

Within-trial adaptation of conflict processing by stimulus conflict

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Introduction

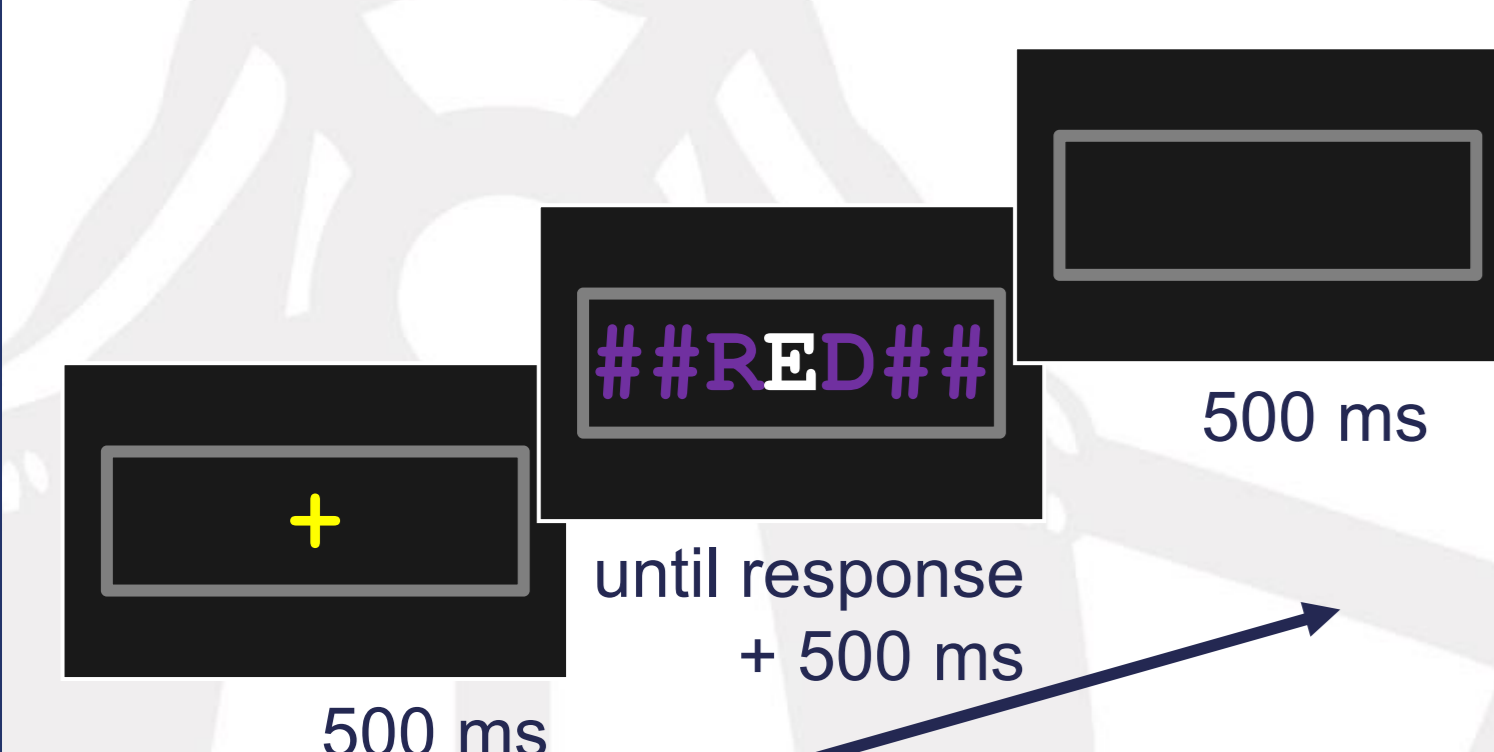
To resolve situations with **multiple conflicts**, the human brain implements a **multitude of control processes** which are hierarchically organized in the prefrontal cortex (Koechlin & Summerfield, 2007).

The **goal** of the present study was to determine whether **responding to multiple concurrent conflicts** results in a **simultaneous** or **sequential conflict resolution**.

We hypothesized that, in situations with multiple concurrent conflicts, an **earlier stimulus conflict** triggers an **adjustment of later conflict processing**, thus reflecting **sequential within-trial conflict adaptation**.

Method

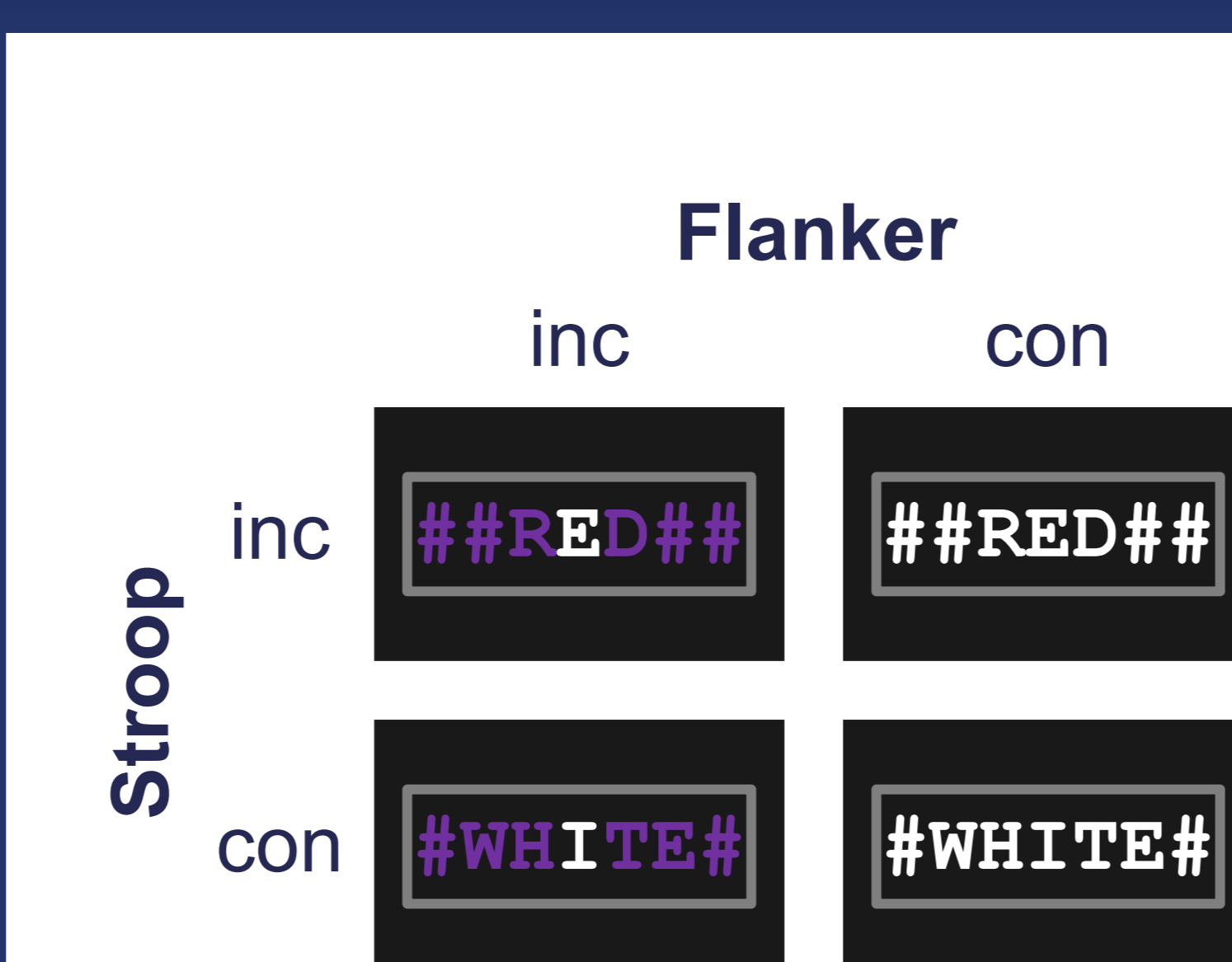
A **Stroop** task was combined with a **flanker** task **within the same trial**.



Participants were asked to **respond to the color of the central letter** while ignoring the meaning of the word (Stroop task) and the color of the flanking letters (flanker task).

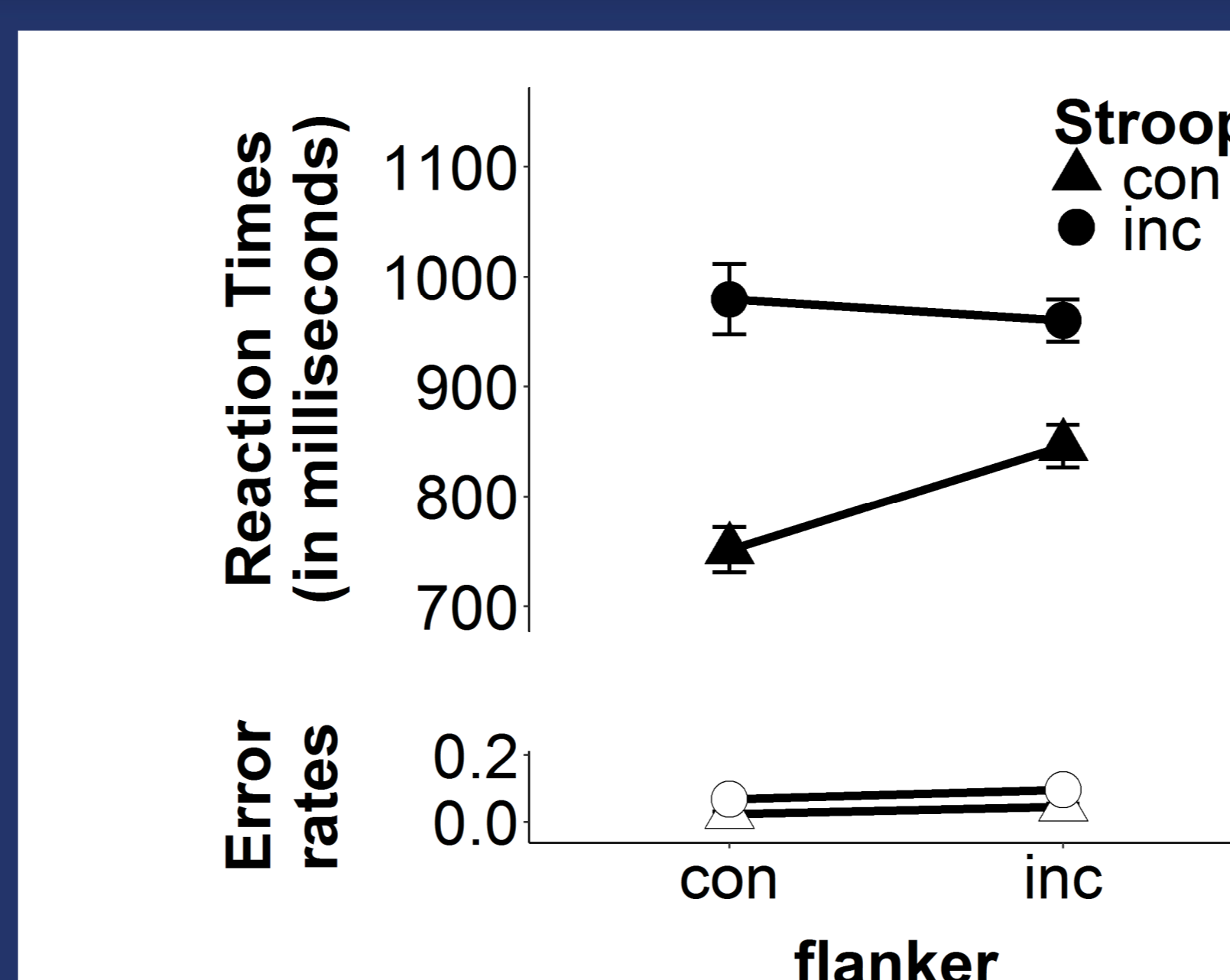
To enhance conflict, 25% of the trials were catch trials in which participants were asked to indicate the word meaning. Catch trials and the first trial after a catch trial were removed from the analyses.

Design



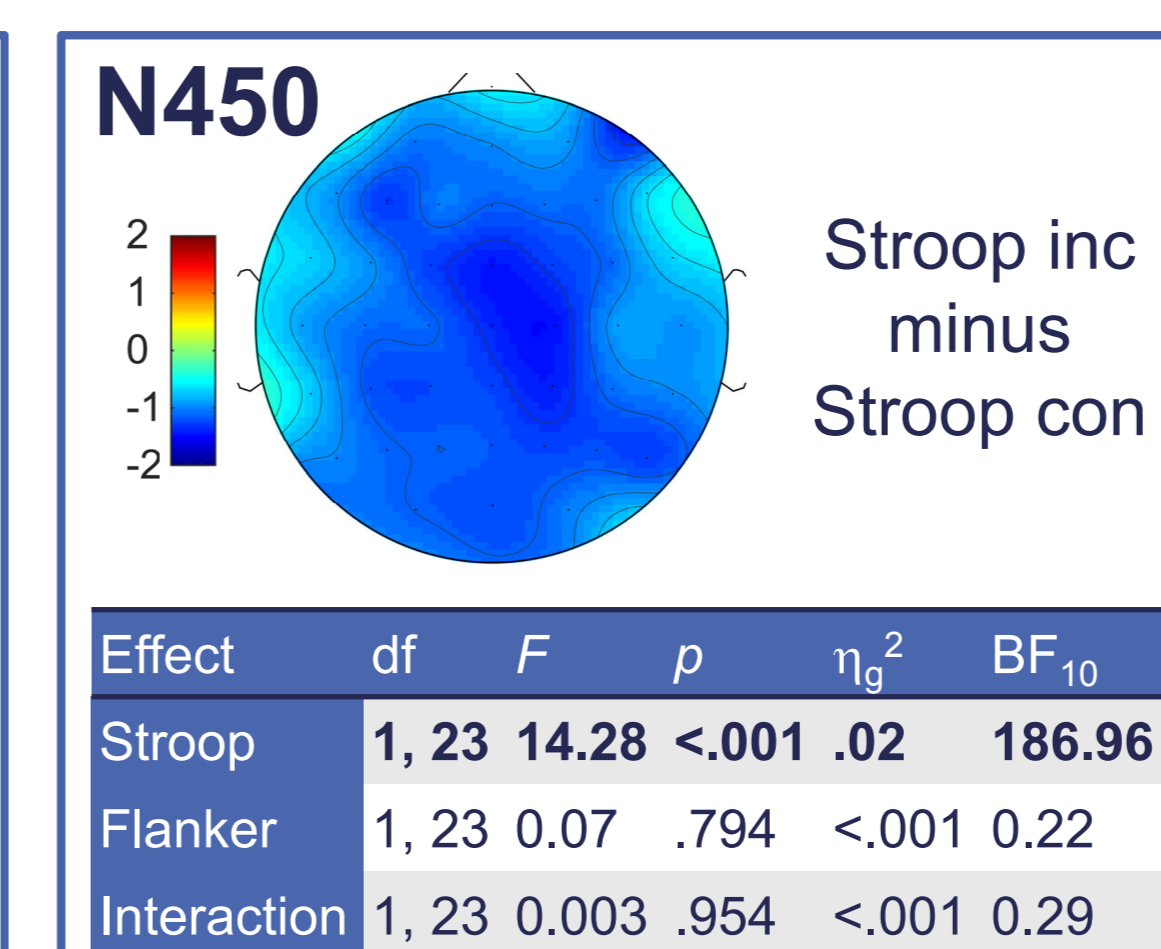
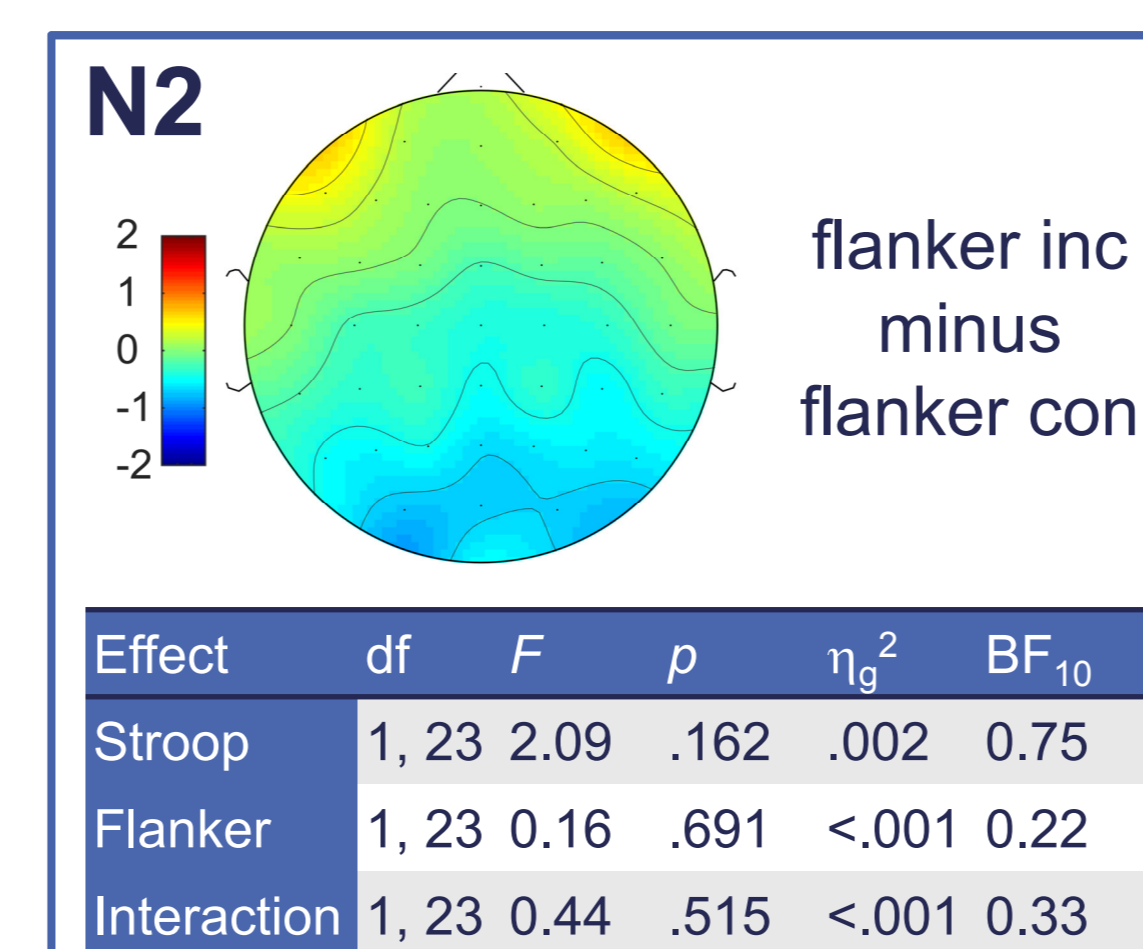
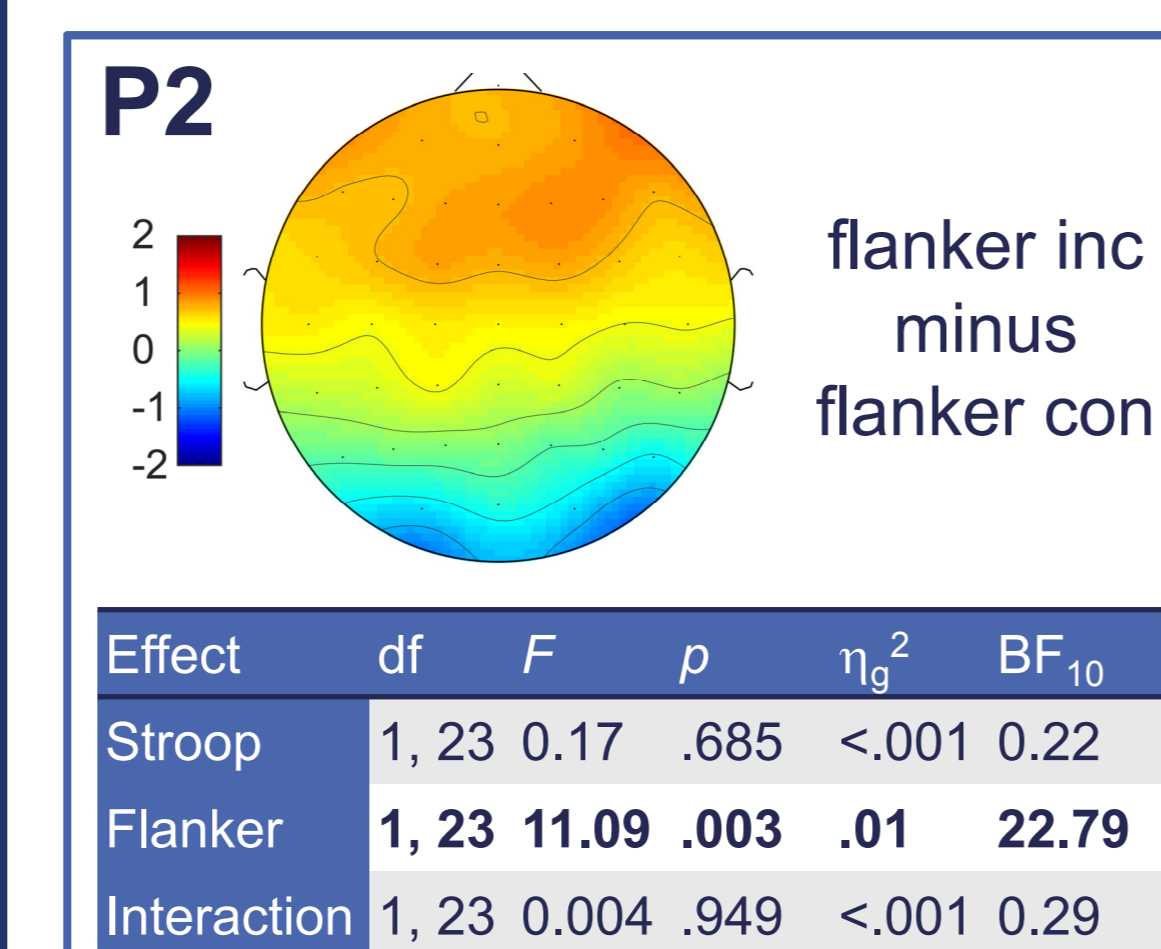
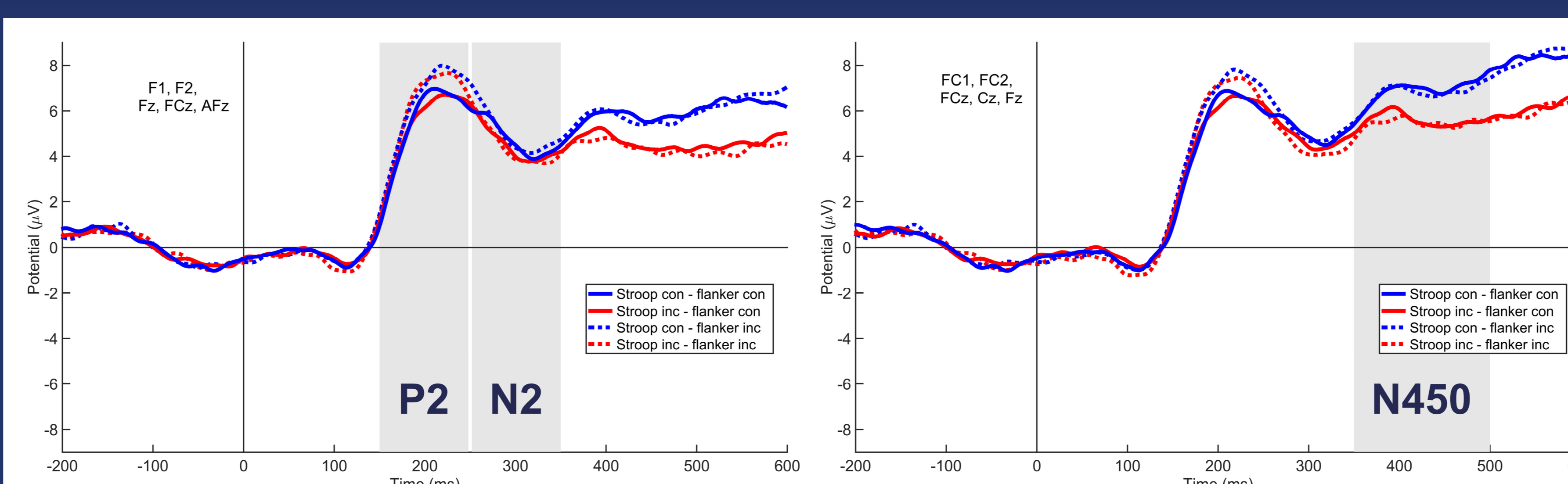
Sample size:
24 students (mean_{age} = 24.3 years, SD_{age} = 3.4)
inc = incongruent; con = congruent

Behavioral Results



Error bars represent within-subject confidence intervals.
Interaction Stroop x Flanker:
• Reaction times: $F(1, 23) = 21.07, p < .001, \eta_p^2 = .03, BF_{10} = 37.37$
• Error rates: $F(1, 23) = 0.08, p = .780, \eta_p^2 < .001, BF_{10} = 0.29$

ERP Results: P2, N2, and N450



Conclusion

Behavioral results:

- We found an **interaction** between **Stroop** and **flanker conflict** (i.e., the difference between Stroop incongruent and congruent trials was smaller for flanker incongruent than for flanker congruent trials; see Rey-Mermet & Gade, 2016).

ERP results:

- An early ERP component – **P2** – was associated with the resolution of the **flanker conflict**.
- A later ERP component – **N450** – was associated with the resolution of the **Stroop conflict**.
- N2 was not modulated by the resolution of any conflict.

Together, these findings emphasize a **sequential organization of conflict resolution processes** in the brain which is adaptive when facing multiple concurrent conflicts.

References

- Koechlin, E., & Summerfield, C. (2007). An information theoretical approach to prefrontal executive function. *Trends in Cognitive Sciences*, 11, 229–235.
- Rey-Mermet, A., & Gade, M. (2016). Contextual within-trial adaptation of cognitive control: Evidence from the combination of conflict tasks. *Journal of Experimental Psychology: Human Perception and Performance*, 42, 1505–1532.