



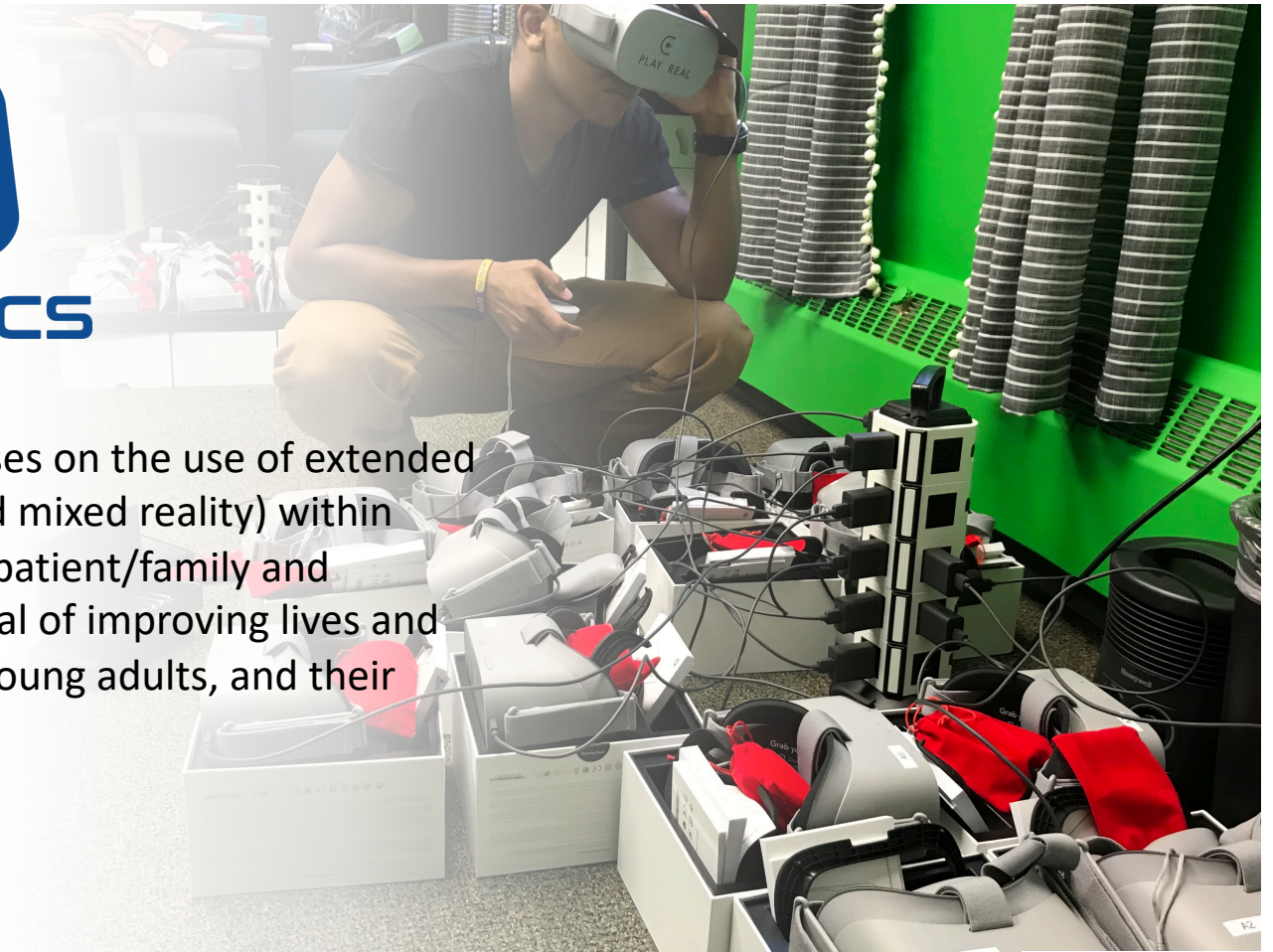
Kids and XR: Leveling Up While Playing it Safe

Kimberly Hieftje, PhD
Asher Marks, MD
GDC 2023



XR in PEDIATRICS

XR in Pediatrics (XRPeds) focuses on the use of extended reality (virtual, augmented, and mixed reality) within research, clinical practice, and patient/family and provider education with the goal of improving lives and reducing disparities of youth, young adults, and their families.





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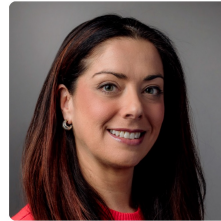
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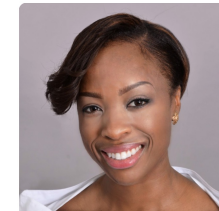
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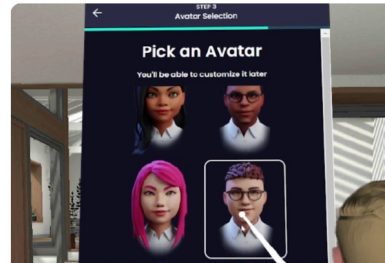
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Social VR-Based Support
Groups for Youth



Project VISIBLE



Invite Only VR: A Vaping
Prevention Game



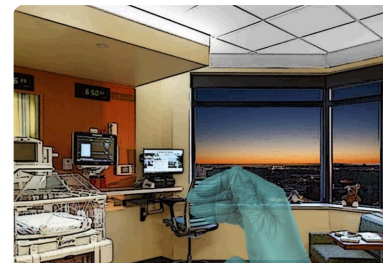
AR Game for Alcohol Harm
Reduction



reHASHED



Multiplayer Game for HIV/STI
Prevention



DeBugged



Year of the Cicadas: A VR
Experience on Grief

Age recommendations for VR/AR headsets are more about COPPA than science



- Samsung Gear VR: 13+
- Google Daydream View: 13+
- Sony PlayStation VR/VR2: 12+
- HTC Vive: HTC doesn't specify an age, but advises young children not to use the product
- Oculus Quest: Children under the age of 13 should not use the Quest
- The age limit for using the Oculus Rift DK 2 was 7 years

The Children's Online Privacy Protection Act (COPPA) was intended to prevent online platforms from collecting the personal data of kids under the age of 13 for ad targeting and tracking

Kids are NOT small adults

1.) Physical

- Head size
- Hand size and height
- Hearing
- Pupillary distance/VAC concerns
- Impulse control

2.) Cognitive

- Cognitive Flexibility (reality vs fantasy)
- Working memory
- Impulse control

3.) Social

- Understanding of social norms
- Falling prey to strangers
- Impulse control



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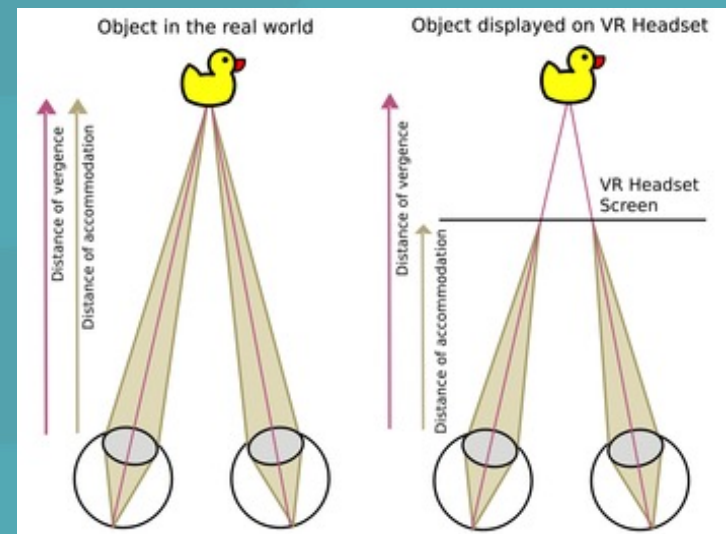
Physical Effects of VR on Children - Vision

1. IPD may vary greatly in children
 - The average adult's IPD is between 54-74 mm and kids' are between 43-58 mm
 - Quest 2 range: 53, 63, 68 mm
 - When wrong, we must consider eye strain, nausea, and a poor viewing experience
 - This will only be compounded with eye tracking

Physical Effects of VR on Children - Vision

2. Vergence Accommodation Conflict (VAC)

- Occurs when required vergence and accommodation don't match
- This results in eye strain
- Don't make objects appear too close



Physical Effects of VR on Children - Vision

American Academy of Ophthalmology

“Although there are no long-term studies, ophthalmologists Agree there is no reason to be concerned that VR headsets will damage eye development, health or function. ‘Age limitations for VR technology might make sense for content, but as far as we know this technology poses no threat to the eyes,’ said Stephen Lipsky, MD, a pediatric ophthalmologist who practices in Georgia.”

Physical Effects of VR on Children - Environmental

1. Coordination and balance
2. Executive Function (develops in preschool)
 - a) Inhibitory control
 - b) Working memory
 - c) Cognitive flexibility



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Physical Effects of VR on Children – Design

- Consider time in the headset – 20-30 min
- Well thought-out and designed UI's
- Smaller guardians with greater room for error or stationary
- HMD adaptations – weight, size, IPD, etc

Cognitive Development and VR in Children – Cognitive flexibility

- Children <7 may face challenges discerning when virtual events are not real
- Virtual characters viewed as real and are in the same physical world as them
- Overstimulation

Cognitive Development and VR in Children – Working memory

- Difficult for children to remember the physical world while processing the rules of the virtual environment
- Confuse VR experiences with actual experience
- Can create false memories in young children



FIGURE 1 A) Three-dimensional model of child's head constructed from two photographs (front and profile). B) Screen shot of child's avatar swimming with whales in virtual world. C) A child wearing the head-mounted display.

Kathryn Y. Segovia & Jeremy N. Bailenson (2009) Virtually True: Children's Acquisition of False Memories in Virtual Reality, *Media Psychology*, 12:4, 371-393.

Cognitive Development and VR in Children – Impulse Control

- Difficulty resisting temptations in virtual environments
- Difficult time resisting temptations in a virtual environments
- Hard to resist imitating realistic virtual characters
- Highly vulnerable to suggestion

Cognitive Development and VR in Children – Summary

- Younger children may struggle to discern when virtual events are not real.
- VR can create false memories in children as old as 7
- Poor impulse control make it difficult to resist temptations in VR

Social Considerations for Children in VR

- Need to consider history of social media
 - Increased presence and immersion
 - Opportunities for “virtual” physical interaction

Social Considerations for Children in VR

- We missed the boat on social media
 - Depression, anxiety, attention, privacy, bullying, isolation, FOMO, irritability, self esteem, poor self esteem, addiction, self obsession
 - Sharing of private information, exposure to sex and violence, misinformation, false marketing, viral trends, trafficking grooming and recruitment

Social Considerations for Children in VR

- Still some very positive things to be learned
 - Development of technical skills
 - Opportunities for self expression
 - Access to niche communities
 - Development of empathy and expression
 - Social skills – imitation of others

Social Considerations for Children in VR

- What is VR adding to all of this?
 - Presence and immersion accentuate all of this
 - Opportunities for simulated assault

Social Considerations for Children in VR- Design

- Default settings
- One button eject to “safe space”
- Separating social spaces by age
- Virtual barriers





< 5

Reality vs Fantasy

False Memories

Sensory overload

5-10

*Controlled or
Supervised conditions
only*

*Small Guardian with
generous borders or
seated*

No social interactions

11+

*Caution should still be
taken*

*Wide range of
maturity*

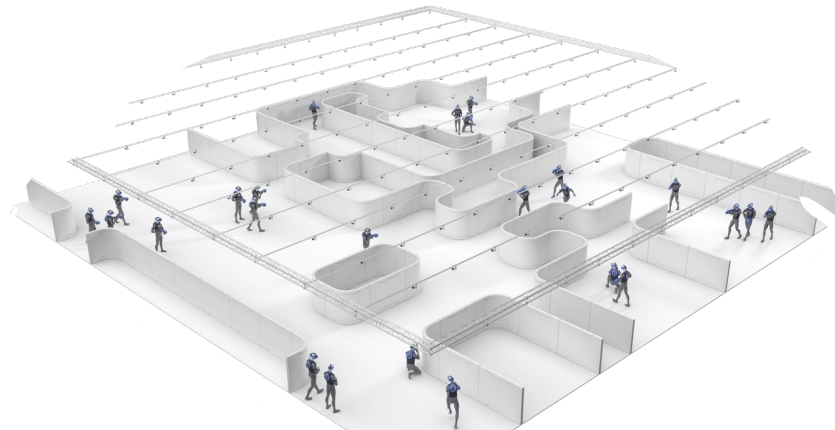
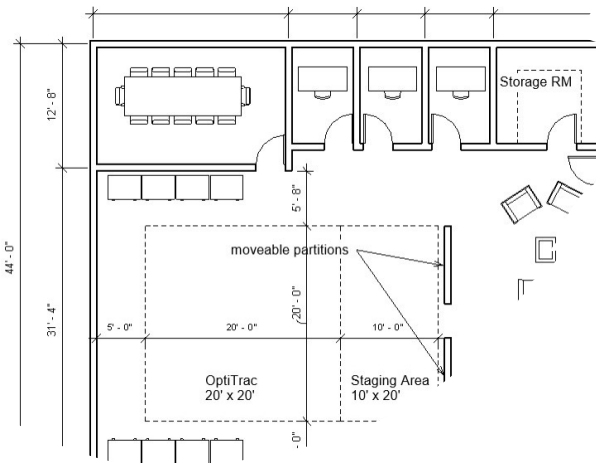
*Social interactions
only when supervise*



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OptiTrack Prototyping



- Getting a jump on AR/MR research
 - Integrating monitors and projectors
 - Think beyond HMDs
- Extended extended reality
 - Haptics
 - High fidelity spatial audio



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