

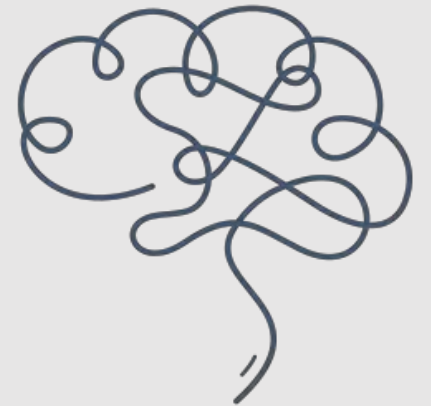
# Slips of the tongue in patients with Gilles de la Tourette syndrome



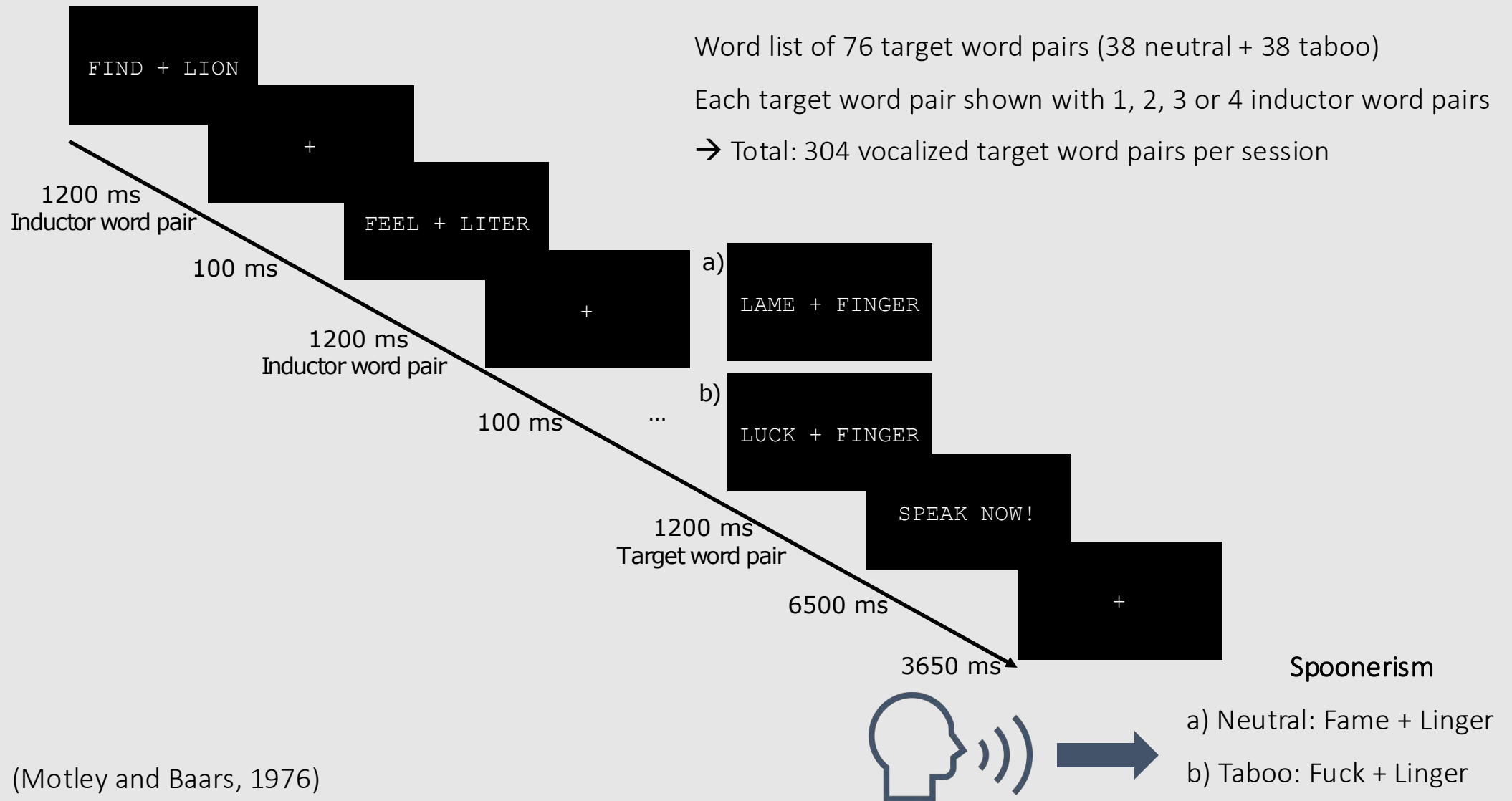
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# Introduction

- Initial assumption: occurrence of tics in Gilles de la Tourette syndrome (GTS) as sign of impaired cognitive control (Jahanshahi and Rothwell, 2017)
- Many patients with GTS can suppress tics → compensatory mechanism leading to enhanced cognitive control (Jackson et al., 2015; Ganos et al., 2014)
- Mixed findings regarding motor behavior (Channon et al., 2009; Mueller et al., 2006 Jung et al., 2013)
- What about vocal tics?
- Cognitive control in speech enables error-free speech (Gauvin and Hartsuiker, 2020)
- Using speech task to analyze if there are differences regarding cognitive control in patients with GTS and typically developed controls (TDC)



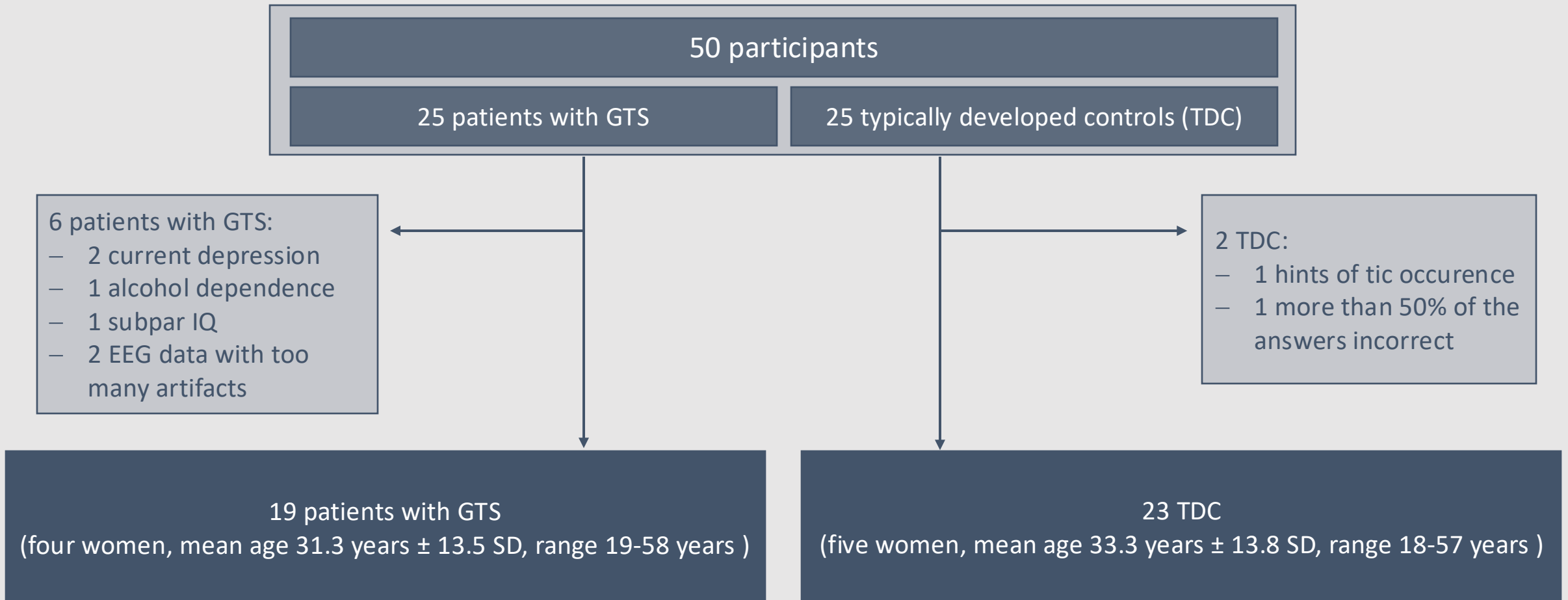
# Spoonerism of Laboratory Induced Predisposition (SLIP) Task



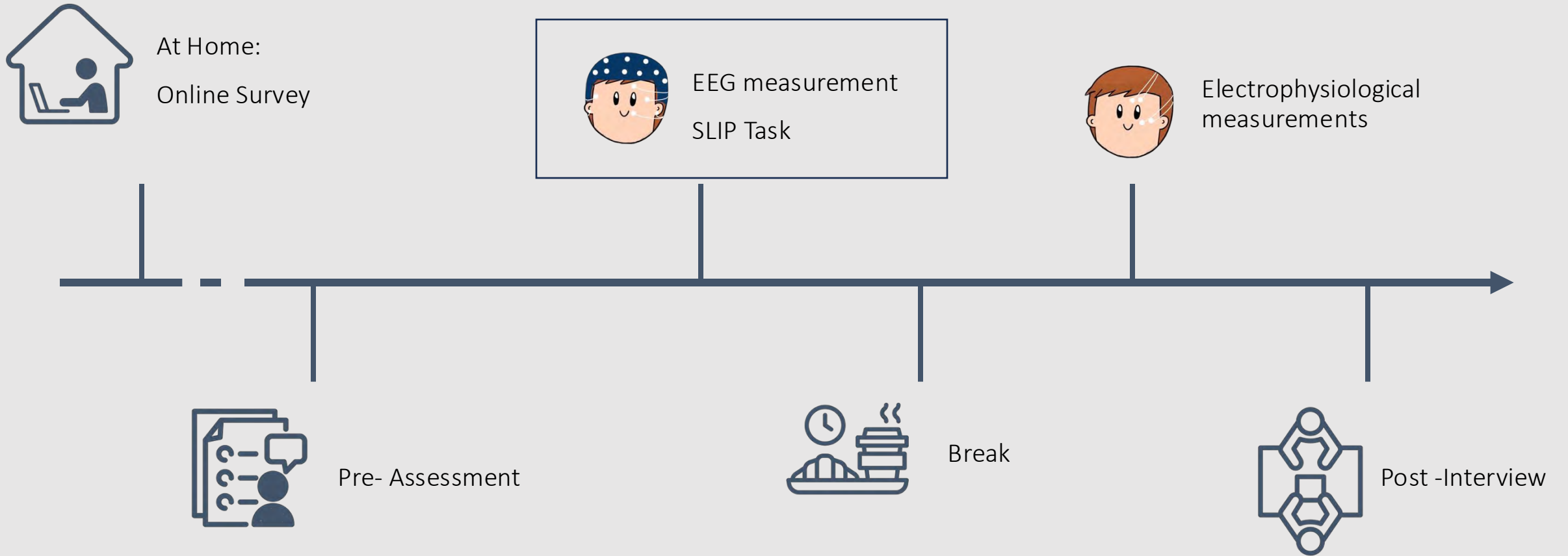
# Hypotheses

- According to previous research (Wagner-Altendorf et al. 2020; Severens et al. 2011 and Möller et al. 2007) using the SLIP paradigm we expected:
- Behavioral:
  - *Condition*: more pronounced suppression of taboo word spoonerism (less speech errors and later voice onset times)
  - *Groups*: suppression of taboo word less effective in patients with GTS
- ERP data:
  - *Condition*: increased negativity in taboo word spoonerism
  - *Groups*: ERP correlates of conflict monitoring to be less pronounced in patients with GTS

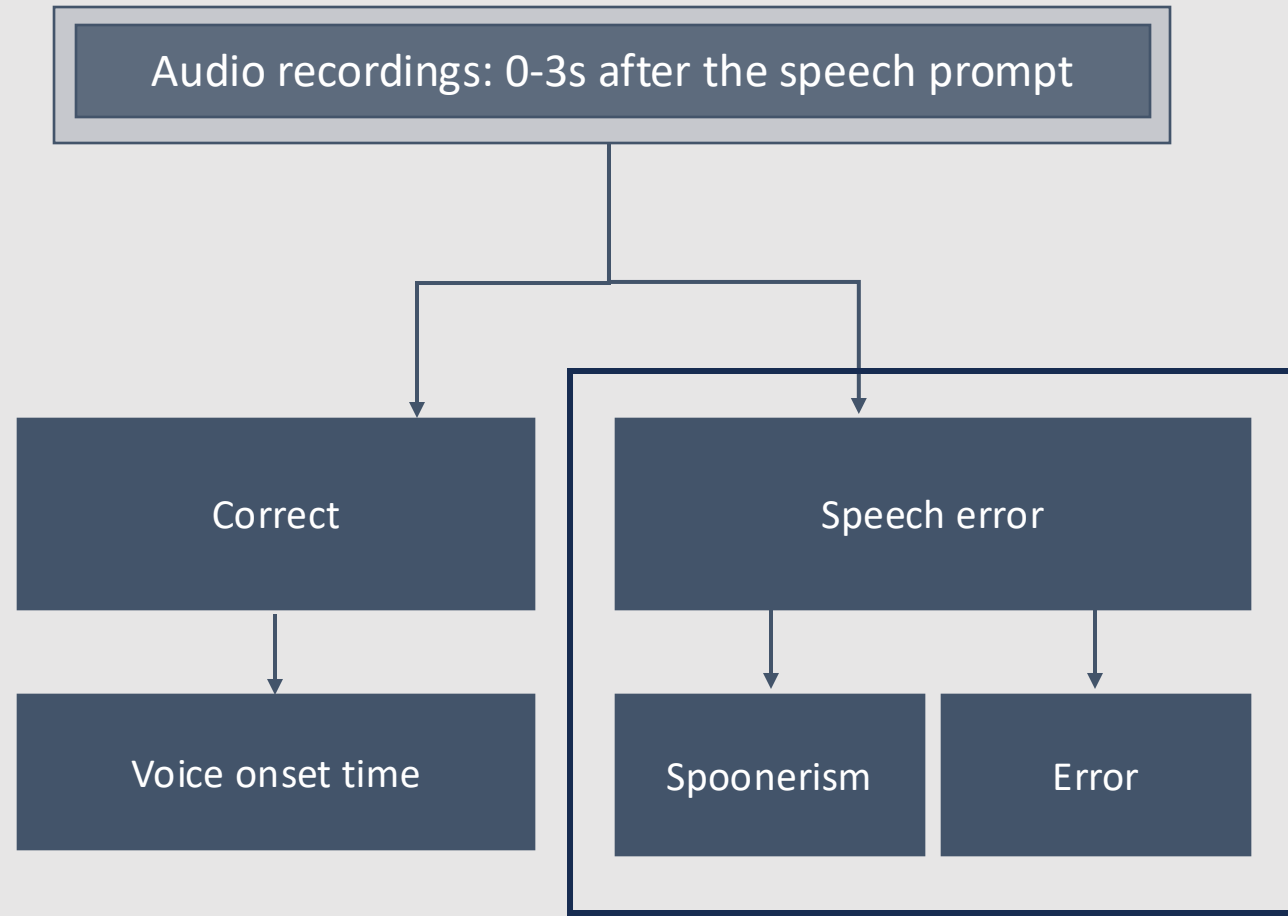
# Participants



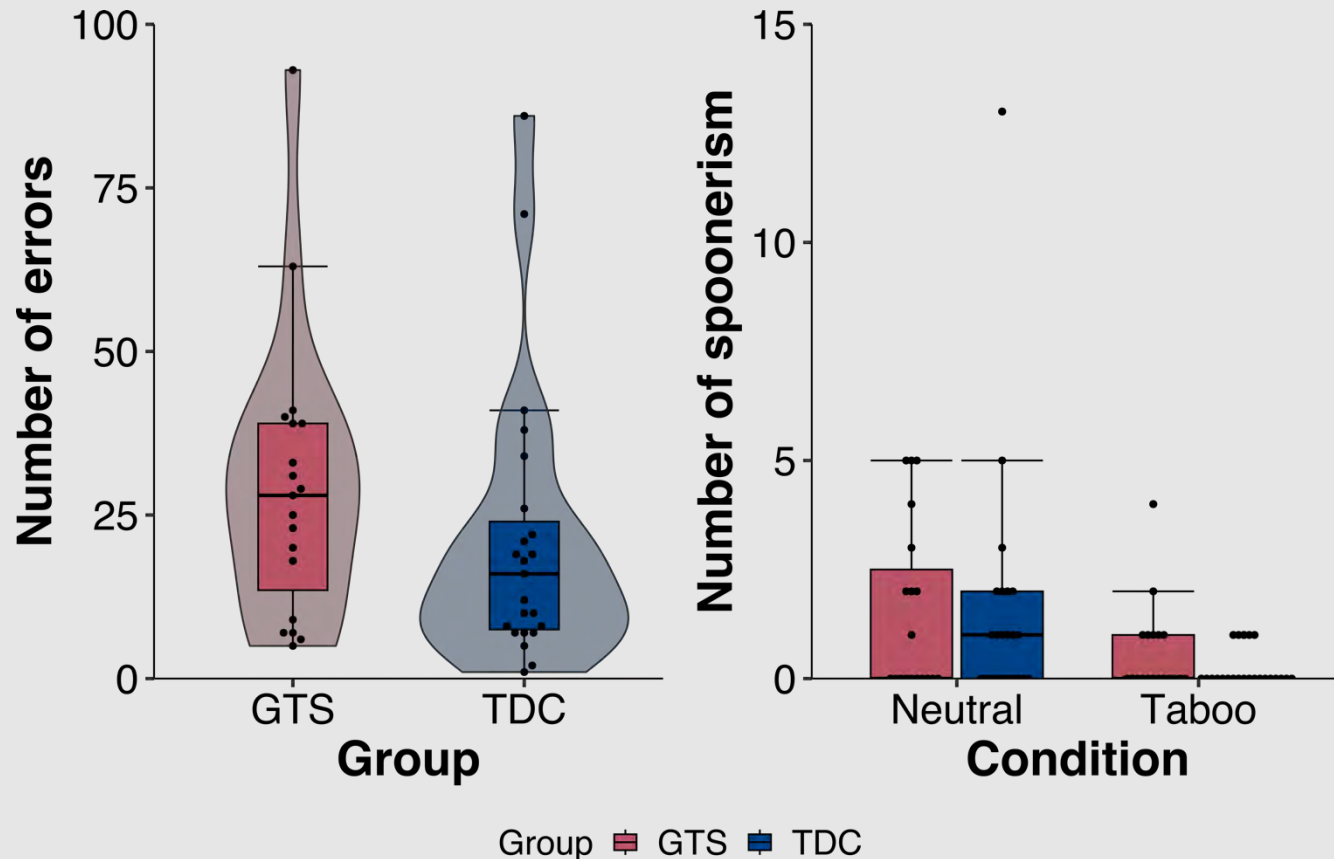
# Procedure



# Behavioral data – analysis steps



# Behavioral data – speech error occurrence



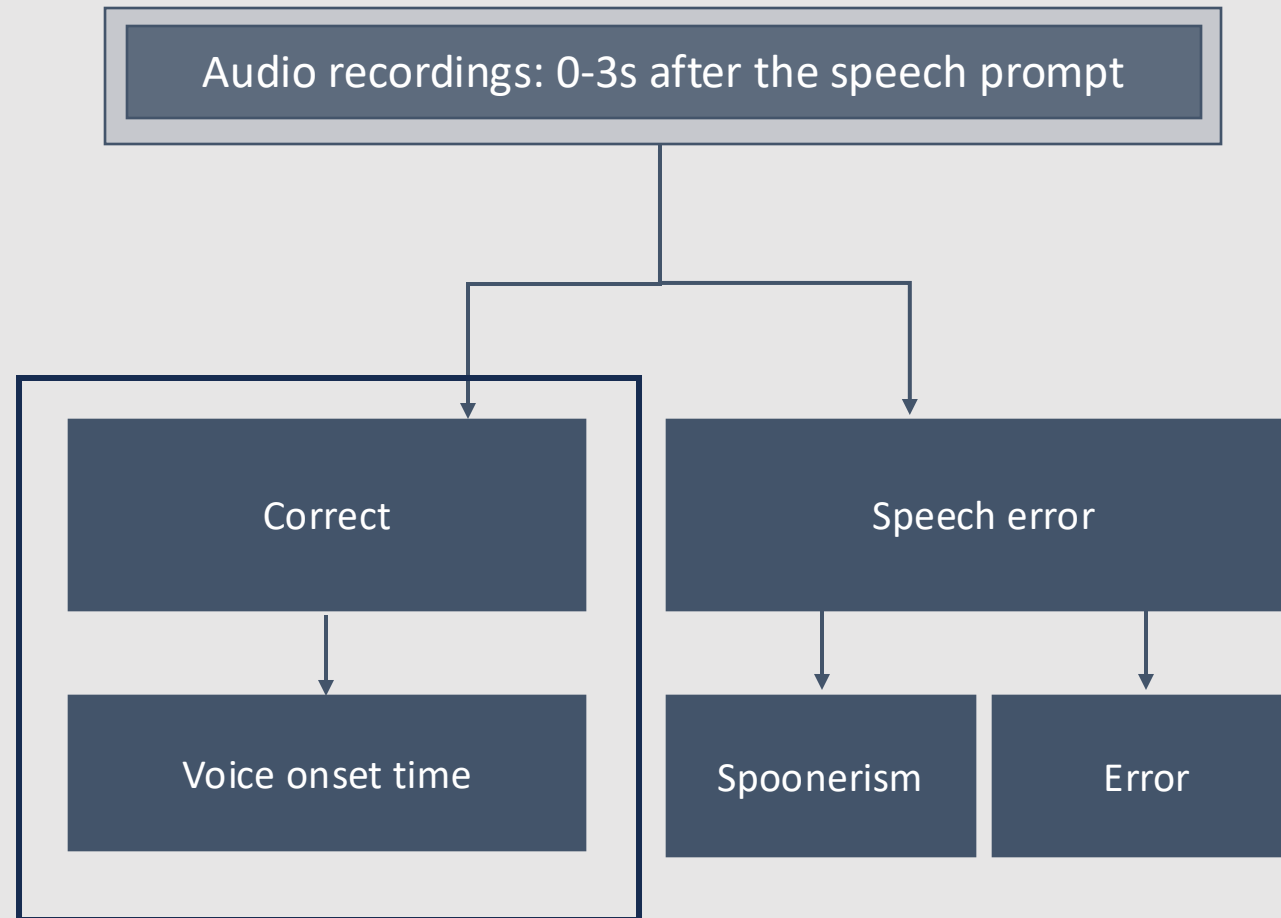
	GTS	TDC
Number of speech error	29.26, SEM=4.97	21.22, SEM=4.43
Total spoonerisms	2.11, SEM=0.51	1.74, SEM=0.64
Neutral spoonerisms	1.53	1.52
Taboo spoonerisms	0.58	0.22

Mann-Whitney-U test between the two groups:

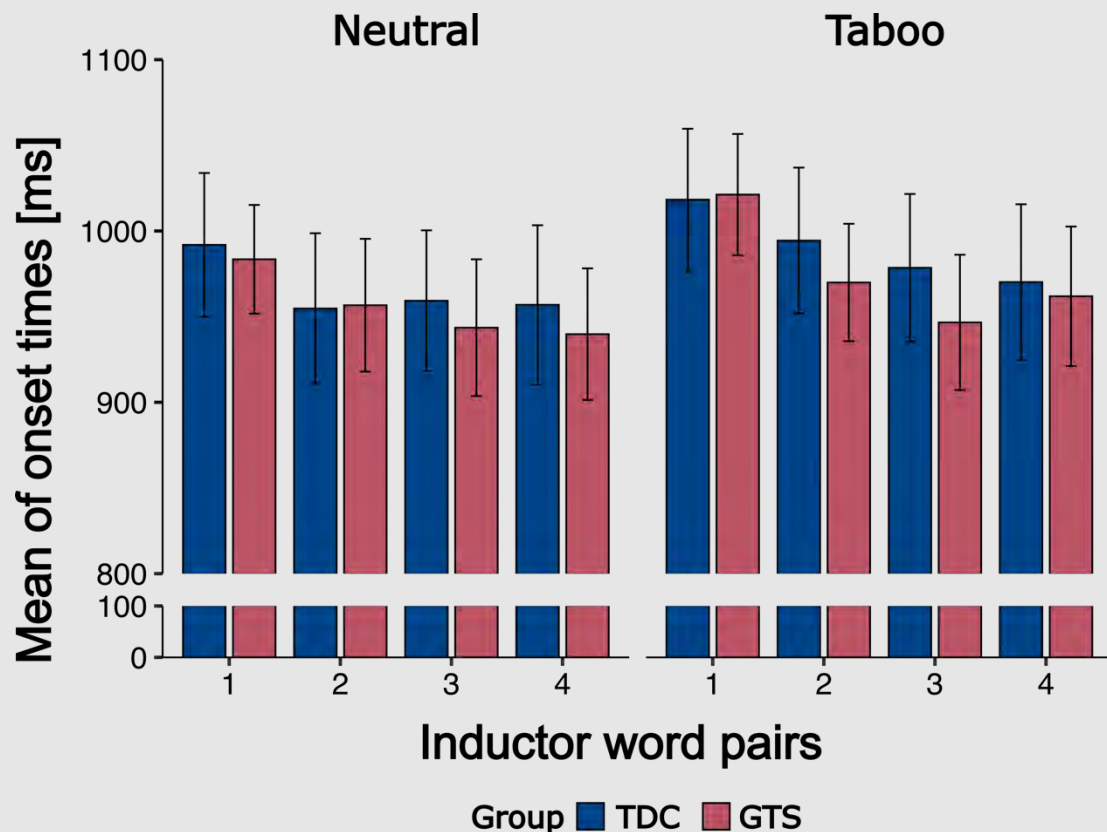
**no significant difference** between

- error rate (U=156.5, p=0.12)
- number of spoonerisms (U=184.5, p=0.37)
- per condition (neutral: U=214, p=0.90; taboo: U=180.5, p=0.22)

# Behavioral data – analysis steps



# Behavioral data – voice onset times



## ANOVA:

2 (Group: GTS vs. TDC) x 2 (Condition: Taboo vs. Neutral) x 4 (Number of inductor word pairs: 1-4)

with **significant main effect**

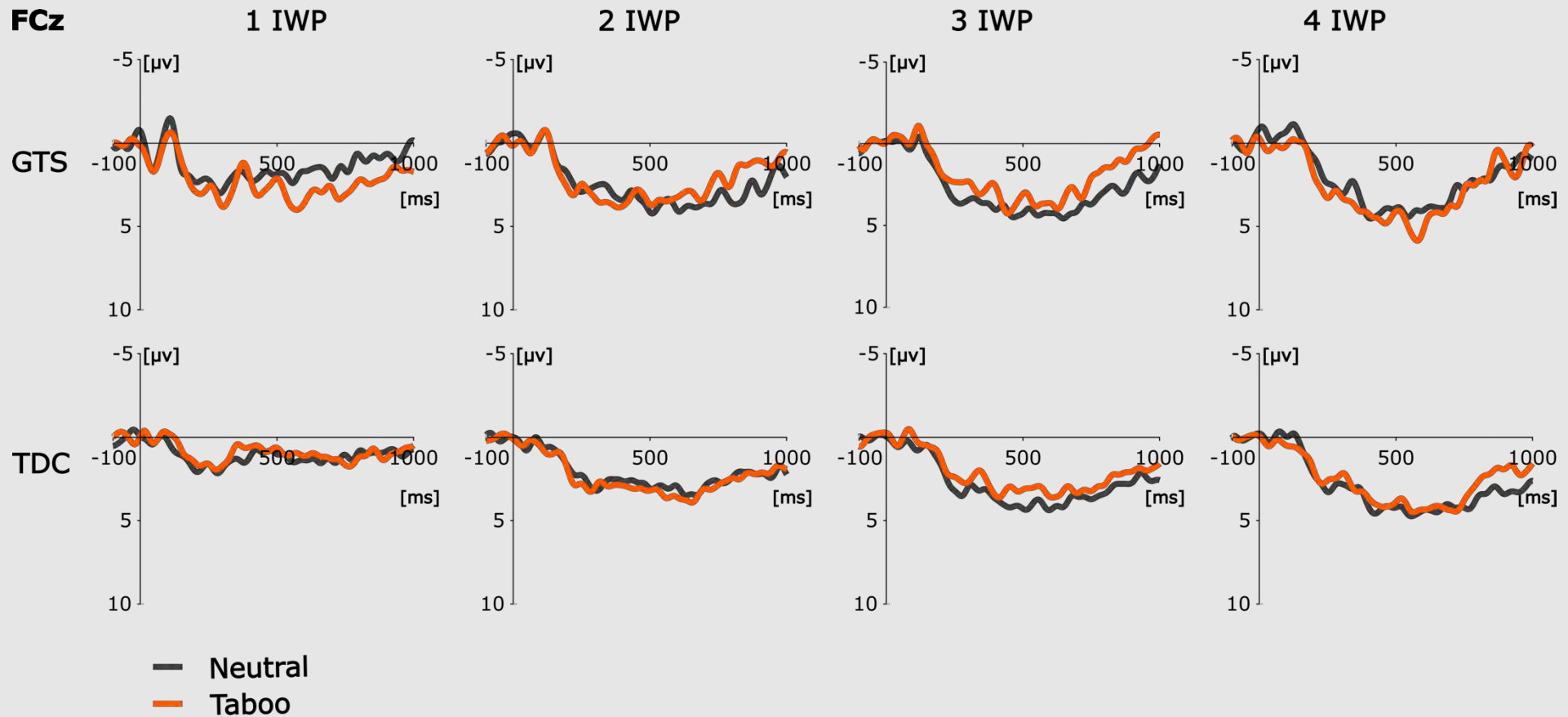
- for the factor condition  
( $F(1,40)=15.29$ ,  $p<0.001$ ,  $\eta^2=0.28$ )

- for the factor inductor word pairs  
( $F(3,120)=9.66$ ,  $p<0.001$ ,  $\eta^2=0.20$ )

-but no main or interaction effect with the factor group.

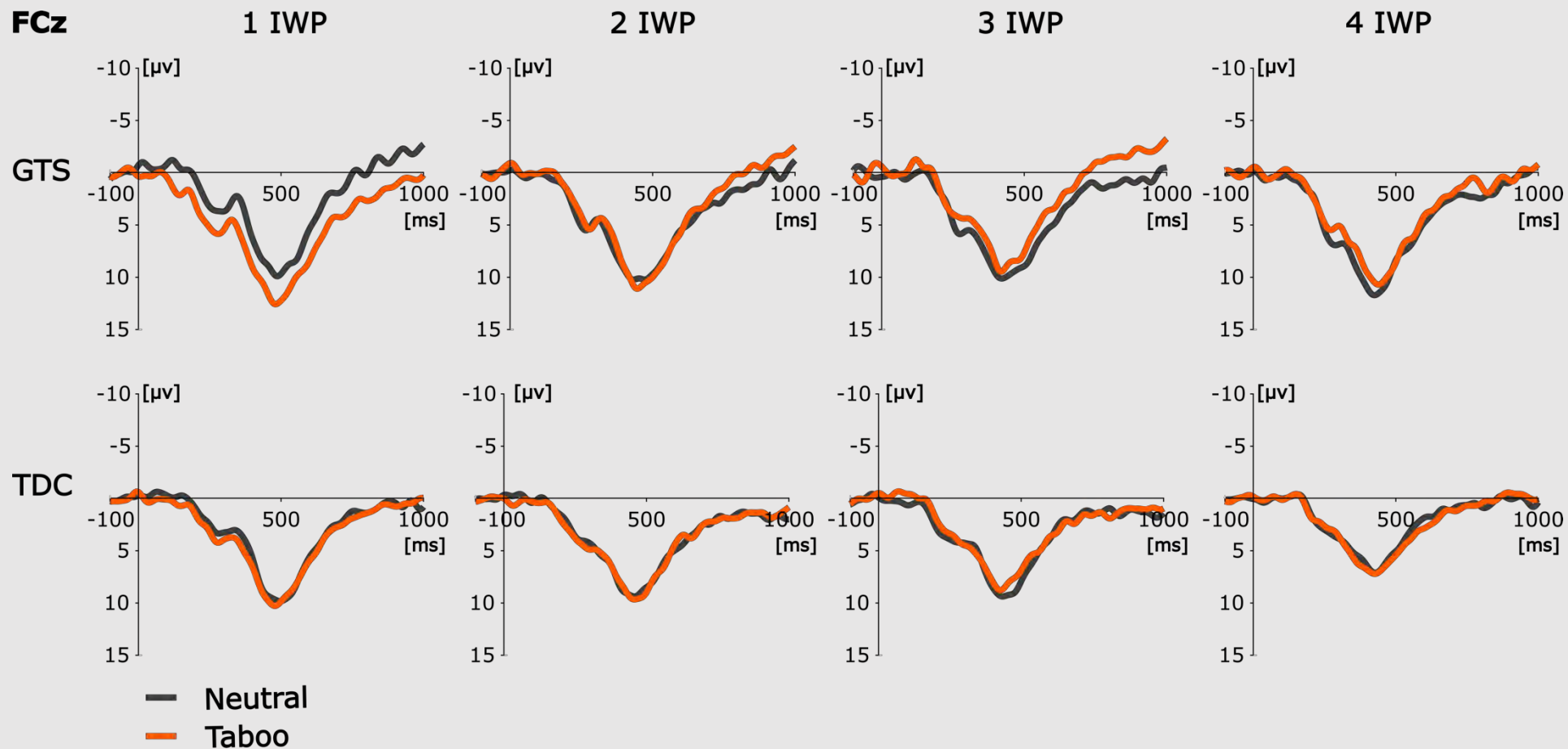
# EEG data

- Analysis of trials with correct answers triggered by the target word pair



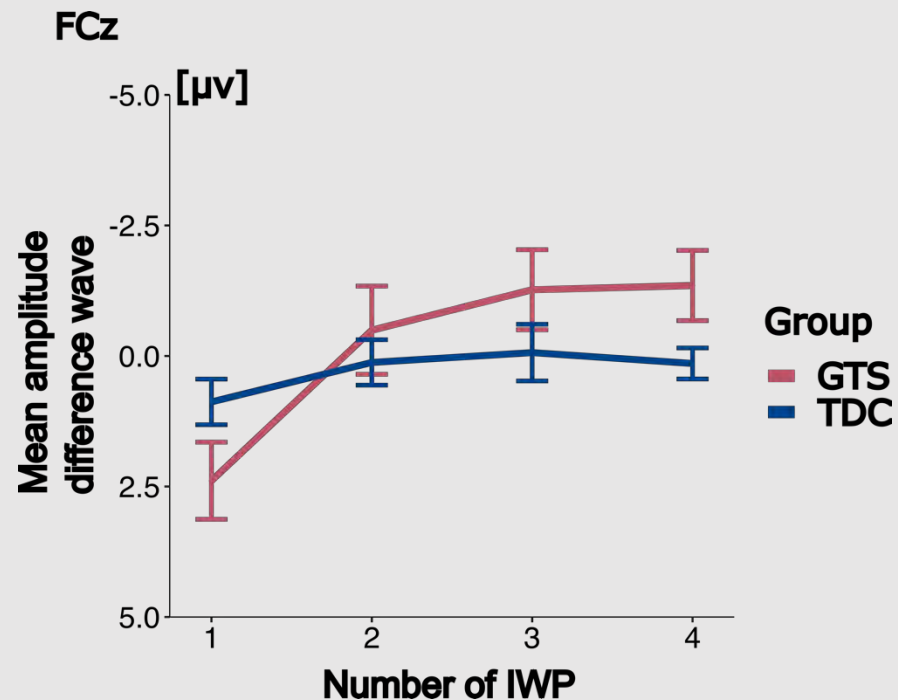
# EEG data

- Analysis of trials with correct answers triggered by the speech prompt



# EEG data

- Difference wave (taboo-neutral) of the ERPs triggered on the speech prompt



## ANOVA of the difference wave

2 (Group: GTS vs. TDC) x 4 (Number of inductor word pairs: 1-4) x 4 (Electrodes: FCz, Cz, CPz, Pz)

found a **significant**

-main effect for the factor inductor word pair ( $F(3,120)=7.50$ ,  $p<0.001$ ,  $\eta^2=0.16$ )

- an interaction effect between group x inductor word pair ( $F(3,120)=3.57$ ,  $p=0.018$ ,  $\eta^2=0.08$ ).

# Discussion

- According to previous research using the SLIP paradigm we expected:
- Behavioral:
  - *Condition*: more pronounced suppression of taboo word spoonerism (less speech errors and later voice onset times) → ✓ taboo word spoonerism rarer and later voice onset times in taboo condition
  - *Groups*: suppression of taboo word less effective in patients with GTS → ✗ no differences between the groups
- ERP data:
  - *Condition*: increased negativity in taboo word spoonerism
  - *Groups*: ERP correlates of conflict monitoring to be less pronounced in patients with GTS  
→ Differences in patients with GTS between conditions not found in TDC and gradual recruitment of cognitive control processes

# Conclusion

- Summary:
  - the voice onset times indicate stronger involvement of cognitive control in the taboo condition along with the less uttered taboo spoonerisms
  - the ERP results suggest a more gradual recruitment of cognitive control processes in GTS
- Limitation: small to moderate group size (25 participants per group), inclusion of patients with comorbidities, underrepresentation of coprolalia in GTS group

*This study provides a first hint of the inhibition of taboo words in patients with GTS. It is among the first to induce swearing in patients with GTS through speech errors (spoonerism) and analyze the inhibition of these using EEG data.*

# Literature

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Thank you for listening!