

Using fMRI connectivity to define a treatment-resistant form of post-traumatic stress disorder

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Soyeon Kim

Introduction

Terrorism

Accidents

Witnessing death or injury

Physical assault

Combat

Sexual abuse



Flashback

Apathy

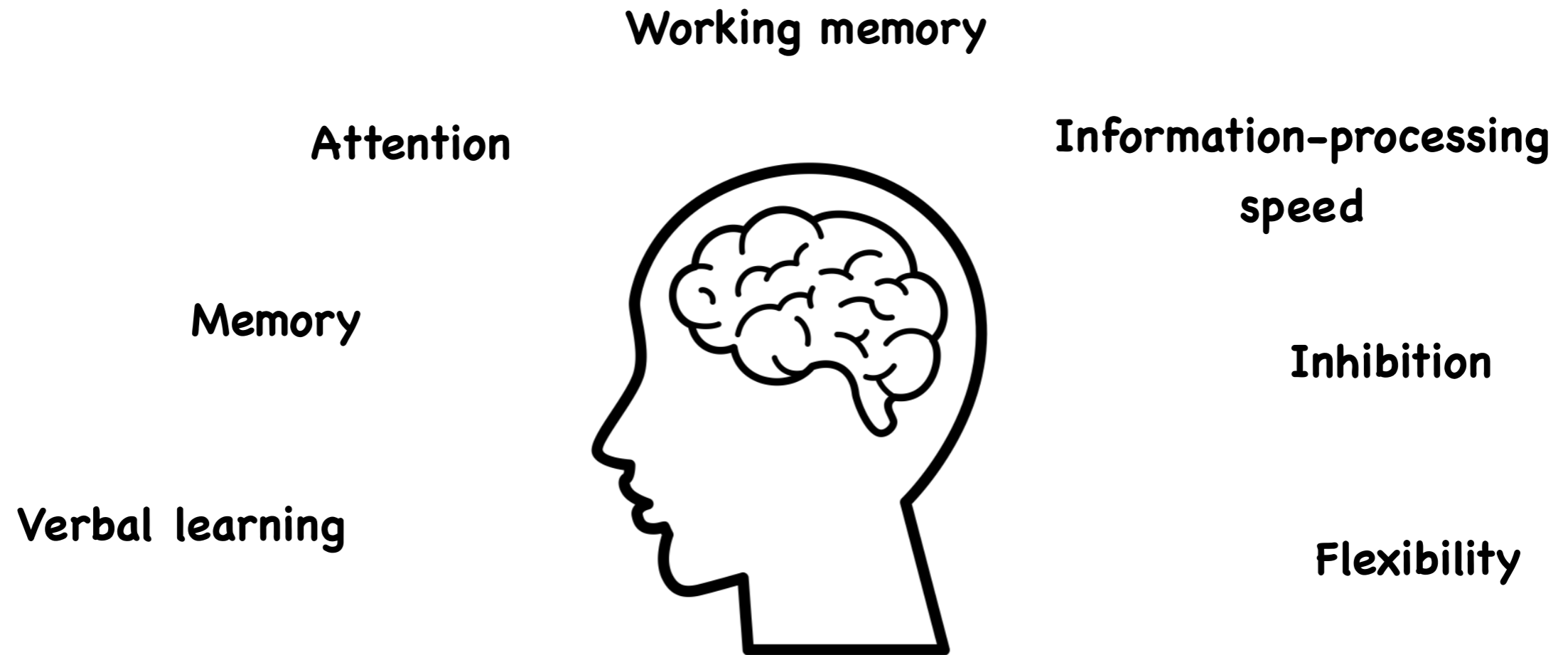
Intrusive distressing memory

Hopelessness

Nightmare

Avoidance

Introduction







Introduction

Treatments

- Prolonged exposure therapy
- Cognitive processing therapy (CPT)
- Eye Movement Destination and reprocessing (EMDR)
- Antidepressants, Selective Serotonin Reuptake Inhibitors (SSRIs), Valium, ...

Research goals

-  Identifying individual differences in cognitive function and resting-state fMRI connectivity within PTSD patients
-  Testing this phenotypes can be generalized
-  Delineating this phenotypes can predict the treatment outcomes
-  Using spTMS/EEG, see certain brain area is related to fMRI connectivity

Methods

Study 1:



fMRI



behavior



clinical



psychotherapy



wait-list

Study 2:



fMRI



behavior



clinical



TMS/EEG

Methods

- N = 36
- Have experienced a criterion A trauma, but not meet lifetime criteria for any Axis 1 psychiatric disorder

Study 1:



trauma-exposed control

- N = 76
- Mostly unmedicated
- Permitted comorbid mood and anxiety disorders secondary to PTSD
- Exclusion criteria : history of psychotic, bipolar or substance dependence, neurological disorder, brain injury, ...

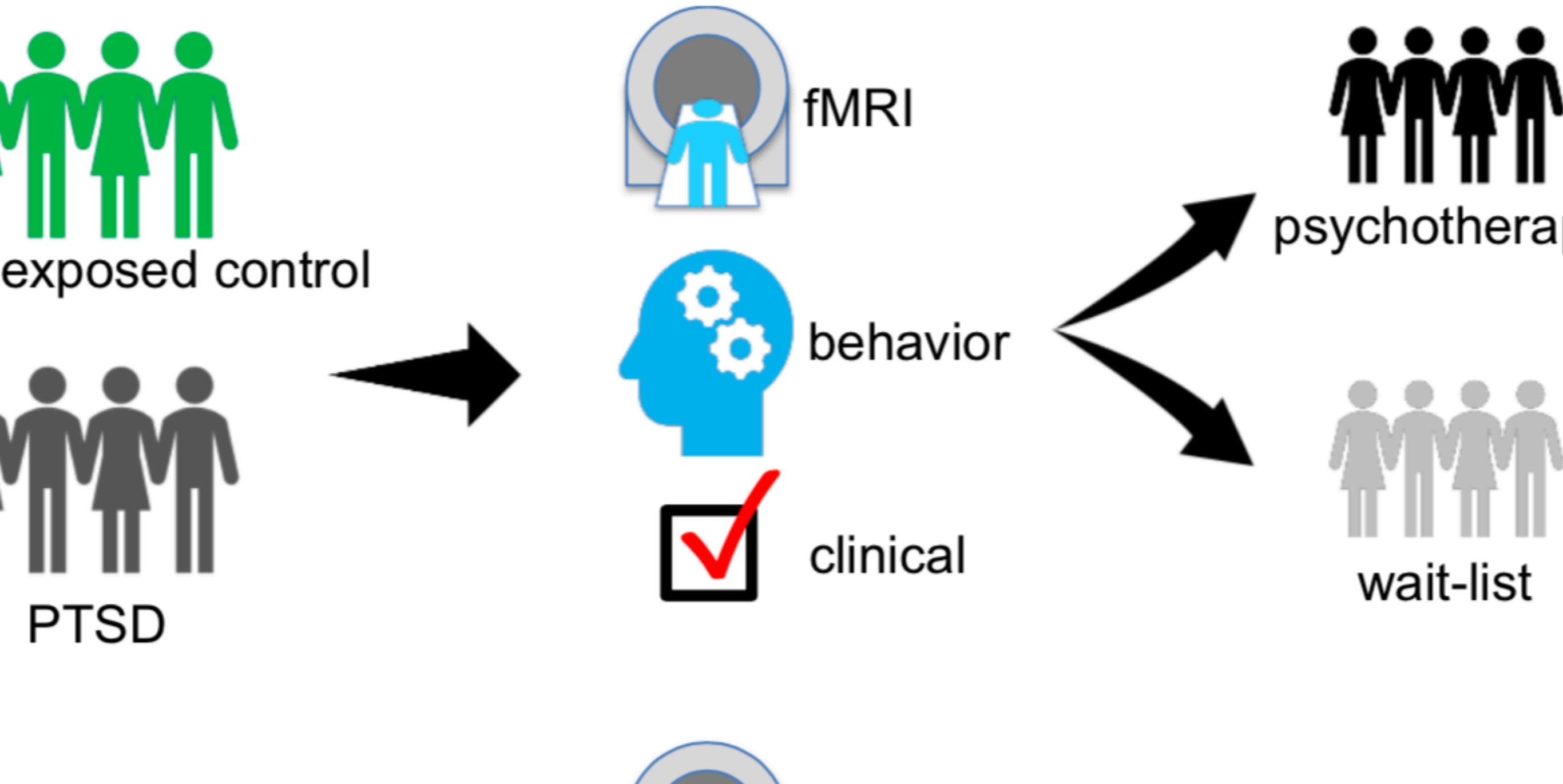


PTSD

Study 2:



Methods



Methods

Resting-State fMRI

- Eight minutes in length

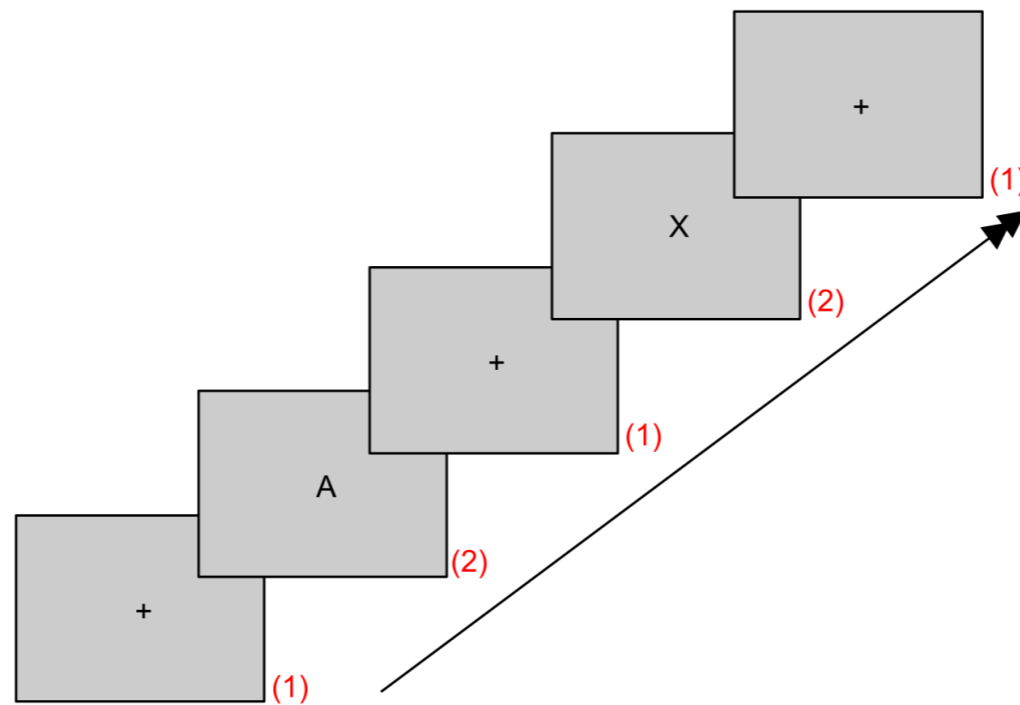
Questionnaires and clinical scales

- WHOQOL-BREF
- Beck Depression inventory-2
- WASI (Wechsler Abbreviated Scale of Intelligence)

Methods

Behavioral assessments

- Word list learning task
- Continuous performance task



Methods

Behavioral assessments

- Digit span forward task

3	7-4-9
4	8-5-2-1
5	2-9-6-8-3
6	5-7-1-9-4-6
7	8-1-5-9-3-6-2
8	3-9-8-2-5-1-4-7
9	7-2-8-5-4-6-7-3-9

Methods

Behavioral assessments

- Color-word Stroop interference task

BLUE

GREEN

YELLOW

PINK

RED

ORANGE

GREY

BLACK

PURPLE

TAN

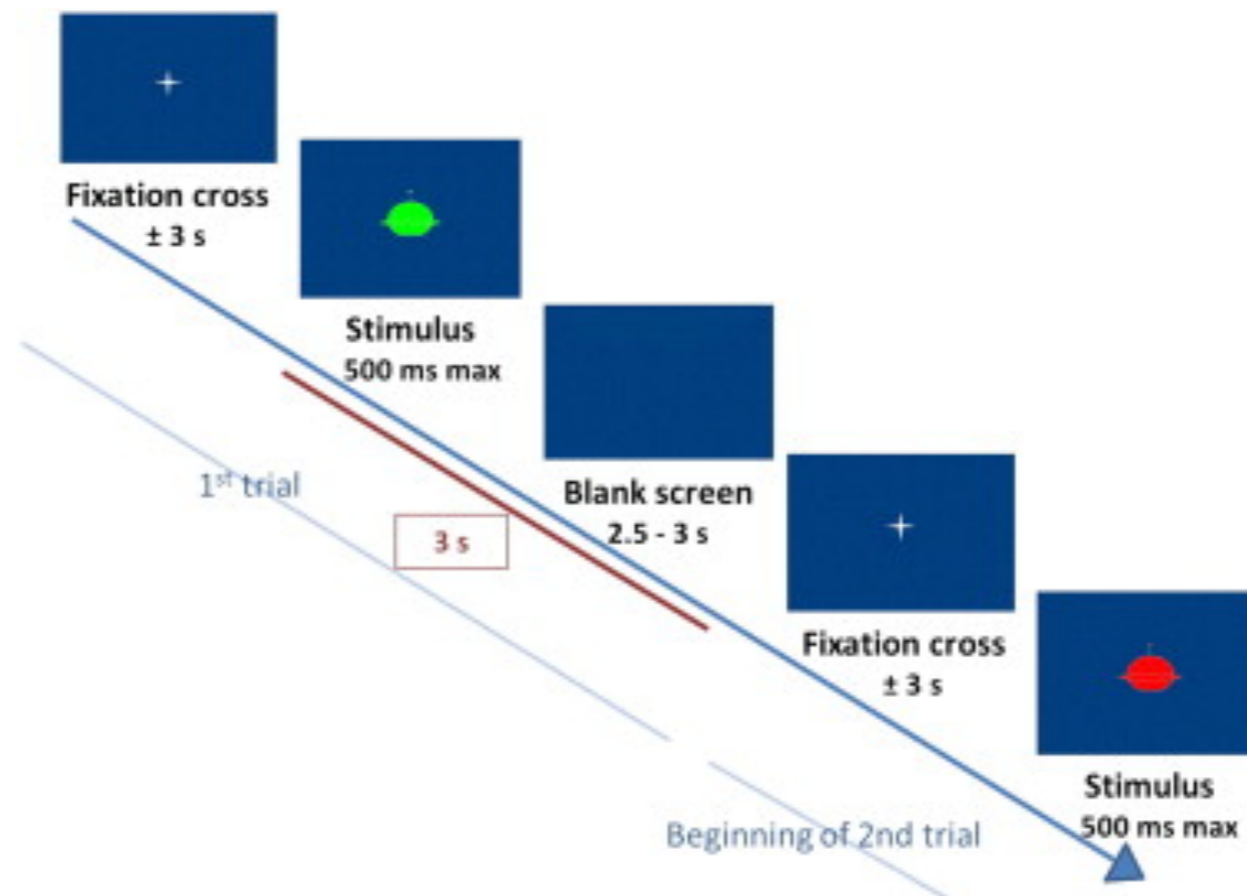
WHITE

BROWN

Methods

Behavioral assessments

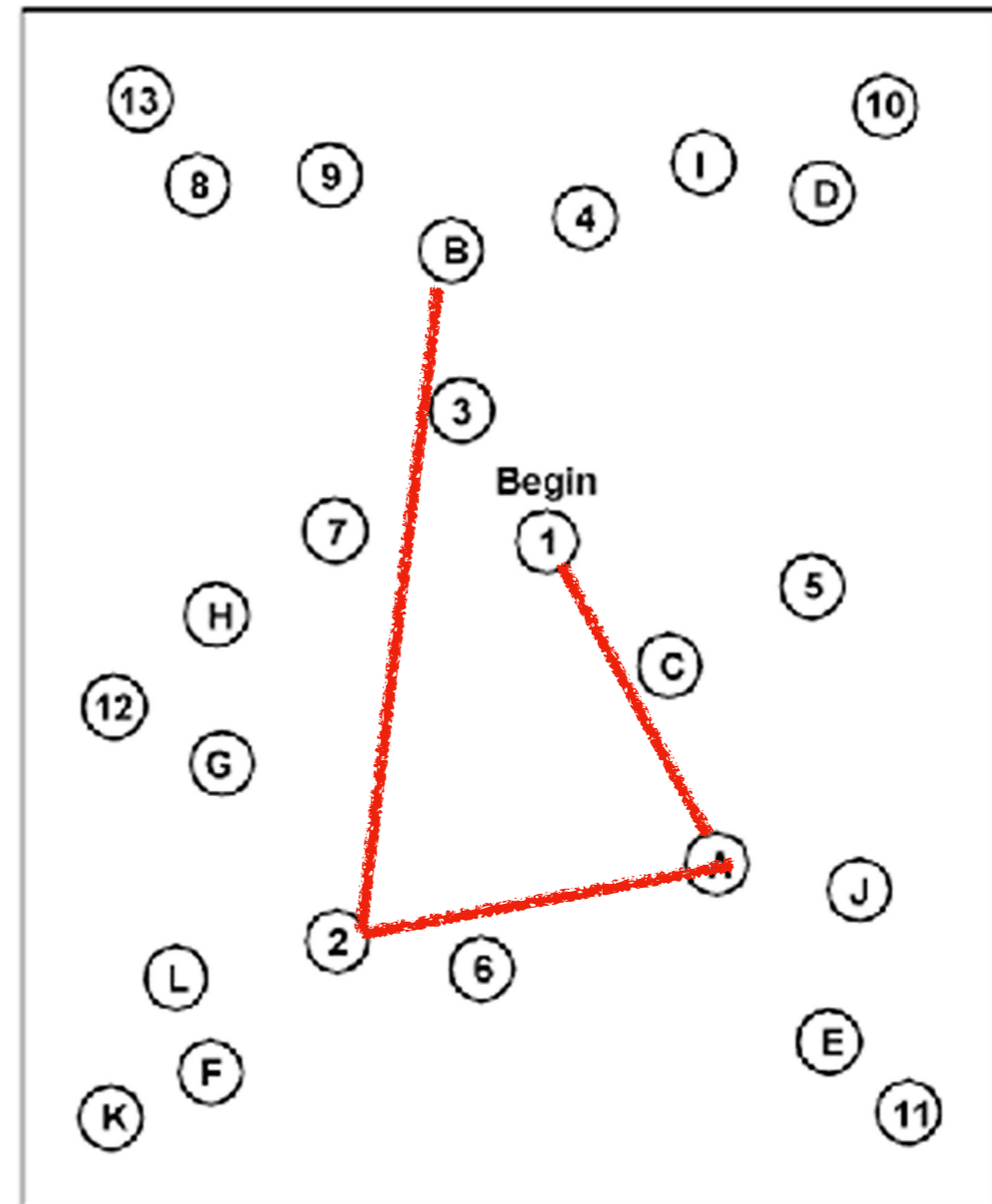
- Go/NoGo task



Methods

Behavioral assessments

- Trails B task



Methods

Behavioral assessments

- Choice reaction time task

Simple task

In the following task, you see one white box on the screen. When a cross appears, press the space bar as fast as possible. You will have to do this **multiple times**, and the time when the cross appears varies slightly from trial to trial.

on screen

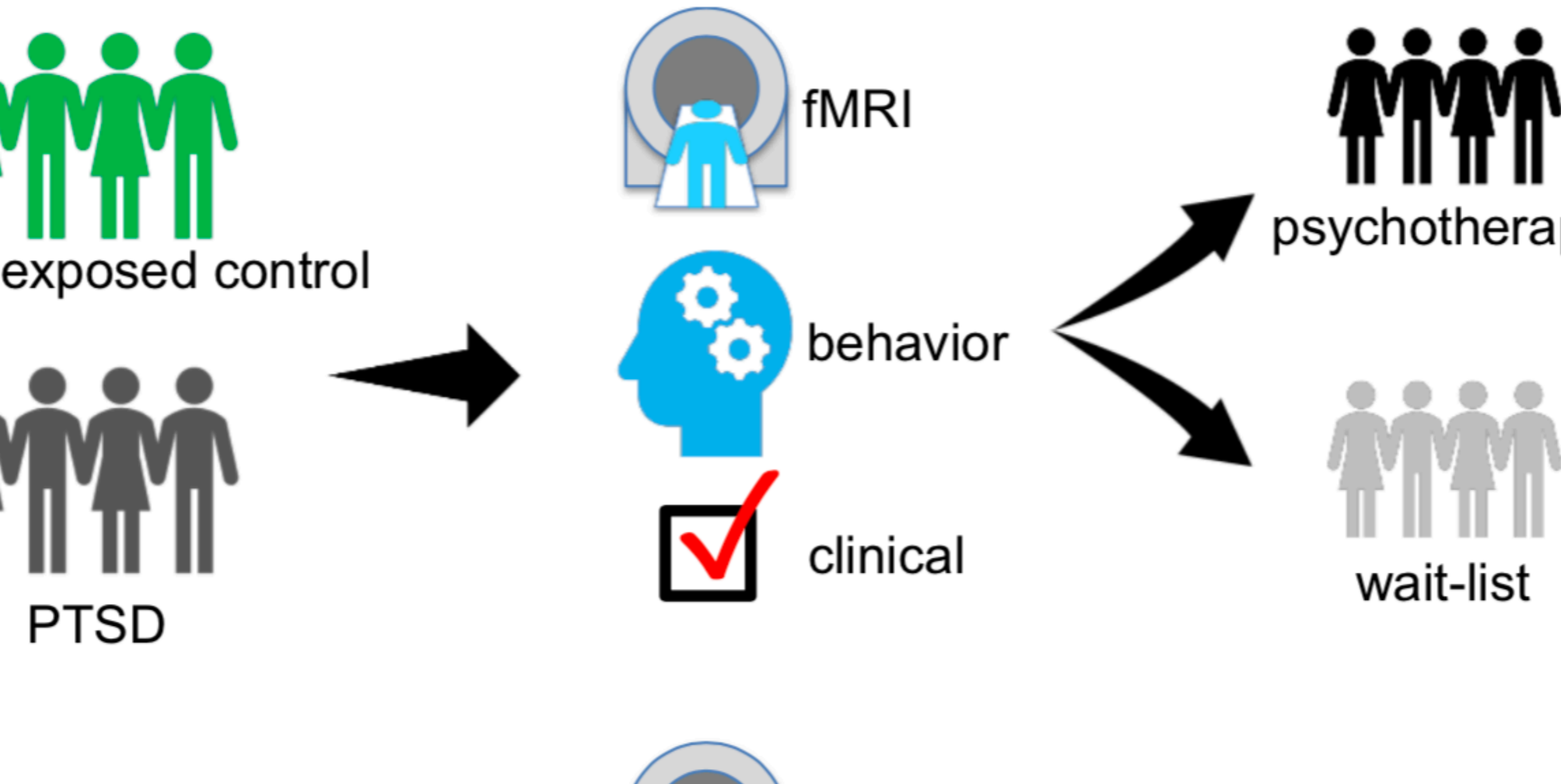


press

space bar

Press space to continue...

Methods



Methods



Prolonged Exposure Therapy



Methods



PTSD

Study 2:

○ N = 117



trauma-exposed control

○ N = 128
○ Including medicated patients
○ Iraq/Afghanistan-era combat veterans



PTSD



PTSD



non-exposed control



PTSD



clinical

wait-list



fMRI



behavior



clinical

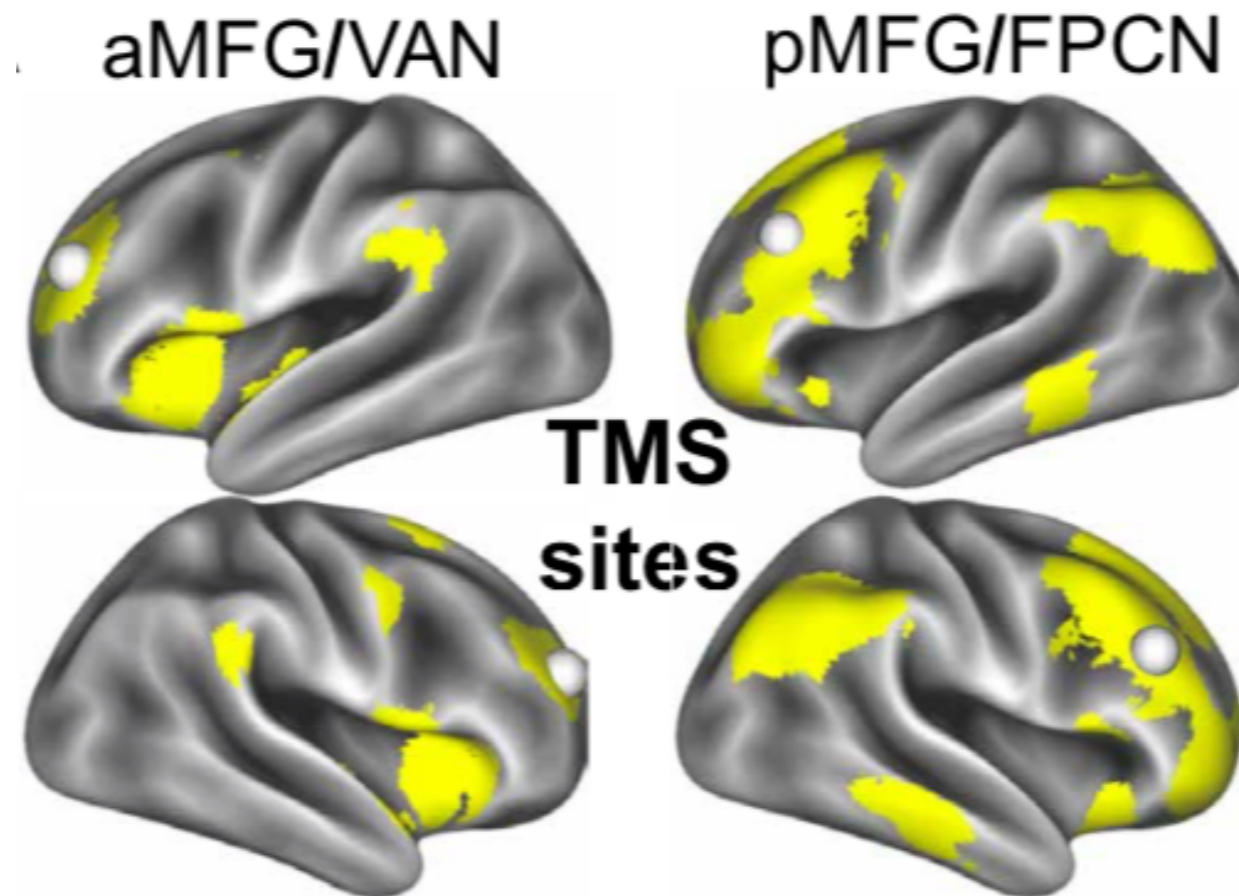


TMS/EEG



Methods

TMS/EEG

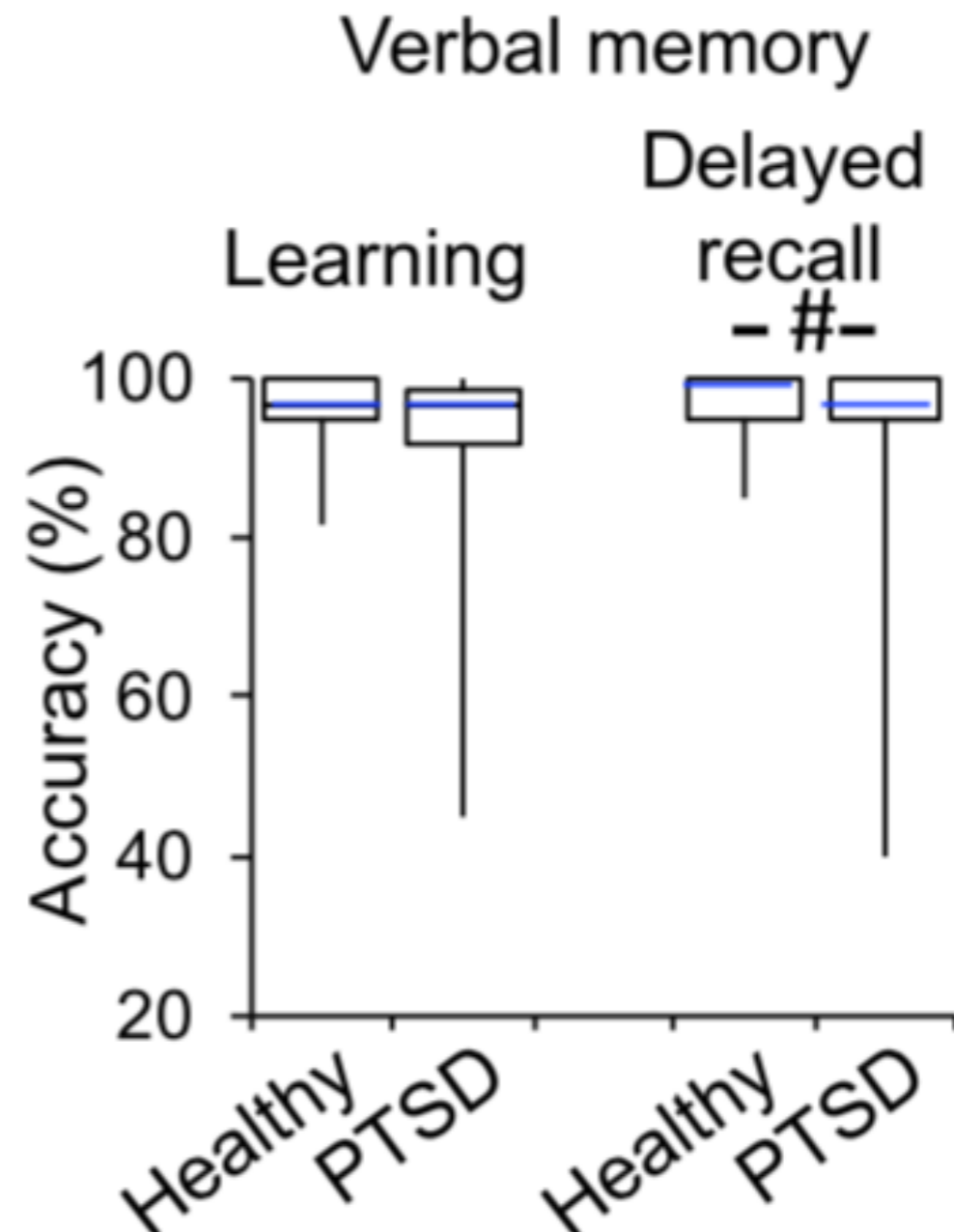


RESULTS

Results

Study 1

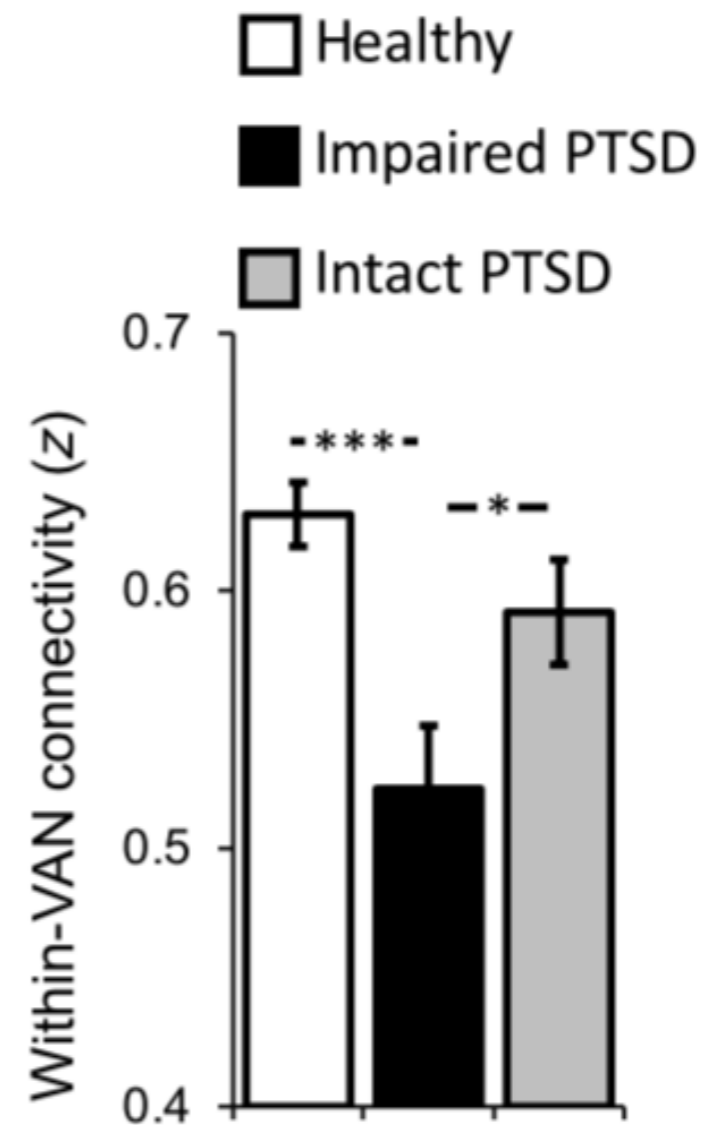
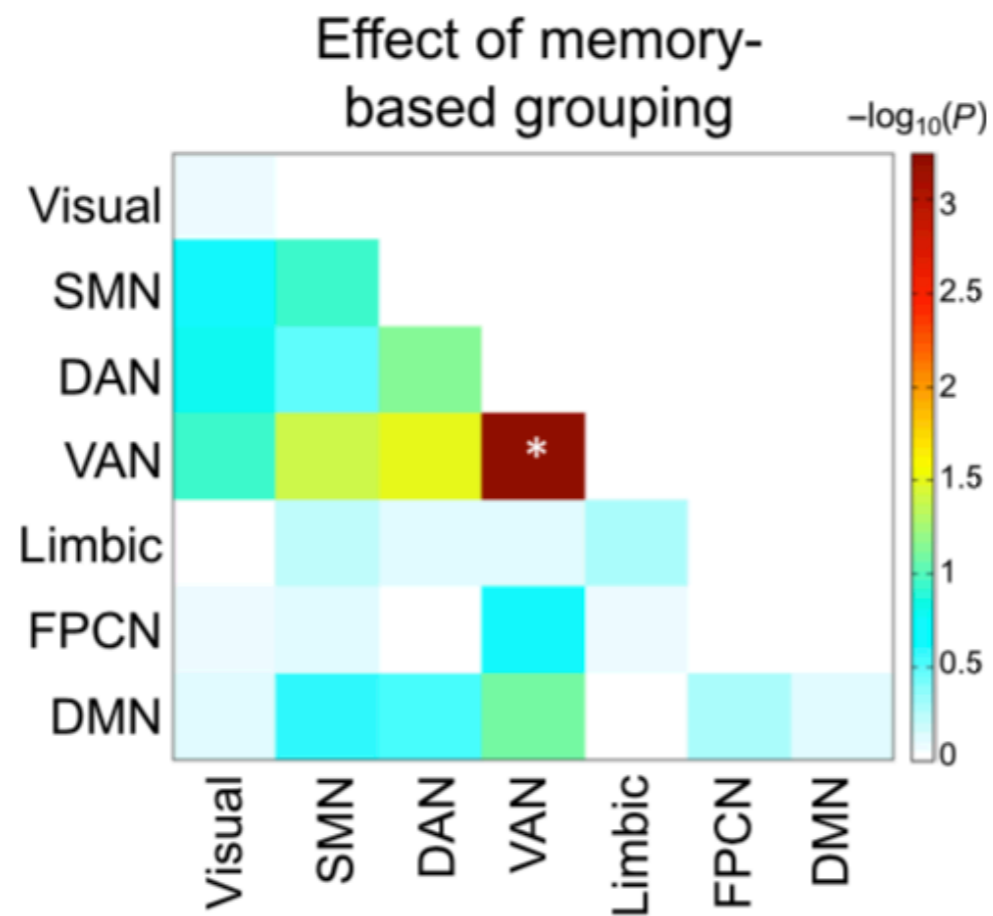
- Cognitive functioning



Results

Study 1

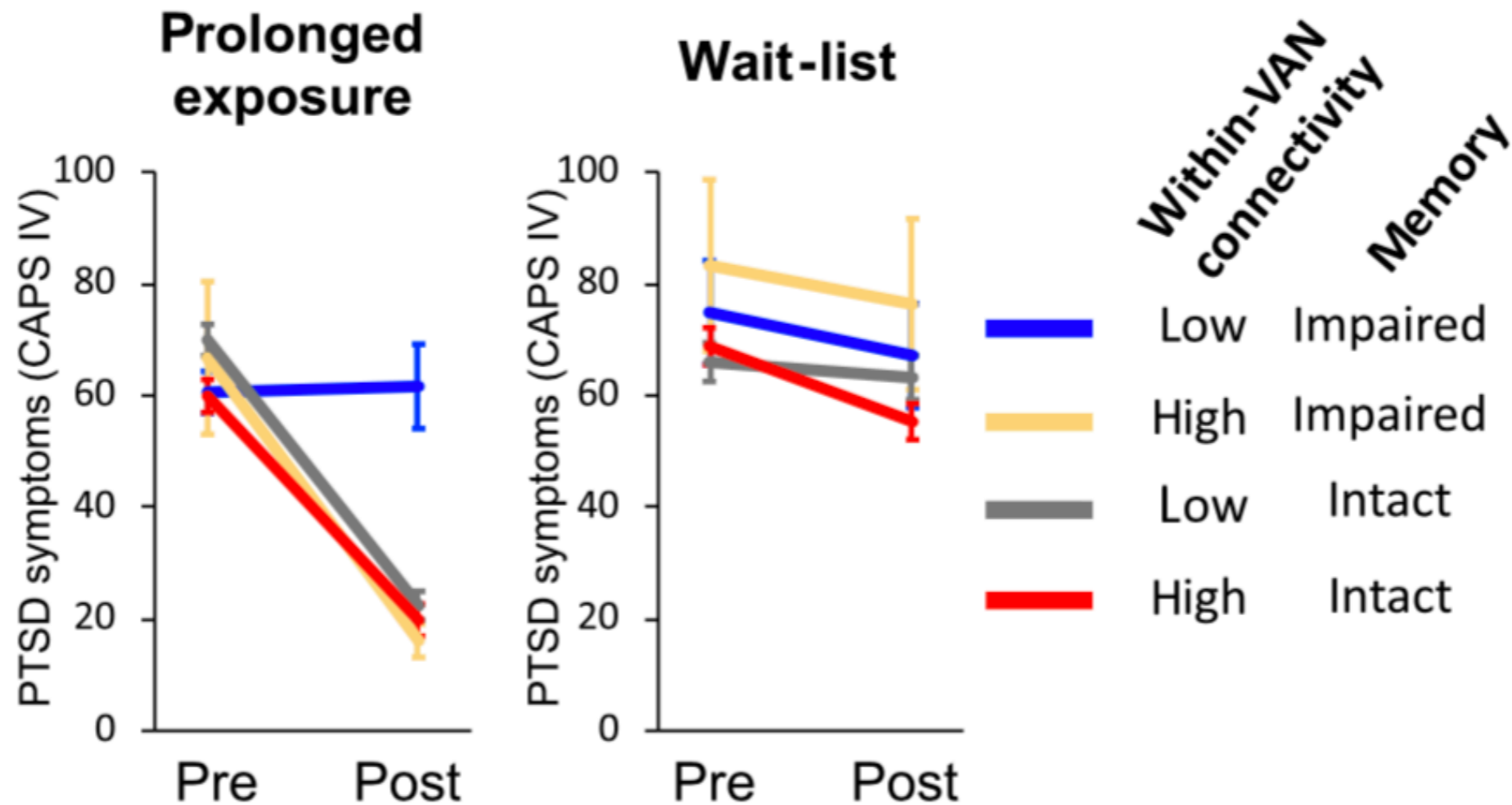
- Resting-state fMRI



Results

Study 1

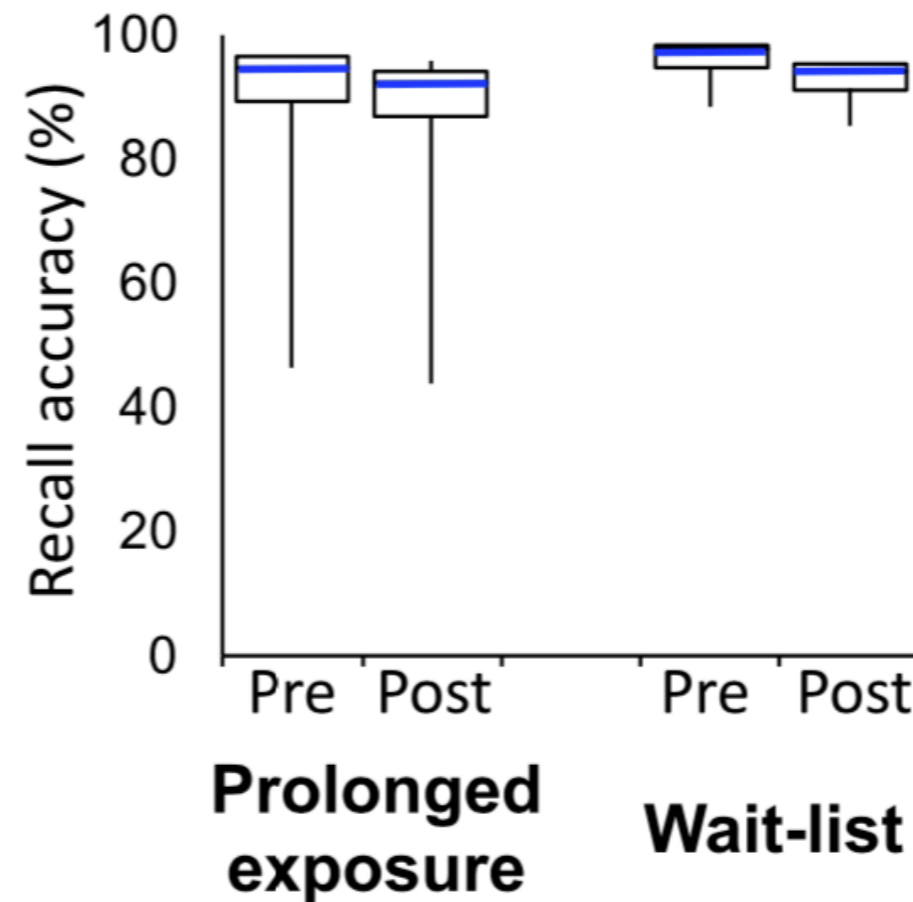
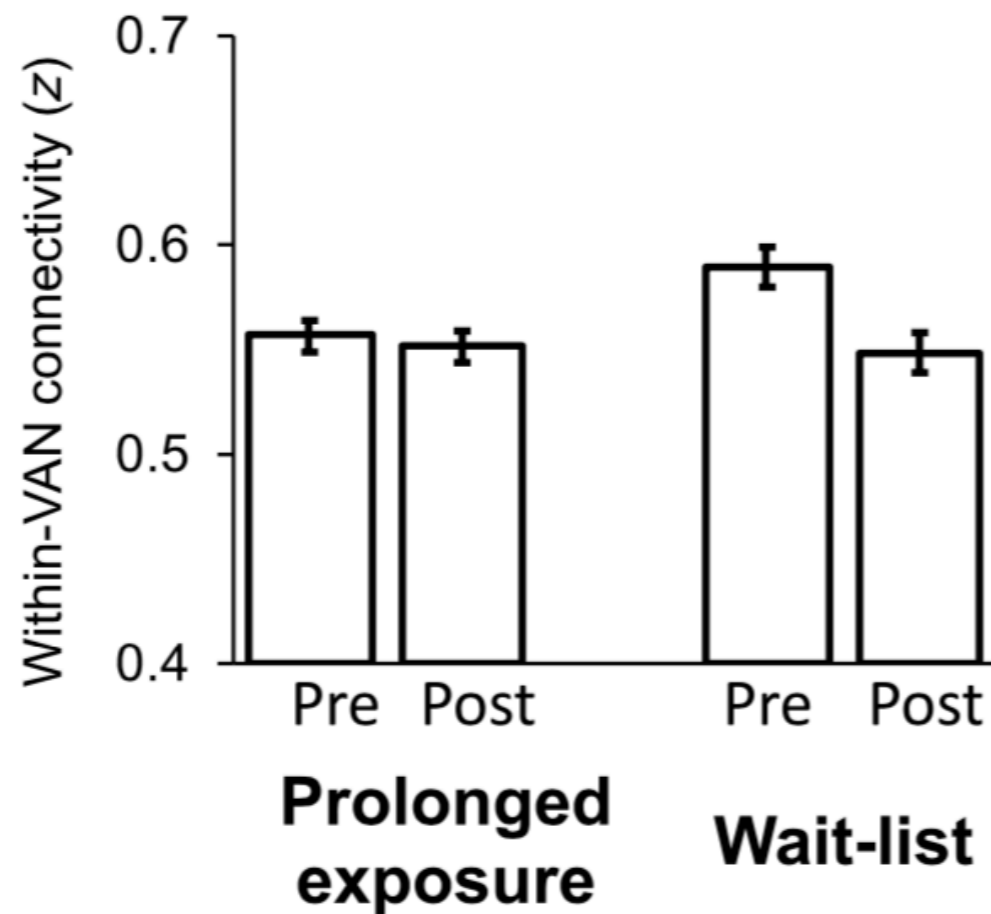
- Treatment outcomes



Results

Study 1

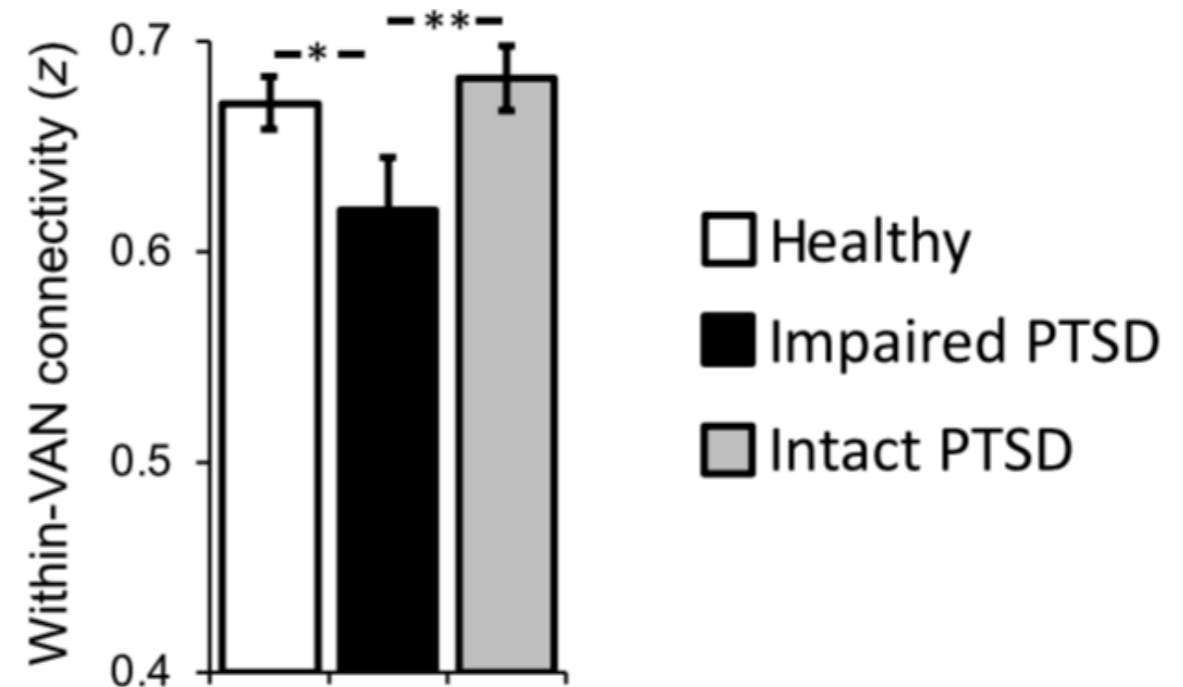
- Treatment outcomes



Results

Study2

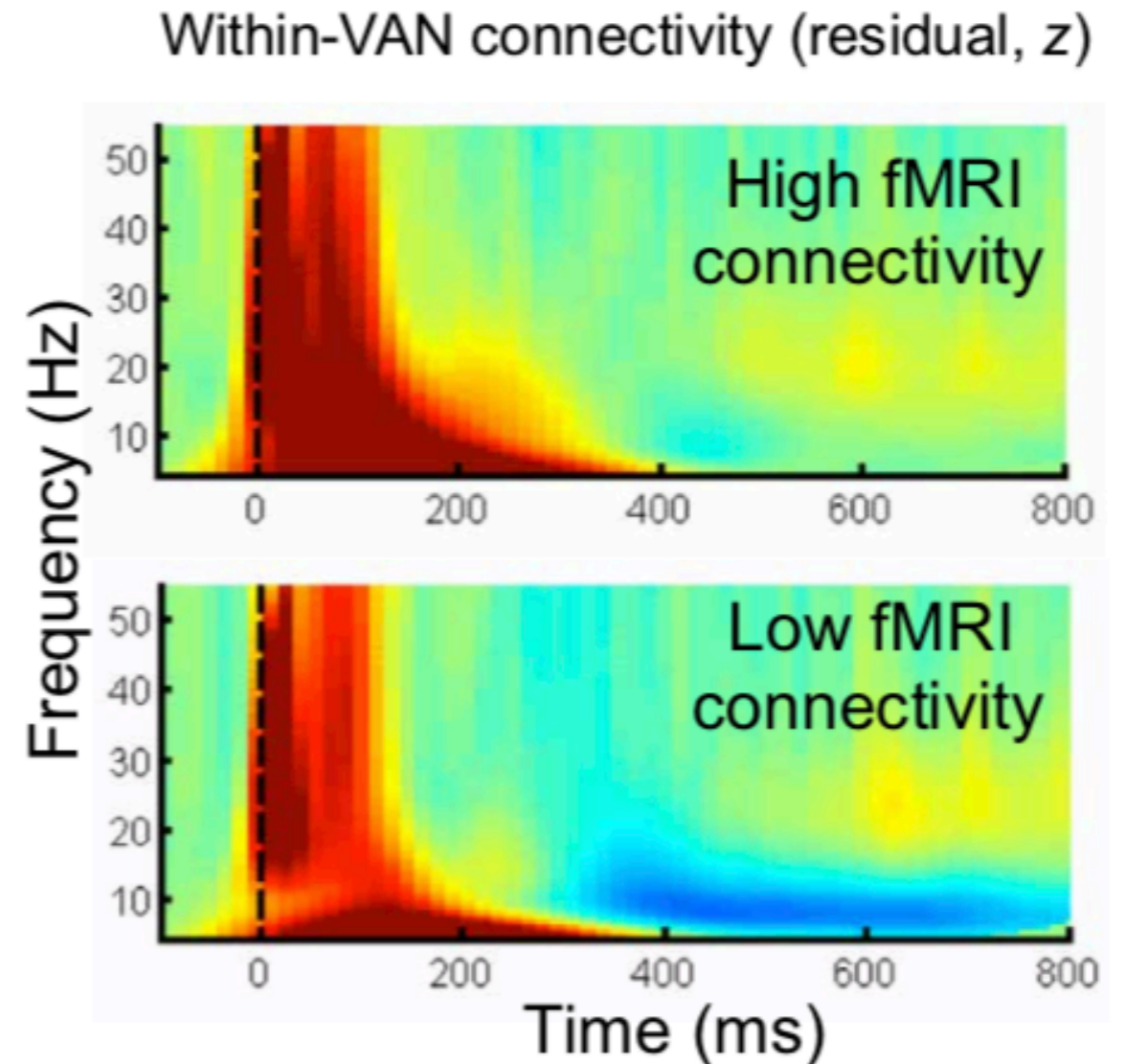
- Cognitive functioning
 - Verbal memory impairment ↑
- Resting-state fMRI



Results

Study 2

- sp TMS / EEG
 - Right aMFG/VAN stimulation → within-VAN fMRI connectivity
 - Prolonged alpha-range desynchronization



Implications

- Identifying neurobehavioral phenotype
- Phenotype can predict treatment outcome
- Finding brain regions related to the degree of within-VAN fMRI connectivity

Future study & limitations

- Identifying which factor of verbal memory and within-VAN connectivity is related
- More generalization
- fMRI are less suited to ultimate clinical translation than EEG

Thank you 🧐