**Virtual reality**

- Morton Heilig developed the first commercial VR system in 1965.
- IBM first used in psychological interventions in 1967.
- Ivan Sutherland and Bob Sproull's head-mounted display in 1968.
- 2012 Oculus prototype.
- 2014-2015 Cardboard VR; Oculus DK2; Gear VR; Others.
- 2016 Oculus Rift; Sony; HTC Vive and others.
- 2018 Oculus-Go and other wireless devices.
- 2019 Oculus-Quest.

**Virtual reality is booming.**

- Key sectors for investment:
  - Video games ($11.6bn)
  - Healthcare ($5.1bn)
  - Education ($0.7bn).

**Safety and ethical concerns**

- Virtual reality has been shown to be a safe tool, suitable for children, teenagers, adults including those experiencing mental health problems.

**Virtual reality gives a ‘sense of being there’.**

- The immersive nature of virtual reality environments is unique because it allows for real-time experience of emotions.
A sense of presence

Uncanny Valley

VR has high ecological validity

Loomis et al. (1999)

Virtual reality and mental health

How is VR used in psychology?

• Psychological processes and mechanisms associated with the onset and maintenance of paranoid ideation and auditory hallucinations.
• Testing real time response to new medication
• Virtual reality assisted therapy for psychosis.
• VR for negative symptoms
• Body image and eating disorders.
• Social anxiety in autism.
• VR games to promote physical activity.
• VR to increase resilience.
• Unconscious bias training for health professionals.

Assessment and Treatment of mental health problems using VR

Virtual reality:

• enables the assessment of cognitive functioning in real time
• enables the assessment of symptoms as they occur
• typically used as an exposure technique
• helps the patient to build up sufficient coping strategies in a safe environment
• enables a tailored intervention with virtual reality assisted therapy
Research: underlying mechanisms, testing effect of intervention in real life

- Interpersonal sensitivity
- Childhood bullying victimisation
- Physical assault
- Perceived ethnic discrimination
- Social defeat
- Population density and ethnic density
- Paranoid ideation
- Anomalous experiences
- Self-confidence
- Self-comparison
- Physiological activation
- Behavioural response

It is SAFE

Virtual reality assisted assessment and therapy

Evidence for VR in PTSD

<table>
<thead>
<tr>
<th>Main findings</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>VR more effective than treatment as usual</td>
<td>Older studies, high drop-out rates (too confronting, or cyber-anexiety)</td>
</tr>
<tr>
<td>VR as effective of more than cognitive behaviour therapy</td>
<td>Small sample sizes and lacked statistical power</td>
</tr>
</tbody>
</table>

Main findings:

- It is SAFE

Virtual reality assisted assessment and therapy

Evidence base: VR treatment

- Eating disorders
- Agoraphobia with or without panic disorder
- Phobias
- Anxiety disorders
- Social anxiety
- PTSD
- Psychosis
- Autism

Main findings:

- VR more effective than treatment as usual
- VR as effective of more than cognitive behaviour therapy

Limitations:

- Older studies, high drop-out rates (too confronting, or cyber-anexiety)
- Small sample sizes and lacked statistical power

Virtual reality assisted assessment and therapy

Evidence base for VR in psychosis

- Immersive VR is safe, no symptom worsening
- VR has the potential to be an effective additional tool for neurocognitive evaluation in psychosis, but it is still in its infancy
- Validity and reliability of VR as a neurocognitive assessment tool remains to be established.
- VR as effective of more than cognitive behaviour therapy

<table>
<thead>
<tr>
<th>Study</th>
<th>Findings</th>
<th>Limitations</th>
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<tbody>
<tr>
<td>Valmaggia et al. 2016</td>
<td>VR more effective than treatment as usual</td>
<td>Older studies, high drop-out rates (too confronting, or cyber-anexiety)</td>
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<tr>
<td>Freeman et al. 2017</td>
<td>VR as effective of more than cognitive behaviour therapy</td>
<td>Small sample sizes and lacked statistical power</td>
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</tbody>
</table>
Week 2 – Loremipsum

Virtual reality and mental health 19

VR Assisted Assessment and Therapy

Valmaggia, Rus-Caroff, Garety 2015
Software Unity, VR developer: Virtualware

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Week 2 – Loremipsum

Virtual reality and mental health 20

VR in PICUP Clinic

• Implementation of VR in ‘real clinical setting’
• Therapist acceptance
• Service users Acceptance

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Week 2 – Loremipsum

Virtual reality and mental health 21

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Negative symptoms

V-NESt: Virtual Reality Supported Therapy for the Negative Symptoms of Psychosis

The mechanism: Reward learning

The VR Intervention:
• To reconstruct everyday situations that are difficult for people with negative symptoms.
• This will enable therapists to provide real-time feedback on everyday tasks and focus on improving cognitive regulation processing.

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Prevention and New Interventions

Prevention Better Than Cure

10% of children and young people with mental health problems often develop a

26
to examine the developmental origins of mental health problems in diverse ethnic groups in an accelerated cohort study …

and, from this, identify modifiable risk and protective factors and mechanisms

---

Measures

<table>
<thead>
<tr>
<th>(1) ~ 4,500</th>
<th>(2) ~ 300</th>
</tr>
</thead>
<tbody>
<tr>
<td>mental health</td>
<td>mental health</td>
</tr>
<tr>
<td>family structure, sex</td>
<td>victimisation</td>
</tr>
<tr>
<td>life events</td>
<td>coping, support (reliance)</td>
</tr>
<tr>
<td>bullying</td>
<td>mental cognition</td>
</tr>
<tr>
<td>discrimination</td>
<td>neurocognition</td>
</tr>
<tr>
<td>exposure to gangs</td>
<td>integration</td>
</tr>
<tr>
<td>networks and support</td>
<td>(3) ~ 300</td>
</tr>
<tr>
<td>coping</td>
<td>virtual reality</td>
</tr>
<tr>
<td>(physical, sleep, internet)</td>
<td>hair cortisol</td>
</tr>
</tbody>
</table>

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Basic data: part 1 N=4000

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>%</th>
<th>Lambeth %</th>
<th>Southwark %</th>
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<tbody>
<tr>
<td>boys</td>
<td>2,026</td>
<td>49.4</td>
<td>50.0</td>
<td>51.7</td>
</tr>
<tr>
<td>girls</td>
<td>2,077</td>
<td>50.6</td>
<td>50.0</td>
<td>48.3</td>
</tr>
<tr>
<td>Black African</td>
<td>1,022</td>
<td>26.2</td>
<td>24.2</td>
<td>28.8</td>
</tr>
<tr>
<td>Black Caribbean</td>
<td>1,507</td>
<td>37.8</td>
<td>25.6</td>
<td>26.5</td>
</tr>
<tr>
<td>(mixed)</td>
<td>569</td>
<td>15.1</td>
<td>11.8</td>
<td>9.8</td>
</tr>
<tr>
<td>White British</td>
<td>470</td>
<td>12.4</td>
<td>10.4</td>
<td>20.2</td>
</tr>
<tr>
<td>other white</td>
<td>326</td>
<td>8.6</td>
<td>13.0</td>
<td>7.7</td>
</tr>
<tr>
<td>other</td>
<td>665</td>
<td>17.6</td>
<td>16.0</td>
<td>24.4</td>
</tr>
</tbody>
</table>

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Design

initial findings (n 200)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boys (vs girls)</td>
<td>0.25 [-0.47 1.16]</td>
<td>0.849</td>
<td></td>
</tr>
<tr>
<td>Ethnicity (vs white British)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black African</td>
<td>-1.34 [-2.51 -0.17]</td>
<td>0.050</td>
<td></td>
</tr>
<tr>
<td>Black Caribbean</td>
<td>-1.53 [-2.85 -0.20]</td>
<td>0.037</td>
<td></td>
</tr>
<tr>
<td>Mixed</td>
<td>-0.37 [-2.75 1.92]</td>
<td>0.717</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>-1.83 [-2.22 -1.44]</td>
<td>0.269</td>
<td></td>
</tr>
<tr>
<td>Other (vs white)</td>
<td>0.07 [-0.08 0.21]</td>
<td>0.382</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.11 [-0.28 0.51]</td>
<td>0.445</td>
<td></td>
</tr>
<tr>
<td>Free school meals*</td>
<td>-0.26 [-0.48 0.06]</td>
<td>0.176</td>
<td></td>
</tr>
</tbody>
</table>

*Higher suspicious thoughts in VR environment.
**Initial findings (n=200)**

- Higher suspicious thoughts in VR environment:

<table>
<thead>
<tr>
<th>Variable</th>
<th>β (95% CI)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bullied at least monthly</td>
<td>1.12 (-0.11, 2.35)</td>
<td>0.074</td>
</tr>
<tr>
<td>Number of adverse life events</td>
<td>0.82 (0.11, 1.52)</td>
<td>0.009</td>
</tr>
<tr>
<td>Experiencing discrimination</td>
<td>2.26 (0.10, 4.69)</td>
<td>0.032</td>
</tr>
<tr>
<td>Having few friends</td>
<td>1.72 (0.89, 2.85)</td>
<td>0.003</td>
</tr>
<tr>
<td>Having no friend who confides in them</td>
<td>1.87 (0.93, 3.80)</td>
<td>0.039</td>
</tr>
<tr>
<td>Having no adult to confide in</td>
<td>1.12 (0.94, 2.35)</td>
<td>0.267</td>
</tr>
<tr>
<td>Feeling lonely for 6 months +</td>
<td>1.63 (0.40, 2.87)</td>
<td>0.010</td>
</tr>
</tbody>
</table>

Mixed effect models used to account for clustering by schools; adjusted for sex, ethnicity, age;

---

**Eating disorders**

- Current studies in collaboration with Riva et al

**STUDY 1**

A) Filming different foods in different environments (public, private) using a 3-D camera.

B) Piloting of VR scenarios with community samples. Assessment of cognitions, emotions, behaviors associated with exposure to the scenarios.

**STUDY 2**

Piloting the use of a software to create 2-D personalized avatars for patients to interact with (software previously used for AVATAR therapy in psychosis, Craig et al., 2018).

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**Autism**

Virtual Reality Supported Therapy for Adolescents with Autism Spectrum Disorders and Social Anxiety

Project starts June 2019

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**VR to tackle Unconscious Bias in health professionals**

- Tackling Inequalities and Discrimination Experiences in Health Services (TIDES) study funded by a Wellcome Trust Investigator’s Award.

  - virtual reality to examine how biases and discrimination impact clinical interactions and treatment recommendations.

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**Pros and cons of virtual reality**

**Key challenges**
Other important considerations:

- Evidence
- Evaluation
- Clinical concerns
- Costs and implementation

Other important considerations:

- Psychological and experience sampling method (EMI measures)
- Recording psychological wellbeing

The four 'P's of VR

- Personalise
- Predictive
- Preventative
- Participatory

Right assessment and treatment, for the right person at the right time

Help to establish which individual factors play a role in the onset of mental health problems

Improve functioning and wellness

Interactive and responsive environments

Acknowledgments

- Colleagues in the VR Research Lab
- BRC, NIHR
- CRF, NIHR
- NARSAD
- Psychiatry Research Trust
- MRC
- NIHR

Thank you for your attention