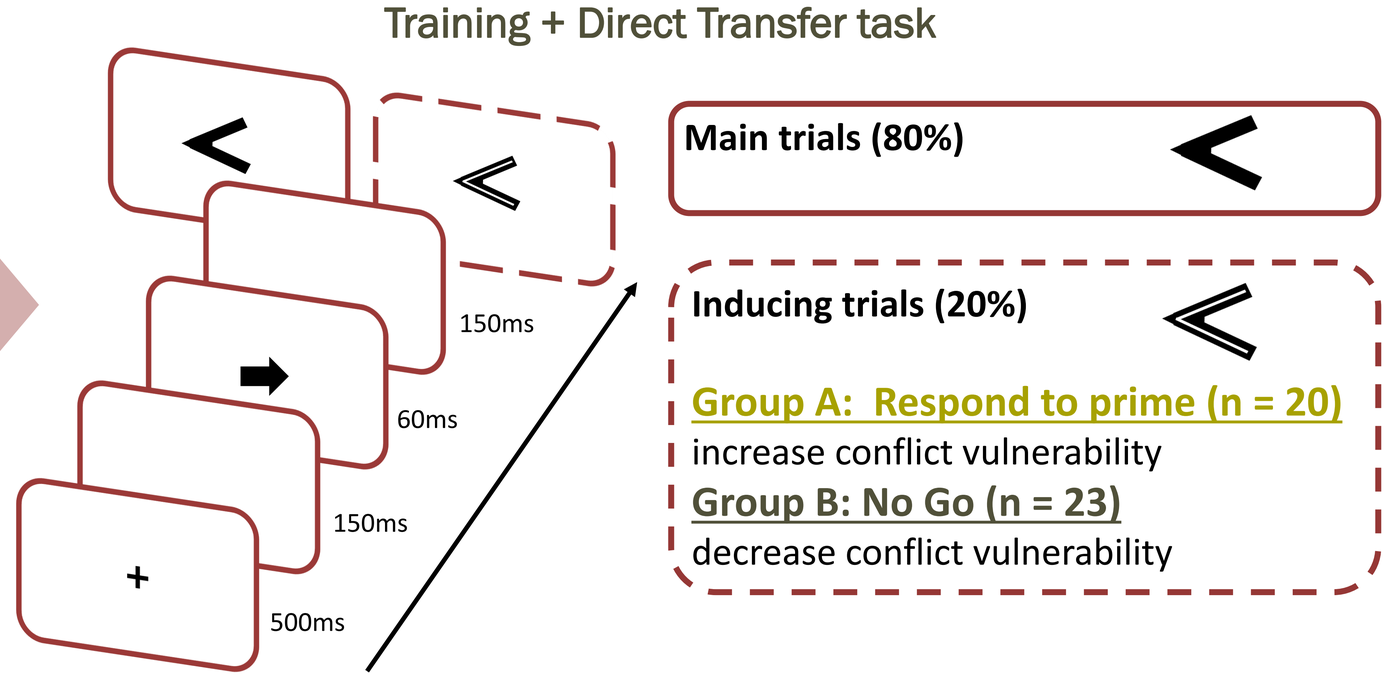
Cognitive control - the ability to overcome automaticity when faced with conflicting response options - is crucial for adaptive behavior and is disrupted in several cognitive disorders. Various studies have shown that cognitive control can be improved through **training** using **instructional** protocols[1, 2, 3] . Although effective in improving performance on the trained task, the explicit nature of such methods may compromise the **consolidation** and **generalizability** of the acquired skills. In the present study, cognitive control was trained using an **implicit attention training protocol** that differed between groups. Transfer of training effects was tested to a task without the attentional manipulation (direct transfer), a task closely related to the trained task (close transfer) and a more distinct task (far transfer).

Method

Design

Task	Day 1	Day 2	Day 3
TRAINING *Arrow priming (modified)*		X	
DIRECT TRANSFER *Arrow priming*	X	X	X
CLOSE TRANSFER *Smaller/larger 5*	X		X
FAR TRANSFER *AX-CPT*	X		X

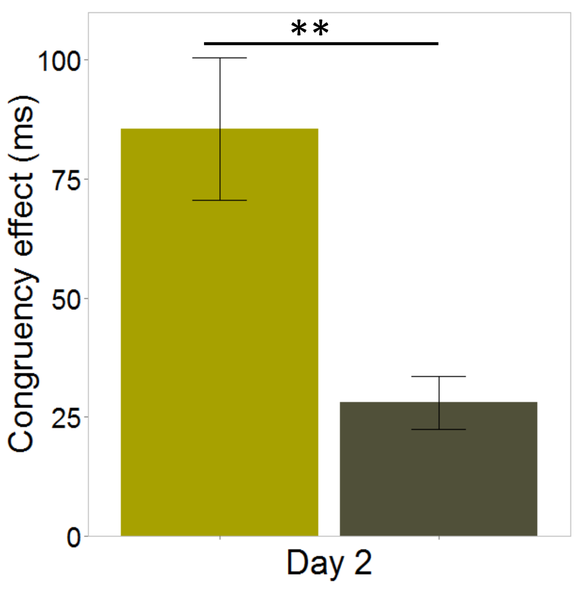
Training + Direct Transfer task



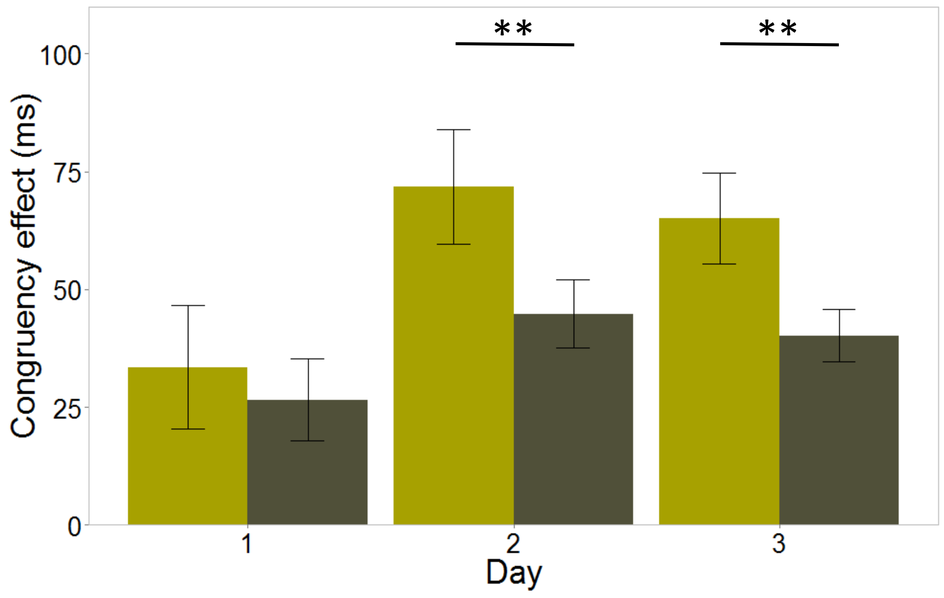
The Training and Direct Transfer tasks were identical, except for the **inducing trials.** These trials were used to **implicitly change attentional settings between groups** and where only present in the **training task**.

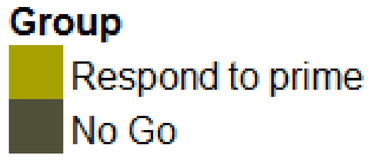
Results

TRAINING (main trials)



DIRECT TRANSFER





1. Was attention manipulation effective? ✓

2. Did training effects transfer to task without attention manipulation (direct transfer)? ✓

3. Did training effects transfer to close and far transfer tasks? ✗

No difference in congruency effect or AY/BX performance was found between the two groups on day 3.

Training or transfer effects were not reflected in error rates.

* $p < .05$; ** $p < .01$;*** $p < .001$

Discussion

We effectively modified cognitive control through an implicit attention manipulation training. The "No Go" group showed a smaller congruency effect than the "Respond to prime" group. These effects were obtained **directly after training** on a task without the attention manipulation (i.e., direct transfer task) and even **maintained on the next day**. This highlights the consolidation of the implicit attention training effects, even **after a single training session**. However, effects were **limited to the trained task context**, which is in agreement with claims that sustained modulations in cognitive control are task-specific [4] (but see [5]). Nevertheless, implicit attention training may be a promising avenue to improve cognitive functioning.

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2. Edwards, et al. (2010*). Front Hum Neurosci, 4,* 32
3. Paxton, et al. (2008), *Cereb Cortex, 18*, 1010-28
4. Fernandez-Duque, et al. (2008) *JEP HPP, 34, 340-55*
5. Millner, et al. (2012). *NeuroImage, 63, 742-53*

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