Understanding Ethical Concerns in Children's Virtual Reality Use: Implications for XR Design

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ABSTRACT

This position paper examines ethical concerns and design considerations for children's virtual reality experiences based on empirical studies with over 250 participants (ages 7-13 and their guardians). Our research reveals tensions between stakeholder priorities: children value play, autonomy, and social connection while parents prioritize brain development, safety, and relationship preservation. Both groups share concerns about privacy, data practices, and mistrust of commercial technology companies. Key findings indicate VR should prioritize safety mechanisms, physical activity support, and privacy protections, with careful consideration of potential developmental impacts. While our studies focused specifically on VR, we seek to explore how these findings might translate across the broader XR spectrum. Different immersive modalities may mitigate certain concerns (such as social isolation in AR/MR) while introducing others (like privacy in augmented shared spaces). This work contributes to developing proactive, family-centered frameworks for ethical XR design that prioritize children's wellbeing alongside engaging experiences.

CCS CONCEPTS

•Human-centered computing ~ Human computer interaction (HCI) ~ Empirical studies in HCI

KEYWORDS

Virtual Reality, Extended Reality, Children, Families, Teens

1. Introduction and Our Prior Work

Virtual Reality (VR) technologies are increasingly accessible to children, offering immersive experiences that can transform education, entertainment, healthcare, and social interaction. As VR headsets become more affordable and content diversifies, researchers have raised important questions about the potential impacts on children's development [3], however little empirical work has been carried out in this domain to date [1]. While VR offers promising applications for learning, therapy, and creative expression, concerns persist regarding physical health effects, potential cognitive impacts, privacy and safety issues, and the risk of diminished real-world social connections. As the technology continues to evolve from specialized equipment to everyday consumer products, there is an urgent need for empirical research that examines children's and families' perspectives on VR use.

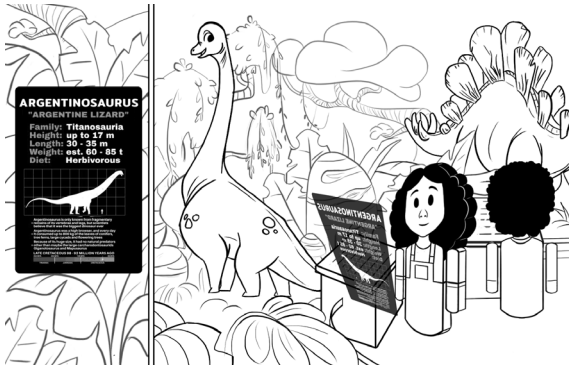

Figure 1. Participants in our studies watched and responded to animated scenarios such as the one in this image illustrating both positive and negative potential VR futures.

Our ongoing research on the ethical concerns and considerations for children's VR usage addresses a critical gap in understanding how immersive technologies might affect young users during crucial developmental stages. As VR becomes increasingly accessible to children through consumer headsets and educational applications, concerns about potential physical, cognitive, social, and ethical impacts require empirical investigation. This work is important because it takes a proactive, family-centered approach to identifying potential risks and benefits before widespread adoption, rather than the reactive stance often taken with new technologies. By including both children's and parents' perspectives, the research provides a comprehensive picture of stakeholder priorities that can guide responsible design, regulation, and usage practices.

The first study (published at IDC last year [2]) examined ethical concerns and considerations through activities and interviews with 122 participants (55 parents, 67 children aged 7-13) using scenario-based methods. Four key ethical concerns emerged: erosion of physical community bonds, long-term negative effects on health and development, risks to safety and privacy, and disparities in equity and inclusion. The research revealed how VR can have mixed impacts, with participants

generally positive about its potential while expressing significant concerns about social isolation, developmental impacts, and safety issues. Key considerations for design included promoting open communication among stakeholders and supporting parental supervision without compromising children's autonomy, especially in areas like education and healthcare where VR shows promising applications.

In our more ongoing recent work, we have built on these findings by exploring what families need to know about VR, what should be developed in the VR space, and which stakeholders should lead this work. We surveyed 137 participants (81 children, 52 guardians), asking them to discuss and prioritize potential directions for future VR research and development. Preliminary analyses reveal strong prioritization of understanding VR's impact on brain development, behavior, and relationships. Safety, privacy, and well-being were consistently prioritized over entertainment and even educational value, showing that families may be concerned over possible negative broader impacts of VR in the home. Families expressed mistrust toward for-profit tech companies and called for leadership from educators, researchers, and public institutions. The most demanded advances were safety mechanisms, support for physical movement, and privacy protections, with children valuing playfulness and autonomy while guardians focused on emotional and developmental outcomes. This second study reinforces the need for transparent, collaborative approaches to VR development that puts children's well-being first.

2. Goals for Workshop

I am excited about the potential opportunity to participate in the IDC 2025 Workshop on “Extended Reality and Children: Risks, Opportunities, and Ethics,” because my research directly addresses the ethical challenges and design considerations for children using immersive technologies. While my studies have focused specifically on VR, I'm eager to explore how these findings might extend to or differ in the broader XR spectrum, which encompasses augmented reality, mixed reality, and other immersive technologies. XR introduces unique considerations beyond VR alone—such as blending digital content with real environments, potentially continuous use throughout daily activities, and different forms of embodiment and interaction. Having conducted studies with over 250 children and parents exploring VR's impact on development, safety, privacy, and inclusion, I'm passionate about collaborating with researchers working across the XR continuum to ensure these technologies evolve responsibly.

I can contribute empirical insights from our two large-scale studies examining how children (ages 7-13) and their parents perceive VR's risks and benefits across educational, family, and healthcare contexts. My research highlights key tensions between stakeholders, including children's desire for autonomy versus parents' safety concerns, and mistrust of for-profit tech companies versus the need for collaboration. These findings raise important questions about whether the same concerns apply to AR experiences that augment rather than replace reality, or how mixed reality might address concerns about social isolation while potentially introducing new privacy challenges. I've developed anticipatory methods using scenarios that could be adapted to evaluate potential ethical issues across different XR modalities before widespread adoption, helping identify where VR-specific concerns might generalize to XR and where new considerations arise.

From this workshop, I hope to gain deeper understanding of how the ethical concerns identified in my VR research translate to the broader XR landscape, particularly regarding different XR modalities' impacts on brain development, social connections, and equitable access. For instance, while VR completely immerses users in virtual environments, AR and MR technologies overlay digital content onto physical spaces—potentially mitigating some concerns about social isolation while introducing new questions about privacy in shared spaces or continuous use. I'm interested in learning about innovative methodologies others are using to study XR's effects on children and exploring potential collaborative opportunities with participants working on complementary aspects of children's XR experiences. I hope to contribute to developing practical guidelines and frameworks that could help designers, researchers, and policymakers create XR technologies that prioritize children's wellbeing, development, and agency—ultimately transforming my research findings into actionable design principles across the XR spectrum.

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