

The conflict adaptation effect: Transfer across mathematical and non-mathematical domains

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Highlights

- Inhibition can transfer across different tasks and domains (mathematical, non-mathematical)
- Inhibition is involved in retrieving answers to multiplication facts

Introduction

- Good mathematical skills are important for success in everyday life. However, many individuals find mathematics difficult, and one area of particular difficulty is multiplication facts.
- Theoretical models (Ashcraft, 1992; Campbell, 1995; Verguts, 2005) propose that multiplication facts are associated in memory and cause interference. For example, on the problem '6 × 7', individuals might incorrectly respond '48' (rather than '42') because the neighboring fact ('6 × 8') is associated with it and causes interference.
- Correlational evidence suggests a link between inhibition and number fact retrieval but few studies have investigated this experimentally
- The Conflict Adaptation Effect (CAE; Gratton, 1992) is the finding that people perform better on incongruent trials preceded by incongruent trials (II) than congruent trials (CI), and on congruent trials preceded by congruent trials (CC) than incongruent trials (IC).

Research questions

Is there a conflict adaptation effect on trials of a multiplication task when preceded by trials of a Stroop task.
Does the size of this effect differ for different types of Stroop task (numerical or non-numerical).

Method

- 450 adults aged 18 – 29 years
- Design, sample and analyses pre-registered (aspredicted.org).
- Completed trials of an animal or number Stroop task intermixed with trials of a multiplication fact task
- Multiplication trials (Figure 1) consisted of a multiplication fact (e.g. '6 × 7') followed by two answers (1 correct, 1 incorrect). The incorrect answer either interfered (e.g. '48') or did not interfere (e.g. '46' with the correct answer).



Figure 1: Incongruent trials of a) an animal-Stroop task, b) a number-Stroop task, c) a multiplication-Stroop task

Results

Accuracy:

People performed better on interference multiplication trials when the previous Stroop trial was incongruent rather than congruent, $F(1,431) = 82.60, p < 0.001, \eta_p^2 = 0.16$, (Figure 2).

Reaction times:

People performed better on non-interference multiplication trials when the previous Stroop trial was congruent rather than incongruent, $F(1,431) = 118.94, p < 0.001, \eta_p^2 = 0.22$, (Figure 2).

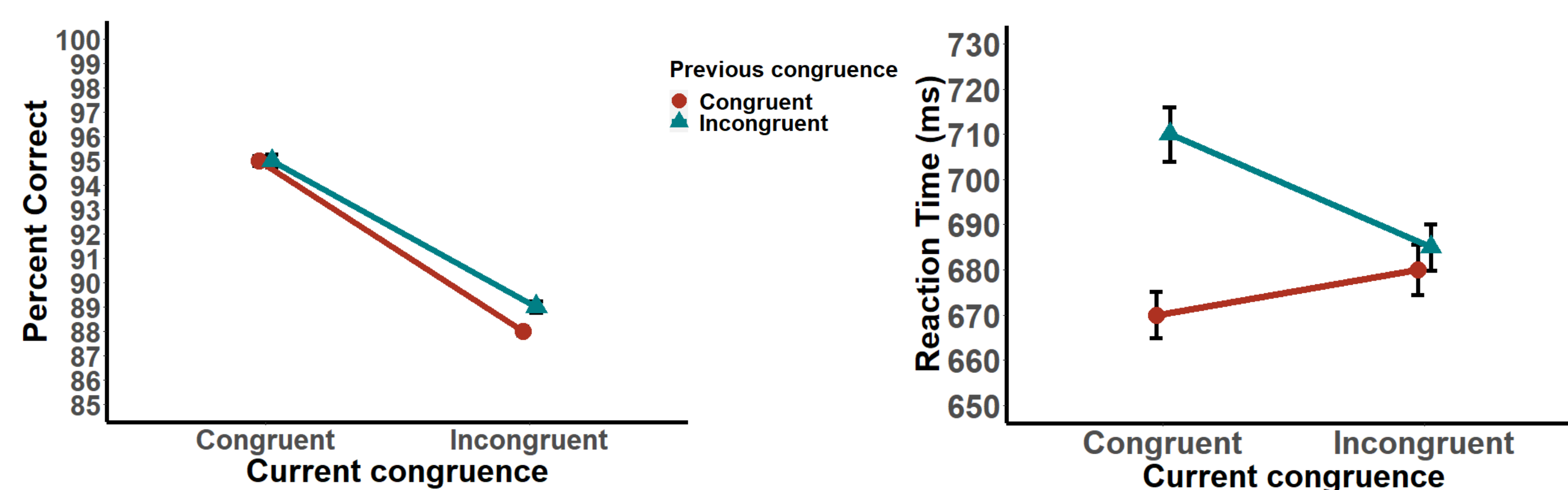


Figure 2: a) mean accuracy and b) median correct RT on the interleaved animal/number-multiplication Stroop

No difference in accuracy or RT between the animal-multiplication and number-multiplication conditions

Discussion

- Inhibition can transfer between different tasks and domains (mathematical and non-mathematical).
- We provide experimental (non-correlational) evidence that inhibition is involved in retrieving answers to multiplication facts.
- Moreover, the type of inhibition used when carrying out a multiplication task is similar to that used in other contexts.
- These findings support theories of multiplication fact knowledge which propose multiplication facts are associated in memory and cause interference.

References

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