

Integration of Gamification for Individuals on the Autism Spectrum - A Review of Literature

Arv Jakhodia^{1*}

ABSTRACT

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition marked by persistent challenges in communication, social interaction, and behavior regulation. Traditional therapeutic models often fall short in addressing the diverse needs of autistic individuals, prompting exploration of alternative approaches. Gamification—the integration of game design elements into non-game settings—has emerged as a promising method to engage individuals with ASD in therapeutic and educational contexts. This systematic review synthesizes findings from five empirical studies using gamified interventions designed to improve communication, engagement, and social interaction among children and adolescents with ASD. The interventions evaluated include tablet-based language tools, augmented reality applications, and collaborative virtual environments. Across these studies, gamified designs were associated with increased task motivation, symbolic understanding, verbal expression, and collaborative behavior. While outcomes were broadly positive, methodological limitations remain. Small sample sizes, short intervention durations, and varied outcome metrics limit generalizability. Furthermore, longitudinal data is lacking, and few studies address real-world implementation challenges. This review highlights gamification as a powerful tool for autism intervention when grounded in visual structure, adaptive feedback, and user-centered design. Further research is needed to standardize evaluation methods, expand accessibility, and support long-term application.

Keywords: *Autism Spectrum Disorder, gamification, augmented reality, collaborative virtual environments, educational technology, communication*

Autism Spectrum Disorder (ASD) is a lifelong, severe neurodevelopmental disorder that affects communication, social interaction, and behaviour patterning. Such difficulties frequently occur in early stages of development and last over the course of a lifetime, impacting different areas of life such as education, social participation, and independence. The spectrum character of ASD incorporates a wide range of levels of symptom severity and functional ability - from non-verbal individuals with accompanying intellectual disability to the individuals with impressive cognitive skills, but with social communication problems (Cabielles-Hernández et al., 2017). Although early intervention and structured behavioral therapies are effective at improving long-term prospects, there is an increasing awareness that cookie-cutter interventions may be inadequate to meet the

¹The Shri Ram School Aravali, Gurgaon, India

*Corresponding Author

Received: June 22, 2025; Revision Received: July 08, 2025; Accepted: July 12, 2025

Integration of Gamification for Individuals on the Autism Spectrum - A Review of Literature

wide-ranging levels of sensory preferences, attention patterns, and learning differences among autistic individuals (Mota et al., 2021a).

Educational technologies targeted at neurodiverse people have in the last decade paved the way to the development of gamified interventions—tools that incorporate game-like mechanics (e.g., points, progress monitoring, avatars, stories, and immediate feedback) within educational or therapeutic frameworks. Gamification has been especially beneficial in engaging individuals with ASD, who usually have a strong preference for structured environments, visual inputs, and repetitive learning contexts (Wang et al., 2018). Unlike traditional didactic-implants, gamified tools can adjust to the learners' rhythm, provide continuous feedback and minimize sensory overstimulation in predictable and interactive displays. This concordance with behavioral and cognitive profiles characteristic of autism makes gamification a compelling area for therapeutic research, especially when integrated into virtual, augmented or tablet environments (Zhang et al., 2018; Mota et al., 2021b).

Gamified tools have been employed in educational contexts to stimulate functional language use, joint attention, and social skills. For example, tablet applications (e.g., “Chain of Words”) have been shown to be effective for children with ASD to compose grammatically correct sentences using visual-symbolic representations (Cabiellas-Hernández et al., 2017). Also, systems such as CoMove and iSocial provide environments where children can interact with peers or avatars in safe and controlled virtual worlds that simulating real-life social context with no physical harm, and therefore triggering verbal initiations and reciprocal communication, as well as turn-taking (Zhang et al., 2018; Wang et al., 2018). Augmented reality applications, as is the case of AssociAR, have also demonstrated to effectively support children learning through the manipulation of virtual objects on the physical space, increasing engagement and multimodal sensory processing (Mota et al., 2021b).

However, some previous findings show positive results, and the evaluation of the overall effectiveness and limitations of gamified interventions for people with ASD need to be assessed through an overview of systematic reviews. The majority of research in this area is of small scale, of mixed design, and uses diverse outcome measures making it challenging to generalize from the findings. Moreover, with the rising adoption of gamification in the clinical environment and home setting, knowledge on the factors that contribute to its effectiveness (e.g., personalized, collaborative model, and technical access) is incredibly important for its future expansion and acceptance by caregivers, educators, and therapists (Cabiellas-Hernández et al., 2017; Mota et al., 2021a).

The current systematic review attempts to fill such gaps, by synthesizing and appraising the available evidence from peer-reviewed studies on using gamified interventions for individuals with ASD in recent years. By highlighting common design principles, intervention methods, and outcomes, this review aims to inform the emerging field of neurodiversity-informed technology, and proposes actionable findings for future research, practice, and policy in autism education and therapy.

Over the past decade, gamification has become incremented by new technologies such as augmented reality (AR), virtual reality (VR), mobile health apps, and neurofeedback interfaces in autism treatment. They provide an immersive, interactive and adaptive experience, which is in line with the structured, multisensory preferences often seen in autistic learning. For example, virtual reality (VR)-based platforms have demonstrated

potential to enhance social cognition and emotion recognition by replicating everyday social interactions in a low-threat digital environment (Ke et al., 2022; Kandalaf et al., 2013). Furthermore, immersive VR training environments can be adjusted to specific needs and level of anxiety, thus facilitating a gradual process of social desensitization and rehearsal (Herrero & Lorenzo, 2020). Mobile AR-embedded tools (e.g., Eggly) also present successful governance of attention through a feedback loop, adjusting the visual display and the resulting experience based on the user's online brain activities (Lyu et al., 2025). Other tools, such as CoVoL, aid vocabulary learning through collaboration while maintaining interaction among peers and developing children with ASD text and language skills (Chodkiewicz et al., 2025). In addition, many of these tools include machine learning or adaptive feedback, resulting in more personalized interventions over time. These studies are beyond the common inclusion criteria of this review but reflect the emerging trend in the direction of multisensorial, gamified, and neuroadaptive platforms, which can reshape the modality of delivery of ASD interventions over the next decade (Destreza et al., 2021; Bauer et al., 2021; Denizli-gulboy & Genc-tosun, 2021).

Research Objective

The primary aims of this systematic review are to conduct a critical review and synthesis of published empirical literature concerning the use of gamified interventions to aid individuals with ASD. More specifically, this review seeks to discover the ways in which digital interventions that are designed with game elements (e.g., point system, interactive feedback, virtual environment, augmented learning context) affect how those on the autism spectrum (children and adolescents) can benefit in the areas of communication, social interaction, motivation, and cognitive engagement. In this regard, among the works that have been studied to include gamification within the context under study are Cabiellas-Hernández et al. (2017), Zhang et al. (2018) and Wang et al. (2018), to review the effectiveness of different gamification platforms and technologies, such as tablet-based educational applications, collaborative virtual environments and augmented reality interfaces (Mota et al., 2021b).

This review is also motivated by the goal to explore potentially shared or disparate features of intervention design, population and location of implementation. Through searching for and browsing extracted contents and categorizing ones that relate to game mechanics, interaction approach, user customizability, and evaluation measures, the study is aimed at identifying key factors that are consistently related to effective results. Considering a growing dependence on technology in educational and therapeutic scenarios, particularly after the COVID-19 health crisis and the spread of distance education, it is critical to verify the scalability and generalizability of these gamified tools (Mota et al., 2021a).

This review also aims to highlight discrepancies in available evidence, as related to sample heterogeneity, methodological uniformity, and long-term outcome assessment. In that regard, the review contributes to the emergence of a more consistent approach that could be adopted to assess gamified interventions for people with ASD, and suggests areas for further study. These are programmed efforts to produce new knowledge on the evidence for gamification using scientifically-motivated interventions such as for autism, which incorporate age appropriate, engaging, and learner centered stimuli (Wang et al., 2018; Cabiellas-Hernández et al., 2017).

METHODOLOGY

The establishment of the present systematic review observed the PRISMA 2020 (Preferred Reporting Items for Systematic reviews and Meta-Analyses) guidelines to assure

Integration of Gamification for Individuals on the Autism Spectrum - A Review of Literature

transparency, reproducibility, and rigorous methodological conduct for identifying, selecting, and synthesizing studies (Page et al., 2021a; Page et al., 2021b). We considered exclusively peer-reviewed empirical studies, which utilized gamified and/or games-based interventions aimed at improving social, communicative, or cognitive abilities, in participants with Autism Spectrum Disorder (ASD). Only the articles written in English were considered that were published in scholarly journals or IEEE/ACM conference proceedings. The study population were children or adolescents with a well-established diagnosis of ASD according to DSM-5 criteria or equivalent clinical instruments.

Search strategy A focused search strategy was applied to find five appropriate studies from indexed research repositories. The studies that met the inclusion criteria were circulated in full-text form for manual screening. Eligible to be included in the meta-analysis were studies that: (1) involved an intervention containing at least one gamified tool (e.g., rewards, progression system, interactivity, collaboration, augmented reality, or avatars); (2) included empirical results (e.g., quantitative, qualitative or mixed methods outcomes) of the study's participants, and finally (3) focused on children, adolescents and/or adults diagnosed with ASD participants' group solely or predominantly. Exclusionary criteria for studies were if they were theoretical or review articles, did not report outcomes from a gamified intervention, or the population was non-ASD.

The structured abstraction form was utilized to perform detailed data extraction for all included articles. For each study, data was collected about: publication date, source country, characteristics of the sample (age, sex, educational level, occupational or condition status), the type and duration of the intervention, technological platform (tablet, AR, CVLE), game mechanics, outcomes related to behavior change or communication that were measured, evaluation method, and the main findings. Because of the heterogeneity of study designs, intervention types and outcome measures, no meta-analysis was performed. Instead, a narrative synthesis was performed to identify primary themes, converge and diverge patterns, and implications for future research and clinical practice.

Since the small number and the heterogeneous nature of studies did not allow for a formal risk of bias tool (e.g., ROBINS-I, Cochrane RoB 2), methodological quality was assessed with a critical eye on methodological transparency, clarity of the intervention, and applicability and strength of the outcome measurement. Reported limitations from the study authors were also documented and considered in interpreting the findings. Due to the fact that only a predefined pool of articles was available, the screening could not be performed in multiple rounds of reviewer screening.

Gray literature, dissertations, and preprints are excluded from this review. The five reviewed studies are comprised of publications in the years 2017-2021, consisting of interventions that were developed in diverse cultural and technological environments. All interventions were delivered in controlled or semi-controlled environments (e.g., clinical rooms, classrooms or laboratory simulations) which allowed the monitoring of behaviors and the recording of outcomes in a consistent manner.

RESULT AND DISCUSSION

This systematic review collated evidence from five published studies about gamified interventions aimed at people with autism spectrum disorder (ASD). In the included studies, many of the participants were children and adolescents aged approximately 5–18 years who had a diagnosed ASD derived from either clinical diagnosis or educational evaluations. All

Integration of Gamification for Individuals on the Autism Spectrum - A Review of Literature

of the studies included interventions designed to target one or more domains that are generally impaired in autism—social interaction, communication, behavioral engagement, or cognitive or linguistic development. A summary of the included studies is presented in Table 1.

The techniques used in the sampled studies were diverse in nature and were delivered online through distinct technological methods. These range from mobile (Mota et al., 2021b), augmented reality (Mota et al., 2021a), collaborative virtual environments (Zhang et al., 2018; Wang et al., 2018) to tablet-based sentence building tools (Cabielles-Hernández et al., 2017). Despite differences in design, the focus of all studies was user-driven development, graphical structuring, immediate/real-time feedback and personalization traits—for instance, particularly beneficial for neurodiversity learners with ASD, often have trouble completing unstructured social or verbal tasks (Cabielles-Hernández et al., 2017; Wang et al., 2018).

In all 5 studies, interventions were administered in structured environments (e.g., therapy centers/special education classrooms/simulated computer laboratories). This assured homogeneity of behavioral observation and reduced environmental interferences that may interfere with task adherence. Sample sizes were diverse and generally small (ranging from 5 to 30 participants per study), with studies using quantitative or mixed methods designs to measure the effectiveness of interventions, some including pre/post and/or task tracking data in real time (Mota et al., 2021a; Zhang et al., 2018).

Table 1 – Summary of the studies

Study	Citation	Methodology (Sample Size)	Duration	Intervention	Key Findings
Chain of Words	Cabielles-Hernández et al. (2017)	Quasi-experimental; N = 15 children with ASD	3 weeks (10 sessions)	Tablet-based app for sentence construction using pictograms and structured feedback	Improved sentence formation and vocabulary; sustained engagement through visual prompts
iSocial	Wang et al. (2018)	Mixed methods; N = 12 autistic youth	5 weeks (10 sessions, 2 per week)	3D CVLE using avatars to simulate social scenarios and enhance peer interaction	Increased embodied social presence (ESP); improved verbal initiation and cooperative behavior
CoMove	Zhang et al. (2018)	Experimental design; N = 10 children with ASD	4 weeks (8 sessions)	CVLE for puzzle-based collaborative gameplay focused on turn-taking and coordination	Greater frequency of joint attention, turn-taking, and sequential verbal exchange

Integration of Gamification for Individuals on the Autism Spectrum - A Review of Literature

Study	Citation	Methodology (Sample Size)	Duration	Intervention	Key Findings
AssociAR (Design Phase)	Mota et al. (2021a)	Usability and pilot evaluation; N = 20	2 weeks (5 exploratory sessions)	AR app with marker-based image-word pairing; gamified matching exercises	Demonstrated high usability and preference for AR; improved matching performance and attention
AssociAR (Implementation Phase)	Mota et al. (2021b)	Intervention + tracking; N = 28 children with ASD	4 weeks	AR + behavioral tracking to monitor regulation and task success rates	Decreased behavioral resistance; increased task persistence and performance accuracy

Gamification Platforms and Intervention Types

The diversity in technological approach across the interventions was striking, but a few clear typologies were evident in how gamification was utilised to assist autistic people.

The first category were learning tools on tablet, where the “Chain of Words” app (Cabielles-Hernández et al., 2017) was the most used. This tool was developed to help children with autism to learn how to construct full, correct sentences by using pictograms and visual symbols to support the elements of a sentence, while building meaning from the contextual clues. Based on the IDEA (Inventory Développementale d’Evaluation d’Autisme) framework, the system provided structured levels, reinforcement for correct use, and increasing challenge over time to keep learners interested. What made it successful was how it effectively married the fluency of visual communication with progressive skill-building, rewarding learners with gamified feedback (like points, levels and visual encouragement) to reinforce word acquisition and grammatical fluency.

The second category was represented by augmented reality (AR) applications; in particular, AssociAR enabled children to manipulate digital content related to real objects (on a tablet interface), employing a marker-based AR system (Mota et al., 2021b). This strategy focused on tactile and visual associative learning accompanied by gamified features, that is, matching tasks, object manipulation and visual feedback. The games’ mechanics of the app were meticulously designed to prevent overexcitation while promoting maximum motivation, thus favoring visual tracking, semantic associations, and elaboration through symbolic representation—three elements of difficulty in the case of ASD (Mota et al., 2021a).

The third type included 3D-CVLEs (e.g., CoMove and iSocial) that were used to create digital common spaces where peers could interact (Zhang et al., 2018; Wang et al., 2018). These applications worked by having user-controlled avatars that were able to collaboratively perform joint tasks (for example, block manipulation, puzzle solving or shared exploration). Gamification features comprised immediate task feedback, rounds in a game-play style, and communicative encouragement. These interventions sought to generate “safe” spaces of social rehearsal in which learners could rehearse speech, gesture-based

signaling, and social coordination in low-stakes settings. In the iSocial, for example, the concept of ESP was a key in assessing the level of user's engagement and peer coherence gape during the shared activities (Wang et al., 2018).

The third category (which is independent but complementary) covered gamified behavior monitoring systems embedded in the form of mobile apps promoting physical activity and anxiety reduction in children with ASD. These systems included targets, motivational challenges, and social comparison tools intended on enhancing user compliance and regulation of emotions in time (Mota et al., 2021b). These interventions were very dependent on behavioral data and reward loops in order to keep members engaged and endorsing healthier daily activities.

Design Elements and Theoretical Foundations of Gamification

Focusing our attention on process-level mechanisms underlying the interventions we looked at, several key concepts of gamification theory were found to be addressed. In all of the studies, the video game elements did more than provide cosmetic appeal; they served as behavioral scaffolding to prop up attention, task persistence, and social-emotional development. This is consistent with Self Determination Theory (SDT), which suggests that intrinsic motivation thrives when a person experiences autonomy, competence, and relatedness. The later two have particular salience to learners with ASD, who may struggle with motivational regulation and do well with systems that have clear goals, systems that provide frequent feedback, and control over pacing (Zhang et al., 2018, Wang et al., 2018).

For instance, in the CoMove and iSocial environments the use of avatars enabled participants to practice cooperative activities within a virtual social scenario, in which relatedness and collaborative efficacy were promoted, but fear of being evaluated negatively by others was lessened. Imagery of task progress and proper turn-taking were cues of visual progress and successful turn-taking that strengthened the sense of competence and helped emotion regulation and behavioural planning (Zhang et al., 2018). Also, the Chain of Words tablet app implemented graduated levels and positive reinforcement strategies—such as animated rewards and congratulatory feedbacks—to help the users to grow from simple to highly complex sentences. These affordances are based on the “competence loop” present in the literature about gamification, where motivation and skill acquisition are promoted through match of challenge and skill (Cabielles-Hernández et al., 2017).

The use of AR by the AssociAR platform not only took advantage of multisensory interactions but it was also oriented to a predictable interaction pattern, a characteristic often deemed as preferential in learning of individuals with ASD. In this sense, gamification was being used as a cognitive organizer; a tool through which learners were able to attach newly acquired vocabulary to objects by means of spatial and visual (visual/spatial) pairing. The fact that participants could interact with the AR elements by hand gestures as well as with styluses enriched embodied cognition—the most fundamental aspect for language acquisition, especially in non-verbal or in low-verbal children (Mota et al., 2021b).

Gamification and Engagement in ASD Populations

A consistent pattern of results across all five studies was the durability of user involvement relative to baseline behavior persistence or control (non-gamified) conditions. Engagement was also assessed in multiple forms, including time-on-task, number of tasks completed, frequency of verbal initiation, and therapist report. More generally, gamified interventions had better results in comparison to formal ones for the attention of children with attentional

Integration of Gamification for Individuals on the Autism Spectrum - A Review of Literature

executive functioning difficulties, and sensory attractions (Cabielles-Hernández et al., 2017; Mota et al., 2021a). As an illustration, the usage of the AssociAR app led to a greater completion and less frustration even in children with high level of behavioural dysregulation, suggesting that the immersive setting might help for the perspective of reducing the aversion for task in ASD settings (Mota et al., 2021b).

From a neuro-cognitive perspective gamification draws on the brain's reward system, especially dopaminergic feedback loops, to promote repetition and mastery. This is particularly useful in ASD training where training can be boring if the person needs to be repeatedly exposed to the task to move the skill into procedural memory. Game-based interventions such as those that provide direct visual or auditory feedback turn repetition into an exciting loop as opposed to a tiresome chore (Zhang et al., 2018). In addition, a number of interventions permitted adaptive advancement, providing the user with some control over pacing that users with attentional problems or variable cognitive endurance may find particularly beneficial.

Beyond Motivation: Social and Communication Outcomes

Gamified interventions not only improved engagement, but also yielded quantifiable benefits in the domain of communication and social interaction. These benefits were particularly evident in interventions featuring collaborative or dialogic tasks. For instance, the iSocial had observed the gain in embodied social presence (ESP) where participants speak and mimic peers more synchronously for the iSocial program after exposed several times in the platform (Wang et al., 2018). This is an exciting result because it is challenging for individuals with ASD to learn social skills and they need frequent, low stress opportunities to practice it.

In CoMove, users got better not just in coordinating their tasks one with another, but also in their sequential communication, which is an important development to reaching at pragmatic language. During the game, verbal prompts were delivered to support sharing and explanation of intention in a format that replicates the structure of natural dialogue but in a controlled, visually scaffolded context (Zhang et al., 2018). The visual logic of the game world enabled users to anticipate consequences, thus supporting causal understanding and reducing anxiety.

Finally, interventions such as Chain of Words facilitated symbolic understanding and syntax skills (in particular for emergent users). These procedures consisted of guiding children with pictures to form words and simple sentences and of using games to strengthen the semantic relations between symbols (images) and sounds (Cabielles-Hernández et al., 2017). This type of repeated symbolic play can be hard to maintain in traditional therapy settings, but when gamified it becomes more feasible as play becomes more playful and choice-interactive.

Cross-Study Comparison and Convergence of Evidence

Despite using different methods, settings and age ranges, the reviewed studies yielded a convergence of results which enable us to arrive at some high level conclusions. Gamified settings are maximally beneficial if they are multi-sensory, visually organized, and responsive to student preferences. Feedback received from others, particularly nonpunitive, supportive mechanisms, is important in enhancing task persistence and in encouraging users to self-correct. Third, collaborative and co-regulatory interventions (even if the collaboration

is in simulated or avatar-mediated forms) have greater potential to transfer to real-life social behaviors.

In addition, all studies cited high user acceptability, which may indicate that gamified tools are less stigmatizing or frightening compared to more medical interventions. This may lead to increased retention and engagement, especially among those users who may have had negative experiences with were formal treatment in the past (Mota et al., 2021b; Wang et al., 2018). Perhaps more broadly, there appears to be a cultural and emotional benefit of gamification, which transcends the domain of task performance.

Patterns in Study Findings and Thematic Trends

There are a number of common issues that resurface across studies regarding the development, intervention and outcomes of gamified technology for individuals with ASD. A dominant trend among all interventions is the implementation of visual structuring to facilitate comprehension and prevent cognitive overload. Be it static pictogram support on sentence construction tools (Cabielles-Hernández et al., 2017), dynamic object tracking within augmented reality interfaces (Mota et al., 2021a), or avatar-assisted interaction within 3D environments (Wang et al., 2018), all papers shared the importance of distinct visual cues to scaffold user engagement and learning.

Another trend that we consistently found is the importance of adaptive feedback in sustaining the users' motivation, and directing and supporting their task execution. Interventions utilized different types of feedback (e.g., visual feedback, scoring systems, progress bars, corrective feedback) to support desired learning and give users a sense of accomplishment. Specifically: a Mobile app called “Chain of Words” offered immediate feedback to create sentences that were grammatically correct to revise and try again without punitive responses (Cabielles-Hernández et al., 2017). Also, AssociAR involved interactive color-based hints upon successful picture-word association, as part of a reinforcement of associative learning (Mota et al., 2021b).

The inclusion of cooperative gameplay is a third major aspect. Although it was not a common characteristic of all interventions, cooperative tasks were fundamental to the operation of CoMove and iSocial environments. Such CVLEs involved users collaborating with peers either in humanoid or avatar forms to complete logical puzzles and achieving co-goals (Zhang et al., 2018; Wang et al., 2018). The tasks were created to encourage important social skills such as turn-taking, verbal prompting, gestural communication and joint problem-solving — all within a carefully controlled virtual environment that minimised the social unpredictability of the real world.

Finally, the majority of studies reported to be oriented at being able to be customized and personalized, and to have the possibility that caregivers or therapists are able to adapt the difficulty level, pacing, and content to the user's developmental phase or behavioral profile. This adaptability was especially highlighted in the development of AssociAR and the mobile and tablet applications, which could be personalized to the learner's vocabulary or sensory needs (Mota et al., 2021b; Cabielles-Hernández et al., 2017).

Effectiveness of Gamified Interventions

In the reviewed studies overall positive results are reported in critical areas of development and behaviour implicated in ASD. Notably, all gamified interventions proved to be effective in enhancing engagement and attention span for task-based learning. Those children who

Integration of Gamification for Individuals on the Autism Spectrum - A Review of Literature

used Chain of Words made progress with sentence formation in the subsequent sessions, as evidenced by increases in their baseline vocabulary learning (Cabielles-Hernández, Raggi C., and Romero N., 2017). Likewise, in the work of Mota et al. (2021b) participants who engaged in AssociAR-based interventions effectively increased scores for object-word association tasks and the probability to do it independently, when comparing baseline with interventions.

Social interaction effects were also interesting. Significant improvements of embodied social presence (ESP) in iSocial: a measure of the extent to which participants synchronized verbal and nonverbal behavior with peers in the virtual environment (Wang et al., 2018). These findings indicate that, even within an artificial environment, gamified simulations can offer useful opportunities for practicing communication. In CoMove, Collaborative Game task involves more joint attention and verbal initiation since participants need to synchronize their action to accomplish common tasks (Zhang et al., 2018).

Another sphere of effectiveness was self-regulation and behaviour acceptance. In the case of gamified behavioral monitoring apps, users' adherence to physical activity goals was found to increase and, for some apps, the anxiety scores significantly reduced with time (Mota et al., 2021b). Although they did not have long-term follow-up, these studies suggest that gamified self-monitoring tools can be viable adjuncts to standard behavioral interventions.

Limitations of the Current Literature

Notwithstanding the positive results, there are limitations in the current literature for the gamified interventions for ASD. Notably, the limited sample size of each study is a major limitation and may affect statistical power and applicability of the findings. For the most part, studies included small groups of under 30 participants and many used convenience samples from specialized educational centers, or clinical settings (Zhang et al., 2018; Mota et al., 2021a). This may raise concerns as to how such interventions would fare in a broader community or populations that have comorbid intellectual disabilities or limited verbal skills.

Another limitation is that interventions are usually short-term. Although the number of days or weeks all the studies were held, there has been little expert questioning if beneficial effects were still evident at follow-up (Cabielles-Hernández et al., 2017; Wang et al., 2018). The lack of longitudinal data is doubly problematic for a developmental disorder such as ASD, as it is crucial to examine the transfer and maintenance of trained skills.

Furthermore, there was no standardized outcome measurement among studies. For some, they employed a structured inventory, such as the IDEA framework (Cabielles-Hernández et al., 2017) or a quantitative engagement metric (Wang et al., 2018) while for others, they used observation checklists or ad hoc performance diaries. This variation is problematic for cross-study analysis, and emphasizes the importance of our field creating more standardized tools for assessing the behavioral and communicative development of children.

Last but not least, despite many of the examined works focused on the portability and flexibility of gamified platforms, only a few discussed the real-world potential of scaling such technology beyond research environments. Matters such as device compatibility, training of caregivers, and cost-effectiveness received little attention, despite being crucial for clinical or educational application of the results (Mota et al., 2021a).

Future Directions

In order to overcome these limitations and advance the burgeoning area of gamified interventions in autism therapy and education, several important lines of future inquiry can be highlighted. There is, firstly, the urgent requirement for larger sample studies with more heterogeneous participant groups in age, language proficiency, comorbidities, and socioeconomic status. This diversity will enable us to assess the generalizability and fairness of gamified tools throughout the autism spectrum.

Secondly, the role of longitudinal designs that investigate durability of intervention effects and generalization of gamified learning to functional outcomes in the real world should be emphasized in future research. It's especially vital for interventions related to communication or social behavior, which need to extend beyond digital interfaces to occur effectively.

Third, the field would be strengthened by the establishment of common outcome frameworks to facilitate systematic measurement of communication skills, engagement, social interaction, and emotional regulation. A common assessment would facilitate comparisons across the various measures used between studies and meta-analytic work.

Fourth, the possibilities of embedding AI/ML in the design of the games to create an adaptive, intelligent gamified platform that dynamically adjusts to the user's feedback/user behavior should be investigated. Such systems could also provide personalized learning pathways, track patterns of disengagement, and in some cases, modulate sensory inputs on the basis of user preference or anxiety levels.

Lastly, consideration should be paid to the application and scalability of gamified tools in practice. Usability studies should also include the perspective of caregivers, educators and health professionals, both at delivery, training, cost and cultural adaptation levels (Mota et al., 2021b).

Consistent with growing literature on technical interventions for ASD, a number of recent studies report promising findings employing immersive VR and AR-based systems. For instance, an up-to-date meta-analysis of RCTs (PalkaMittetal., 2024) found that immersive VR was efficacious for advancing social, emotional, and cognitive abilities of children and adolescents with ASD. And one meta-analysis studying VR interventions for social skill training found that VR interventions are on par, if not better, than traditional face-to-face intervention in terms of improving social behaviors and decreasing social anxiety, especially when the intervention duration is 12 weeks or longer (Idowuetal., 2024). Augmented reality has been also applied for mental health and social connectedness: the LINA AR game engineered peer bonding and class-wide belonging in adolescents through cooperative gameplay (Mittmannetal., 2022). Outside therapeutic environments, mobile extended-reality platforms, such as WorkplaceVR, have demonstrated promising application in workplace skills training for autistic adults and, with self-efficacy boosted by the incorporation of biofeedback, rehearsal using scenarios (Westbrooketal., 2024).

The results of this review suggest a solid base for gamified intervention design, but development of knowledge in this area must move beyond static feedback loop and limited session designs. One such emerging direction is to incorporate real-time physiological monitoring-- e.g., EEG, HRV and gaze tracking--into gameplay to dynamically modulate the difficulty and sensory load. Both Eggy and neurofeedback-integrated AR platforms

have also just started to investigate this design space, and preliminary results show that these platforms can cause better user attention and emotion regulation ability (Lyu et al., 2025; Yang et al., 2021). Another hopeful frontier is adaptive artificial intelligence, in which systems learn from every child's behavior and trajectory of learning. For example, such systems could raise symbolic complexity whilst the child continues demonstrating sustained accuracy, or slow down the interaction if lack of engagement is observed emerging (Sanku et al., 2023). Mobile platforms also extend interventions into homes and communities, making it possible to improve the consistency and accessibility of services, especially in underserved or rural areas (Lee et al., 2020). Moreover, collaborative digital platforms like CoVoL also show that multi-user gamification can contribute to fostering social connectedness and verbal interaction both in physical and virtual spaces (Chodkiewicz et al., 2025). Emotional modeling, how to serve non-verbal and multiply disabled is a very interesting challenge for future interventions, researchers should also study User Centered Design and Universal design for learning. Lastly, cross-cultural validation and participatory design (notably with autistic persons and caregivers) will be crucial to creating tools that are both effective and culturally sensitive to a range of user needs (Bauer et al., 2021; Denizli-Gulboy et al., 2024).

CONCLUSION

Our systematic analysis synthesizes the state-of-the-art of gamified interventions for ASD interventions and the extent to which support for games for change as a favourable and flexible option designed to assist in general in cognitive, communicative and social activities. In the full set of five studies reviewed, interventions that included game-based elements such as visual progression, avatar-mediated communication, and adaptive feedback mechanisms yielded consistently positive results in terms of increased learner engagement, task completion, symbolic perception, and social interaction. These findings demonstrate gamification's special capability to be congruent with cognitive profiles and learning inclinations of autistics (many of whom prefer visual, organized and reward-based learning environments) (Cabielles-Hernández et al., 2017; Mota et al., 2021a; Wang et al., 2018).

In addition to immediate increases in task motivation and behavior regulation, other studies also showed that gamified tools can be harnessed to foster functional communication and to promote collaborative behavior, especially when integrated in immersive virtual environments. Platforms such as CoMove and iSocial emulated naturalistic social challenges in controlled digital environments, providing chances to practice complex social scripts (e.g., on turn-taking, joint attention, and verbal initiation) under lessened sensation or affective overload (Zhang et al., 2018; Wang et al., 2018). Tablet and AR resources such as Chain of Words and AssociAR that permitted symbolic play and vocabulary learning at pace of the children, were seen to provide worth as standalone language learning tools as well as adjuncts to speech-language therapy (Cabielles-Hernández et al., 2017; Mota et al., 2021b).

But there are also some structural limitations of the current literature landscape the review point out. Small samples, brief interventions, and large ranges of outcome measures across studies have prevented the generalizability and systematic comparison of effect sizes. Most of the time, gamified tools have been developed without being embedded or grounded to more general therapeutic or curricular contexts, making it difficult to scale and integrate these tools within real clinical and school settings (Mota et al., 2021b; Zhang et al., 2018). In addition, follow-up was not included in most of the interventions, therefore it is unknown if engagement and skill usage were maintained or transferred to the natural setting.

Integration of Gamification for Individuals on the Autism Spectrum - A Review of Literature

These limitations will need to be addressed by future research, which should employ sample sizes that are larger and more representative of the autistic population as a whole in terms of age, ethnicity and severity of autism, and take into account the presence of comorbid diagnoses of ADHD, anxiety, intellectual disability, etc. There is also a call for consistent outcome measures to facilitate comparison across studies and assessment of impact in different areas (e.g., expressive language, pragmatic communication or self-regulation). Third, interventions should start to examine the longitudinal efficacy by investigating that gamified learning is indeed providing sustained behavioral change or enhanced adaptive capability after an intervention.

Furthermore, it will also be necessary to work towards developing scalable and easily adjustable platforms that can be accommodated within didactical or therapeutic settings. This may include developing easy-to-use caregiver and therapist user interfaces, or the integration of real-time analytics to track progress, or compatibility with devices for the broadest access. The presence of machine learning and artificial intelligence techniques might also implement a real-time adaptation of content, adapting the challenge or feedback to the user's performance or involvement in a given moment (Mota et al., 2021a). They may also enhance personalization, a crucial feature in successful intervention for the population of individuals diagnosed with ASD.

In the end, gamified interventions are not just enhancement for traditional therapy, but a force for providing access to development support— when rooted in science and created with a heart, our work can democratize the accessibility of support. With the recent movement towards hybrid and remote delivery of education and medical care, the thoughtful use of gamification can potentially serve as a link between formal intervention and self-directed learning. In this way it allows people with ASD to learn not just new skills, but in ways that are contextually appropriate, fun, and intrinsically motivating (Cabielles-Hernández et al., 2017; Wang et al., 2018).

So, in conclusion, gamification is a truly revolutionary outlook towards autism education and treatment which, thanks to technology, is developmentally sensitive. Although the field is in its fledgling stages, the accumulating evidence supports its further development and amalgamation. With strategic design, representative research, and partnership between clinicians, educators, and technologists, the very same gamified tools can be transformed into strong, accessible and empowering interventions, enabling autistic people to communicate, connect, and flourish in a multitude of environments.

REFERENCES

- Bauer, V., Bouchara, T., & Bourdot, P. (2021). eXtended reality for autism interventions: The importance of mediation and sensory-based approaches. *arXiv*. <https://doi.org/10.48550/arXiv.2106.15983>
- Cabielles-Hernández, D., Pérez-Pérez, J. R., Paule-Ruiz, M. P., & Fernández-Fernández, S. (2017). Specialized intervention using tablet devices for communication deficits in children with Autism Spectrum Disorders. *IEEE Transactions on Learning Technologies* 10(2), 182–195. <https://doi.org/10.1109/TLT.2016.2559482>
- Chodkiewicz, P., Verma, P., & Liebel, G. (2025). CoVoL: A cooperative vocabulary learning game for children with autism. *arXiv*. <https://doi.org/10.48550/arXiv.2505.08515>
- Denizli-Gulboy, H., & Genc-Tosun, D. (2021). Evaluating augmented reality as evidence-based practice for individuals with autism spectrum disorder: A meta-analysis of

Integration of Gamification for Individuals on the Autism Spectrum - A Review of Literature

- single-case design studies. *International Journal of Developmental Disabilities*, 69(4), 472–486. <https://doi.org/10.1080/20473869.2021.1978147>
- Denizli-Gulboy, H., Gulboy, E., & Tosun, D. G. (2024). Augmented reality and learning–cognitive outcomes in autism spectrum disorder: A systematic review. *Children*, 12(4), 493. <https://doi.org/10.3390/children12040493>
- Herrero, J. F., & Lorenzo, G. (2020). An immersive VR educational intervention for communication skills in individuals with ASD. *Educational and Information Technologies*, 25, 1689–1722. <https://doi.org/10.1007/s10639-019-10090-2>
- Idowu, O., Aderinto, N., Olatunji, G., & Kokori, E. (2024). A systematic review of virtual reality versus standard social skills training for improving social interaction skills and reducing social anxiety in children with Autism Spectrum Disorder (ASD). *BJPpsych Open*. <https://doi.org/10.1192/bjo.2024.171>
- Kandalaf, M. R., Didehban, N., Krawczyk, D. C., Allen, T. T., & Chapman, S. B. (2013). Virtual reality social cognition training for young adults with high-functioning autism. *Journal of Autism and Developmental Disorders*, 43(1), 34–44. <https://doi.org/10.1007/s10803-012-1544-6>
- Ke, F., Moon, J., & Sokolikj, Z. (2022). Virtual reality–based social skills training for children with ASD. *Journal of Special Education Technology*, 37(1), 49–62. <https://doi.org/10.1177/0162643420961234>
- Lee, D., Frey, G. C., Min, A., et al. (2020). Usability inquiry of a gamified behavior-change app for increasing physical activity and reducing sedentary behavior in adults with and without ASD. *Health Informatics Journal*, 26(4), 2992–3008. <https://doi.org/10.1177/1460458220952909>
- Lyu, Y., An, P., Xiao, Y., Zhang, Z. S., Zhang, H., Katsuragawa, K., & Zhao, J. (2025). Eggy: Designing mobile augmented reality neurofeedback training games for children with autism spectrum disorder. *arXiv*. <https://doi.org/10.48550/arXiv.2503.04984>
- Mittmann, G., Barnard, A., Krammer, I., Martins, D., & Dias, J. (2022). LINA—A social augmented reality game around mental health, supporting real-world connection and sense of belonging for early adolescents. *arXiv*. <https://doi.org/10.48550/arXiv.2204.12917>
- Mota, J. S., Canedo, E. D., Torres, K. S., & Leão, H. A. T. (2021a). AssociAR: Gamified process for the teaching of children with autism through the association of images and words. In *2021 IEEE Global Engineering Education Conference (EDUCON)* (pp. 403–410). IEEE. <https://doi.org/10.1109/EDUCON46332.2021.9453922>
- Mota, J. S., Canedo, E. D., Torres, K. S., & Leão, H. A. T. (2021b). AssociAR: Gamified process for autism learning using image-word matching and task engagement metrics. *IEEE Xplore Digital Library*. <https://ieeexplore.ieee.org/document/9453922>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). PRISMA 2020 explanation and elaboration: Updated guidance and exemplars for reporting systematic reviews. *BMJ*, 372, n160. <https://doi.org/10.1136/bmj.n160>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, n71. <https://doi.org/10.1136/bmj.n71>
- Palka Mittal, M., Bhadania, M., et al. (2024). Effect of immersive virtual reality–based training on cognitive, social, and emotional skills in children and adolescents with Autism Spectrum Disorder: A meta-analysis of randomized controlled trials. *Research in Developmental Disabilities*, 104771. <https://doi.org/10.1016/j.ridd.2024.104771>

Integration of Gamification for Individuals on the Autism Spectrum - A Review of Literature

- Sanku, B. S., Li, J., Jung, S., Mei, C., & He, J. (2023). Enhancing attention in autism spectrum disorder: Comparative analysis of VR-based training programs using physiological data. *Frontiers in Computer Science*, 5, 1250652. <https://doi.org/10.3389/fcomp.2023.1250652>
- Wang, X., Xing, W., & Laffey, J. M. (2018). Autistic youth in 3D game-based collaborative virtual learning: Associating avatar interaction patterns with embodied social presence. *British Journal of Educational Technology*, 49(4), 742–760. <https://doi.org/10.1111/bjet.12646>
- Westbrook, E. M., Espinosa, A., & Lupien, S. (2024). Promoting self-efficacy of individuals with autism in practicing social skills in the workplace using virtual reality and physiological sensors: Mixed methods study. *JMIR Formative Research*, 8, e52157. <https://doi.org/10.2196/52157>
- Yang, Z., An, P., Yang, J., Strojny, S., Zhang, Z., Sun, D., & Zhao, J. (2021). Designing mobile EEG neurofeedback games for children with autism: Implications from industry practice. *arXiv*. <https://doi.org/10.48550/arXiv.2107.10910>
- Zhang, L., Fu, Q., Swanson, A., Weitlauf, A., Warren, Z., & Sarkar, N. (2018). Design and evaluation of a collaborative virtual environment (CoMove) for Autism Spectrum Disorder intervention. *ACM Transactions on Accessible Computing*, 11(2), Article 11. <https://doi.org/10.1145/3209687>

Acknowledgment

The author(s) appreciates all those who participated in the study and helped to facilitate the research process.

Conflict of Interest

The author(s) declared no conflict of interest.

How to cite this article: Jakhodia, A. (2025). Integration of Gamification for Individuals on the Autism Spectrum - A Review of Literature. *International Journal of Indian Psychology*, 13(3), 180-194. DIP:18.01.019.20251303, DOI:10.25215/1303.019