

# DOES COMBINED DECISION-MAKING TRAINING AND TDCS PRODUCE GENERALISABLE COGNITIVE BENEFITS IN HEALTHY OLDER ADULTS?

## CAN COMBINED DECISION-MAKING TRAINING AND TDCS PRODUCE LASTING AND GENERALISABLE COGNITIVE BENEFITS IN HEALTHY OLDER ADULTS?

- Age-related decline in cognitive function is one of the greatest challenges posed by the ageing population
- “Executive functions” disproportionately represented in this decline
- Excitement around promise of cognitive training and brain stimulation interventions
- Evidence that combining training and tDCS can enhance training benefits in older adults on specific tasks
- Much less evidence for “transfer” to other cognitive tasks and everyday function

Study accepted in principal as a Stage 1 Registered Report at *Nature Human Behaviour*

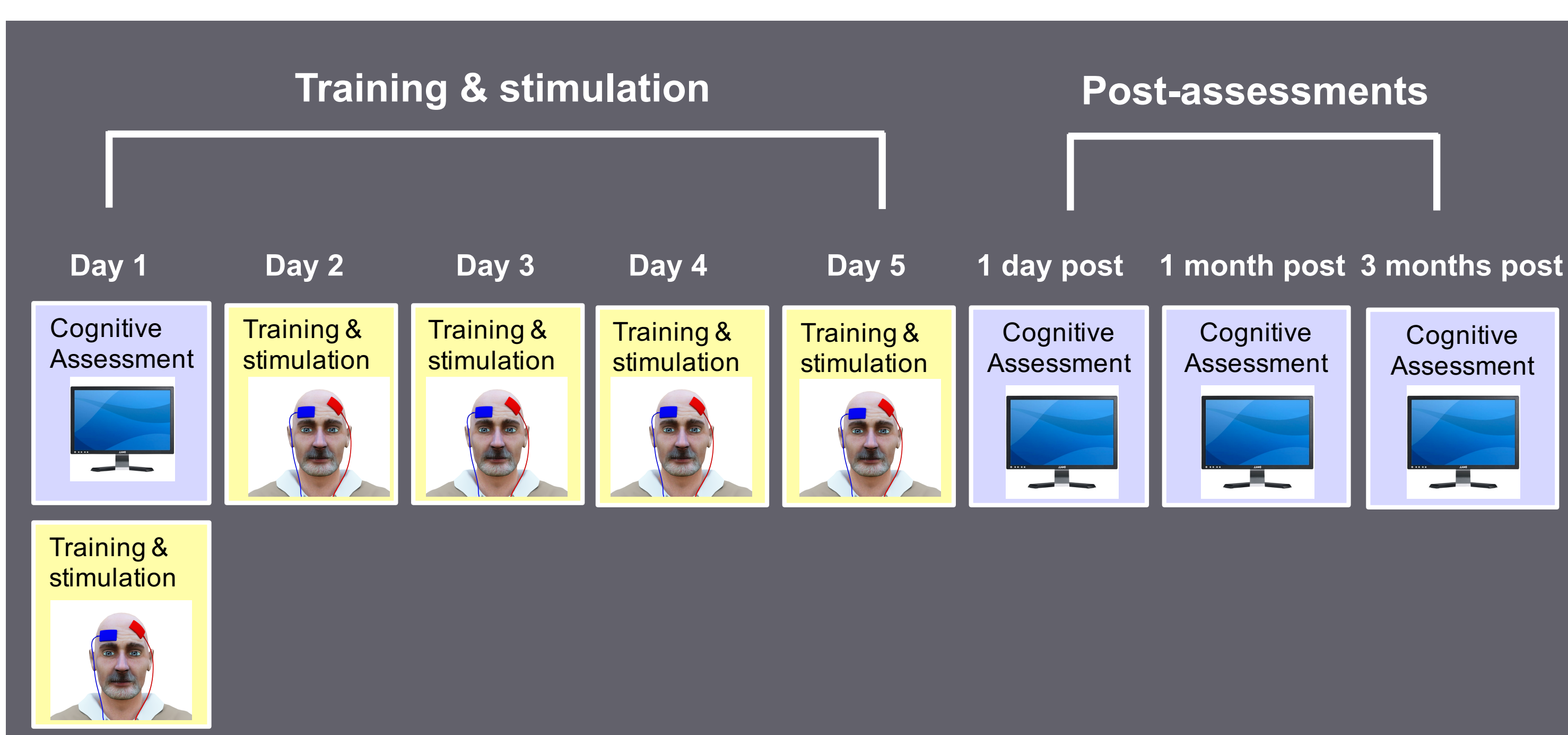
### METHOD

- 131 healthy older adults aged 60-75 (75 female, mean age =  $67.62 \pm 4.21$  years, mean education =  $15.47 \pm 3.35$  years)
- Participants randomly assigned to one of four matched groups:
  1. Left PFC 2mA tDCS and decision-making training (based on Filmer et al., 2017)
  2. Left PFC sham tDCS and decision-making training
  3. Left PFC 2mA tDCS and “control” training
  4. Left V1 2mA tDCS and decision-making training
- All training/stimulation sessions were 20 minutes duration
- Stimulation was administered “online” - i.e. during training task

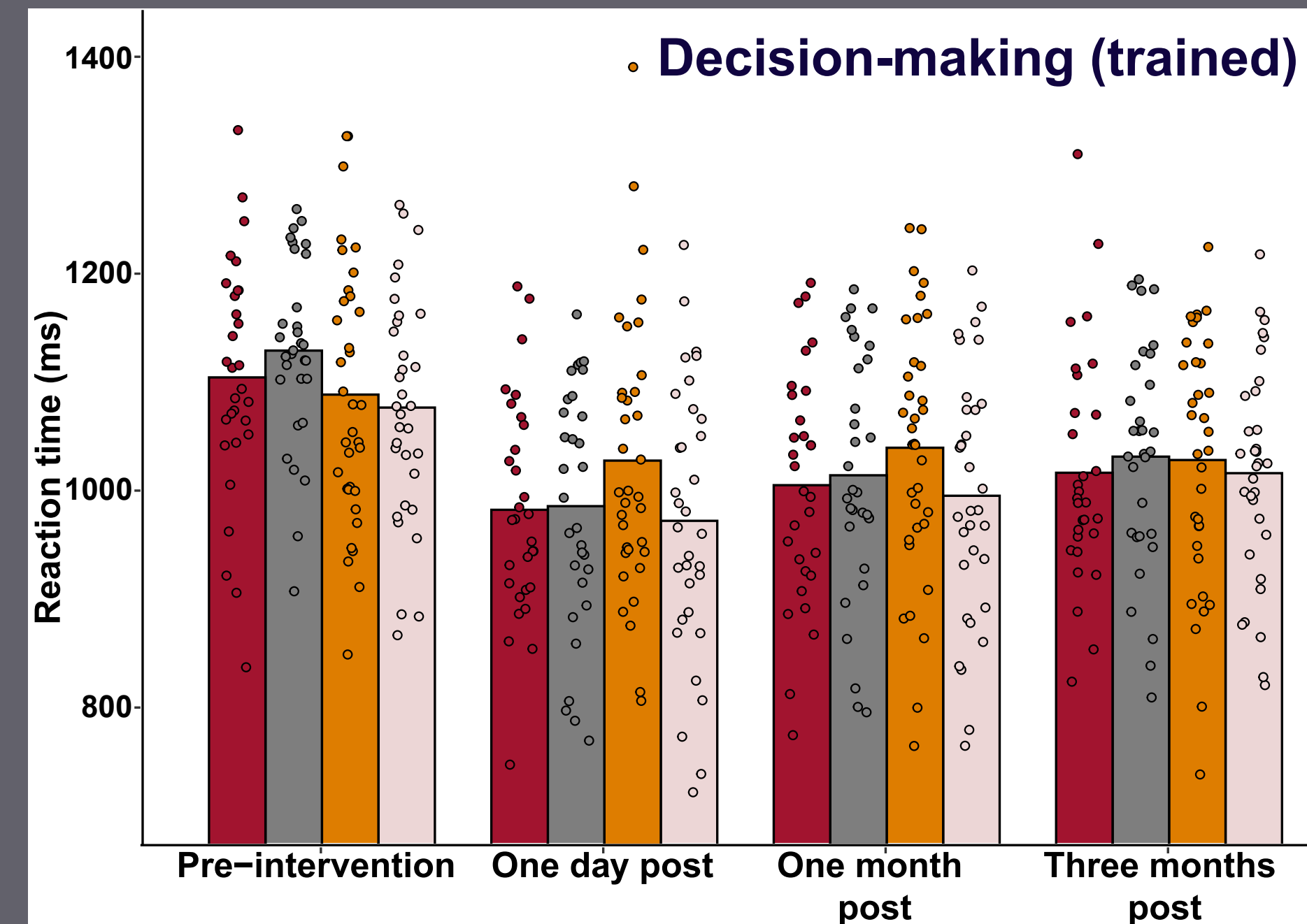
### COGNITIVE BATTERY

<b>Training</b> Decision-making task six choice auditory discrimination	Reading the Mind in the Eyes Test
<b>Near transfer</b> Single vs. dual task	<b>Memory</b> Visual 2AFC memory test Verbal 2AFC memory test
<b>Far transfer</b> Visual Search Operation Span Stop-signal task	<b>Processing speed</b> Symbol-digit modalities test Stimulus detection task
<b>Translational</b> Wisconsin Card Sorting Test	<b>Questionnaires</b> Behaviour Rating Inventory of Executive Function - Adult Frenchay Activities Index

### TESTING PIPELINE

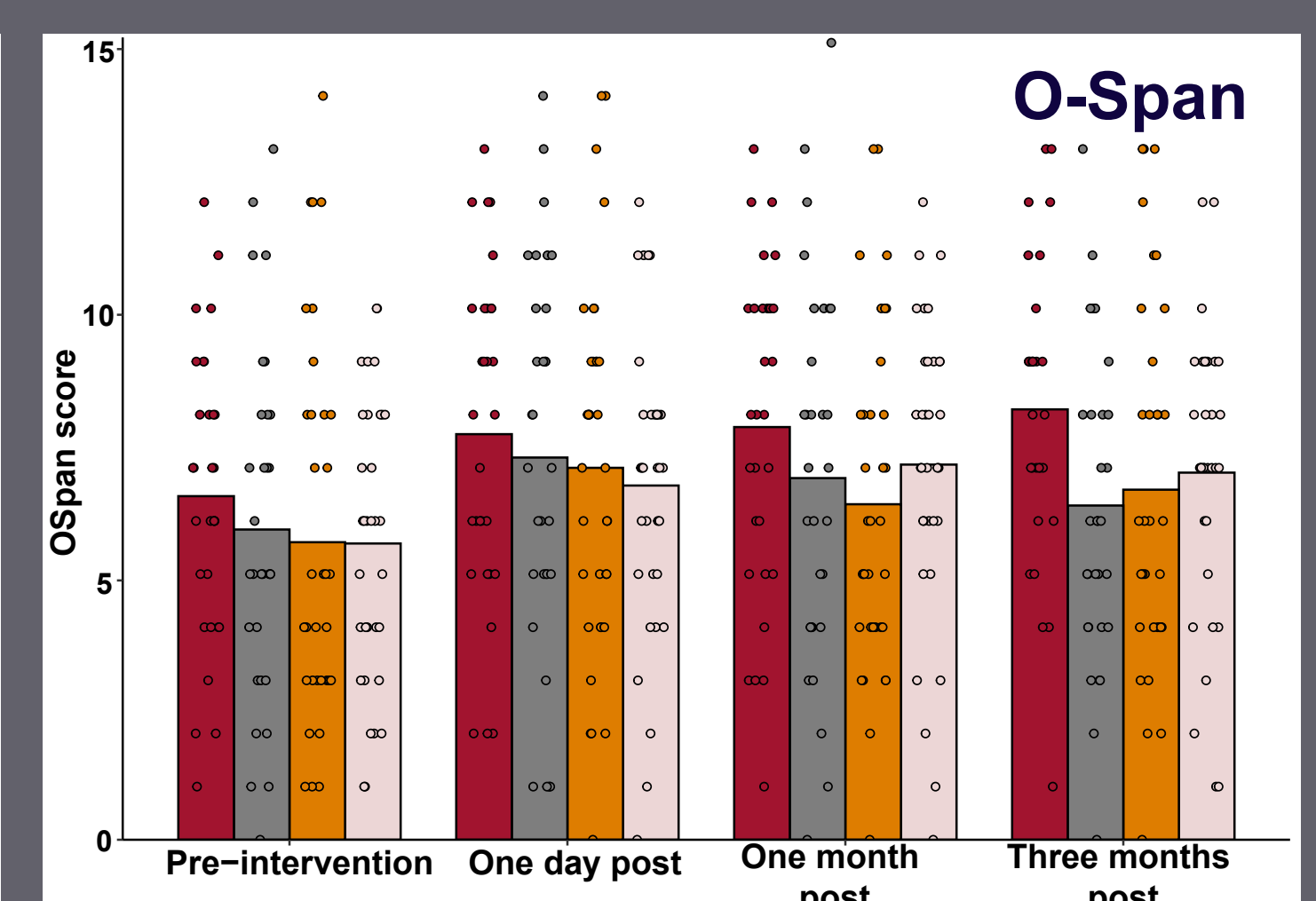
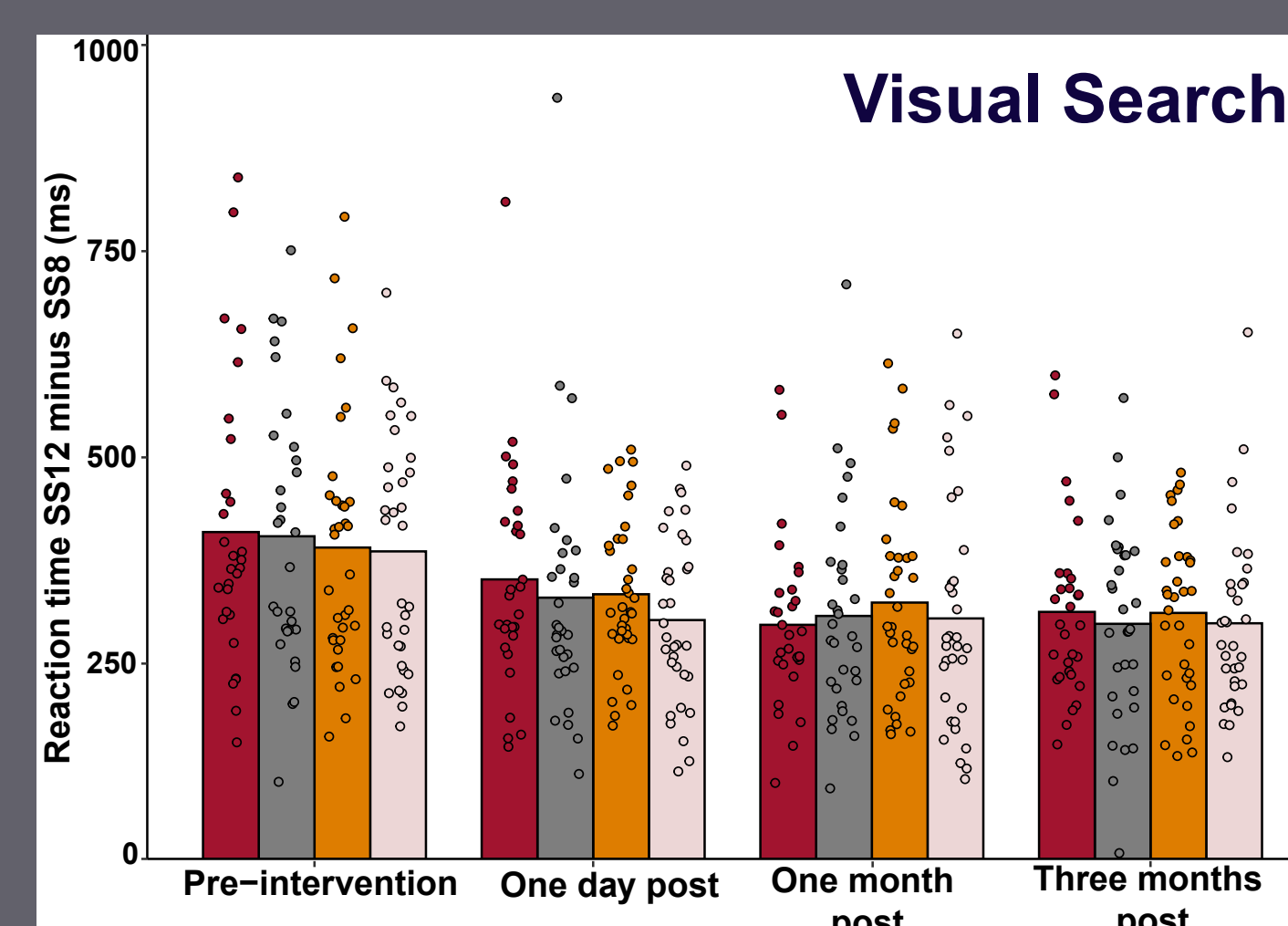


### RESULTS



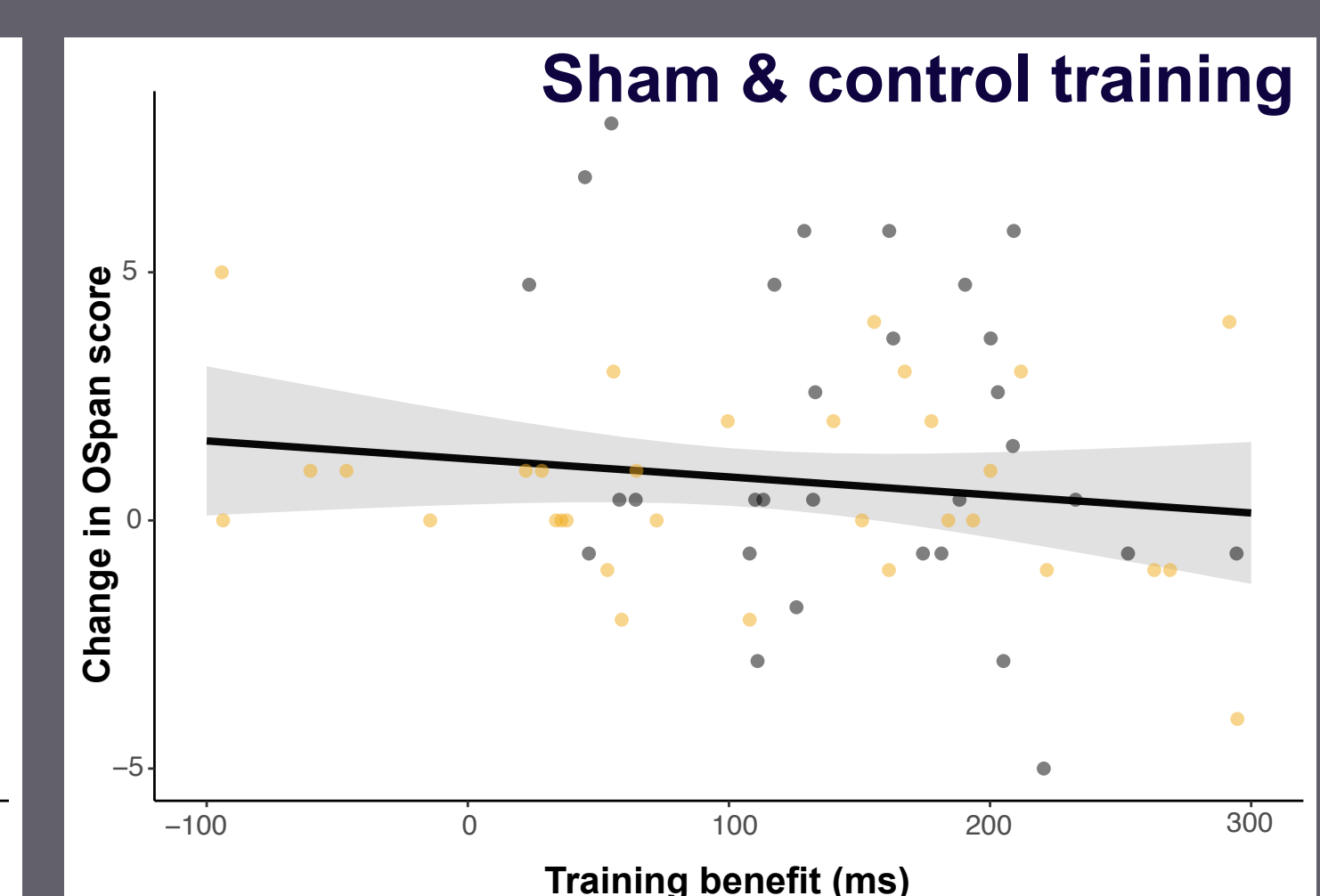
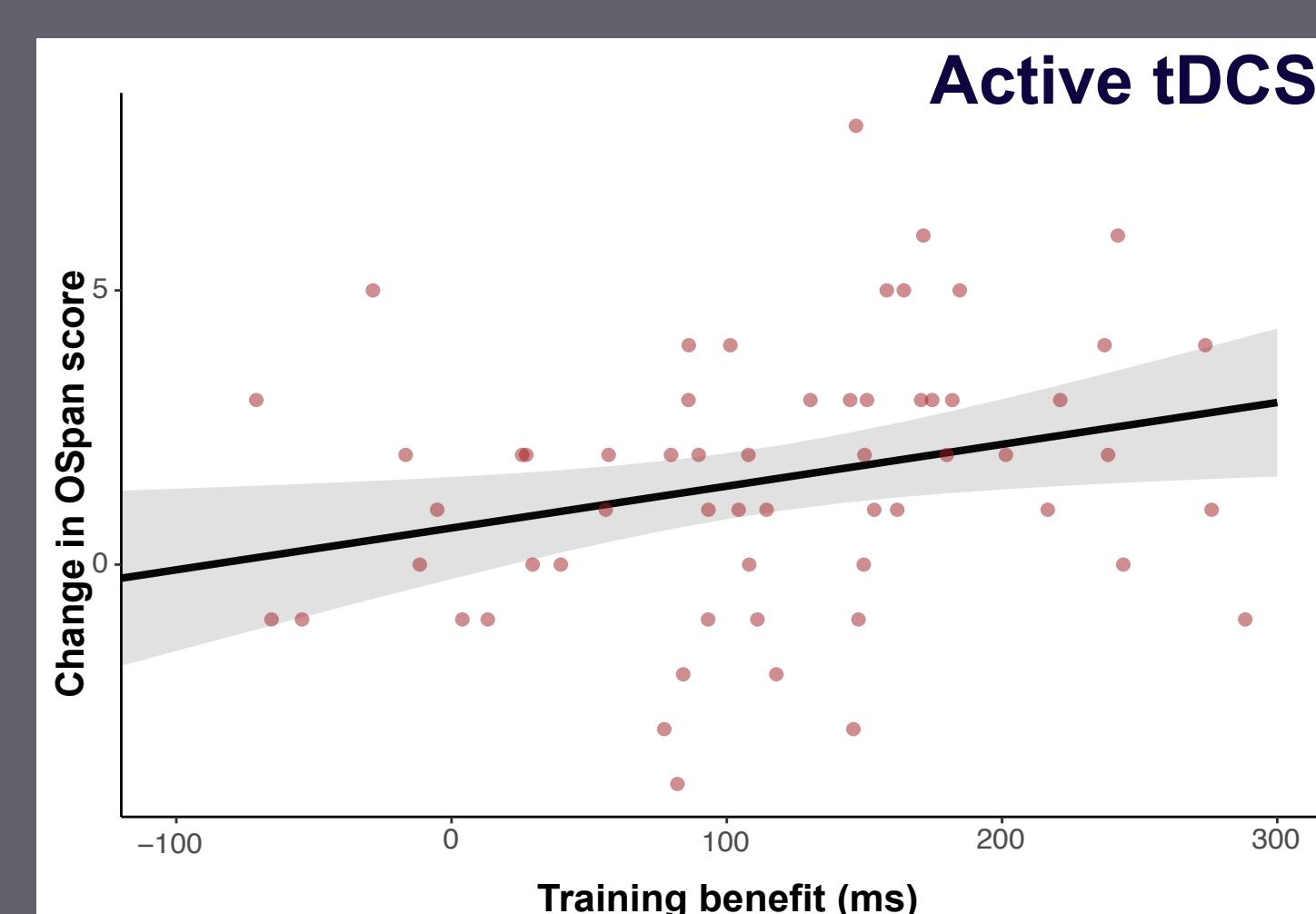
Left PFC tDCS did not enhance training benefits on the decision making task

Previously, enhancement has been found in younger adults (Filmer et al., 2017)

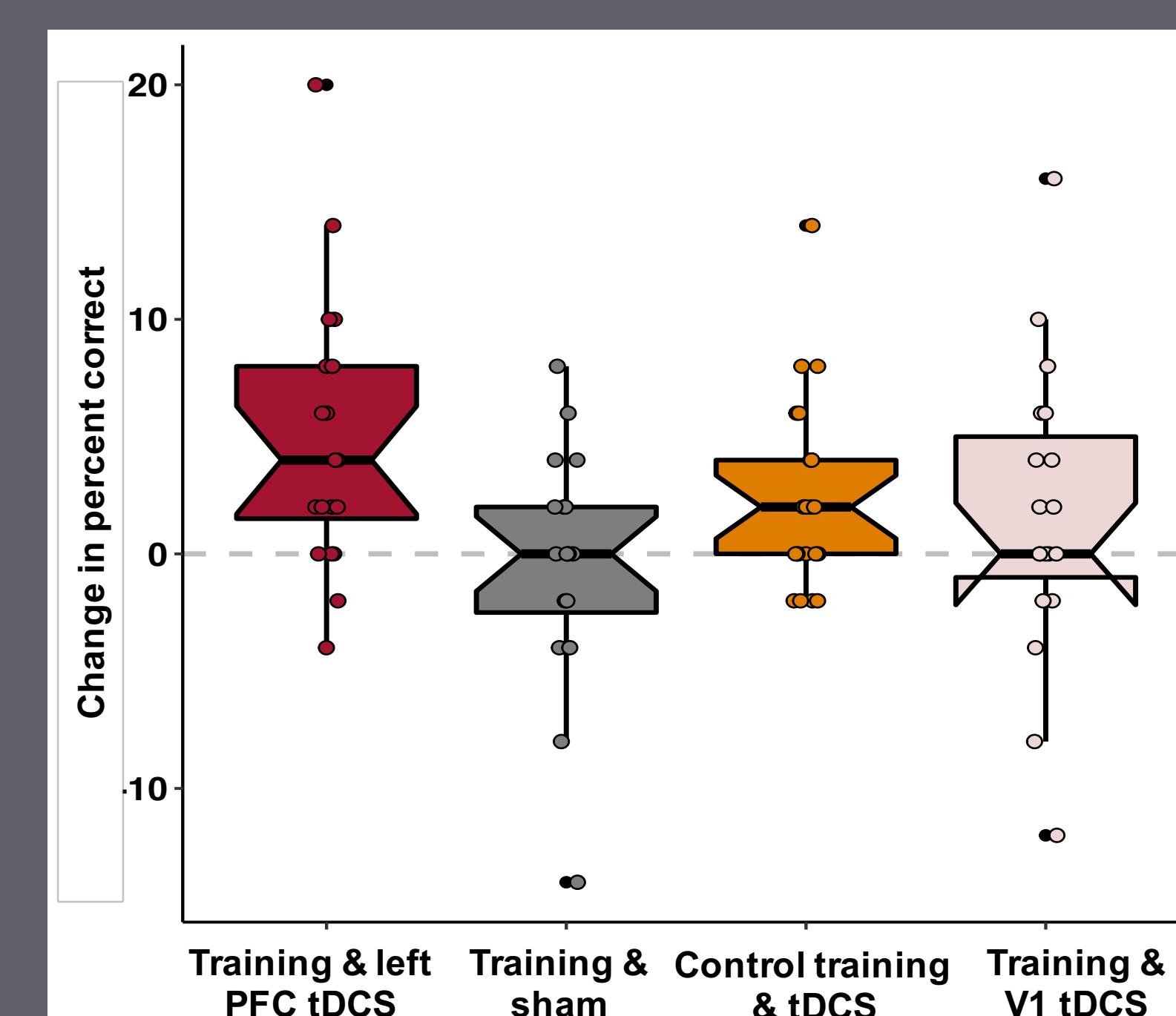


Training benefits did not transfer to unrelated tasks - most tasks demonstrated pattern of improvement overall but no between group differences

### INDIVIDUAL DIFFERENCES?



Training benefit predicted change in working memory performance at one month follow-up for both active stimulation groups, but not control training or sham groups



For BDNF Val/Val carriers: Training and tDCS improved visual memory at three month follow-up relative to sham

There were no between group differences for BDNF Val/Met carriers

### CONCLUSIONS

- In contrast to healthy young adults, left PFC anodal tDCS did not enhance training benefits in healthy older adults
- Training benefits observed on the decision-making task did not transfer to other cognitive domains or everyday function at the group level
- BUT, Individual difference analyses suggest possible transfer of training and stimulation benefits to working memory and visual episodic memory, likely dependent on individual differences (e.g. genotype)