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# Identifying & Treating Working Memory Problems in Psychosis to improve quality of life

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## The relevance of cognitive deficits for the understanding of schizophrenia

- Schizophrenia is associated with acute psychiatric symptoms (i.e. hallucinations, delusions).
- Even when free of these symptoms (which is most of the time), individuals suffer from severe problems in day to day life resulting in tremendous personal and economic costs.
- These appear to be highly related to cognitive deficits associated with the disorder.



## Self-reports

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- "Nothing settles in my mind—not even for a second. It just comes in and then it's out. My mind goes away—too many things come into my head at once and I lose control ..."
- "Things go too quick for my mind. Everything is too fast and too big for me—too quick to study. Things get blurred and it's like being **blind**. I can't make them out clearly."



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# Working Memory

- The ability to retain and manipulate information for a brief period of time

Example: Digit Span



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1 7



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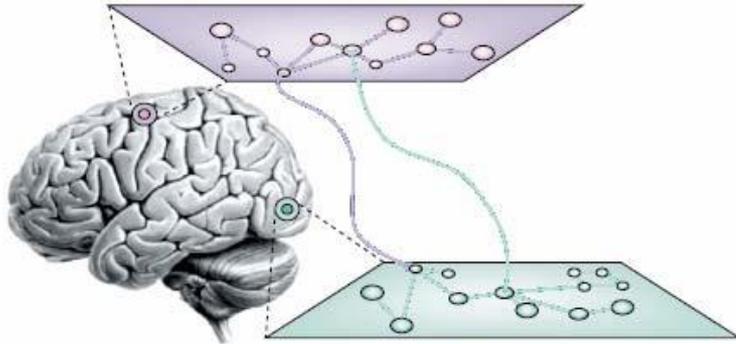


# Working Memory

- Impaired visual working memory (WM) is a core deficit in schizophrenia and can also be found in many other disorders (dementia, anxiety etc).
- WM dysfunctions predict:
  - Poor community function,
  - Decreased self-care and health maintenance activities,
  - Compromised vocational and social functioning
  - Poor quality of life.

# Linking the brain to working memory performance in healthy and clinical populations

- Complex mental processes, like working memory, are dependent on coordination of neural activity across the brain (not just one area).
- Electroencephalography (EEG) allows the identification of the precise timing and coordination of activity related to memory across different areas of the brain.



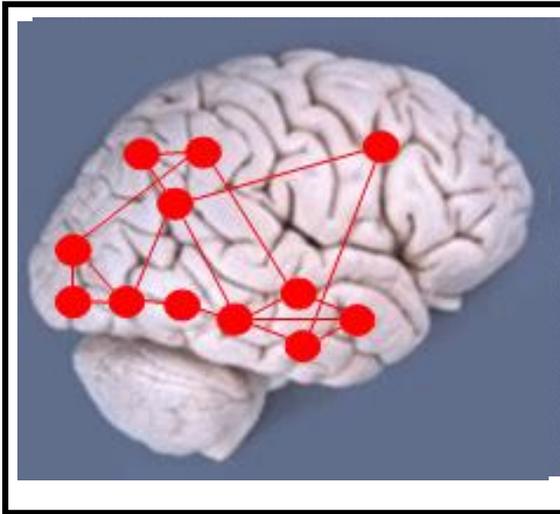
This is called Neural Synchrony



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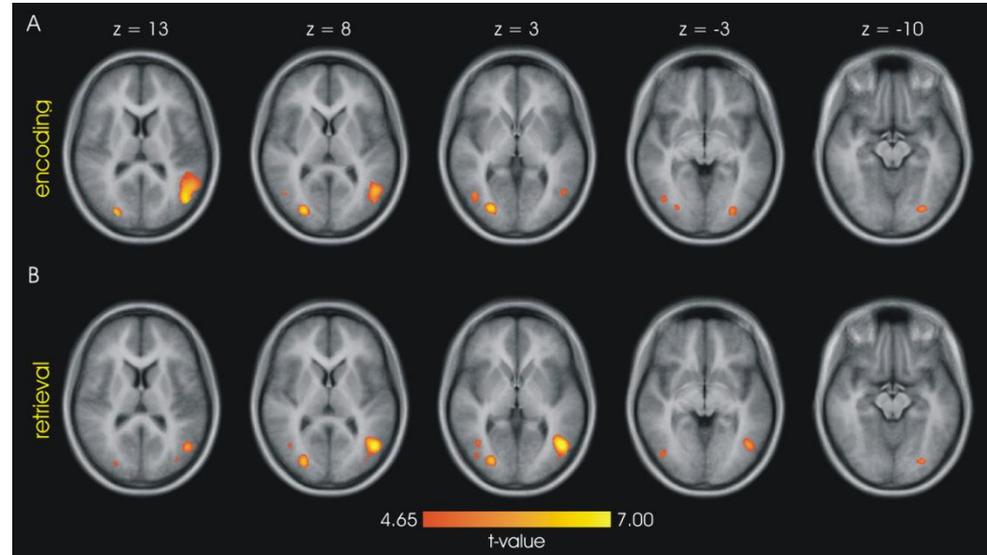
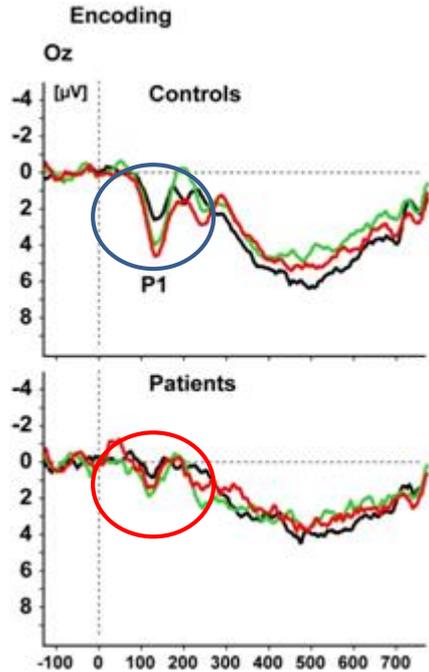
# The Importance of Neural Synchrony

Orchestra (except brain has no Conductor)



Schizophrenia: Abnormalities in the neural interplay

# Things get blurred and it's like being blind....



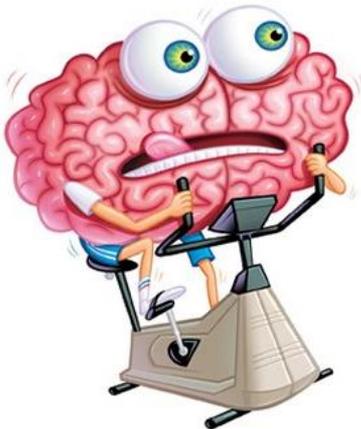
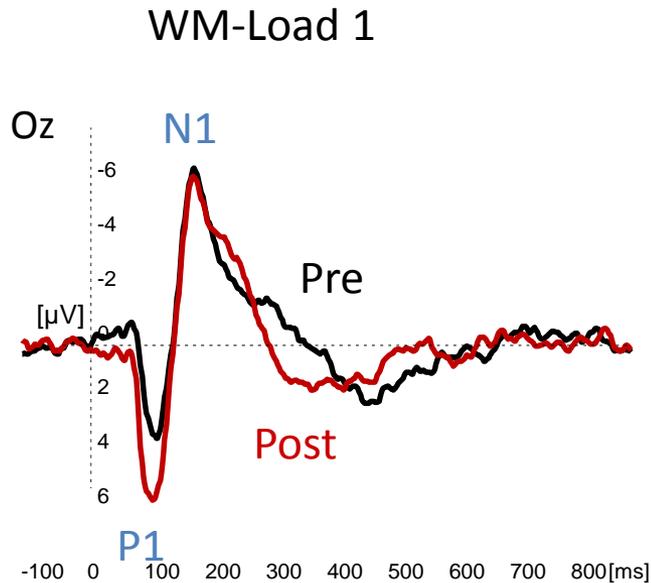
- Brain activity indexing early visual processing (P1 ERP component) increases with load predicting performance in controls,
- **but** is severely reduced in early onset schizophrenia.
- This is in line with reduced activity in early visual areas.



## Improving WM...

- We know that cognitive behavioural interventions can improve the symptoms associated with schizophrenia, but sensory deficits create a bottleneck restricting the response to such programs.
- Understanding the neural basis of the WM problems may facilitate the development of further therapies that more effectively target the underlying impairments.

# But there is hope; we might be able to train this!



We tested the effects of a 4-week WM training program in unimpaired elderly participants

➤ Increase in Performance (behavioural improvement)

➤ And increase in P1 following WM-training (demonstrating a change in early sensory processing)





# WM training

- Broad Cognitive remediation training (CRT), cognitive enhancement therapy (CET)
  - Improve attention, memory, problem solving and other cognitive-based symptoms
- Perceptual training
  - Brain fitness program: Auditory processing/verbal learning training program
    - Improvement in early (auditory) processing associated with improvement in higher-order cognition and WM



## Why is this useful

1. Improving WM will benefit the many aspects of everyday life and social function, for example, in occupational and general social settings.
2. It is likely to increase responsiveness to other behavioural therapies, which depend on WM for learning and applying regulatory strategies.
3. Improvements in day to day life and responsiveness to therapy may allow reductions in the levels of medication.
4. May reduce the likelihood of relapse rates (improved daily functioning will reduce stress and anxiety and enhance life satisfaction).

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# “*Paths are made by walking*”



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