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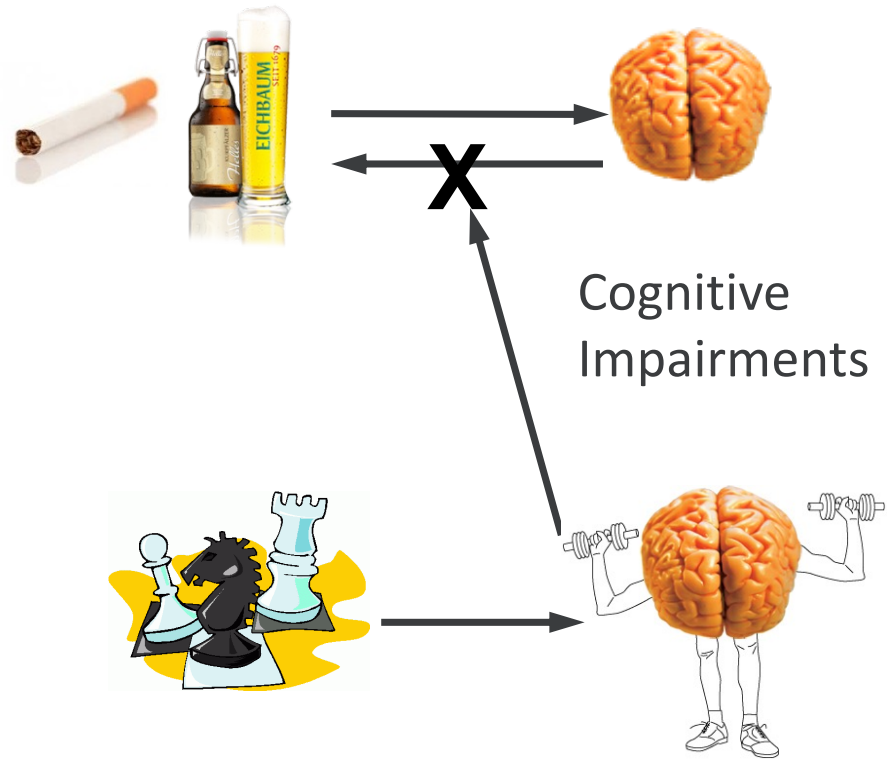
Chess as an add-on intervention in substance use disorders

Conference „Bio-Psycho-Social Applications of the Game of Chess“, 15th October 2022

Chess against Substance Use Disorder?



Same neural networks?

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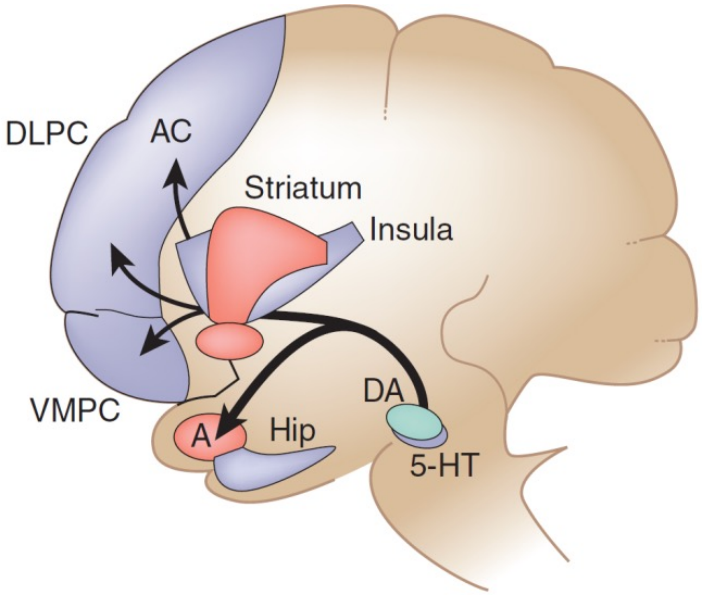
Imbalance between two systems in Substance Use Disorder



Impulsive system

➔ Immediate reward

Reflective system

➔ Long-term consequences

➔ hypersensitivity to reward
➔ preference of smaller, sooner rewards over larger, later rewards
➔ poor decision making, risky behavior

➔ Can we work against this imbalance with chess?

Bechara Nat Neurosci 2005

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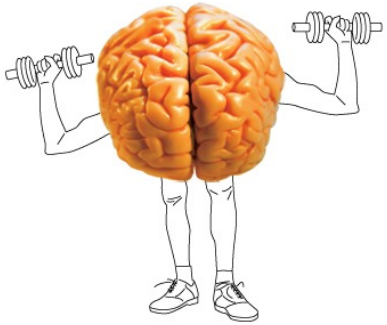
Cognitive remediation therapy (CRT)



Cognitive remediation therapy (CRT)

= cognitive enhancement therapy (CET)

= cognitive rehabilitation (CR)

Behavioral treatment to improve cognitive impairments in

- executive functioning (inhibition, decision-making, cognitive flexibility, working memory)
- attention

– Exercises to improve neuropsychological skills
– Often computer-based

➔ **Can we use chess as cognitive remediation therapy?**

Cella et al. Curr Opin Behav Sci 2015

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Cognitive remediation therapy (CRT)

- CRT has been proven to be successful as an add-on therapy in treating:
  - schizophrenia (Bellani et al. 2019)
  - mood disorders (Siegle & Thase 2007)
  - attention deficit-hyperactivity disorders (Cortese et al. 2015)
  - social anxiety disorder (MacLeod et al. 2002)
  - eating disorders (Brockmeyer et al. 2014)

- Only a few studies on CRT against SUD (Sofuoglu et al. 2016) with methodological deficiencies

Chess as „add-on therapy“

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Chess players vs. non-chess players
- better working memory (e.g. Fattahier et al. 2015)
- better planning skills (e.g. Unterrainer et al. 2006)

Positive effects of playing chess in
- **Schizophrenia**: improved impulse control and planning skills (Demily et al., 2009)
- **ADHD**:
  - decrease in severity (Blasco-Fontecilla et al. 2015)
  - improvement of concentration skills and period (ElDaou & El-Shamieh 2015)
- **Addiction:**
  - field report: rehabilitation of cognitive deficits ➔ patients' recovery and abstinence in cocaine and crack addiction (de Andrade, 2021)
  - cocaine-dependent patients, chess training as add-on: greater improvements in executive functioning (Goncalves et al., 2014)

Study 1

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Modification of the imbalance between goal-directed and habitual behavior in smokers

90 smokers will be randomized into 3 groups (3 x 30 smokers):

- Standard smoking cessation program (SCP, 6 weeks)
- Standard SCP plus CRT (chess-based cognitive remediation therapy)
- Standard SCP plus other treatment

Research questions:

➔does chess-based CRT as add-on intervention increase cognitive function?

➔does chess-based CRT as add-on intervention help to stay abstinent?

DFG (German Research Foundation)
TRR 265 Project-ID 402170461

Study 2

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vs.

BMJ Open **Effects of chess-based cognitive remediation training as therapy add-on in alcohol and tobacco use disorders: protocol of a randomised, controlled clinical fMRI trial**

Sarah Gerhardt ,[1] Gereon Lex,[1] Jennifer Holzammer,[1] Damian Karl,[1] Alfred Wieland,[2] Roland Schmitt,[1] Ainoa Jiménez Recuero,[3] Juan Antonio Montero,[3] Tillmann Weber,[4] Sabine Vollstädt-Klein [1,5]

48 smokers ➔ 2 groups
- Standard treatment
- Standard treatment plus CRT (chess-based cognitive remediation therapy)

48 alcohol-dependent patients ➔ 2 groups
- Standard treatment
- Standard treatment plus CRT (chess-based cognitive remediation therapy)

Research questions:

➔does chess-based CRT as add-on intervention increase cognitive function?

➔does chess-based CRT as add-on intervention help to stay abstinent?

➔ Are there similar effects and mechanisms in smoking and alcohol-dependence?

Gerhardt S, et al. BMJ Open 2022;12:e057707. doi:10.1136/bmjopen-2021-057707

DFG (German Research Foundation) Project-ID 402170461

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Preliminary results

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Data collection ongoing

➔merged data from both studies, **smokers only!**

N=45 smokers

- 25 in the chess-based CRT group
- 20 in the standard treatment group

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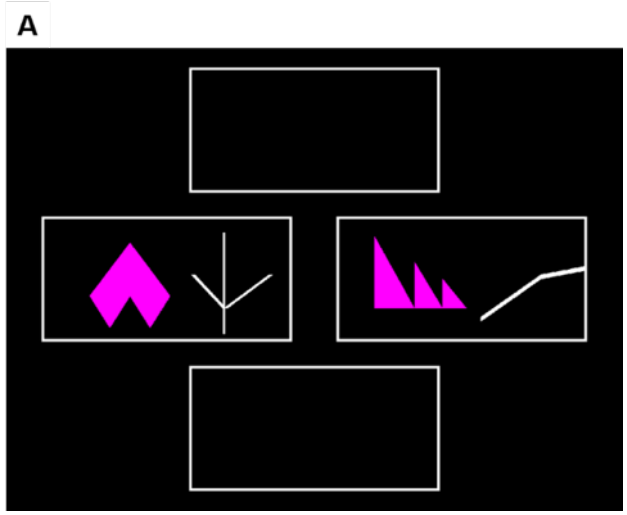
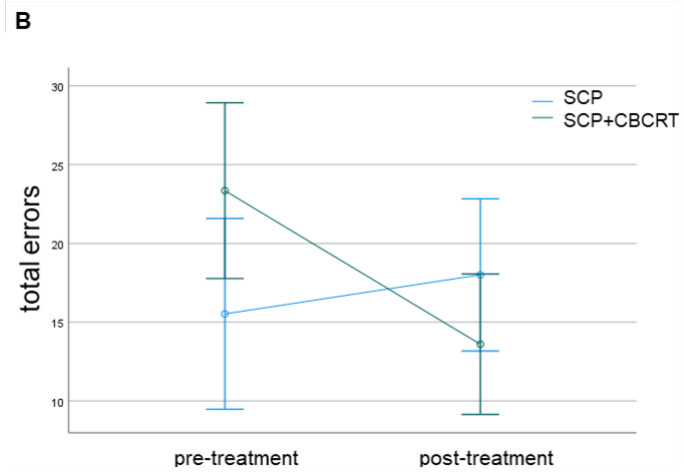
Cognitive flexibility task

decrease in number of errors in the chess-based CRT group





➔ Chess-based CRT group shows better cognitive flexibility

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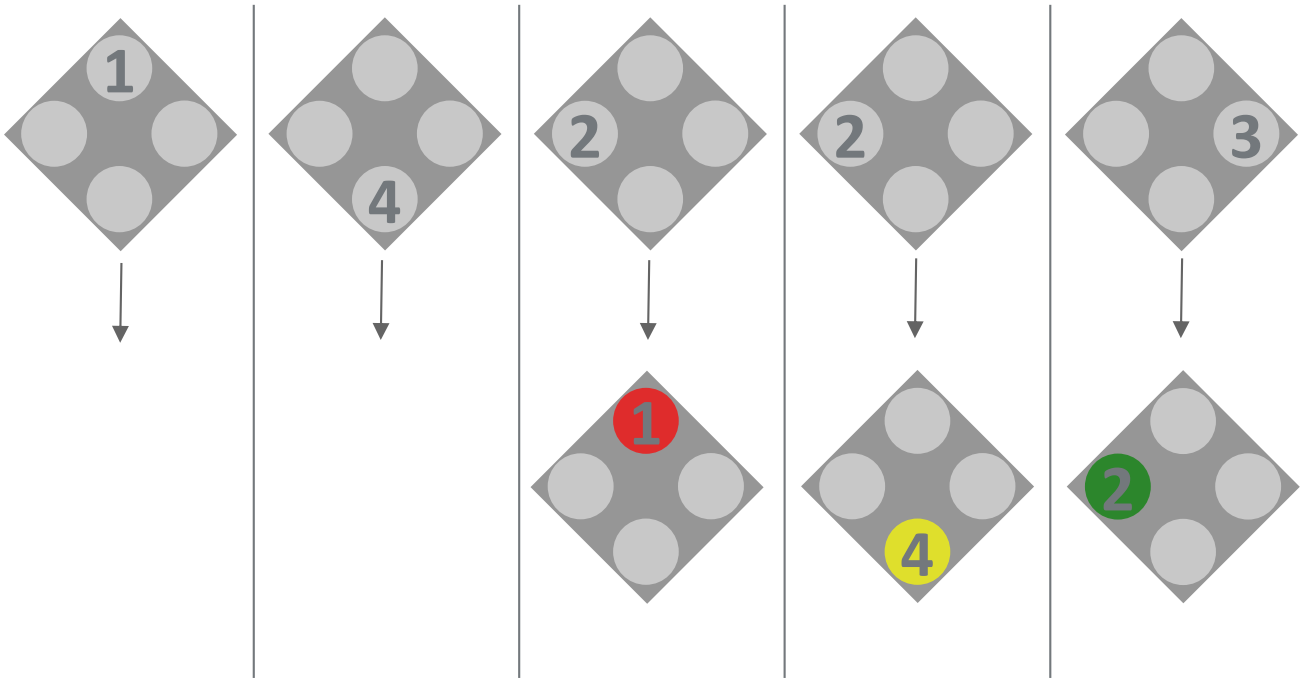
Working memory task (“2-Back”)

Display

Response



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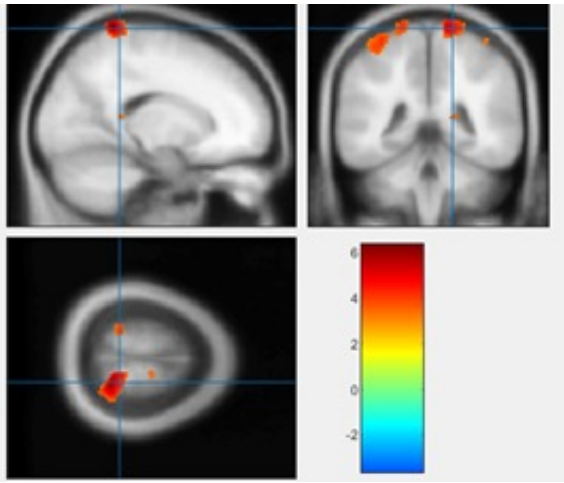
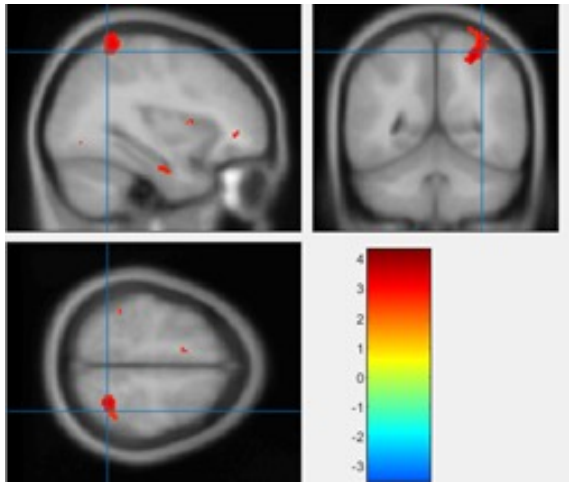
Working memory task ("2-Back")

decrease in brain activation in the chess-based CRT group



association between brain activation and abstinence



➔ Lower brain activation in chess-based CRT group is associated with better treatment outcome

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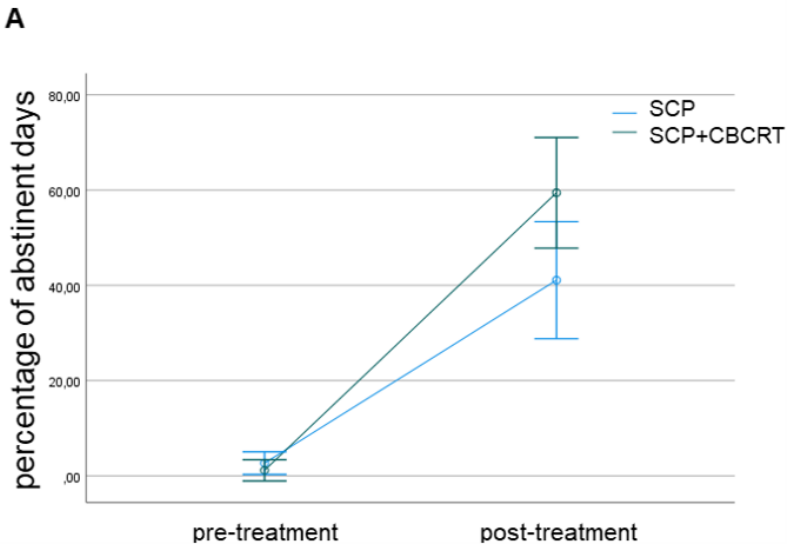
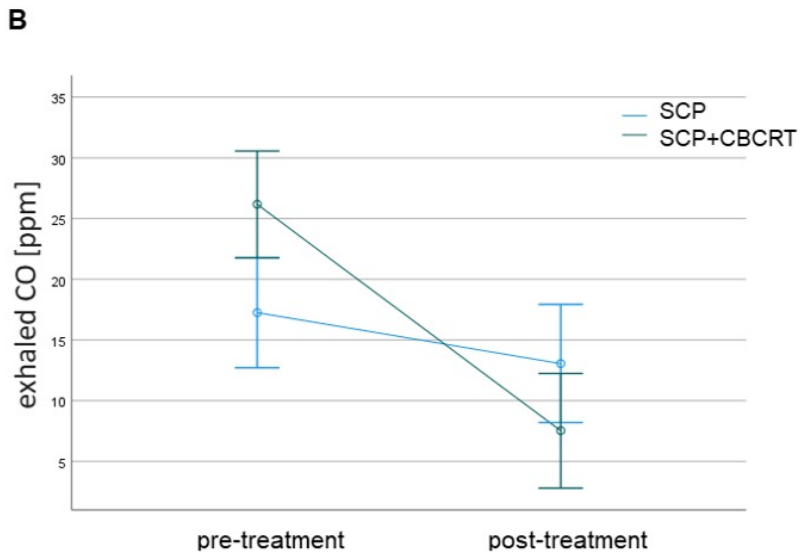
Treatment outcome





➔ Chess-based CRT group has better treatment outcome

Take home messages

Chess-based CRT seems to be suitable as add-on intervention against substance use disorders

➔ improvement in cognitive function
➔ positive effect on abstinence
➔ positive impact on brain circuits

Benefits:

- Easy to implement, can be applied computer-based
- Can be applied after discharge / at home
- Low-cost treatment add-on

Thanks to

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- Ainoa Jiménez Recuero

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Thank you for your attention!

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