

WHICH EXECUTIVE FUNCTIONS ARE INVOLVED IN THE DIFFERENT SEMANTIC FLUENCY TASKS?

RESULTS IN HEALTHY SUBJECTS

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POSTER 62 – LANGUAGE #2

Executive functions are often assessed via verbal fluency tasks

EXECUTIVE FUNCTIONS AND VERBAL FLUENCY

Executive functions

- Allow us to organize our behavior and override immediate demands in favor of longer-term goals (Dawson & Guare, 2014)
- Shifting, updating, inhibition (Miyake et al., 2014)
- Higher executive functions: Reasoning, problem solving, planning (e.g. Collins & Koechlin, 2012)

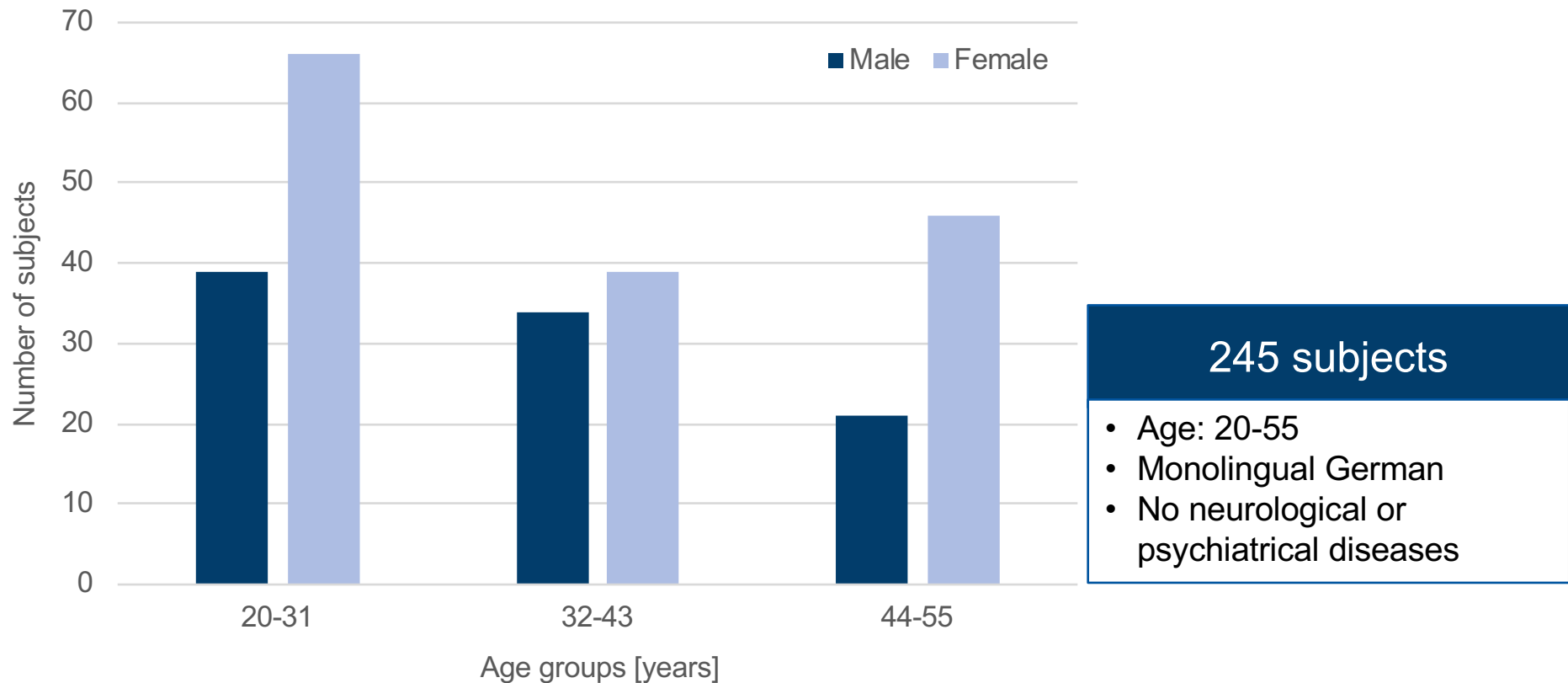
Verbal fluency

- Examinee is asked to generate as many words as possible to a specific letter (phonemic) or specific category (**semantic verbal fluency**)
- requires executive control over cognitive processes

The aim is to investigate which executive functions contribute most to the **semantic verbal fluency task**

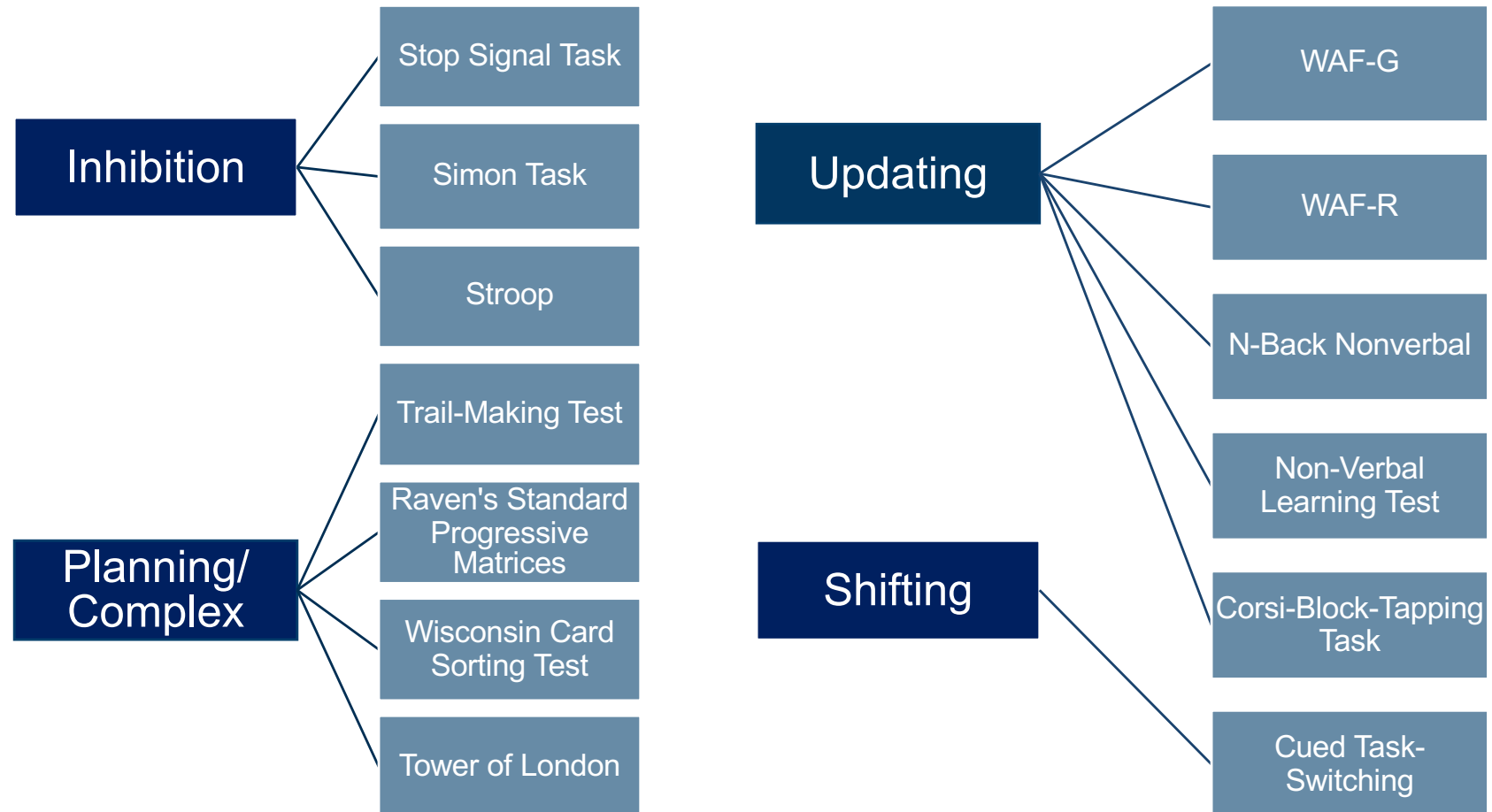
245 subjects have been tested – 151 females and 94 males

SUBJECTS



Thirteen different tests are used to measure the different aspects of executive functioning

EXECUTIVE FUNCTIONS TEST BATTERY



Two simple and one switching task were used to assess semantic verbal fluency

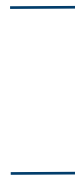
SEMANTIC VERBAL FLUENCY

- Based on *Regensburger Wortflüssigkeitstest* (Aschenbrenner et al., 2001)
- Each task is performed for 2 minutes

1. Animals

2. Jobs

3. Fruits $\leftarrow \rightarrow$ Sports



Simple tasks

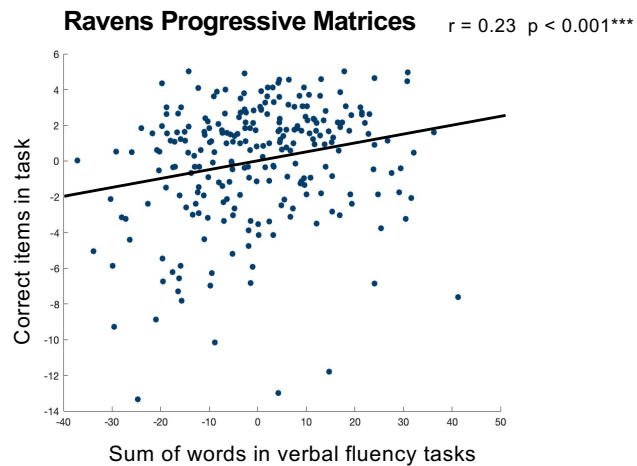


Switching task

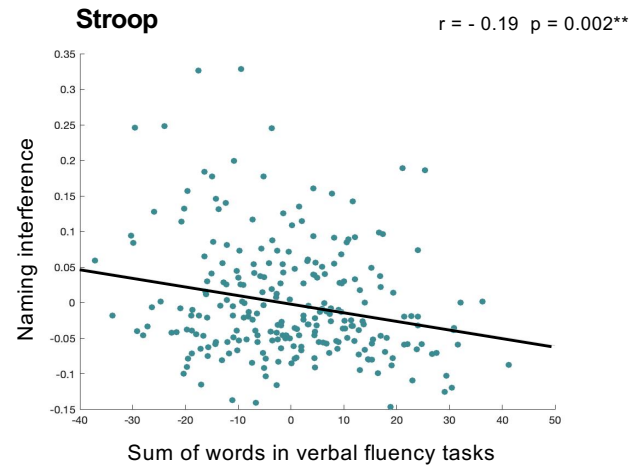
Total sum of words correlates with tests from planning, inhibition and shifting

RESULTS

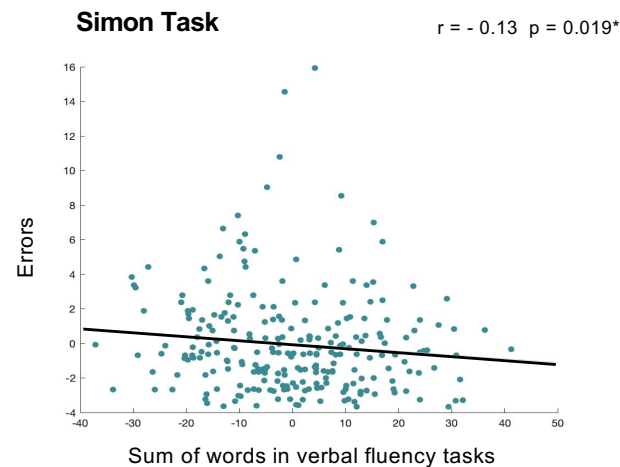
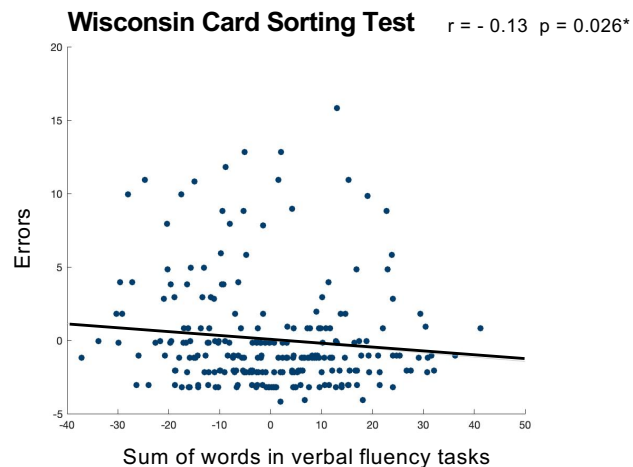
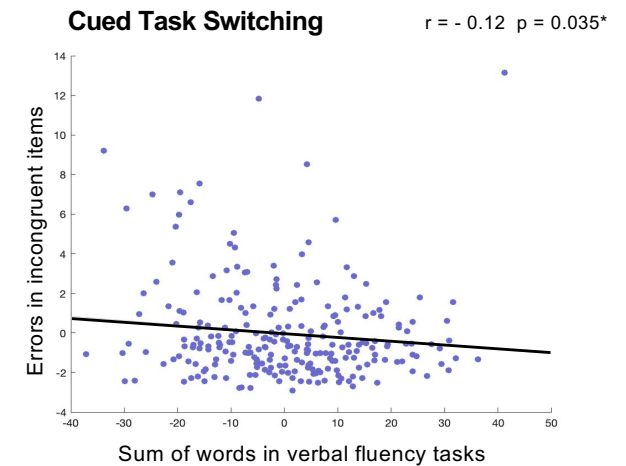
Verbal fluency vs. planning



Verbal fluency vs. inhibition



Verbal fluency vs. shifting



The switching component in verbal fluency tasks seems to involve more planning ability than simple tasks

PLANNING IN VERBAL FLUENCY

		Simple tasks	Switching task
Planning	Trail-Making-Test	$r = -0.08$ $p = 0.094$	$r = -0.12$ $p = 0.033^*$
	Raven's Standard Progressive Matrices	$r = 0.21$ $p < 0.001^{***}$	$r = 0.21$ $p < 0.001^{***}$
	Wisconsin Card Sorting Test	$r = -0.12$ $p = 0.032^*$	$r = -0.10$ $p = 0.058$
	Tower of London	$r = 0.05$ $p = 0.211$	$r = 0.13$ $p = 0.025^*$

For efficiency in generating words it is necessary to cluster words in sub-categories

Inhibition plays an important role in both simple and switching tasks

INHIBITION IN VERBAL FLUENCY

		Simple tasks	Switching task
Inhibition	Stop-Signal Task	$r = -0.05$ $p = 0.216$	$r = -0.08$ $p = 0.108$
	Simon Task	$r = -0.01$ $p = 0.022^*$	$r = -0.11$ $p = 0.037^*$
	Stroop	$r = -0.13$ $p = 0.005^{**}$	$r = -0.14$ $p = 0.014^*$

> Inhibition might be needed for suppressing already produced words

Shifting seems to be a specific executive function which is necessary for switching in verbal fluency task

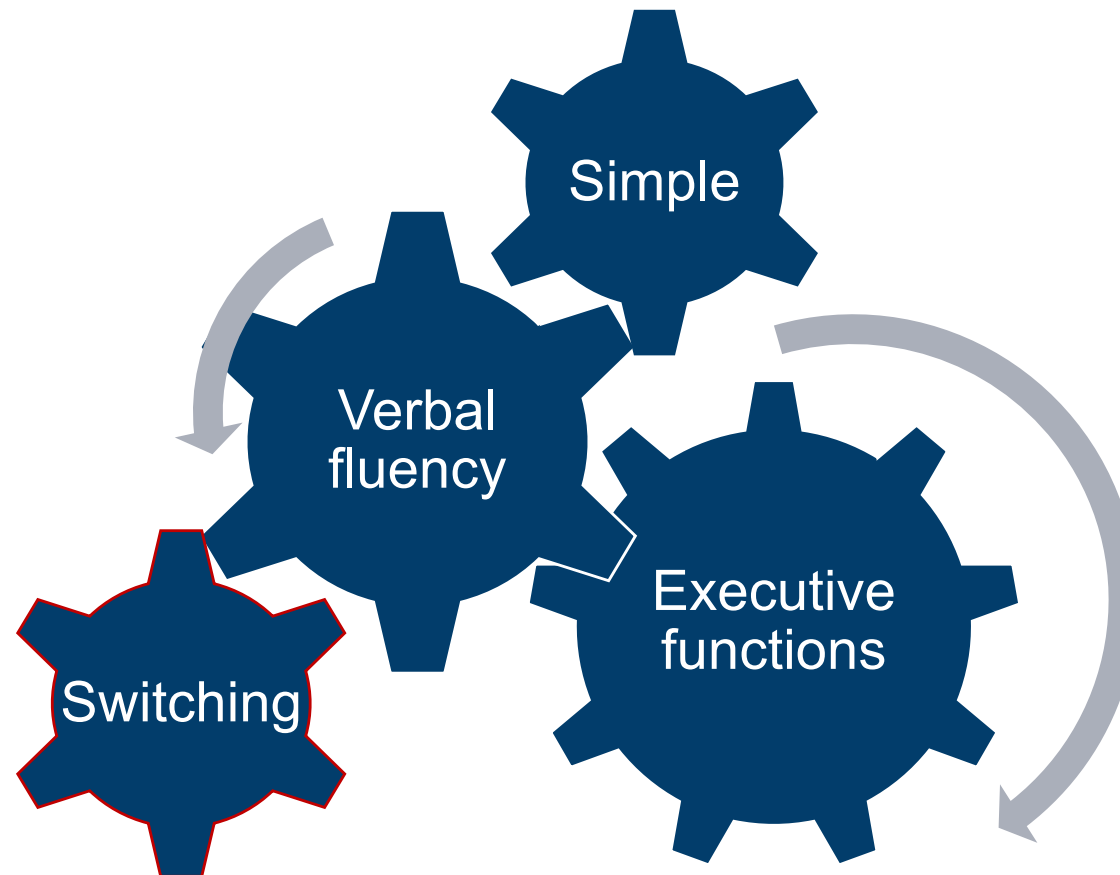
SHIFTING IN VERBAL FLUENCY

		Simple tasks	Switching task
Shifting	Cued Task Switching	$r = -0.10$ $p = 0.056$	$r = -0.13$ $p = 0.017^*$

Switching in verbal fluency task is more sensitive in testing shifting ability than simple tasks

Different domains of executive functions are involved in the semantic verbal fluency task

SUMMARY



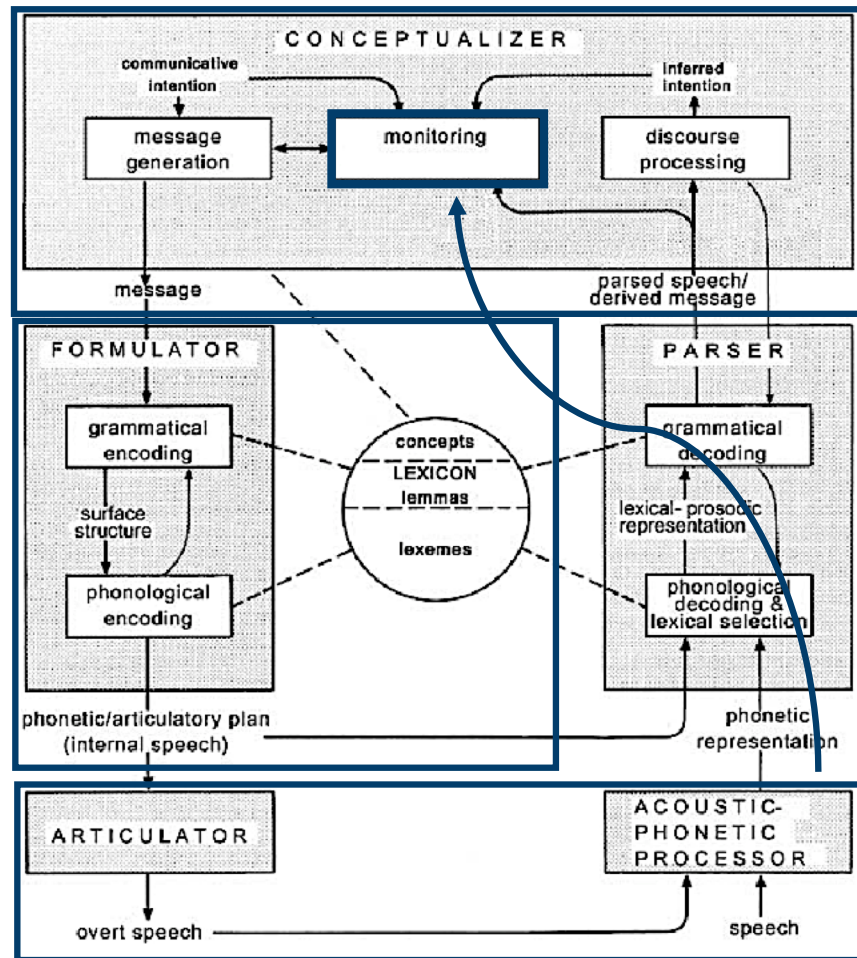


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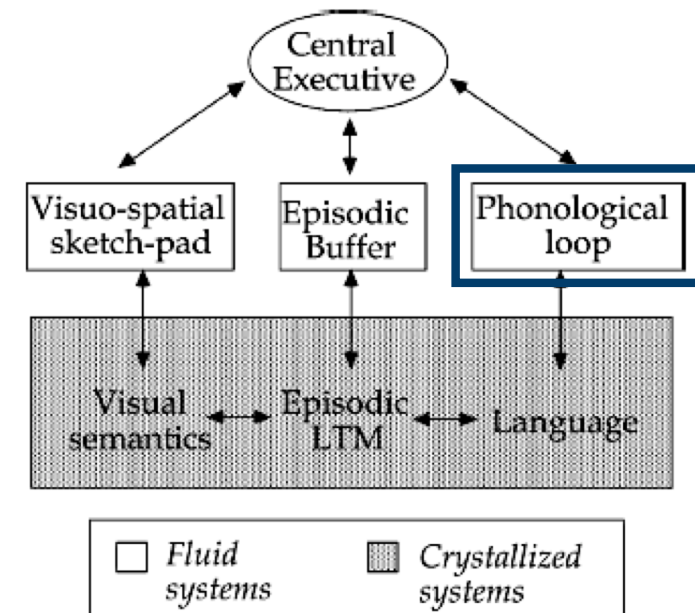


Executive functions are involved in several cognitive speech generating processes

EXECUTIVE FUNCTIONS AND SPEECH



Modified version of Levelt's speech processing model (1993)
by Dietrich (2002)



Multi-component model of working memory,
Baddeley (2003)