Flashbacks and Flash Forwards: An Experimental Psychopathology Approach

Dr Emily A. Holmes
Wellcome Trust Clinical Fellow, Department of Psychiatry, University of Oxford
Thank you!

My Background:
Clinical Psychologist, CBT
PhD Cognitive Neuroscience
*CBT therapist Traumatic Stress Clinic, London (1999-2005)*

Research Approach:
Experimental psychopathology → mechanisms

Research Area:
Mental imagery and emotion
Research approach

“Cognitive science for cognitive therapy”
Research approach

flashbacks in clinic  flashbacks in lab
Posttraumatic Stress Disorder (PTSD)

- **Criterion**
  - Experience/witness actual/threatened death/serious injury/threat to physical integrity self/others
  - intense fear, helplessness or horror

- **Symptoms**
  - reexperiencing
  - avoidance / numbing
  - Hyperarousal

- **Significant impairment**

  DSM-IV
Flashbacks = hallmark of PTSD
Flashbacks are mental images
what is mental imagery?

“mental imagery occurs when perceptual information
is accessed from memory, giving rise to the
experience of ‘seeing with the mind’s eye’, ‘hearing
with the mind’s ear’ and so on. By contrast,
perception occurs when information is directly
registered from the senses.

Mental images need not result simply from the recall
of previously perceived objects or events; they can
also be created by combining and modifying stored
perceptual information in novel ways.”

Kosslyn et al. (2001)
Imagery has amazing properties!

Basic properties of mental imagery for emotional disorders reviewed by Holmes & Mathews (2010), Clinical Psychology Review
1. Seeing is believing

Ganisa, Thompson & Kosslyn, 2004
2. Imagery helps you learn

- imagining playing a piano exercise (mental practice)

"mental practice alone seems to be sufficient to promote the modulation of neural circuits involved in the early stages of motor skill learning."

(Pascual-Leone et al 1995)
3. Imagery promotes behaviour

- E.g. Voting behaviour
  Libby et al 2007, *Psych Science*
4. Imagery has a special relationship with emotion

- Compared to verbal processing of the same material, imagery has a more powerful impact on emotion

• Why is it important that imagery has a powerful impact on emotion?

  – In therapy we want to
    • identify the most toxic cognitions
    • employ the most powerful cognitive treatment techniques
Product placement!

Out in 2011

ANN HACKMANN, Warneford Hospital, Oxford, UK,
JAMES BENNETT-LEVY, University of Sydney, Australia, and
EMILY A. HOLMES, Department of Psychiatry, University of Oxford, UK
PTSD flashbacks are mental images
What are flashbacks like?

- Images
- Involuntary
- Highly emotional
• Only parts of a trauma flashback

• Which parts?
Hotspots research
(thanks to Nick Grey, Kerry Young, Deborah Lee & Pippa Stallworthy)
What are hotspots?

• Specific parts of trauma memory that cause high levels of distress, that may be difficult to recall deliberately, and are associated with intense reliving (flashback images) of the trauma

• ‘worst moments’ → intrusive images

_Ehlers & Clark (2000)  
_Foa & Rothbaum (1998)  
_Richards & Lovell (1999)  

## Hotspot example: Mugging

from Grey, Holmes & Brewin, 2001

<table>
<thead>
<tr>
<th>SITUATION</th>
<th>COGNITION</th>
<th>EMOTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>hands pulling at bag</td>
<td>they’ll trying to pull me over</td>
<td>fear</td>
</tr>
<tr>
<td>fallen on ground</td>
<td>I’ve lost, they’ve won, I’m stupid</td>
<td>humiliation</td>
</tr>
<tr>
<td>kicked in stomach</td>
<td>They’re taking away my chance</td>
<td>sadness</td>
</tr>
<tr>
<td></td>
<td>to have children</td>
<td></td>
</tr>
<tr>
<td>seeing self on ground</td>
<td>I look like a rag doll, I’m useless</td>
<td>dissociated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(unreal)</td>
</tr>
</tbody>
</table>
Some research

- Patients with PTSD
- Traumatic Stress Clinic
- Range of traumatic events

Holmes, Grey & Young, 2005;
Grey & Holmes, 2008
How many hotspots per trauma?

\[ M = 4.1 \text{ (2.4)} \text{ range } = 0 \text{ to } 10 \]
Holmes, Grey & Young , 2005, BTEP

*Close match with images*
Examples of hotspots images

- Feeling like I am being stabbed in the chest
- Gun put to head
- Kick in face – feel of shoe kicking head
- Seeing (the body) fall past
- Sound of child screaming
- The doctor saying if you had been standing up you would have been dead
- His face above me, laughing, laughing, laughing
- Knocking at neighbours door, hoping someone is there, feeling alone
Emotions in hotspots images

• 11 categories
  – Fear, anger, disgust, sadness, happiness
  – Shame, guilt, surprise
  – Helplessness, horror
  – Dissociation

• Only 42% were fear, helplessness or horror
Range of emotions in hotspots

Mean emotion occurrence per participant

- Fear
- Dissociation
- Sadness
- Surprise
- Anger
- Helplessness
- Shame
- Guilt
- Horror
- Disgust
- Happiness

The graph shows the distribution of various emotions experienced by participants in hotspots, with fear being the most commonly reported emotion.
Cognitive themes in hotspots images

• **Physical threat and injury**
  - Something bad will happen, I’m going to die
  What are they doing?

• **Psychological threat and control**
  – *abandonment and isolation:* No one is here to help or defend me
  – *esteem:* I’m dirty and disgusting
  – *consequences of trauma:* I’ll never see my son again
  – *control:* I must fight back, I can still appeal to him
  – *cognitive avoidance:* this isn’t happening
Replication at Institute of Psychiatry
>50% emotion not fear, helplessness or horror

Grey & Holmes, 2008, *Memory*
Imagery has amazing properties!

1. Seeing is believing
2. Imagery helps you learn
3. Imagery promotes behaviour
3. Imagery has a special relationship with emotion
• So when someone has a flashback (image), what does it tell them about themselves?
Self viewpoint:
Self viewpoint:

- Cognitive avoidance
- Loss of control
- Negative consequences
- Abandonment and isolation
- Esteem

Threat, injury, death
Rexperienced self viewpoint: (client terms)

- unreal, spaced out (dissociation), overwhelmed by trauma, can’t tolerate memory or meaning of it
- self loosing control, trying to but can’t change the outcome, inhuman, revengeful
- negative long term consequences e.g. totally disabled, loss of job, family, no future
- abandoned, lonely, unhelpable, let down
- low self esteem, useless, worthless, guilty, shameful, blamed

threat, injury, death
Re-experienced
Self viewpoint:

unreal, spaced out (dissociation), overwhelmed by trauma, can’t tolerate memory or meaning of it

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threat, injury, death
A focus on flashbacks: clinical implications

• Target hotspots (not the whole trauma memory) in treatment (e.g. Ehlers & Clark, 2000; Grey, Young & Holmes, 2002)

• Flashback images contain other emotions than fear, helplessness and horror, e.g. sadness, shame & guilt

• Mere exposure unlikely to be effective
Implications cont.

- Idiosyncratic cognitive themes in flashbacks, predominantly not Physical threat, but about Psychological threat and control e.g. abandoned.

- **Change problematic images in image-mode:**
  - e.g. in ‘trauma-focussed cognitive therapy’ by cognitive restructuring *within the imagery reliving*
  - e.g. by Imagery restructuring
Imagery Rescripting
e.g. I’m going to die
e.g. I didn’t die

*verbal cold, imagery hot*

*Imagery has amazing properties:*

*you can manipulate it in the mind’s eye*
e.g. I didn’t die
• In PTSD - evidence for imagery rescripting (vs imaginal exposure) Arntz, Tiesman & Kindt, 2007, *JBTEP*.
• Especially for non-fear emotions

• E.g. shame – see Deborah Lee
• Compassionate mind imagery
• Deborah Lee and Kerry Young – Enhanced reliving workshop tomorrow!
• Hotspots and the “patchiness” of trauma memories

• Can we use clinical research to inform the legal system about trauma?
• e.g. Jane Herlihy, Stuart Turner et al
Does Trauma Memory Play a Role in the Attrition of Sexual Assault Cases?
Hardy, Young & Holmes, 2010, Memory

- The Criminal Justice System expects victims to provide consistent and coherent accounts of sexual assault (Office for Criminal Justice Reform 2006)
- However trauma victims report jumbled, incomplete and fragmented memories
- Victims of sexual assault (N = 22) completed questions on self-reported trauma-related psychological processes and perceived experience of police interview:
  1. Peri-traumatic dissociation
  2. Memory fragmentation
  3. Account incoherence
  4. Likelihood of proceeding with case
- Paradoxically, genuine victims of sexual assault may be those most likely to have their credibility questioned and least likely to see their case successfully prosecuted.
• Hardy, A., Young, K., & Holmes, E. A. (2011). Does psychological trauma in victims play a role in the attrition of sexual assault cases? Criminal Bar Quarterly.


• SEE WORKSHOP BY SARAH HEKE AND GEORGINA SMITH TOMORROW

Summary: Flashbacks in the clinic:

– Phenomenology of patient flashbacks
– Hotspots in trauma memory
– Range of emotions (not just fear)
– Mental imagery nature
– Flashback-centred treatment
– More research needs on the nature of trauma memory, hotspots, flashbacks e.g. re. the legal system

How are flashbacks formed (and prevented)?

Studying people during real trauma is clearly unethical

An experimental psychopathology approach
Some definitions

• **Psychopathology** = the study of cognitions, behaviours and experiences indicative of psychiatric impairment

• **Experimental** psychopathology = use of experimental and laboratory methods
Studying flashback development in the lab
Traumatic film paradigm

- healthy volunteers
- film as analogue trauma
- generate flashbacks
- monitor in real world

Holmes & Bourne 2008, Acta Psychologica
Are films a good analogue?

- DSM-V
- Will include traumatic films in a work related stressor (e.g. customs officials finding child pornography) as meeting criteria for a real “traumatic event”
Trauma Film

Pre-film measures → Trauma Film

Task / no task

Post-film measures → Intrusion diary

1-week

F/up measures

e.g. of a fireman carrying a baby
Can use paradigm to test “Vulnerability” Questions:
e.g. High schizotypy associated with increased flashbacks

Holmes & Steel, 2004, *JNMD*
• E.g. findings extend to “real world”

• For trauma psychosis
• **See Craig Steel keynote coming up next!**
Trauma film paradigm can test causal hypotheses
e.g. Studying flashback formation via competing tasks
during encoding of trauma film

Rationale from experimental psychology:
• limited capacity processing
• dual tasks selectively compete for resources
Peri-traumatic processing

Diagnostic criteria for PTSD

Meta-analysis of PTSD predictors (Ozer et al. 2003)
- Peri-traumatic processing (e.g. dissociation) strongest predictor; above trauma type, mental health history, etc
Predictions from CBT models of PTSD

Type of processing during trauma → flashback frequency

(Ehlers & Clark 2000; Brewin, 2001)
CBT Models

Peri-traumatically (during trauma):

- **Verbal / conceptual processing** helps *prevent* images.
- **Sensory / perceptual processing** forms basis of images.

**Number of flashbacks**
Verbal / conceptual processing helps prevent images, which forms the basis of images. Fewer flashbacks are observed.
Hypothesis from CBT + cognitive science:

1. Flashback memories are mental images
2. Visuospatial tasks interfere with mental images

→ Therefore, a visuospatial task during trauma will reduce flashbacks

→ Series of experiments comparing different task conditions (visuospatial vs verbal vs control)
Visuospatial complex pattern tapping task during trauma film

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<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
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<td>V</td>
<td>W</td>
<td>X</td>
<td>Y</td>
<td></td>
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</tbody>
</table>
• Visuospatial tasks during trauma encoding can selectively reduce later flashbacks

• Verbal tasks do not, and sometimes worsen

Possible treatment innovation?
an interweave between the clinic and the lab

Theory from cognitive science

Relation to cognitive therapy

Lab studies

Clinical translation

Clinical observations → impetus
peri-traumatic tasks? knitting by the guillotine:
In the real world, unlikely to be able to do a concurrent task during trauma....
Can we prevent the build up of PTSD flashbacks soon AFTER trauma?
Rationale: memory consolidation time window:

6 hour window to disrupt memory

(Nader, 2003; Walker, Brakefield, Hobson, Stickgold, 2003)
What time interval after trauma?

- 30 minutes: ambulance time to A&E
Another problem: concealed visuospatial complex pattern tapping a bit impractical!

can we impede flashback formation after trauma with a more “real world”, widely available, visuospatial task?

..lab brainstorm
Tetris: a visuospatial task!

Green & Bavelier, 2003; Sims & Mayer, 2002
Holmes, James, Coode-Bate & Deeprose (2009). PLoS ONE.
Results:

Number of flashbacks over one week
Flashbacks in 1-week diary: Tetris $\rightarrow$ fewer flashbacks

Holmes, James, Coode-Bate & Deeprose (2009). PLoS ONE.
Clinical PTSD questionnaire (IES): Tetris → lowest IES score

Holmes, James, Coode-Bate & Deeprose (2009). PLoS ONE.
Recognition Memory (Day 7)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-task</td>
<td>20 ± 2</td>
</tr>
<tr>
<td>Tetris</td>
<td>19 ± 2</td>
</tr>
</tbody>
</table>

But is Tetris merely a distraction?

- Need an equally enjoyable VERBAL game
“Pub Quiz!”

1 - In golf which club is usually used to sink the ball into the hole?
   A) Putter B) Potter C) Patter D) Petter

2 – How many pillars are there at this hotel?
   A) one B) three C) four D) forty

3 - What do tadpoles grow up to be?
   A) Spiders B) Frogs C) Butterflies D) Snakes
Tetris vs. Pub Quiz

With thanks to Ella James

Holmes, James, Kilford & Deeprose (2010). PLoS ONE.
• Rated equally enjoyable!
Flashbacks in 1-week diary

<table>
<thead>
<tr>
<th>Condition</th>
<th>Number of Intrusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-task</td>
<td></td>
</tr>
<tr>
<td>Tetris</td>
<td></td>
</tr>
<tr>
<td>Verbal Quiz</td>
<td></td>
</tr>
</tbody>
</table>

Holmes, James, Kilford & Deeprse (2010). PLoS ONE.
Verbal / conceptual processing helps prevent images from forming the basis of images, leading to more flashbacks due to competing verbal tasks.
What tasks might protect against flashbacks & why?

- Visuospatial tasks e.g. Tetris
- Flashbacks = visual memories
- Trauma memories labile initially
- Play in the “memory consolidation” phase

*Tetris selectively interferes with visual sensory-perceptual processing of traumatic material. i.e the types of memories that make flashbacks*
Take home message:

(Don’t play pub quizzes after a trauma…)

→ Tetris can reduce flashback formation

Holmes, James, Kilford & Deeprose (2010). PLoS ONE.
Tetris effects last when played 4 hours post-film

Holmes, James, Kilford & Deeprose (2010). PLoS ONE
Computer puzzle may ease post-traumatic stress

Thu Jan 8, 2009 6:03pm GMT

LONDON (Reuters) - Playing Tetris, rated one of the greatest video games of all time, immediately after traumatic events appears to reduce flashbacks that plague sufferers of post-traumatic stress disorder, according to a British study.

The preliminary findings could lead to new treatments to prevent or cut flashbacks that are a hallmark of the condition, also known as PTSD, Oxford University researchers said.

"This is only a first step in showing that this might be a viable approach to preventing post traumatic stress disorder," Emily Holmes, a psychologist who led the study, said.

"This was a pure science experiment about how the mind works from which we can try to understand the bigger picture," Holmes said in a statement.
Future research: develop a **“cognitive vaccine”** against flashbacks?

Theory from cognitive science

Relation to cognitive therapy

Lab studies

Clinical translation

Clinical observations → impetus
What is a ‘cognitive vaccine’?

Edward Jenner's 1796 - derived from *cow pox* (Latin *variolæ vaccinæ*, from *vacca* cow), which, when administered to humans, provided them protection against smallpox
• A cognitive vaccine – a cognitive intervention that improves resilience to a particular psychological disease
  – e.g. trauma and PTSD
Why would we need a cognition vaccine after traumatic events?
% individuals who develop PTSD after specific traumas

<table>
<thead>
<tr>
<th>Trauma type</th>
<th>% PTSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Held captive/tortured/kidnapped</td>
<td>53.8</td>
</tr>
<tr>
<td><strong>Rape</strong></td>
<td>49.0</td>
</tr>
<tr>
<td>Badly beaten up</td>
<td>31.9</td>
</tr>
<tr>
<td>Sexual assault (other than rape)</td>
<td>23.7</td>
</tr>
<tr>
<td>Other serious accident</td>
<td>16.8</td>
</tr>
<tr>
<td>Mugged/ threatened with weapon</td>
<td>7.3</td>
</tr>
<tr>
<td>Witness killing/ serious injury</td>
<td>3.8</td>
</tr>
<tr>
<td><strong>Natural disaster</strong></td>
<td>2.3</td>
</tr>
</tbody>
</table>

(Breslau et al., 1998)
We lack something (safe) to offer people in the immediate aftermath of trauma
Review of all available treatments for PTSD: UK “NICE Guidelines” (2005)
< 4 weeks and soon after trauma?

There are no recommended interventions immediately following trauma.

NICE Guidelines suggest…

• ‘Watchful waiting’;
  ‘offer practical, social and emotional support’

• Drugs as routine first-line treatment for adult PTSD sufferers are not recommended

• Further…. 
Crisis counseling: critical incident stress ‘debriefing’

- NICE Guidelines, 2005; Cochrane Intervention Review, 2009 recommend that brief, single-session interventions (‘debriefing’) should not be given as a treatment after trauma.

- Evidence suggests that psychological debriefing may even be harmful following trauma (see Rose and colleagues).

But, what about giving medication after trauma?
Propanolol and trauma

• 2002: Pitman et al, Bio Psychai, Pilot study

• Prevention

• A&E, 40mg propanolol within 6 hours of trauma vs placebo
• Total N = 40
• At 1 and 3 months – not sig diff in CAPS (PTSD scale)
• but at 3 months, during script-driven imagery reduced heart rate reactivity with propanolol
• Great excitement

• lack of replication
developing a simple ‘cognitive vaccine’ (e.g. via Tetris) may be useful but requires more research. What are some potential criticisms?
Why target the flashbacks rather than other features of PTSD?
Reexperiencing symptoms at 8 days predict PTSD symptoms at 1 year

Flashback memories = the “hub” of successful trauma-focussed models of PTSD

Is there any evidence this experimental work might extend to patients?

• **There is no clinical trial for “Tetris” type tasks. This research would need to be done**

• small experimental studies indicate visuo-spatial tasks help dampen flashbacks in patients
  
  
  – E.g. Englehard et al; Andrade; Kavanagh etc
• Doesn’t playing a computer game like Tetris sound too trivial after the horror of a real trauma?
• “Simple” is not the same as “ineffective”: Handwashing before surgery

• Ask people
“…I suffer from PTSD symptoms. I have known for some time that the computer game “marbles” is quite effective at reducing/blocking my symptoms (and actually it is a game akin to Tetris.) Experientially it feels like what I imagine a morphine drip would feel like for someone with a physical pain.

While I accidently found how effective this computer game was for my symptoms, it is quite validating to see that there is actually research being conducted.”
• Further research is warranted
• A full clinical trial would be needed before recommending a “tetris” type intervention after trauma

• Need to continue understanding trauma at a clinical-research-brain level
• See Kennerley workshop tomorrow!
Summary: Flashbacks in the lab

– Studying people during real trauma unethical
– generate flashbacks in the lab - Trauma film paradigm
– Simple cognitive tasks influence flashback development (improve / worsen)
– It may be possible to develop a cognitive vaccine after trauma with more research?
– Experimental psychopathology offers a way to test an intervention safely in the lab and determine optimal parameters
• Imagery is the hallmark of PTSD,
• Do other conditions also feature “flashback” type images?
“flashbacks” after listening to trauma

Experiment:

Relevant to trauma therapists
“flashbacks” to the media
e.g. September 11th 2001 terrorist attacks as experienced by London school children

Holmes, Creswell, & O’Connor (2007)
• Intrusive imagery in other psychological disorders:
Imagery in depression

• negative intrusive images of past negative events e.g. Brewin / Kuyken / Michelle Moulds
Imagery in social phobia

Hackmann, Clark & McManus (2000)
Imagery in agoraphobia

The room starts off big. Then gets smaller and smaller until I can't stand it any more and all I can see is gravity or leaking at me. There are cuts into me.
Imagery in spider phobia

Pratt, Cooper & Hackmann, (2004)
Imagery in OCD

de Silva (1986)
Less researched images

– suicidal imagery
  • “flash-forward” images associated with the act or suicide or its aftermath

  • Holmes, Crane, Fennel & Williams (2007), *JBTEP*
Suicidal imagery
bipolar disorder = highest risk of suicide

Hales, Goodwin, Deeprose & Holmes, under review
Imagery in bipolar disorder

e.g. “I’m going to buy one”
flash-forwards” = intrusive images of future events

• “This term relates to “flashbacks” to past trauma—a hallmark of PTSD, but to thoughts of future (suicide) rather than to past trauma” (Holmes et al., 2007, JBTEP)

E.g. flash-forwards in mania
E.g. flash-forwards in OCD
E.g. flash-forwards to feared future events more broadly: Engelhard, van den Hout, Janssen, & van der Beek (2010).
flash-forwards” = intrusive images of future events

• Can we adapt treatments for flashbacks to flash-forwards?
• Conversely, can we think about treatments promoting more positive images of the future and harness these post-trauma?
In conclusion

Flashbacks and Flash-Forwards: An Experimental Psychopathology Approach
Research approach

“Cognitive science for cognitive therapy”
Research approach

flashbacks in clinic  flashbacks in lab
I keep having these flashbacks.
Thank you to

Trauma colleagues including:

– Kerry Young
– Nick Grey
– Deborah Lee
– Pippa Stallworthy
– Craig Steel
– Amy Hardy
– Chris Brewin
THANK YOU TO

EPACT lab: Experimental Psychopathology & Cognitive Therapy, Oxford

Catherine Deeprose
Aiysha Malik
Arnaud Pictet
Ella James
Susie Hales

Simon Blackwell
Ian Clark
Sophie Wallace-Hadrill
Mike Browning
Chantal Berna
Funders
THANK YOU!

Left arrow-move left
Right arrow-move right
Down arrow-drop fast
Up arrow-instant drop
Spacebar, X-rotate right
Z-rotate left

Press P to pause
References: tetris!


References: mental imagery

References: tasks that worsen flashbacks


References: memory and the law

- Hardy, A., Young, K., & Holmes, E. A. (in press). Does psychological trauma in victims play a role in the attrition of sexual assault cases? *Criminal Bar Quarterly*.
References: hotspots


Product placement!

Out in 2011

ANN HACKMANN, Warneford Hospital, Oxford, UK, JAMES BENNETT-LEVY, University of Sydney, Australia, and EMILY A. HOLMES, Department of Psychiatry, University of Oxford, UK