

# Mental imagery and imaging mental disorders: implications for psychological treatments

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The Brain Forum

Symposium 14:15-15:15: 'The Brain and Mental Health:  
Increasing Awareness and Reducing Stigma.' 27<sup>th</sup> May 2016

# Thank you Brain Forum!

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Psychological Treatments





IMPROVING MENTAL  
HEALTH TREATMENTS...



UNDERSTANDING  
MENTAL FUNCTION  
THROUGH DYSFUNCTION

# Mental health & mental disorders

Scale is huge:

- 1 in 4 people will have a mental disorder
- Most families are / will be affected  
e.g. depression, anxiety (most common)  
bipolar disorder, schizophrenia
- 1/2 cases begin by age 14

Impact is huge:

- Suicide = leading cause of death in young people
- Costly: responsible for 30-40% of chronic sick leave

<http://www.euro.who.int/en/health-topics/noncommunicable-diseases/mental-health/mental-health/>

MQ Landscape Analysis, April 2015

# Mental disorders “invisible” / stigmatised

e.g. family members and colleagues reluctant to talk about it

# Research helps reduce stigma

Research Charity MQ aim:

“Mental health is as respected as physical health, and mental illness is understood, diagnosed and treated like any other disorder”

Dr Sophie Dix, MQ  
Brain Forum,  
Thursday



# Mental health research “scandalously under funded”



Our treatments demand improvement

MQ Landscape Analysis in UK, April 2015;  
Holmes et al., 2014, *Nature*



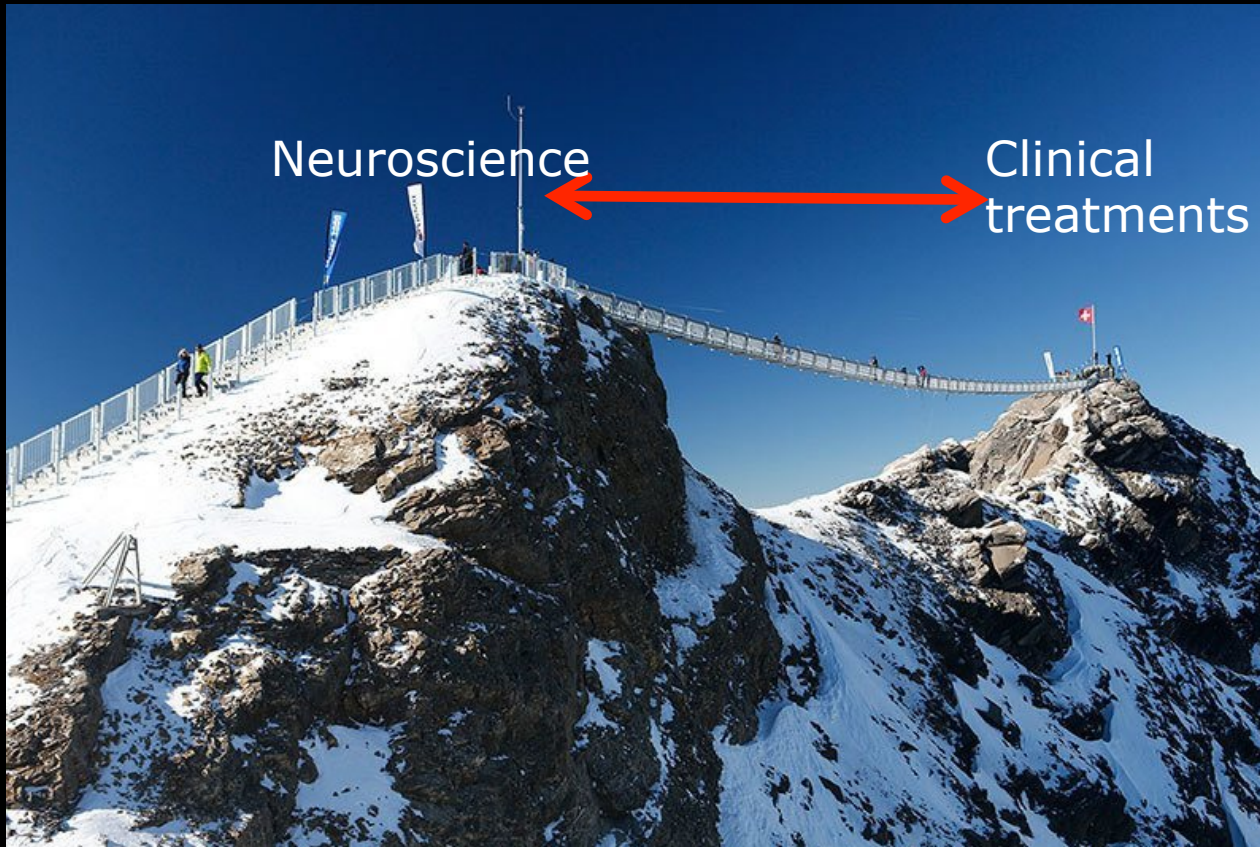
# What is a mental disorder?

"a syndrome characterized by clinically significant disturbance in an individual's **cognition, emotion regulation, or behavior** that reflects a dysfunction in the psychological, biological, or developmental processes underlying mental functioning."

American Psychiatric Association (2013). Diagnostic and statistical manual of mental disorders: DSM-5. Washington, D.C:



**cognition, emotion, behavior =**  
bridge between neuroscience & treatment innovation



# Psychological treatments



# Psychological treatments research is important & exciting

- Not just lying on couches!
- Strong evidence-base across many diagnostic conditions  
e.g. cognitive behaviour therapy (CBT)
- Manualised protocols
- Cognition, behaviour, habits, learning....

American Psychological Association, 2012

<http://www.apa.org/about/policy/resolution-psychotherapy.aspx>; National Institute  
Clinical Excellence UK *clinical guidelines*.

Mohr et al., 2012; 5, 6 CBT Research

# How do they work?

“How does one human talking to another, as occurs in psychological therapy, bring about changes in brain activity and cure or ease mental disorders?”

We don't know. We need to.

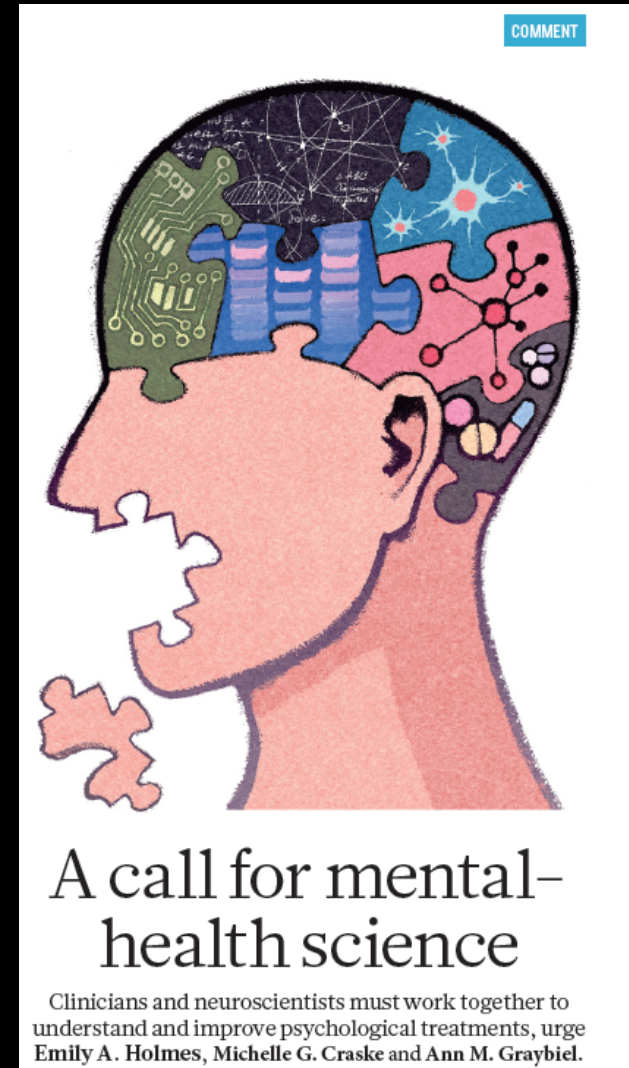
Holmes, Craske & Graybiel, 2014, *Nature*



# Research vision: psychological treatments

1. Uncovering the mechanisms behind successful psychological treatments
2. Optimising psychological treatments and generating new ones
3. Forging links between clinical and laboratory researchers

Holmes, Craske & Graybiel, 2014, *Nature*





- Mechanisms can be studied at many levels:
  - Molecular
  - Cellular
  - Neural circuitry
  - Cognitive
  - Behavioural
- We need science and treatments at all levels

McGrath, ... & Mayberg, 2013, *JAMA Psychiatry*  
Wong, ... & Licinio, 2012, *Mol Psychiatry*  
Meyer-Lindenberg, & Tost, 2012, *Nat Neurosci*  
Holmes, Craske & Graybiel, 2014, *Nature*



# Intrusive imagery of trauma and post-traumatic stress disorder (PTSD)

- After a traumatic event:
  - Intrusive images come to mind unbidden
  - Brief but highly distressing
  - Can persist for years
- Cardinal symptom of PTSD

# Intrusive mental imagery of war in posttraumatic stress disorder ('flashbacks')





# Intrusive imagery of surgery in patients with chronic pain



Berna, Vincent, Moore, Tracey, Goodwin, Holmes (2011) *Pain Medicine*  
Dr Chantal Berna – Lausanne University Hospital / CHUV

# Intrusive imagery of a traumatic childbirth



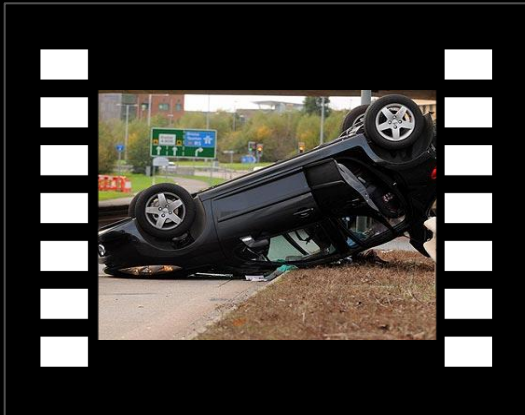
# Mental imagery

- “Representations & experience of sensory information without a direct external stimulus”
- Seeing in the mind’s eye, hearing with our mind’s ear etc.
- Clinically: intrude when we don’t want them too

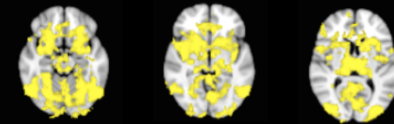


# Are intrusive images determined peri-traumatically?

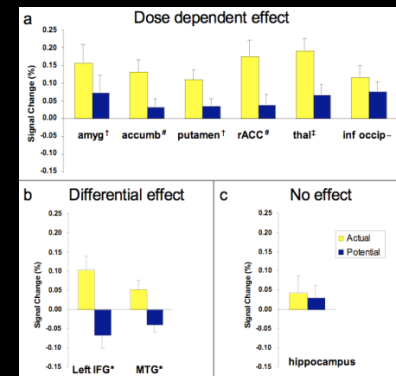
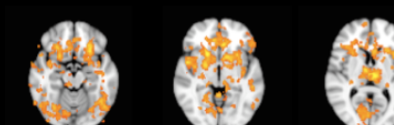
- fMRI data acquired while viewing traumatic film material tell us that moments that become intrusive memories differ from those that do not



Flashback v Control



Flashback v Potential



Bourne, Mackay & Holmes, 2013, *Psych Medicine*;  
Clark, Holmes et al., 2016, *Psych Medicine*

# Decoding an individual's brain activity while viewing traumatic film

**Predicts** an individual's future intrusive images

Multi-voxel pattern analysis (MVPA); Accuracy (% correct)

- Across participants: 68.0% (SE = 2.4%)
- Within participants: 97.3% (SE = 0.93%)

Clark, Niehaus .... Holmes, 2014, *Behaviour Research and Therapy*

c.f. "Mind reading" Kay et al., 2008; Nishimoto et al., 2011; Horokawa et al., 2013; Visser et al., 2013, 2015

But we lack preventative treatments after trauma

c.f. dog bite/rabies vaccine

- Processing at time of trauma important for later symptoms
- Could develop a “cognitive vaccine” against intrusive memories?



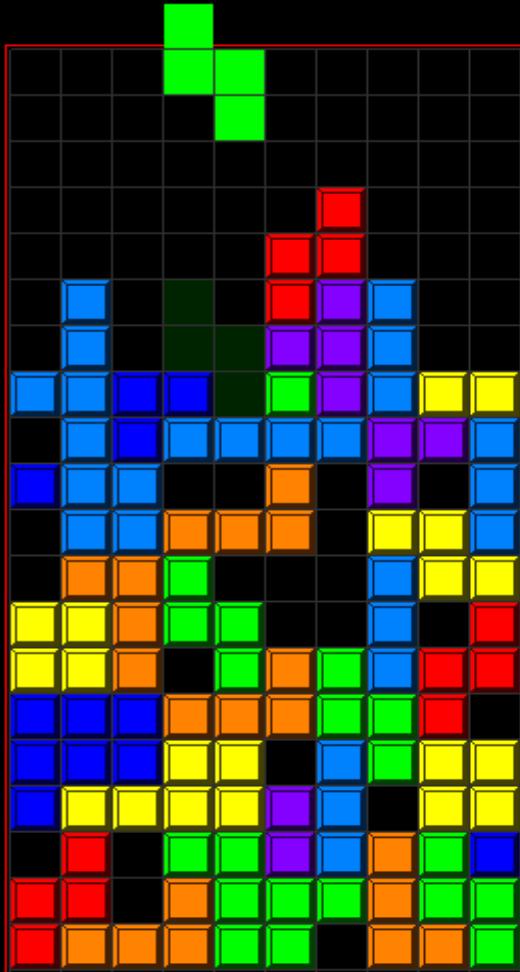
# Hypothesis: Brain-directed cognitive behavioural treatment innovation

Disrupt mental imagery representations from cementing into memory

How?



Imagery competing task  
(Tetris)



During memory  
consolidation (first  
hours after trauma)



memory is still labile and can be  
disrupted before storage in long term  
memory

(Walker et al 2003, Nature)

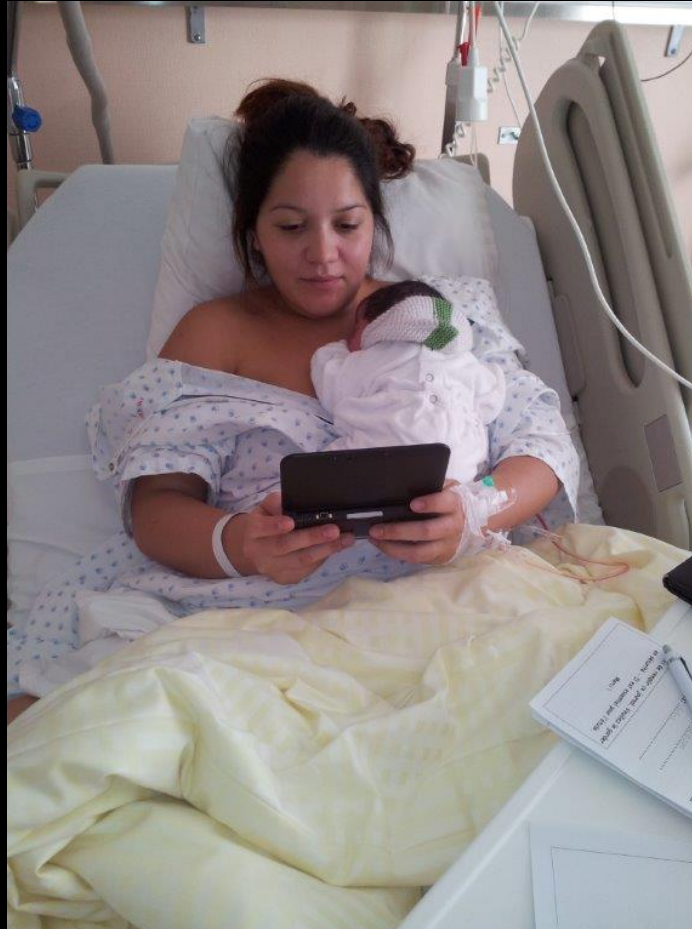
Laboratory studies → intrusions reduced  
(Holmes et al, 2004; 2009; 2010; 2012)

e.g. James, Bonsall, Hoppitt, Tunbridge, Geddes, Milton, Holmes, 2015, *Psych Science*



# A cognitive “vaccine” to reduce intrusive memories after traumatic childbirth

The same cognitive behavioural procedure in the wake-up room of maternity ward (in progress)



# High scale of traumatic events worldwide



e.g. trauma and refugees

# Imagine a day when...

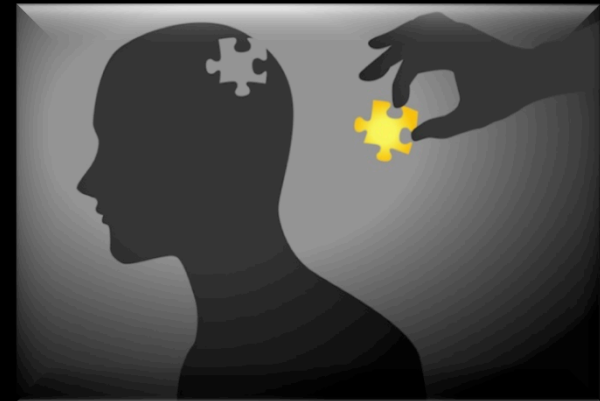
... mental health = physical health

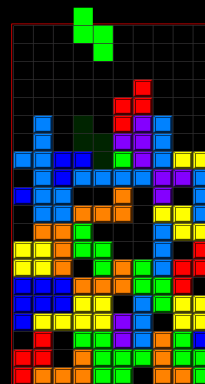
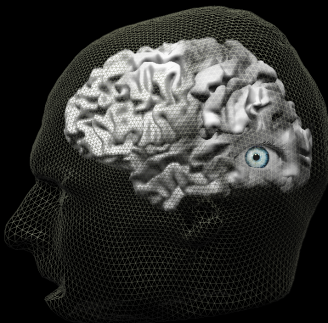
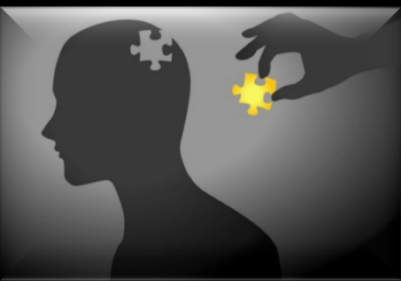
....we can give 'cognitive vaccines' after trauma

... clinicians have tools as 'cognitive surgeons'

... we can 'see' memories in real-time

... we can treat toxic parts via brain-directed  
cognitive/behavioural innovations





## Key points

1. Mental health needs science
2. Psychological treatments = exciting frontier
3. Cognitive and behavioural mechanisms
4. Brain-directed cognitive behavioural treatment innovation: mental imagery

# Thank you to my research team: psychiatry, psychology, neuroscience



Fritz  
Renner



Martina  
Di Simplicio



Ella  
James



Lali  
Iyadurai



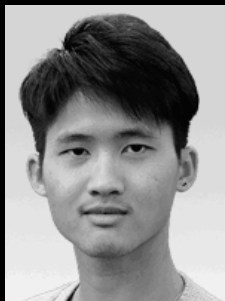
Renee  
Visser



Roger  
Ng



Julie  
Ji



Alex  
Lau Zhu



Olivia  
Kukacka



Chantal  
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Antje  
Horsch

# Thank you



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