



# Report of the TxABA Public Policy Group Technology Task Force Group

Emerging technologies and ABA service delivery models

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# Introduction

The field of behavior analysis continues to evolve with the introduction of novel technologies that expand service modality options for practitioners (Neely et al., 2023). Traditionally, applied behavior analytic (ABA) services have been delivered through in-person, direct interactions with clients. However, advancements in technology, such as telehealth, augmented reality (AR), and virtual reality (VR) are transforming the way interventions are designed and implemented (Carnett et al., 2022; Neely et al., 2023). These technologies offer innovative solutions to enhance accessibility, personalization, and efficiency in service delivery (Cihak et al., 2016; McMahon et al., 2015a, 2015b; Cheng et al., 2015). The purpose of this document is to provide a review of the scientific research, an overview of the ethical considerations under the State of Texas and the Behavior Analysis Certification Board Ethical Code, and recommendations for providers. This report is intended to serve as a resource to providers of ABA services, consumers of ABA services, and to persons involved in public policy decisions regarding ABA services. It then offers some summary comments and recommendations.

## Telehealth

Telehealth has been used in ABA-based services to conduct assessments, implement interventions, and prepare interventionists, caregivers, and educators in ABA. The TxABA Public Policy Group Telehealth Task Force published a report with information regarding the history, definitions, telehealth models, technology requirements, and session requirements. As such, this report will not focus on further details of the telehealth technologies. For the original report, [please click here](#).

# Review of the Literature

## Augmented Reality (AR)

AR in ABA-based services integrates digital prompts, visuals, or models into real-world settings to facilitate skill development, reduce therapist dependence, and support generalization. A growing body of literature suggests that AR, when paired with behavior analytic strategies, holds promise for targeting adaptive, academic, and social skills. In a comprehensive systematic review, Neely et al. (2023) examined 14 AR-based interventions aimed at supporting behavior change among individuals with developmental disabilities. Three studies stood out as methodologically strong:

Cihak et al. (2016) used AR to help elementary students with autism complete chained tasks, such as multi-step activities. Participants received real-time visual prompts through tablets, significantly increasing independence and task completion accuracy.

McMahon et al. (2015a) used digital navigation aids to improve spatial orientation for adults with intellectual disabilities. The AR overlay reduced reliance on staff prompts and helped users generalize navigation across unfamiliar routes.

McMahon et al. (2015b) applied AR tools to simulate real-life vocational environments for postsecondary students. These simulations allowed users to explore job sites, practice routines, and transition more confidently into employment.

Several studies have also highlighted the flexibility of AR in promoting social communication skills among individuals with developmental disabilities. For example, Perez-Fuster et al. (2022) demonstrated significant gains in joint attention among preschool-aged children by using AR avatars that modeled gaze-following and shared attention behaviors. Similarly, Sun et al. (2024) reported improvements in reciprocal social behaviors and friendship-building skills. Their intervention combined AR-based scenes with reinforcement systems to simulate playground interactions and cooperative play, offering participants realistic and engaging opportunities to practice social exchanges.

In academic contexts, Lee et al. (2024) used AR to deliver interactive math problems embedded in real-world objects (e.g., measuring furniture or counting money at a store). Students not only showed improved accuracy but also increased on-task behavior. Root et al. (2022) evaluated AR-based financial literacy instruction, such as budgeting and paying bills, and found that participants maintained skills weeks after the intervention ended, highlighting

AR's potential in supporting long-term retention when integrated with self-monitoring checklists.



Figure 1. Example of AR technology.

### *Limitations*

Many studies reviewed by Neely et al. (2023) had small sample sizes, lacked control groups, or did not include maintenance and generalization probes. Additionally, practical concerns, such as hardware costs, device tolerance (particularly for learners with sensory sensitivities), and the need for reliable internet and technical support, may hinder wide-scale implementation. Research has also disproportionately focused on relatively high-functioning, verbal individuals, limiting generalizability.

Right now, AR cannot be classified as an evidence-based modality within ABA-based services. However, the available research suggests it is a potentially effective tool for targeted applications, especially when integrated with established behavior analytic strategies and individualized to learner needs.

### **Virtual Reality (VR)**

VR in ABA-based services provides immersive, computer-generated environments where learners can safely practice skills through simulations. These environments often incorporate interactive feedback, motion tracking, and customizable scenarios, allowing for targeted and repeated learning trials. A growing body of literature supports VR as a tool for skill acquisition across vocational, safety, social, and cognitive domains. In a systematic review of 23 studies, Carnett et al. (2022) identified 11 that met quality criteria to be classified as "strong" or "adequate". These studies focused on using VR to teach practical

life skills, promote social functioning, and support behavior regulation. Notably, VR interventions provide controlled yet realistic contexts for teaching high-risk or complex behaviors that are difficult to address through in vivo approaches.

For example, participants can repeatedly practice crossing a street, navigating a workplace, or interacting in social settings with reduced risk and increased instructional control. Driving safety and hazard recognition are among the most well-supported applications. Cox et al. (2017) used a VR driving simulator to assess executive functioning and teach hazard identification. The program included real-time prompts and feedback, resulting in measurable improvements in reaction times and decision-making. Similarly, Wade et al. (2016) found that teens with developmental disabilities significantly increased their hazard detection accuracy following multiple VR driving sessions.

VR has also shown promise for job readiness. Genova et al. (2021) and Smith et al. (2014, 2021a) evaluated VR-based interview simulations for individuals with autism spectrum disorder (ASD). Participants practiced responding to common interview questions and demonstrated improved fluency, nonverbal communication, and reduced anxiety over time. These findings suggest that VR can enhance employment-related soft skills in a way that is both engaging and accessible.

VR may also be used for safety instruction and exposure-based training. Dixon et al. (2020) designed a VR street-crossing task with embedded prompting and fading, helping participants learn when it was safe to cross in various traffic conditions. Participants transferred skills to real-world settings, supporting VR's potential for generalization. Similarly, Meindl et al. (2019) used VR in exposure therapy to gradually desensitize individuals to anxiety-provoking scenarios in a safe and controlled manner.

VR has also been explored for functional and spatial learning. Simões et al. (2018) developed a VR-based navigation tool to support individuals in learning public transit routes, and Wang and Reid (2013) examined perceptual skill development in immersive virtual classrooms, reporting increased task accuracy and reduced error rates.



Figure 2. Example of VR technology.

### *Limitations*

Similar to AR, many VR studies in ABA have small sample sizes, lack control groups, and often do not include long-term follow-up or generalization data. Participants are frequently limited to higher-functioning, verbal individuals, reducing the generalizability of findings. Practical challenges, such as high equipment costs, the need for significant practitioner training, and user tolerance issues (e.g., sensory sensitivity or cybersickness), also mirror those found in AR research.

Although the body of research on VR within behavior analytic interventions is still developing, VR currently has a broader and more established base of empirical support than other emerging modalities, particularly for teaching safety skills. Studies have demonstrated that VR can effectively simulate real-world environments—such as street crossings, driving, and emergency situations—allowing autistic individuals and those with other developmental disabilities to practice high-risk behaviors in a safe, controlled setting. This has led to significant improvements in hazard recognition, decision-making, and skill generalization to natural environments (Carnett et al., 2022; Cox et al., 2017; Dixon et al., 2020).

# **Review of State of Texas Statutes and Rules**

## *General Statutes and Regulations of Human Service Professions in Texas*

During a review of the statutes and rules in Texas, it was found that there are no specific provisions addressing the coverage of virtual reality (VR) or augmented reality (AR) technologies. This absence of regulation means that the use of VR and AR in clinical applications, including Applied Behavior Analysis (ABA), remains unaddressed by current Texas laws. Consequently, any implementation of these technologies would need to be carefully considered, particularly regarding their experimental status and the necessity for appropriate consents and notifications. Additionally, Licensed Behavior Analysts (LBAs) are required to comply with the Behavior Analyst Certification Board (BACB) Ethics Code, which includes considerations for the use of emerging technologies. The Texas Department of Licensing and Regulation (TDLR) may also issue guidance in the future on the use of artificial intelligence (AI), which could potentially extend to VR and AR technologies. Practitioners should stay informed of any updates and exercise clinical judgment aligned with ethical and regulatory standards.

However, there is a Category III Temporary Current Procedural Terminology (CPT) code that describes the integration of VR technology in ABA therapy. Category III CPT codes are assigned by the American Medical Association (AMA) CPT Editorial Panel to track emerging technologies, services, and procedures that require further study. To transition a Category III code to permanent Category I status, there must be sufficient clinical evidence and peer-reviewed research.

The CPT 0770T code can be used when VR technology is integral to the session, meaning it is a central component actively contributing to the therapeutic goals. The use of VR should be clearly documented in the client's treatment plan, indicating how it aids in achieving specific behavioral objectives. Exclusions to this code include the use of VR as a supplementary tool rather than a primary therapeutic modality, and the use VR for entertainment or leisure during therapy sessions.

CPT 0770T is a practice expense-only code, which reimburses for the cost of the VR technology but not the provider's time or clinical service. It must be billed in conjunction with a primary therapeutic service, as it cannot be used on its own. The CPT codes that can be used in conjunction with 0770T include:

Code Name	Code Number
Adaptive Behavior Treatment by Protocol	97153
Group Adaptive Behavior Treatment by Protocol	97154
Adaptive Behavior Treatment with Protocol Modification	97155
Group Adaptive Behavior Treatment with Protocol Modification	97158

Because this code is a Category III temporary code, some funders may accept this code for reimbursement while others may not. Therefore, it is crucial to consult with the funders directly to determine if this code will be reimbursed and to ensure that it is explicitly included in the ABA provider's contracted fee schedule to support reimbursement.

## Ethical Considerations

Before considering the use of AR/VR technologies, it is essential that BCBAs ground their decision-making in the foundational principles of ethical practice. Two core principles from the BACB Ethics Code for Behavior Analysts (2020) are especially relevant to the integration of emerging technologies into clinical work.

Core Principle 3: Behave with Integrity, emphasizes the importance of BCBAs being knowledgeable about, and upholding, all applicable BACB and regulatory requirements. This includes ensuring that the use of novel technologies such as AR and VR aligns with professional and legal standards.

Core Principle 4: Ensure their Competence, highlights the responsibility of BCBAs to remain current in their field and actively work to increase their knowledge and skills. This includes staying informed about best practices, advances in technology, and the scientific support behind intervention methods.

AR and VR technologies introduce additional ethical considerations beyond traditional in-person interventions, requiring careful evaluation of their appropriateness for each client. Below is a table that outlines some of the relevant BCBA Ethical Codes (BACB, 2020), and their application to the use of AR/VR as part of treatment.

BACB Ethics Code	Relevance to AR/VR Use
<b>1.01</b> Relying on Scientific Knowledge	BCBAs must use AR/VR only when supported by empirical evidence. Novelty alone does not justify implementation.
<b>2.06</b> Maintaining Confidentiality	AR/VR platforms often collect or store sensitive data; strict data security and HIPAA compliance are essential.
<b>2.09</b> Treatment/ Intervention Efficacy	Practitioners must use AR/VR only if it is likely to be effective based on current research and individualized client needs.
<b>2.11</b> Documenting Professional Work	Use of AR/VR should be clearly documented in treatment plans, including its purpose and how it supports behavior goals.
<b>3.01</b> Responsibility for Supervision	If AR/VR is used by caregivers or paraprofessionals, BCBAs are responsible for training and supervising its proper use.
<b>4.02</b> Involving Clients in Planning and Consent	Clients and caregivers must be fully informed about AR/VR use, including benefits, risks (e.g., cybersickness), and alternatives.

<b>4.07</b> Environmental Conditions That Interfere with Implementation	BCBAs must evaluate whether clients can access or tolerate AR/VR equipment before use.
<b>5.03</b> Protecting Confidential Information	Use of third-party AR/VR platforms requires assurance of privacy and security, especially in telehealth or remote settings.
<b>5.06</b> Avoiding False or Deceptive Statements	BCBAs must accurately represent the capabilities and limitations of AR/VR technologies when discussing treatment options.
<b>6.01</b> Affirming Principles	Use of AR/VR must uphold the dignity and welfare of clients, avoiding reliance on technology that could hinder social engagement or progress.

BCBAs must determine whether these technologies can be ethically and effectively implemented (Code 2.09, Treatment/Intervention Efficacy), particularly for clients who may require more direct, in-person support than technology can accommodate. If caregivers or support staff are unable to facilitate the appropriate use of AR/VR, alternative interventions should be considered in alignment with Code 4.07, Environmental Conditions that Interfere with Implementation.

Confidentiality and data security are also critical concerns. AR/VR technologies introduce the risk of data breaches and unauthorized access to sensitive client information. To reduce these risks, BCBAs should only use HIPAA-compliant AR/VR software from companies willing to establish a Business Associate Agreement (BAA) (Code 2.06, Maintaining Confidentiality). They must also implement strict protocols to prevent unauthorized individuals from accessing client data or treatment sessions, as emphasized in Code 2.09, Protecting Confidential Information.

Finally, informed consent remains a fundamental ethical obligation (Code 4.02, Involving Clients in Planning and Consent). Clients and caregivers must fully understand the benefits, risks, and limitations of AR/VR interventions, including potential side effects such as cybersickness or sensory overstimulation. Transparent communication and ongoing monitoring of client response are essential to ensuring ethical and effective treatment. By addressing these considerations, BCBAs can integrate AR/VR technologies responsibly while maintaining the highest ethical and professional standards.

## Considerations & Recommendations

When considering the integration of AR and VR into behavior analytic practice, BCBAs must evaluate several key factors based on recent research (Simões et al., 2018; Rios et al., 2020; Dechsling et al., 2021; Neely et al., 2023; Carnett et al., 2022). First, the initial and ongoing costs of AR/VR technologies are significant considerations, as these can vary widely depending on the choice of hardware (e.g., head-mounted displays, tablets) and the complexity of software development. Additionally, the costs may extend to training practitioners and acquiring specialized equipment necessary for immersive VR setups. Beyond the financial aspects, the feasibility and accessibility of AR/VR-mediated interventions also play a critical role. These technologies often require wearable devices that may not be suitable for learners with sensitivities to such equipment. Furthermore, VR-mediated interventions have typically been tested with less impacted individuals, excluding those with significant cognitive or sensory impairments. Use of VR-mediated interventions for individuals severely impacted by sensory or cognitive disabilities may not be warranted.

In terms of implementation and practical application, effective deployment of AR in behavior analytic interventions demands substantial training for both practitioners and participants (Neely et al., 2023). While AR and VR have shown promise in skill acquisition areas—such as teaching social skills, daily living tasks, job interview skills, and safety behaviors—the suitability and efficacy for behavior reduction or assessment are less supported by current literature (Carnett et al., 2022). This necessitates a careful cost-benefit analysis before adopting AR/VR in practice. Additionally, BCBAs should be aware of the quality of evidence and the existing research gaps. In particular, many studies on AR/VR-mediated interventions do not meet rigorous quality criteria, highlighting the need for further research to establish these technologies as evidence-based modalities. Technology limitations, such as the need for specific environmental setups or marker-based tracking, can also restrict the usability of AR in diverse settings. Similarly, VR interventions often require substantial computational power, motion tracking, and real-time feedback mechanisms, which may pose technical barriers. Lastly, while these technologies can enhance motivation and engagement through interactive and immersive learning experiences, it is crucial to ensure that the AR/VR elements do not overshadow the instructional goals.

Overall, prior to using AR/VR mediated interventions, practitioners might consider lower-tech solutions. For instance, Chen et al. (2015) utilized AR for response prompting to teach emotional matching in social situations. However, its necessity is uncertain, as similar outcomes might have been achievable with lower-tech alternatives (e.g., flashcards), or the effectiveness could have been driven by the therapists' error correction procedures rather than the AR

component itself. Similarly, while VR is useful for simulating real-life experiences (e.g., job interviews, driving skills), practitioners should assess whether the same skills could be taught using less expensive, traditional behavior analytic methods.

### **Overall Recommendations**

1. BCBAs should critically assess the research supporting AR/VR interventions before incorporating them into treatment plans. Rely on evidence-based practices and avoid using technology solely for its novelty.
2. Use only HIPAA-compliant AR/VR software from companies willing to establish a Business Associate Agreement (BAA). Implement strict protocols to prevent unauthorized access to client data and treatment sessions.
3. Obtain informed consent from clients and caregivers, ensuring they understand the benefits, risks, and limitations of AR/VR interventions. Discuss potential side effects such as cybersickness or sensory overstimulation.
4. Provide substantial training for both practitioners and participants to ensure effective deployment of AR/VR in behavior analytic interventions. Continuous monitoring and data collection should be used to assess effectiveness.
5. Evaluate the client's access to necessary technology, the cost of implementation, and the ability to use AR/VR effectively in natural settings. If barriers exist, prioritize alternative evidence-based interventions.
6. Use AR/VR to enhance, not replace, individualized, direct behavioral interventions. Ensure that its use aligns with behavior-analytic principles and does not compromise client progress or reduce meaningful social interaction opportunities.
7. Regularly review and reflect on the ethical implications of using AR/VR technologies in practice. Stay informed about the latest research and best practices to maintain high ethical and professional standards.
8. Consider lower-tech solutions before adopting AR/VR interventions. Assess whether similar outcomes could be achieved with less expensive, traditional behavior analytic methods.

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