

# The working memory basis of normal and pathological speech dysfluencies

L. Van der Linden<sup>1</sup>, A. Szmalec<sup>1</sup>, C. Moerenhout<sup>2,3</sup>, G. Reunes<sup>3</sup> & R. Hartsuiker<sup>4</sup>

<sup>1</sup> Psychological Sciences Research Institute, Université Catholique de Louvain, Belgium

<sup>2</sup> Department of Speech, Language and Hearing Sciences, Vesalius University College Ghent, Belgium

<sup>3</sup> vzw BEST, Ghent, Belgium

<sup>4</sup> Department of Experimental Psychology, Ghent University, Belgium

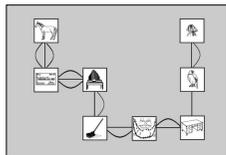
## Theoretical background

- We aim to investigate the involvement of working memory (executive control) resources in the production of speech dysfluencies
- Some dual-task studies report an increase in stuttering behaviors under conditions of divided attention (e.g., Bosshardt, 2002), while other studies rather claim that stuttering is reduced under dual-task demands (e.g., Vasic & Wijnen, 2005)
- Assumption that stuttering is a consequence of hypervigilant speech-monitoring system, at the level of brain areas responsible for executive control (e.g., right Inferior Frontal Gyrus, rIFG; Loucks, Kraft, Choo, Sharma, & Ambrose, 2012)

## Participants

Twenty (n=20) adult diagnosed stutters (M = 26.10 years, SD = 8.50) and controls (M = 26.95, SD = 8.48) matched on age, gender and education level

## Experiment 1



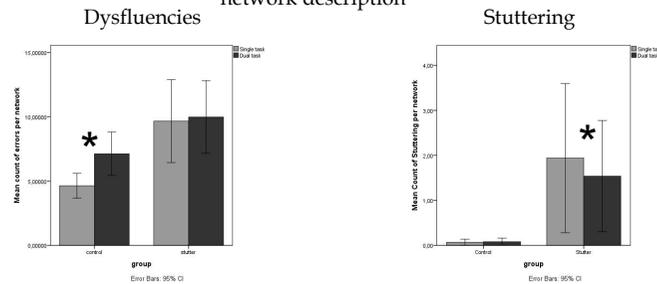
From: Hartsuiker & Notebaert, 2010

## Design

2 (group: control vs. stutterer) x 2 (condition: single task vs. dual task)

Dual task = divided attention using executive control secondary task (i.e., sound discrimination task)

Dependent variables: total # dysfluencies in general, self-corrections, repetitions, extensions and stuttering during network description

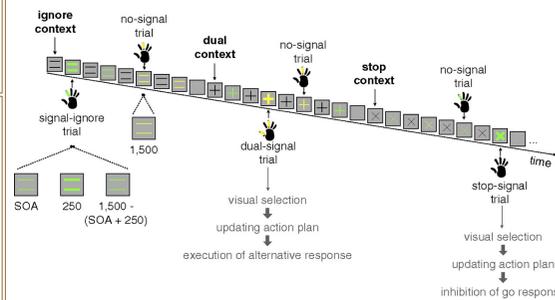


**Conclusion** Divided attention increases dysfluencies in normal speakers but decreases stuttering in diagnosed stutters, in line with hypervigilant speech monitoring account

## Predictions

- If stuttering is a consequence of hypervigilance in speech-monitoring, we predict:
  1. Decrease of speech dysfluencies under conditions of divided attention in diagnosed stutters (≠ matched controls), using a picture-network description task (EXPERIMENT 1)
  2. Better performance for diagnosed stutters in an executive control task, a color-matching task involving inhibition and updating, that has been shown to rely on the inferior frontal cortex (IFC; Verbruggen, Aron, Stevens, & Chambers, 2010) (EXPERIMENT 2)

## Experiment 2



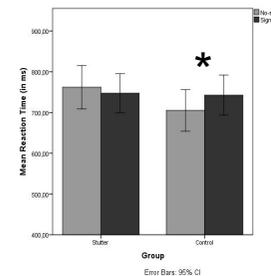
From: Verbruggen, Aron, Stevens & Chambers, 2010

## Design

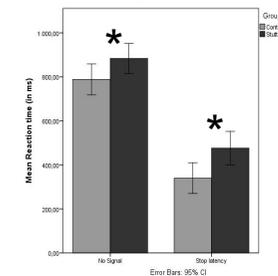
2 (group: controls vs. stutters) x 3 (context: ignore vs. dual vs. stop)

Context-cueing paradigm  
rIFG involved in dual (updating) and stop (inhibition) trials, but not in ignore trials

## Dual Trials



## Stop Trials



**Conclusion** Stutters higher inhibitory control capacity, but less mental flexibility

## Acknowledgements

The authors would like to thank the members of vzw BEST for their participation.