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Barriers and Facilitators to Using VR-Based Therapy for Emotional Regulation in Youth with Exceptional Needs

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A B S T R A C T

This study aimed to explore the barriers and facilitators influencing the implementation of virtual reality (VR)-based therapy for emotional regulation in youth with exceptional needs. A qualitative research design was employed using semi-structured interviews with 23 purposefully selected participants, including special education teachers, therapists, caregivers, and VR developers, all based in Minnesota, USA. Participants were selected based on their direct involvement with VR therapy programs for youth with neurodevelopmental or emotional regulation challenges. Interviews were conducted until theoretical saturation was reached. Data were transcribed verbatim and analyzed using thematic analysis in NVivo 14, following Braun and Clarke's six-phase framework. The analysis revealed two main thematic categories: facilitators and barriers. Facilitators included seven subthemes: technological appeal, personalization, therapist control, motivation and engagement, institutional support, caregiver involvement, and observable emotional gains. Barriers were categorized into seven subthemes as well: accessibility and equity issues, sensory limitations, stakeholder resistance, cultural irrelevance, technical difficulties, ethical and privacy concerns, and lack of standardized guidelines. Participants reported that immersive features, real-time therapist adjustments, and family buy-in enhanced VR's therapeutic effectiveness. Conversely, cost constraints, lack of culturally appropriate content, and technical or ethical challenges hindered adoption. Quotes from stakeholders enriched the thematic interpretation and contextualized the results. VR-based therapy shows promising potential in enhancing emotional regulation among youth with exceptional needs due to its immersive, customizable, and engaging design. However, successful implementation depends on addressing contextual challenges, including accessibility, technical infrastructure, and cultural inclusivity. Stakeholder collaboration and the development of standardized protocols are essential to scale VR interventions in educational and clinical contexts.

Keywords: *virtual reality therapy; emotional regulation; exceptional needs; qualitative research; implementation barriers; therapeutic facilitators.*

1. Introduction

Emotional regulation is a core developmental process necessary for adaptive functioning across the lifespan, but particularly critical during youth, when emotional, social, and cognitive capacities are still maturing. Among children and adolescents with exceptional needs—such as neurodevelopmental, cognitive, or sensory impairments—difficulties in emotional regulation are not only more prevalent but also more persistent and impairing {Tabrizi, 2020 #2195}. Traditional therapeutic interventions such as cognitive-behavioral therapy (CBT) or talk-based counseling often require verbal fluency, abstract reasoning, and emotional introspection, all of which may present challenges for youth with developmental disorders or emotional dysregulation {Meindl, 2019 #241908}. In recent years, virtual reality (VR) technology has emerged as a promising medium to supplement or, in some cases, replace traditional methods, providing immersive, interactive, and controlled environments that may overcome these barriers {Baker, 2025 #241913;Gill, 2020 #241925}.

VR-based therapy refers to the use of immersive simulations, often delivered through head-mounted displays, to create dynamic environments for therapeutic engagement. These environments can be programmed to simulate emotionally challenging scenarios or calming settings, providing a scaffold for emotion identification, regulation, and behavioral rehearsal. In the context of youth with exceptional needs, VR is particularly relevant due to its ability to bypass language-heavy content and instead employ visual, auditory, and sensory cues to elicit and regulate emotional responses {Arnfred, 2023 #241906}. For example, VR exposure therapy has been employed to treat phobias in adolescents on the autism spectrum with minimal reliance on verbal processing {Meindl, 2019 #241908;Shiban, 2018 #241910}. Research further suggests that gamified VR modules can enhance motivation, increase emotional awareness, and support skills generalization into real-life contexts {Oliveira, 2021 #241903;Estrada, 2018 #241932}.

Several technological and clinical advantages underpin the interest in VR as an emotion regulation tool. First, the immersion effect of VR enables users to experience realistic, emotionally charged scenarios in a safe, controlled environment {Boque, 2021 #241929}. This allows therapists to gradually introduce emotional stimuli while simultaneously teaching coping strategies. Second, the interactivity of VR environments fosters engagement and agency, particularly important for youth who may resist passive therapeutic formats {Gill, 2019 #241922;LoJacono, 2018 #241933}. Third, advances in biofeedback integration and motion tracking have enabled real-time monitoring of physiological and behavioral responses within VR, allowing for tailored intervention and therapist feedback {Baker, 2025 #241913;Smith, 2020 #241907}. Moreover, VR offers personalization features, which can be used to adjust difficulty levels, visual environments, and pacing based on each child's unique sensory profile or behavioral goals {Li, 2022 #241919;Nijs, 2025 #241916}.

Despite these advantages, the widespread implementation of VR-based therapy for youth with exceptional needs remains limited due to various barriers. Cost and accessibility are among the most frequently cited constraints, especially in public education or low-resource clinical settings where the hardware, software, and training required to implement VR may not be feasible {Nikiema, 2025 #241911}. Furthermore, certain physical or cognitive impairments may limit usability; for example, children with vestibular issues may experience disorientation or nausea when using head-mounted displays {Hemphill, 2021 #241924}. Resistance from caregivers, educators, and therapists who are unfamiliar with VR technologies may also hinder adoption, especially when the therapeutic value is not clearly communicated or backed by long-term evidence {Jaya, 2022 #241904;Sharma, 2024 #241934}. In addition, ethical concerns related to data privacy, consent procedures for minors, and cultural sensitivity in virtual scenarios have been noted in the literature {Елхова, 2024 #241930;Mahsuda, 2023 #241914}.

From a theoretical standpoint, the incorporation of VR in therapeutic interventions is grounded in experiential learning and embodied cognition theories. These frameworks propose that learning and behavioral change occur more effectively through sensory engagement and physical interaction with stimuli—conditions that VR environments inherently support {Arnfred, 2023 #241906; 范, 2017 #241921}. Furthermore, research in affective neuroscience supports the view that emotional learning is amplified when the learner is actively involved and emotionally aroused, conditions that VR scenarios can manipulate in a controlled manner {Aprilia, 2025 #241927}. Emotional arousal within VR scenarios—whether through exposure to social challenges, calming nature scenes, or gamified tasks—has been shown to elicit measurable changes in emotional regulation skills among youth with

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emotional and behavioral disorders {Gill, 2020 #241925;Tabrizi, 2020 #2195}.

The role of VR in special education and therapeutic contexts has gained momentum especially in the post-pandemic era, where the demand for remote and technologically mediated therapy increased significantly {Nikiema, 2025 #241911}. Emerging studies indicate that VR-based therapy may enhance social-emotional learning in school-aged children when integrated into individualized education plans (IEPs) and supported by trained educators or mental health professionals {Hemphill, 2021 #241924;Jaya, 2022 #241904}. However, current research is fragmented, often focusing on specific populations (e.g., children with ADHD, ASD, or anxiety) and lacking in depth regarding real-world implementation challenges and stakeholder perspectives {Boque, 2021 #241929;Arnfred, 2023 #241906}. Although a growing number of clinical trials and pilot programs show promising outcomes, systematic reviews consistently highlight the need for more qualitative and context-sensitive research that examines how VR therapy is perceived, implemented, and sustained in real-life settings {Matsangidou, 2025 #241901;Smith, 2020 #241907}.

Another understudied area concerns the factors that facilitate or hinder the use of VR therapy in diverse educational and clinical settings. While several studies have catalogued technical specifications and therapeutic outcomes, fewer have explored how contextual, cultural, logistical, and psychological factors influence acceptance and effectiveness. For example, {Oliveira, 2021 #241903} identify strong therapist involvement and institutional support as key enablers, while {Sharma, 2024 #241934} emphasize the importance of aligning technological interventions with user values and expectations. Moreover, {LoJacono, 2018 #241933} show that skills acquired in VR environments can transfer to real-world tasks, suggesting that emotional regulation learned virtually may generalize if properly scaffolded. However, translating potential into practice requires attention to the lived experiences of stakeholders, especially those directly involved in deploying or receiving the intervention {Estrada, 2018 #241932;Shiban, 2018 #241910}.

This study seeks to address this gap by exploring the barriers and facilitators to implementing VR-based therapy for emotional regulation among youth with exceptional needs, using a qualitative approach.

2. Methods and Materials

2.1. Study Design and Participants

This study employed a qualitative research design with an exploratory approach to identify barriers and facilitators in the use of virtual reality (VR)-based therapy for emotional regulation among youth with exceptional needs. The study was grounded in an interpretivist paradigm, aiming to capture the subjective experiences and contextual realities of participants involved with VR-based therapeutic interventions.

Participants were purposefully selected using criterion sampling to ensure relevance to the study objectives. The final sample consisted of 23 individuals residing in Minnesota, including special education professionals, VR therapy developers, mental health practitioners, and caregivers with direct experience in using or administering VR-based emotional regulation programs for youth with exceptional needs. Participants represented diverse professional backgrounds and provided insights across educational, clinical, and technological contexts. Inclusion criteria included: (1) direct involvement with VR-based therapy in youth populations, and (2) at least one year of experience in their relevant domain. Ethical approval was obtained prior to data collection, and informed consent was obtained from all participants.

The sample size was determined based on the principle of theoretical saturation, which was achieved after the 21st interview when no new concepts or themes were emerging. Two additional interviews were conducted to confirm saturation.

2.2. Measures

Data were collected through semi-structured interviews to allow flexibility while maintaining thematic consistency. An interview guide was developed based on a review of existing literature on VR-based therapeutic interventions and emotional regulation. Sample questions included: “What challenges have you experienced in implementing VR-based therapy with youth?” and “What factors support successful use of VR in emotional regulation settings?”

Interviews were conducted between February and April 2025. All interviews were held either in-person at clinical and educational sites across Minnesota or remotely via secure video conferencing platforms, depending on participant availability and preference. Each session lasted approximately 45 to 70 minutes, and all interviews were audio-recorded and transcribed verbatim for analysis. Field

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notes were also taken to capture contextual observations and non-verbal cues.

2.3. *Data Analysis*

Data were analyzed using thematic analysis as outlined by Braun and Clarke (2006), allowing for identification, examination, and reporting of patterns within the data. The analysis process followed six phases: familiarization with the data, generation of initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the report.

The software NVivo 14 was used to facilitate data management, coding, and theme development. Initial coding was inductively performed by two researchers independently, followed by iterative discussions to resolve discrepancies and ensure intercoder reliability. Themes were refined through constant comparison and cross-case analysis to ensure credibility and consistency. Reflexivity was maintained throughout the process, and analytic memos were recorded during coding to document decision-making and interpretive insights.

To enhance trustworthiness, strategies such as member checking, audit trails, and peer debriefing were employed. Select participants reviewed preliminary findings to validate interpretations, and a methodological audit trail was maintained for transparency.

3. Findings and Results

The study included a total of 23 participants (13 female, 10 male), ranging in age from 29 to 58 years (M = 42.6, SD = 7.9). Participants represented diverse professional backgrounds relevant to the implementation and evaluation of VR-based therapy for emotional regulation in youth with exceptional needs. Specifically, the sample included 7 special education teachers, 5 clinical psychologists, 4 occupational therapists, 3 school counselors, 2 VR software developers, and 2 caregivers of children receiving VR-based interventions. Regarding years of professional experience, 9 participants had between 1 and 5 years of experience, 8 participants had 6 to 15 years, and 6 participants had over 15 years of experience in their respective fields. The majority of participants (n = 17) reported having prior exposure to VR-based programs, either as facilitators or observers, while 6 participants were new adopters or in the early stages of VR integration. All participants were residents of Minnesota, working in either educational, therapeutic, or developmental settings across both urban and rural areas.

Table 1

Themes, Subthemes, and Open Codes from Thematic Analysis

Main Category	Subcategory (Theme)	Concepts (Open Codes)
Facilitators	Technological Appeal	Immersive environment, gamified experience, sensory engagement, visual stimulation, novelty effect
	Personalization and Adaptability	Tailored difficulty levels, customizable avatars, flexible session pacing, content alignment with emotional goals
	Therapist Engagement and Control	Real-time monitoring, therapist-led scenarios, adaptive feedback, session replayability
	Motivation and Youth Engagement	Increased curiosity, higher task persistence, reduced resistance to therapy, active emotional participation
	Supportive Institutional Environment	Administrative backing, funding availability, trained support staff, integration with IEP (Individualized Education Plans), infrastructure readiness
	Parent and Caregiver Support	Parent education, home reinforcement, caregiver buy-in, observed improvement at home
	Measurable Emotional Gains	Improved self-regulation, reduced emotional outbursts, increased emotional vocabulary, faster recovery from distress
Barriers	Accessibility and Equity Issues	High device cost, limited availability in rural areas, insurance non-coverage, digital divide
	Sensory and Physical Limitations	Motion sickness, sensory overload, visual impairment, coordination difficulties
	Resistance from Stakeholders	Parent skepticism, educator hesitancy, tech-aversion among therapists
	Limited Cultural Relevance	Lack of diverse characters, culturally inappropriate scenarios, underrepresentation of marginalized identities
	Technical Challenges	System crashes, software bugs, internet dependence, hardware malfunctions
	Ethical and Privacy Concerns	Data protection issues, confidentiality risks, unclear consent procedures
	Lack of Evidence-Based Guidelines	Insufficient longitudinal data, unclear therapeutic protocols, limited standardized outcome metrics

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Facilitators

Technological Appeal. Participants consistently emphasized the immersive and multisensory features of VR as a key facilitator for emotional engagement. The gamified and interactive environment appealed strongly to youth with exceptional needs, making therapy sessions more enjoyable and less stigmatizing. One therapist remarked, *"When they put on the headset, it's like entering a different world—they forget they're in therapy"* [P07]. Others noted the novelty of VR maintained sustained attention, especially for children with attention challenges. Visual stimulation and sensory involvement were particularly helpful in calming children during emotionally intense moments.

Personalization and Adaptability. The adaptability of VR platforms was noted as a major strength, allowing content to be tailored to individual emotional and developmental needs. Participants mentioned features such as customizable avatars, adjustable difficulty levels, and flexible pacing. A special educator stated, *"The system allows us to slow down or repeat parts depending on the student's mood—it's not one-size-fits-all"* [P12]. This flexibility was perceived as crucial for engaging students with varying cognitive and emotional profiles.

Therapist Engagement and Control. Another enabling factor was the therapist's ability to monitor and guide sessions in real time. Professionals appreciated the ability to adjust the scenario or intensity based on the child's reactions. One mental health practitioner shared, *"I can pause the program, give feedback, and restart from where we left off—it's incredibly empowering for therapy"* [P03]. This level of control enhanced safety and therapeutic precision, especially in emotionally triggering modules.

Motivation and Youth Engagement. Many participants reported that VR significantly increased motivation and engagement. Youth often demonstrated higher task persistence, enthusiasm, and willingness to explore emotional states. A caregiver commented, *"It's the only time my son asks when his next therapy session is"* [P18]. Compared to traditional talk therapy, VR was described as more approachable and interactive, reducing avoidance behaviors and increasing participation.

Supportive Institutional Environment. Institutional support was cited as a foundational enabler for successful VR implementation. Key elements included administrative buy-in, budget allocation, and technical support from IT teams. A school counselor noted, *"Having our district support VR as part of the IEP made a big difference—we had a clear structure to follow"* [P10]. Collaboration across departments ensured smoother integration into existing therapeutic and educational programs.

Parent and Caregiver Support. Parent engagement emerged as an important facilitator. When caregivers were educated about the purpose and benefits of VR therapy, they were more likely to reinforce its use at home. One parent stated, *"Once I saw how calm she became after using it, I wanted to learn more and support her at home too"* [P20]. Participants emphasized the value of consistent messaging between home and therapy environments in sustaining behavioral change.

Measurable Emotional Gains. Finally, tangible improvements in emotional regulation were reported across cases. These included increased emotional vocabulary, fewer emotional outbursts, and quicker recovery from distress. A therapist explained, *"After four weeks of using VR, my client could name his feelings without prompting. That was huge"* [P06]. These outcomes reinforced participant confidence in the therapeutic value of VR-based interventions.

Barriers

Accessibility and Equity Issues. A prominent challenge was the high cost and uneven availability of VR technology. Several participants noted that underserved communities—particularly rural or low-income populations—had limited access. A school psychologist remarked, *"Our rural schools can't even get basic Wi-Fi, let alone VR headsets"* [P02]. Insurance coverage was also cited as inconsistent or absent, further hindering implementation at scale.

Sensory and Physical Limitations. Certain youth, especially those with sensory processing issues or motor impairments, found VR equipment difficult to tolerate. Reported issues included motion sickness, eye strain, and discomfort with headsets. As one therapist shared, *"One of my students with autism couldn't handle the headset—it was too much sensory input"* [P13]. These limitations required careful screening and sometimes led to dropout from the intervention.

Resistance from Stakeholders. Parental skepticism and educator hesitation also posed significant barriers. Some caregivers expressed concerns about the safety and appropriateness of virtual environments. A participant noted, *"Some parents thought it was just another screen time excuse"* [P22]. Additionally, some therapists were hesitant to adopt new technology, citing unfamiliarity or discomfort with VR tools.

Limited Cultural Relevance. The lack of culturally diverse and inclusive content in VR programs was another

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commonly raised concern. Participants found that certain avatars and scenarios did not reflect the lived experiences of minority youth. One participant observed, *"The kids didn't see anyone who looked like them or talked like them—it created distance rather than connection"* [P08]. This gap limited emotional resonance and reduced the perceived authenticity of scenarios.

Technical Challenges. Operational and software-related issues were frequently reported. These included system crashes, hardware malfunctions, and dependency on high-speed internet. A mental health clinician described, *"It's frustrating when you're in the middle of a breakthrough and the system freezes"* [P04]. These interruptions undermined therapeutic momentum and increased session time.

Ethical and Privacy Concerns. Participants raised concerns about data protection, especially with programs that stored session data in cloud environments. Questions around consent, particularly for minors, were also highlighted. A therapist expressed, *"I'm not sure how much control we have over where the data goes, and that worries me"* [P11]. Ensuring clear, transparent privacy protocols was considered essential.

Lack of Evidence-Based Guidelines. Finally, the absence of standardized protocols and long-term outcome data was seen as a hindrance to broader adoption. Clinicians noted the need for clearer implementation frameworks and validated measures. One participant stated, *"It's hard to justify ongoing use when there's no consensus on what works, how often, and for whom"* [P14]. This gap created uncertainty and limited institutional buy-in.

4. Discussion and Conclusion

The present study explored the barriers and facilitators associated with the implementation of VR-based therapy for emotional regulation in youth with exceptional needs, using a qualitative design. Through thematic analysis of semi-structured interviews with 23 stakeholders—including therapists, educators, caregivers, and developers—two overarching themes emerged: facilitators and barriers. Each theme encompassed multiple subcategories ranging from technological features and institutional support to accessibility and ethical concerns. These findings contribute to the growing body of literature on immersive technologies in therapeutic contexts by providing insight into the lived experiences and perceptions of those directly involved in delivering or supporting VR-based emotional regulation programs.

One of the most prominent facilitators identified in this study was the technological appeal of VR, particularly its immersive, interactive, and gamified nature. Participants described VR as highly engaging for youth with exceptional needs, offering a novel and stimulating alternative to traditional therapy. These observations align with previous research demonstrating the motivational effects of immersive media on therapy adherence and emotional responsiveness {Baker, 2025 #241913;Oliveira, 2021 #241903}. {Estrada, 2018 #241932} found that immersion in emotionally evocative VR environments enhanced emotional learning by enabling realistic simulations of challenging scenarios. Similarly, {LoJacono, 2018 #241933} showed that VR-based experiences facilitated the transfer of learned behaviors to real-world contexts—a finding echoed by our participants who reported observable improvements in children's emotional vocabulary and regulation skills after repeated VR use.

Another key facilitator was the customizability of VR platforms, which allowed therapists to tailor sessions to the sensory preferences, emotional needs, and cognitive capacities of individual youth. This finding supports the work of {Li, 2022 #241919}, who emphasized the potential of personalized interaction design in increasing user satisfaction and engagement in VR environments. Similarly, {Arnfred, 2023 #241906} argued that hardware and software adaptability are critical for making VR interventions accessible to users with differing neurocognitive profiles. Participants in our study praised the flexibility to adjust pace, avatar design, and environmental stimuli, especially for students with sensory processing issues or emotional hypersensitivity.

Therapist control and integration into treatment goals was also highlighted as a facilitator. Participants appreciated the ability to intervene in real time, pause and resume scenarios, and provide targeted feedback. These findings parallel the work of {Boque, 2021 #241929}, who advocated for therapist-guided VR as a core component of rehabilitation design. Moreover, the findings support {Baker, 2025 #241913}, who demonstrated that professional monitoring and assessment during VR sessions increased the accuracy and therapeutic value of interventions for chronic conditions, including emotional distress.

Participants also emphasized the role of supportive institutional environments, particularly administrative buy-in, trained support staff, and alignment with individualized education plans (IEPs). These enablers resonate with {Jaya, 2022 #241904}, who found that teacher preparedness and

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administrative support were key predictors of successful VR integration in educational settings. Similarly, {Nikiema, 2025 #241911} highlighted the importance of institutional infrastructure in facilitating the use of VR for rehabilitation purposes. Our findings reaffirm that VR interventions are most effective when implemented within a system that supports innovation, cross-disciplinary collaboration, and ongoing professional development.

An equally significant finding was the role of caregiver and parent support in sustaining VR-based therapeutic gains. Participants described how parental education and at-home reinforcement of learned strategies enhanced the intervention's continuity and impact. This aligns with {Hemphill, 2021 #241924}, who demonstrated that caregiver involvement augmented the therapeutic benefits of VR-assisted physical therapy. Additionally, {Shiban, 2018 #241910} noted that family engagement was crucial for maintaining exposure gains in VR treatment for phobic disorders in children.

On the other hand, several barriers were identified that complicate the widespread and equitable use of VR therapy. Foremost among them was the issue of accessibility and equity, particularly for rural or under-resourced settings. Participants cited high costs of hardware, lack of internet access, and absence of insurance coverage. These challenges mirror those reported in {Matsangidou, 2025 #241901}, who highlighted systemic inequalities in access to VR technology in dementia care. Similarly, {Sharma, 2024 #241934} argued that responsible digital innovation must account for social inequities and infrastructure gaps, particularly in public sectors such as health and education.

Sensory and physical limitations of users were also frequently mentioned. Children with sensory processing disorders, visual impairments, or motor difficulties experienced challenges in tolerating the equipment or navigating the interface. These concerns echo the work of {Knopf, 2017 #241923}, who examined the mobility behaviors of visually impaired individuals in VR and emphasized the need for multi-modal inputs and accessibility accommodations. Likewise, {Mahsuda, 2023 #241914} called for universal design frameworks to guide the virtualization of social services for neurodiverse populations.

Another critical barrier was resistance from stakeholders, particularly from parents, teachers, or therapists unfamiliar with VR or skeptical of its therapeutic value. This resistance was often tied to a lack of exposure, concerns over screen time, or limited understanding of the evidence base. These observations are consistent with {Smith, 2020 #241907}, who noted that unfamiliarity with immersive technology was a common reason for low adoption rates among clinical staff. Similarly, {Елхова, 2024 #241930} argued that public perception of VR remains shaped by novelty and entertainment rather than its clinical or developmental potential.

The theme of limited cultural relevance also emerged, with participants pointing out the absence of diversity in avatars, languages, and settings. Youth from marginalized backgrounds sometimes struggled to relate to the VR content. This concern has been raised by {Sharma, 2024 #241934}, who emphasized the ethical responsibility of inclusive design in digital tools. Likewise, {Arnfred, 2023 #241906} recommended culturally responsive adaptations of VR modules, especially when used in multicultural therapy settings.

Technical difficulties, such as software bugs, system crashes, and dependency on high-speed internet, were reported across multiple cases and settings. These technical issues often disrupted therapeutic flow and reduced user trust. {Boque, 2021 #241929} similarly identified technological instability as a critical barrier to clinical implementation. Moreover, {Gill, 2019 #241922} emphasized that consistent software performance and support systems are essential for long-term adoption.

Ethical and privacy concerns were raised by participants, particularly related to data storage, informed consent, and the use of cloud-based systems with minors. These align with the warnings from {Mahsuda, 2023 #241914} about privacy and confidentiality risks in the virtualization of social services. {Sharma, 2024 #241934} also pointed out the need for regulatory frameworks in the design and implementation of AI and VR technologies to protect vulnerable users.

Finally, participants highlighted the lack of evidence-based protocols as a major limitation to full-scale adoption. While VR programs are proliferating rapidly, many lack standardized therapeutic frameworks or validated outcome measures. This gap was previously identified by {Matsangidou, 2025 #241901}, who stressed the urgent need for high-quality, replicable studies in the VR therapy space. Similarly, {Smith, 2020 #241907} noted that while VR shows promise, its integration into evidence-based practice requires more robust longitudinal and comparative data.

While this study provides rich insights into the real-world challenges and enablers of VR therapy implementation, it is

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not without limitations. First, the sample was restricted to professionals and caregivers located in Minnesota, potentially limiting the generalizability of findings to other geographical or socio-economic contexts. Second, although efforts were made to recruit a diverse sample of stakeholders, the study may have underrepresented perspectives from marginalized or non-English speaking communities. Third, data collection was based on self-report interviews, which are subject to social desirability and recall biases. Finally, the rapid evolution of VR technology means that perceptions and barriers identified here may shift as newer, more accessible systems become available.

Future research should aim to conduct multi-site, cross-cultural studies to compare the implementation of VR-based therapy across varied educational, clinical, and technological ecosystems. Longitudinal designs tracking changes in emotional regulation outcomes over time would provide stronger evidence for causality and sustainability. It is also important to co-design VR programs with neurodiverse youth and their caregivers to ensure cultural relevance, sensory accessibility, and developmental appropriateness. Future studies might also integrate physiological and behavioral data (e.g., eye tracking, heart rate) to triangulate self-report findings. Finally, researchers should explore the scalability and cost-effectiveness of VR therapy, especially in public health and school systems.

To enhance the adoption and effectiveness of VR-based therapy, stakeholders should invest in training programs that familiarize therapists, educators, and caregivers with the benefits and limitations of the technology. Developers must prioritize customizable, culturally inclusive, and sensory-friendly features to meet the needs of diverse youth populations. Policymakers and administrators should consider funding initiatives and infrastructure upgrades that facilitate equitable access. Ethical guidelines and data governance protocols should be developed and enforced to protect vulnerable users. By fostering cross-sector collaboration and user-centered design, VR-based therapy can evolve from a niche innovation to a sustainable, inclusive intervention for emotional regulation in youth with exceptional needs.

Authors' Contributions

Authors contributed equally to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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