



Eyes on the Prize: Virtual Reality and Children's Vision Health

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Learning Objectives

- LO1: Understand the potential adverse effects associated with the use of virtual reality.
- LO2: Recognise the areas of clinical practice that may be benefited by virtual reality, and opportunities for future research.

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Extended Reality (XR)



Virtual Reality (VR)



Augmented Reality



Mixed Reality

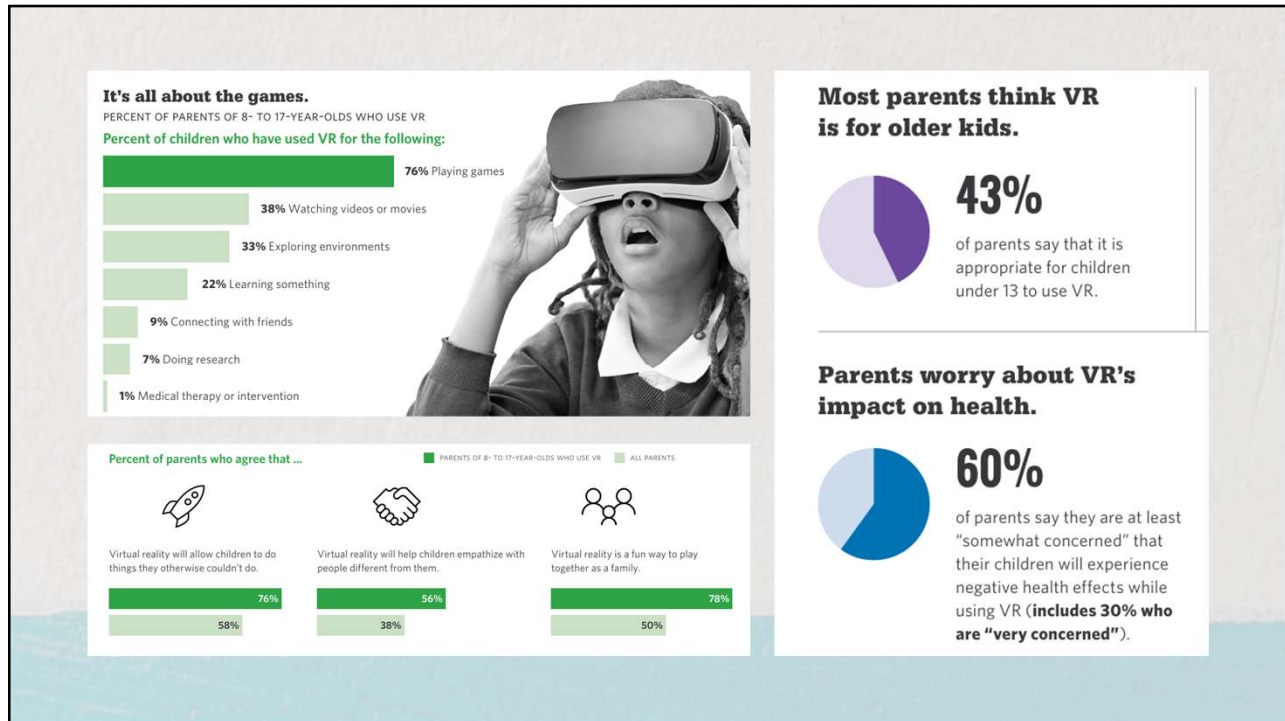
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Virtual Reality for Kids

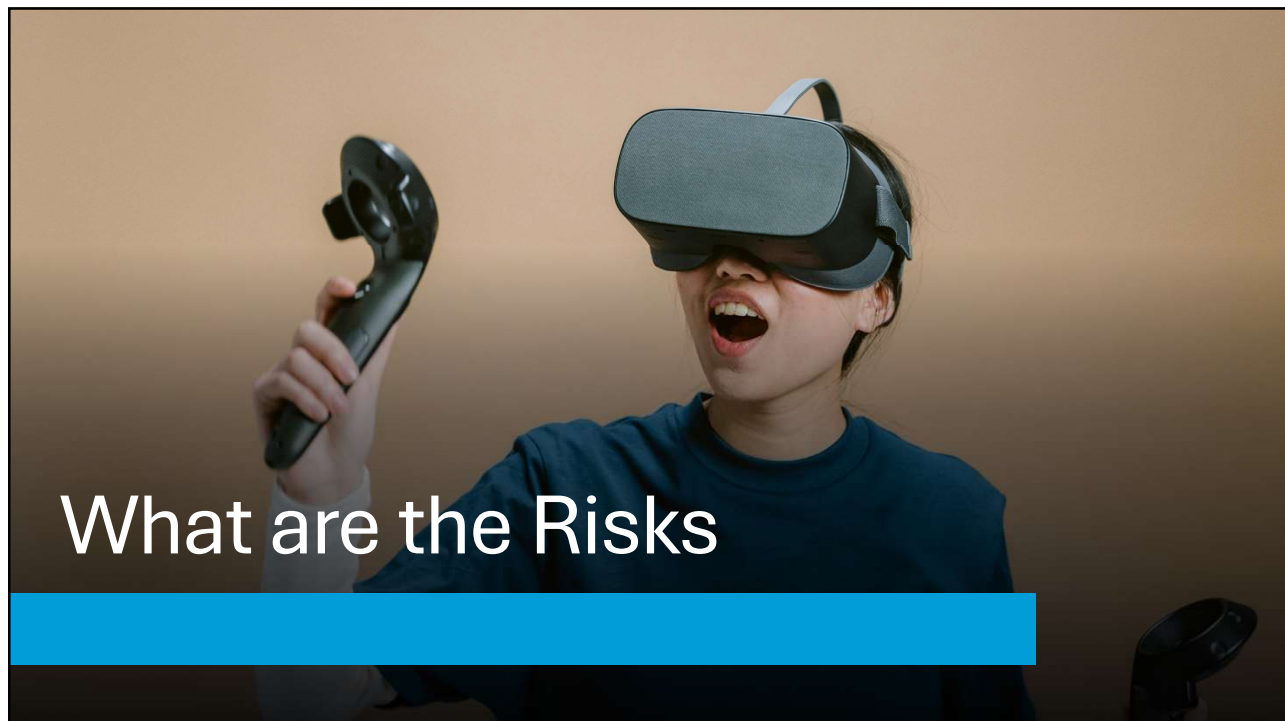
- Games
- Videos
- Classroom



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Cybersickness

- Similar to motion sickness
- Nausea
- Visual discomfort
- Disorientation



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Cybersickness

- Reported as secondary outcome measure of studies
- Low rates (<5%) of:
 - Feeling confused
 - Nausea
 - Headache
 - Eye pain
 - Transient double vision (amblyopes)
- Similar rates vs control group (eg television)

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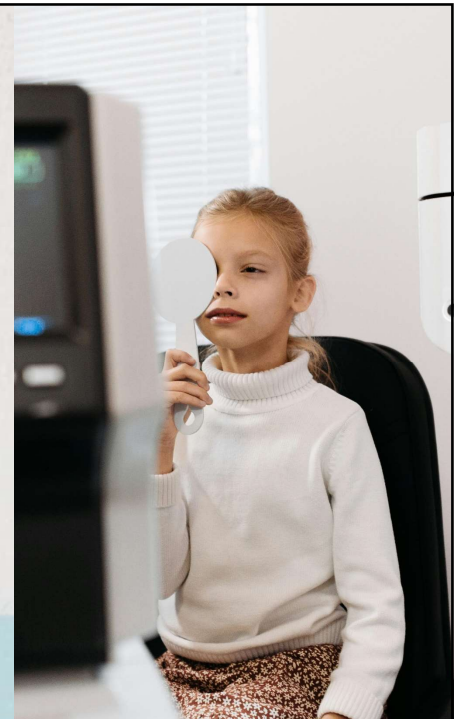
Cybersickness Risk Factors (adults)

- History of motion sickness
- Older age (30-40+)
- Females?
- Smoking is negatively associated

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Vision

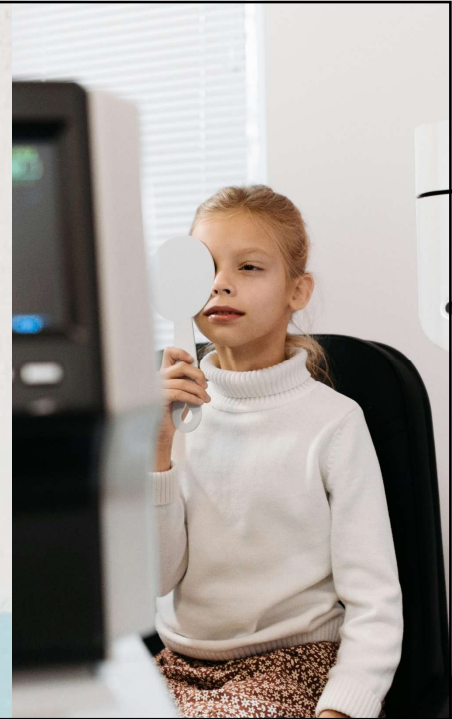
- Study of 4-10yo using 60 minutes of VR
- After exposure there was no change to:
 - Binocular VA
 - Refractive error, or
 - Binocular eye alignment



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Vision

- Adult study (18-35yo)
- 40 min in 4x environments
 - Real vs virtual
 - Indoor and outdoor environments
- No changes to:
 - Binocular posture at distance and near
 - Gaze stability
 - Amplitude of accommodation, or
 - Stereopsis



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Physical changes

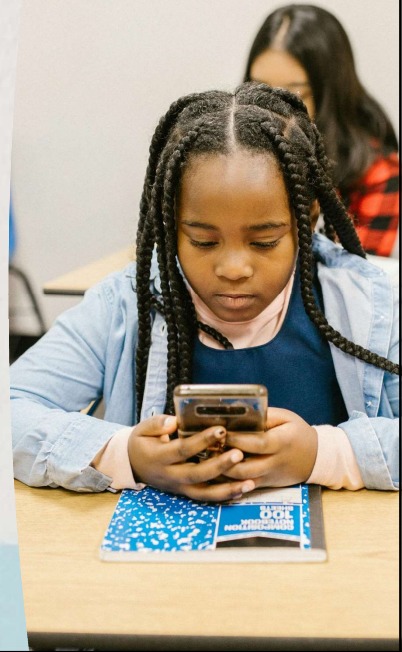
- Facial deformity
- Posture changes
- VR units not designed for small heads



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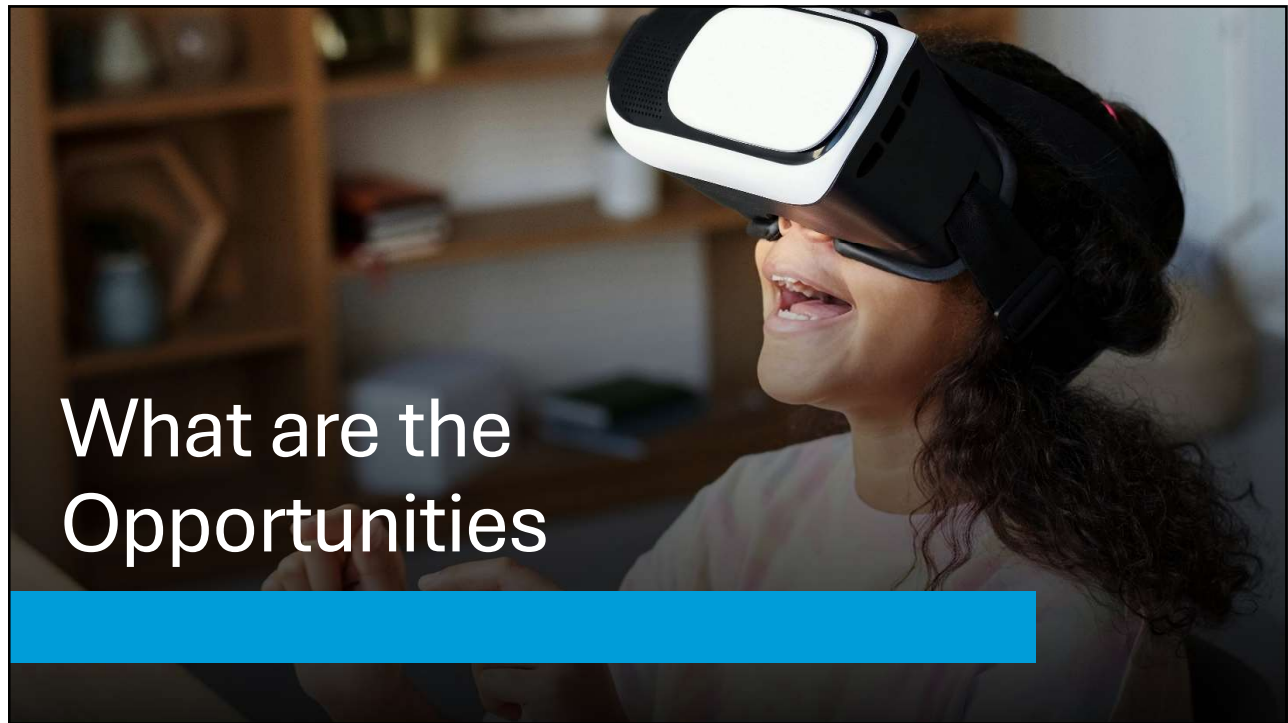
Psychological and Cognitive Development

- Unclear impact
 - Spatial cognition
 - Addiction
 - Anxiety
 - Social behaviours
- Amplification of known digital risks
 - Increased realism and trauma response
 - Predatory events



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What are the Opportunities



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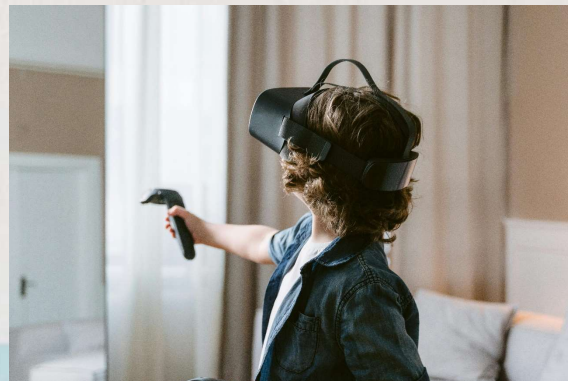
Amblyopia Treatment

- Meta analysis of eight studies showed improvement compared to patching alone
 - 0.07 logMAR (3.5 letters)
- Best improvement for children <7yo
 - And for <20h hours treatment duration

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Treatment of Binocular Vision Disorders

- Orthoptic exercises
- Stroke rehabilitation



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Myopia Management

- VR Vision Therapy
 - 20 min per day for 3 months
 - Axial length progression was halved at 3 months
 - Increased choroidal thickness
- Is VR better than using traditional computer screens?

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Education

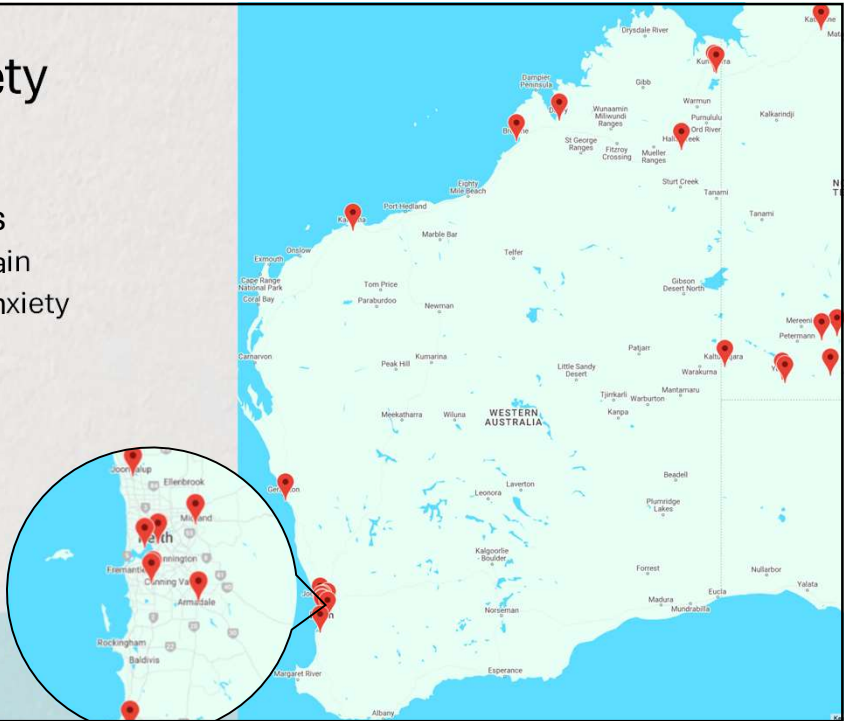
- Unique learning environments
 - Eg for disabled children
- Empathy experiences
 - Eg colourblindness
- Training of advanced skills
 - Eg surgery, BIO operation
- Increased enthusiasm,
 - Similar information retention



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Pain and Anxiety Management

- Medical procedures
 - 60% reduction in pain
 - 40% reduction in anxiety



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Other Opportunities

- Visual field analysis
- Spectacle lens prescribing
 - Multifocal demonstrations
 - Customised measurements
- Dry eye
 - Moisture chamber effect

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What's Next?

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Further Research

- Long term myopia studies
- More research on BV treatment

A young boy with dark hair, wearing a white long-sleeved shirt and a white VR headset, is shown in profile. He is looking towards the right. The background is a blurred indoor setting with warm lighting and a blue wall.

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Adverse Effects

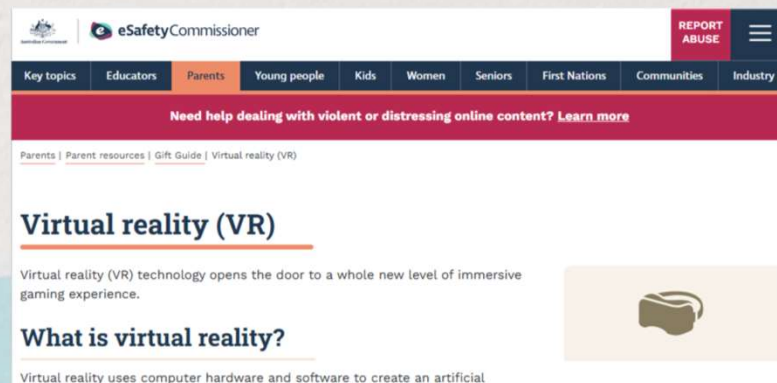
- “Absence of evidence is not evidence of absence”
- Cognitive and psychological impact



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Evidence-Based Recommendations

- Minimum age
- Duration recommendations
- Types of content



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