International Journal of Scientific Reports
Syriopoulou-Delli KC et al. Int J Sci Rep. 2026 Feb;12(2):83-93
http://www.sci-rep.com
pISSN 2454-2156 | eISSN 2454-2164
DOI: https://dx.doi.org/10.18203/issn.2454-2156.IntJSciRep20260039

Review Article

The use of serious games to develop social skills in children with autism: a literature review

Christine K. Syriopoulou-Delli*, Paul Hatzigiannakoglou, Eleni Margariti

Department of Educational and Social Policy, University of Macedonia, Thessaloniki, Greece

Received: 27 October 2025
Revised: 11 December 2025
Accepted: 09 January 2026

***Correspondence:**
Dr. Christine K. Syriopoulou-Delli,
E-mail: csyriop@uom.edu.gr

ABSTRACT

Purpose of this literature review is to explore the role of serious games in improving the social and emotional intelligence of children with autism spectrum disorder (ASD). The research included 38 studies examining the effectiveness of these games in enhancing skills such as social interaction, understanding social rules, cooperation, effective communication, expression, and management of emotions by offering interactive learning experiences. Serious games are an innovative, promising educational tool that can improve the overall well-being of individuals with autism. In conclusion, however, choosing the right game depends on many factors that require proper assessment of the children's individual characteristics, good knowledge of the game and take under consideration all of the available material and technical resources.

Keywords: Serious games, Autism spectrum disorder, Socioemotional intelligence, Special education, Gamification

INTRODUCTION

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by persistent impairments in social communication and restricted and/or repetitive patterns of behavior.[1] Typical difficulties include social interactions, using and understanding basic social.[2] Baron-Cohen points out that impairments in social skills vary from person to person and fall within a broad spectrum.

At one end of the spectrum there are children who tend toward loneliness, avoiding interactions with others. At the other end of the spectrum, some children actively seek social engagement but lack important skills such as interpreting the thoughts and feelings of others, maintaining conversations, and participating in cooperative activities.[3]

The aim of this research is to study the role of serious games as a modern educational tool in improving the social and emotional intelligence of children with autism. More specifically, it attempts to investigate the degree of influence of serious games on the development of social skills, such as social interaction, emotion recognition and understanding social rules, answering the main question of whether these games influence the process of developing social skills, to what extent, and which aspects of it.

The necessity of this research stems, initially, from the importance of these skills in individuals with ASD and secondly, from the particular preference for technology and technological tools shown by children with autism, which also includes serious games.[4,5]

The innovation presented by this new educational tool is therefore evident, which, combined with the limited number of studies investigating its impact on the social and emotional intelligence of children with autism, stimulates research interest.[6,7]

Finally, it is worth mentioning the value that will be added to the educational and therapeutic community, as the promotion of new, evidence-based educational practices will improve the quality of life of children with autism.[8]

Serious games

Michael Zyda defines serious games as a mental competition that takes place through digital technology, following predetermined rules and using entertainment to achieve goals related to education, vocational training, health, public safety, and effective communication.[9] On the other hand, Stokes offers a more comprehensive definition, arguing that these games are designed to entertain players while also educating and training them, thereby influencing their behavior.[10] Thus, the entertainment dimension is emphasized as the means that will enhance the development of knowledge and skills.[11] The student-players participate experientially, practicing in a safe environment and acquiring knowledge about how to manage realistic everyday situations.[12]

These games are different from traditional games. The differences can be found in the constructivist learning theory they follow, the purpose they aim to achieve, the audience they target, the design they follow and the influence they have on players' behavior.[13]

Serious games have beneficial features such as creating positive emotions, interactivity, immediate feedback, enhancing cooperation, and logical thinking. Thus, students acquire knowledge through their own activity.[11,14]

Autism and social skills

The lack of social skills in individuals with autism makes it difficult for children and their families to cope with the demands of everyday life, making it necessary to implement interventions that promote the development of social and emotional skills. Well-developed social skills increase levels of social functioning and have multiple benefits in individual, family, school, and social environments.[15-20]

METHODS

The methodology of this research followed the structure of a systematic literature review, gathering and analyzing data from reliable sources in order to clarify the effectiveness of serious games as a tool for supporting children with autism. A systematic search was conducted in scientific databases such as Google Scholar, PubMed, Scopus, Web of Science and IEEE Xplore using the following keywords, “serious games”, “autism”, “social-emotional intelligence”, “special education”, “gamification”, “ASD interventions”.

Inclusion criteria

The criteria for inclusion were the language in which the articles were written, the time span of their publication, their focus on a specific population group with an exclusive diagnosis of autism spectrum disorder, and the use of serious games. In this way, articles written in English over the last fifteen years (2010-2025) were accepted, focus on children with ASD, and evaluate the effect of serious games exclusively on social and emotional intelligence.

Exclusion criteria

The exclusion criteria apply to articles that were not directly related to the topic and concern, for example, cognitive or motor skills, articles focusing on other population groups, and articles of non-scientific origin, such as personal opinions, unevaluated articles, or texts not published in reputable academic journals.

The review highlighted several studies that support the effectiveness of serious games in developing social and emotional skills in children with autism. More specifically, the study selection process began with the identification of 500 records from the following databases, Google Scholar, PubMed, Scopus, Web of Science and IEEE Xplore using the keywords. In addition, 22 entries were identified through manual searches and reference lists, bringing the total number of entries initially identified to 522. Applying the inclusion and exclusion criteria, 480 records remained, of which 30 were duplicates and were removed.

Proceeding to the evaluation of the suitability of the findings, it appeared that several of them were not entirely relevant to the topic, either in terms of the type of disability under study, the type of games used for intervention, or the skills targeted. Thus, of the 100 full-text articles that remained, 62 were removed because they did not meet methodological requirements, presenting incomplete research design and insufficient data regarding the intervention applied and the theoretical basis followed.

A total of 38 studies were included after a systematic review of the maximum suitability for the research topic.

The research questions that this study seeks to answer are as follows: Do serious games contribute to improving the social and emotional intelligence of children with ASD, and if so, how? What social and emotional intelligence skills can be developed through serious games in children with ASD, and how? What characteristics make these games effective in improving social interaction and emotional understanding? What are the most effective types of serious games for educating children with ASD? (e.g., digital games, board games, virtual reality games), What factors influence the success of using serious games with children with ASD (e.g., age, degree of autism spectrum, interaction with adults or peers)? and What are the challenges and limitations in using serious games for the education of children with ASD?

RESULTS

The results of this study are presented in the following sections. First, we discuss the impact of serious games on the development of social and emotional skills. Next, we list the characteristics that make serious games more

effective, as well as the limitations that come with them and that are important to keep in mind when designing and implementing educational or therapeutic interventions. The studies included are summarized in the Table 1.

Table 1: Studies included.

A/A	Authors (year)	Aim	Methodology	Results	Conclusions
1	Almurashi et al (2022)	A systematic review on the use of augmented reality (AR), serious games, and the picture exchange communi-cation system (pecs) for individuals with ASD	Systematic review of 66 articles	The serious games with AR enhance the social interaction	The development of personalized technologies is recommended for ASD
2	Aresti-Bartolomeet al (2015)	Development of a cognitive rehabilitation system through serious games	Pilot study with 10 children with ASD diagnosis	Improvement cognitive and social skills through the serious games	The games have positive effects, but further research is needed
3	Arzone et al (2020)	The correlation between gamification and emotional intelligence in children with ASD	Quantitative research using questionnaires	The serious games improve the emotional intelligence	Gamification can enhance the development of emotional skills
4	Barajas et al (2017)	Design and development serious games as therapeutic tools	Design and evaluation of a game with a sample of 15 participants	Improvement social interaction and communication	The serious games can take place as therapeutic tools
5	Bernardini et al (2014)	Design the game “ECHOES” for growth social communication	A laboratory-based study conducted with children diagnosed with ASD	The participants have raised their interactions within the game	The serious games can improve the social cognition
6	Bossavit et al (2016)	Co-design of serious games involving high-functioning adolescents on the autism spectrum"	Experimental study with adolescents with ASD	The participants upgraded crucial game elements	The co-design of serious games by high-functioning adolescents with autism correlation with their effectiveness
7	Boucenna et al (2014)	Review of interactive technologies for children with ASD	Systematic review	The technologies enhance the social and emotional growth	It is very important to personalize the technological application
8	Carneiro et al (2024)	Review of serious games for social skills in ASD	Systematic review	The serious games improve social skills	It is more useful to adapt games to meet the needs of people with autism
9	Caruso et al (2023)	VR serious games for ASD	Systematic review	The VR technology improve social interaction and social cognition	Suggestion for design VR, serious games
10	Carvalho et al (2023)	Review of serious games for children in ASD	Systematic review	The serious games are accepted as effective tools but it is needed more investigation	The serious games need more assessment
11	Chung et al (2016)	Development of an online game for teaching social awareness to adolescents with ASD	Study fMRI with adolescents with ASD	The game caused increased brain activity in areas of social processing	Online games can strengthen social perception

Continued.

A/A	Authors (year)	Aim	Methodology	Results	Conclusions
12	Freitas et al (2024)	Use of dynamically adapted serious games in ADHD treatment	Implementation the adapted serious games in children with ASD	The games improved the children's behavior and interaction	Dynamic adaptation of games improves ASD therapy
13	El-Sattar et al (2024)	Development of a participatory research framework through serious games for education	Experimental study with children with ASD	Serious games promoted learning and social participation	The gaming enhances the learning
14	Fernandes et al (2011)	Building a system of moving faces to recognize expressions	Software development and experimental evaluation	Users recognized facial expressions better	Technology can assist in emotion recognition
15	Fridenson-Hayo et al (2017)	Design of 'emotiplay' for teaching emotions to children with ASD	Cross-cultural assessment of play with children with ASD	Children improved their emotional recognition skills through play	Serious games are effective in teaching emotions
16	Garcia-Garcia et al (2021)	Use of emotion recognition technologies for educating children with ASD	Experimental research with emotion recognition technologies	The children learned to recognize and express emotions	Emotion recognition technologies help educate children with ASD
17	Ghanouni et al (2021)	Creation of serious game for perspectives taking skills for children with ASD	Usability testing of serious games with children with ASD	The game was effective in teaching perspective thinking	Serious games can develop forward thinking skills
18	Grossard et al (2017)	Using serious games to learn social interactions and emotions	Experimental evaluation of serious games	Participants developed better social and emotional skills	Games are useful tools for learning social skills
19	Hassan et al (2021)	Development of serious games to improve social and emotional intelligence	Development and testing of games for children with ASD	Games helped improve social and emotional intelligence	It is possible to develop social and emotional intelligence through games
20	Hourcade et al (2012)	Using multitouch applications to improve social skills in children with ASD	Experimental study with multitouch applications	Multitouch applications improved the social skills of children with ASD	Multitouch applications are effective learning tools for ASD
21	Honrado et al (2024)	Use of serious games for the social integration of children with ASD	Analysis of serious games application through human-computer interface	Improving social skills through play	Serious games can support the social integration of children with ASD
22	Kirst et al (2022)	Developing emotional skills through parent-supported serious game	Randomized controlled trial in multiple centers	Significant improvement in social-emotional skills	Parental involvement enhances the effectiveness of play
23	López-Bouzas et al (2025)	Review of research on gamified environments for students with ASD	Systematic review	Confirmation of positive effects of gamified environments	Gamified environments are useful for improving the skills of children with ASD
24	López-Bouzas et al (2024)	Improving social-emotional skills through a gamified environment	Experimental study	Skill improvement after intervention	Technology can enhance learning for children with ASD
25	Löytömäki et al (2023)	Serious game 'the emotion detectives' for social-emotional skills	Case study	Significant progress in children's skills	Serious games can enhance social development

Continued.

A/A	Authors (year)	Aim	Methodology	Results	Conclusions
26	Marchi et al (2018)	ASC-inclusion platform for perceptual learning through serious gaming	Development and evaluation of application	Improving emotional understanding	Serious games can contribute to the integration of children with ASD
27	Nawahdah et al (2019)	Serious game for communication and social skills for children with ASD	Serious game development and evaluation	Improvement of communication skills	Serious games have a positive impact on learning and communication
28	Noor et al (2012)	Literature review on serious games in the education of children with ASD	Literature review	Confirmation of positive effects	Serious games offer significant benefits in the education of children with ASD
29	Ribeiro et al (2014)	Development of a collaborative serious game for communication skills for children with ASD	Session presentation	Successful promotion of communication through collaborative serious games	Collaboration through Serious games promotes communication among children with ASD
30	Serret et al (2014)	Pilot study on teaching emotions through serious game	Pilot study with individuals of low and high functionality	Improved emotional recognition	Serious games help children understand and express their emotions
31	Silva et al (2021)	Systematic review of interventions with serious games for individuals with ASD	Systematic review	Recognition of the advantages and limitations of serious games in individuals with ASD	Serious games themselves can enhance skills, but further research is needed
32	Stasolla et al (2025)	A scoping review of serious games, social interaction, and VR in adolescents with ASD	Scoping review	Combination of serious games and VR improves social skills	Using serious games and VR can give you some extra support
33	Azadboni et al (2024)	Assessment of the effectiveness of serious games in teaching social skills to individuals with ASD	Systematic review	Serious games are effective in teaching social skills	Serious games have a positive effect on social skills training for people with ASD
34	Terlouw et al (2021)	Development of escape room serious game for social interaction of children with ASD	Design study with iterative design	Serious games are effective in teaching social skills	Escape room serious games enhance social interaction
35	Vallefuoco et al (2017)	Personalized design of serious games for people with ASD	Personalized design of serious games	Successful adaptation of serious games for different player profiles	Personalized serious games design improves engagement
36	Walsh et al (2024)	Study of the effectiveness of serious games in teaching social skills to children with ASD	Review of empirical research	Improving social skills in children with ASD through serious games	Serious games promote learning and social development
37	Whyte et al (2015)	Design of serious game interventions for individuals with ASD	Design study of serious games	Serious games can help cognitive and social development	Well-designed Serious Games are effective in educating individuals with ASD
38	Zakari (2014)	Review of serious games for children with ASD	Literature review	Serious games offer benefits but require adaptation to the needs of children with ASD	Serious games require personalization to be fully effective

The use of serious games in developing social and emotional intelligence in children with autism

Social intelligence involves the ability to understand, analyze, and interpret social situations, recognizing the intentions of others, and creating and maintaining interpersonal relationships. Children with ASD have difficulty understanding nonverbal signals, such as facial expressions, body language, and tone of voice, as well as a lack of reciprocity in communication.[24] Emotional intelligences, on the other hand, involves skills such as recognizing, expressing, and regulating emotions both themselves and others, while often showing limited empathy and expressing their emotions in less acceptable ways.[21,22] Technological advances have brought innovative educational tools such as serious games. There is a lot of research highlighting the effectiveness of these games in developing the social and emotional intelligence of children with autism.[22-24]

Social intelligence

The study by Bernardini, Porayska-Pomsta, and Smith describes "ECHOES," an interactive game that allows children with ASD to practice social communication.[25] Through interaction with a virtual environment, children showed increased use of eye contact, better understanding of social signals, and enhanced attention to social stimulations. Equally important are the findings of the study by Honrado et al and Hourcade et al in which studies have shown the development of social initiative, cooperation, and participation in team activities.[26,27]

The researchers' games Nawahdah et al and Ribeiro et al, highlight the collaborative nature of play.[28,29] Through cooperative scenarios, children are encouraged to make decisions collectively and resolve disagreements. The authors Terlouw et al point out that the teamwork setting and cooperative puzzles of the escape room serious game that they developed improve children's sense of initiative, communication, and cooperation.[30]

The researchers report that serious games have positive effects on the behavior of children with autism, improving their levels of social and emotional interaction.[31] The study of Caruso et al emphasized that virtual reality facilitates the engagement of children with ASD in social scenarios. However, they emphasize the importance of properly adapting VR environments to meet the needs of children with ASD in order to avoid overstimulation and enhance the user's engagement.[32]

Similarly, Almurashi et al argue that combining AR with the picture exchange communication system (PECS) enhances nonverbal communication and understanding of social concepts. Furthermore, they highlighted that AR in combination with educational scenarios facilitates the transfer of knowledge into everyday life.[33]

A systematic review by Barajas, Shirmohammadi and Carneiro and colleagues suggests that serious games provide a safe and enjoyable learning environment, particularly useful for practicing social skills. ASC-Inclusion, a platform that combines cognitive technologies with games, has contributed to improving social understanding.[7,34,35]

The research by Vallefuoco et al recognizes that serious games have the ability to improve communication, the learning process, social behavior, and the physical abilities in individuals.[36]

Strengthening theory of mind—the ability to understand that others have different beliefs, desires, and intentions—is also very important. The research by Chung et al uses an online game that presents everyday social situations, leading to neurologically documented improvements in the functional connectivity of brain regions related to social cognition.[37]

The multimedia characteristics of serious games, which utilize visual, audio, and kinaesthetic elements, make them exceptionally effective for educating students about advanced social concepts.[21,38]

Emotional intelligence

The application “Emotiplay” employed multimedia stimuli to train children with ASD in emotion recognition, yielding positive outcomes in the accuracy of identifying emotional expressions.[21] The “LIFEisGAME” focused on the reproduction of facial expressions through animated characters, enabling children to practice in a way that was both engaging and effective.[38] Another game, “the emotion detectives”, demonstrates that serious games can serve as effective tools for supporting socio emotional learning, as discussed by Löytömäki et al.[39] Emotion recognition technology based on biometric signals, such as facial expression and voice, has contributed to the personalization of learning processes by accounting for individual reactions, according to Garcia et al.[40]

At the same time, Carvalho et al, Caruso et al and Stasolla et al emphasize that tailoring games to the individual needs of children is a key factor in the success of interventions. They propose the integration of neurofeedback technologies and adaptive algorithms so that the content can be adjusted in response to user reactions.[32,41,42] Simulated social interaction scenarios included in serious games enhance emotional intelligence, as highlighted by Hassan et al and Azadboni et al.[43,44] Through these scenarios, children adopt the perspectives of others, thereby increasing their empathy. The ability to take another person’s viewpoint strengthens the understanding of social norms and supports conflict prevention, as noted by Ghanouni et al.[45] Emotional understanding and self-regulation help children develop functional strategies for initiating and maintaining positive social relationships.[46,47]

Finally, the study by Zakari et al examines forty serious games designed for children with ASD. The authors categorize these games based on technological platforms, graphics and methods of user interaction. Their review reports that serious games played on mobile phones and tablets have effectively supported players in expressing their emotions and increasing their engagement with others.[8]

Factors that enhance the effectiveness of serious games

The game mechanics used in serious games are based on interactivity, challenge, and real-time feedback, elements that facilitate learning and enhance children's engagement.[23] A particular advantage is that they provide a controlled environment in which children with ASD can practice social situations without the threat of failure or social rejection. The repeatability of the scenarios allows children to boost their confidence in social interactions and internalize basic social skills in a pleasant and non-threatening way.[48]

The use of technologies such as AR and VR offers enriched learning experiences, reducing cognitive barriers and enhancing concentration.[32] Through AR, children can see objects "come to life" in their physical space, which facilitates the generalization of skills. According to Almurashi et al, the integration of AR into serious games creates an interesting context that enhances the participation, attention, and persistence of children with ASD in completing activities. Interactive graphics provide visualised information that helps in understanding abstract concepts. These technologies have the ability to present social scenarios through images, animations and sound, facilitating understanding and interaction.[33] Similarly, Aresti-Bartolome and Garcia-Zapirain developed a cognitive rehabilitation system based on serious games, which focuses on strengthening social skills. The results of their pilot study show significant improvement in understanding social situations and interacting with peers. The game uses narratives and characters to teach the importance of communication, waiting in line, and expressing emotions.[49]

The contribution of VR games to the creation of safe learning environments is also noteworthy. The review by Caruso et al. offers guidelines for designing immersive VR serious games for children with ASD, which allow experimentation with collaborative behaviors. Three-dimensional visualization and the ability to navigate social environments in first person expand opportunities for experiential learning.[32]

Flexibility-oriented design includes settings such as game speed, number of stimuli, and mission complexity. Functionality on mobile devices, offline use, and easy access for teachers and parents enhance the sustainability of interventions. Technical support, ease of use, and the ability to integrate games into the child's daily life (school, home) positively influence the maintenance of interest and consistency in use.[22,27]

Furthermore, it is important to create games that are accessible regardless of the child's cognitive or verbal level. It is important that serious games are appropriate for the child's chronological and developmental age.[48,50] Games such as "emotiplay" and "ASC-Inclusion" use simple graphics, sounds, and nonverbal cues to serve children with low functionality. On the other hand, the game "ECHOES" can be adapted to low and high functioning profiles through simulated scenarios.[25] The integration of alternative input methods (e.g., buttons instead of a mouse) and the use of touch make the experience more user-friendly for a wide range of abilities.[21,35]

Games should be predictable, with clear goals, limited stimuli, and positive feedback. The absence of unpredictable or noisy stimuli is particularly important, as children with autism often exhibit hypersensitivity to auditory or visual stimuli. The structure of games should provide stability and security, encouraging repetition without causing confusion or disorientation.[51] The use of incentives such as virtual rewards, badges, or progressive difficulty levels maintains focus and encourages continuous effort.[52]

The use of mini-games with a clear structure and goal is particularly positive, as they reinforce rewards and offer repeated opportunities for success. These games are short, usually lasting only a few minutes (5-15 minutes), have a simple design without a complex environment and graphics, and aim to teach a single concept or skill.[6]

Adapting games to the cultural identity of the player, as demonstrated by the research of Fridenson-Hayo et al is important in order to enhance the acceptance of the content and the relevance of the scenarios.[21] The use of characters, costumes, languages, and behaviors familiar to the child enhances identification and assimilation of information. In addition, environments such as virtual classrooms, virtual homes, or playgrounds help transfer the experience to real social situations.[42]

The majority of serious games for people with ASD focus on developing social skills and emotion recognition.[7,21] Games that promote the learning of basic emotional concepts (such as “Emotiplay”, “ASC-Inclusion”) through experiential experiences and multimodal stimuli (sound, image, video) show increased success rates.[35] The use of facial and emotion recognition technologies, as reported by Garcia et al enhances interactivity and personalized learning. The ability for children to see their expressions reflected in characters or receive feedback on their understanding of an emotion increases awareness and promotes empathy.[40]

According to Whyte et al, teachers contribute significantly to the design of appropriate learning environments through

serious games, taking into account the specific needs of each child with ASD.[51] Teacher training is also essential. Almurashi et al emphasize that professionals' skills in technology enhance the proper use of these games.[33] In addition, educators can act as mentors for parents, teaching them how to use the appropriate games and suggesting strategies for continuing the intervention at home, thereby reinforcing the role of serious games as intervention tools rather than mere entertainment.[6]

Finally, Kirst et al presented a game that involves parents in the cultivation of social and emotional skills. The results of their study show that parental involvement enhances the transfer of skills from the virtual to the real environment. Parent-child collaboration creates opportunities for real-time guidance and reinforcement, enhancing the sense of security. Thus, adults act as a bridge between the experiences the child gains from play and the application of these in real environments, such as school or family.[53]

However, choosing the right game is crucial to the success of the intervention, as, the appropriate game is crucial to the success of the intervention, as it should respond to the specific needs of the children, be based on scientifically proven methods, and facilitate the development of social, emotional, and cognitive skills.[41] The heterogeneity that characterizes ASD requires the personalization of serious games. The adaptability of the game to different levels of functionality and the possibility of personalized intervention are fundamental selection criteria.[33] It is particularly beneficial for games to incorporate behavior recording and analysis capabilities, providing the desired information to specialists and parents.[53] Interdisciplinary collaborations between educational specialists, designers, and psychologists will also ensure that games are based on/framed by educational principles, enhancing their effectiveness and availability in various environments, such as school and home.[54]

In conclusion, the integration of serious games into the therapeutic and educational approach for children with ASD has shown particularly encouraging results. They improve social understanding, enhance emotional recognition, and promote active interaction. Despite differences in technologies and methods, the common denominator is the ability of serious games to provide safe, controlled, and engaging environments where children can learn and practice critical social skills.

Limitations in the application of games

Despite their benefits, researchers have identified several limitations and challenges that affect the effective integration of these tools into educational and therapeutic practice. One of the main limitations is the low degree of individualization in serious games. Many of these games do not account for the high heterogeneity that characterizes children with ASD, which means they may not address the specific needs or functional levels of users.[7,41,55,56]

Linguistic and cultural adaptation is another critical factor. Many serious games have been developed in English speaking contexts, with limited availability in other languages or cultural settings, which hinders their use internationally.[21]

Furthermore, in societies where play is regarded as a secondary or non-serious activity, the acceptance and support of serious games may be reduced. Promoting the value of play as an educational tool requires systematic awareness raising among all stakeholders.[25]

At the same time, ongoing training is necessary for both educators and parents concerning the technological and pedagogical implementation of these tools. Professional development related to their use remains limited, creating barriers to effective application.[50,51]

Technical complexity and the need for specialized equipment constitute an additional challenge that may restrict accessibility for schools or families with limited resources. This raises concerns about equal opportunities and social inclusion, particularly in developing countries or rural areas.[32,42]

At the cognitive level, the outcomes of using serious games are not always clear. Several studies rely on small samples and short intervention periods, making it difficult to generalize their findings.[37,49] The absence of long-term evaluation of the impact of serious games raises questions regarding the generalization of skills acquired through gameplay.[6,44] The complexity of measuring improvements in social or emotional skills, which often requires qualitative data or long-term monitoring, represents a methodological challenge.[40,53] In addition, evaluation procedures may fail to account for variables such as parental involvement or the broader learning environment, which can affect the validity of results.[30,46]

In many cases, serious games are treated as supplementary or recreational tools without a clear orientation toward therapeutic goals, which leads to limited systematic integration into intervention programs.[23,52]

Finally, there is also an ethical dimension to the use of serious games. The need to collect personal data, often through technologies involving facial or emotion recognition, raises concerns related to privacy and consent, particularly when minors are involved.[35,48]

DISCUSSION

The present study examined the extent to which serious games influence the development of social and emotional skills in children on the autism spectrum. The central research question concerned whether and to what degree this type of game can function effectively within interventions that focus on cultivating social and emotional intelligence.

Across the review of 38 studies, the findings support a positive answer. Serious games appear to be effective learning tools that engage the player and sustain participation in the intervention program.

Despite the heterogeneity that characterizes autism, difficulties in social skills remain a common feature. Individuals on the spectrum often struggle to interact in socially acceptable ways, to maintain a conversation, to express their emotions and to recognize the perspective of others. These challenges contribute to social isolation, increase introversion and negatively affect daily functioning.

Parents, educators and therapists frequently encounter such difficulties. For this reason, they design and implement educational and therapeutic programs aimed at developing social and emotional skills through a variety of techniques and tools. The use of technological means, including serious games, is particularly effective because individuals with ASD often find them both appealing and comfortable to use.

On the social level, improvements are reported in social responsiveness, communication, eye contact, interaction, understanding of social norms and cooperation. In the domain of emotional skills, abilities related to distinguishing, identifying and expressing emotions show notable enhancement. Through perspective taking, the cultivation of empathy and engagement with others becomes more achievable.[21,25,31]

Several features of serious games support the development of these skills through their design and play mechanics. Such features include animated virtual characters, playful interactive environments, sensory functions that activate touch, sight and hearing, simulations of social situations, virtual or augmented reality, alternative communication systems such as PECS, biometric facial and vocal recognition signals and multimedia stimuli including movement, sound, color and shape.[33,40]

In addition, the effectiveness of serious games is reinforced by their design capabilities such as adaptation to individual characteristics of players including developmental age, character selection, behaviors, clothing, language and environment, immediate feedback, imitation, repetition and ease of use on both portable and non-portable devices. Features such as attractive and controlled environments, multimodal components including narration, text, sound, color, movement, touch and vision, and familiar social situations facilitate the transfer of learned skills to everyday life.

However, the use of serious games also presents challenges. The heterogeneity of the autism spectrum itself, the need for a clear understanding of each child's individual characteristics, the appropriate design of the intervention and the selection of the game that best suits the context are all important considerations. Moreover, the tendency of some children with autism to become strongly attached to technological media may increase the difficulty of disengaging from the game. Finally, the ethical dimension related to the recording, collection and processing of personal data raises important issues of privacy and consent for a vulnerable population group.[41,44,50]

CONCLUSION

In conclusion, serious games represent one of the most promising technological applications for supporting children with autism spectrum disorder. They offer significant benefits for the development of social, emotional and cognitive skills. By combining enjoyment with meaningful learning objectives, serious games introduce innovation to education and transform learning into an accessible and engaging process for all.

Recommendations

The absence of a coordinated policy often leads to the fragmented implementation of these tools, without the necessary evaluation or training of teachers. Therefore, investigating the long-term impact of serious games on the psychosocial development of children with ASD, the sustainability of the skills acquired, and the degree of generalization of these skills are important areas that deserve future research attention.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed, text rev (DSM-5-TR). Washington (DC): American Psychiatric Publishing. 2022. Available at: https://psychiatryonline.org/doi/book/10.1176/appi.books.9780890425787. Accessed on 30 October 2025.
2. Syriopoulou-Delli CK, Agaliotis I, Papaefstathiou E. Social skills characteristics of students with autism spectrum disorder. Int J Dev Disabil. 2018;64(1):35-44.
3. Baron-Cohen S. Autism and Asperger syndrome. 1st ed. Oxford (UK): Oxford University Press. 2008. Available at: https://global.oup.com/academic/product/autism-and-asperger-syndrome-9780198504900. Accessed on 30 October 2025.
4. Wolstencroft J, Robinson L, Srinivasan R, Kerry E, Mandy W, Skuse D. A systematic review of group social skills interventions and meta-analysis of outcomes for children with high-functioning ASD. J Autism Dev Disord. 2018;48(7):2293-307.
5. Grynszpan O, Weiss PL, Perez-Diaz F, Gal E. Innovative technology-based interventions for

autism spectrum disorders: a meta-analysis. Autism. 2014;18(4):346-61.
6. Silva GM, Souto JJdS, Fernandes TP, Bolis I, Santos NA. Interventions with serious games and entertainment games in autism spectrum disorder: a systematic review. Dev Neuropsychol. 2021;46(6):463-85.
7. Carneiro T, Carvalho A, Frota S, Filipe MG. Serious games for developing social skills in children and adolescents with autism spectrum disorder: a systematic review. Healthcare. 2024;12(5):508.
8. Zakari HM, Ma M, Simmons D. A review of serious games for children with autism spectrum disorders (ASD). In: Ma M, Oliveira MF, Hauge JH, editors. Serious games development and applications. Lecture Notes Computer Sci. 2014;8778:93-106.
9. Zyda M. From visual simulation to virtual reality to games. IEEE Comput. 2005;38(9):25-32.
10. Stokes B. Video games have changed: time to consider serious games. Dev Educ J. 2005;11(108):33-41.
11. Ahmad S, Umirzakova S, Jamil F, Whangbo TK. Internet-of-things enabled serious games: a comprehensive survey. Future Gener Comput Syst. 2022;136:67-83.
12. Squire KD. Changing the game: what happens when video games enter the classroom? Innovate J Online Educ. 2005;1(6):12-21.
13. Koster R. A theory of fun for game design. Sebastopol (CA): O'Reilly Media. 2013. Available at: https://www.oreilly.com/library/view/theory-of-fun/9781449363208/. Accessed on 30 October 2025.
14. Chrysafiadi K, Papadimitriou S, Virvou M. Cognitive-based adaptive scenarios in educational games using fuzzy reasoning. Knowl Based Syst. 2022;248:109111.
15. Rao PA, Beidel DC, Murray JJ. Social skills interventions for children with Asperger's syndrome or high-functioning autism: a review and recommendations. J Autism Dev Disord. 2008;38:353-61.
16. Cox L. The relationship between social functioning and anxiety symptoms in preschoolers with autism. Senior Theses. 2020;337.
17. White SW, Koenig K, Scahill L. Social skills development in children with autism spectrum disorders: a review of the intervention research. J Autism Dev Disord. 2007;37(10):1858-68.
18. Duan S, Lee M, Wolf J, Naples AJ, McPartland JC. Higher depressive symptoms predict lower social adaptive functioning in children and adolescents with ASD. J Clin Child Adolesc Psychol. 2020;49:12-22.
19. Kanne SM, Mazurek MO. Aggression in children and adolescents with ASD: prevalence and risk factors. J Autism Dev Disord. 2011;41(7):926-37.
20. Bellini S, Peters JK, Benner L, Hopf A. A meta-analysis of school-based social skills interventions for children with autism spectrum disorders. Remedial Spec Educ. 2007;28(3):153-62.
21. Fridenson-Hayo S, Berggren S, Lassalle A, Tal S, Pigat D, Bölte S, et al. Emotiplay: a serious game for learning about emotions in children with autism. Mol Autism. 2017;8:3.
22. Serret S, Hun S, Iakimova G, Lozada J, Anastassova M, Santos A, et al. Teaching emotions to individuals with low- and high-functioning autism using a serious game. Mol Autism. 2014;5:37.
23. Noor HAM, Shahbodin F, Pee NC. Serious game for autism children: review of literature. Int J Psychol Behav Sci. 2012;6(7):554-9.
24. López-Bouzas N, Pérez M, Fernández J. Improved socio-emotional skills in students with ASD following an augmented gamified environment. Int J Child Comput Interact. 2024;42:100683.
25. Bernardini S, Porayska-Pomsta K, Smith TJ. ECHOES: an intelligent serious game for fostering social communication in children with autism. Inf Sci. 2014;264:41-60.
26. Jiménez Honrado J, Rivera GS, Gallud JA, Penichet VMR. Serious games to facilitate social integration for children with autism spectrum disorder. In: Proc 23rd Int Conf Hum Comput Interact (Interacción '23). New York: ACM. 2024;1-8.
27. Hourcade JP, Bullock-Rest NE, Hansen TE. Multitouch tablet applications to enhance social skills of children with autism spectrum disorders. Pers Ubiquitous Comput. 2012;16(2):157-68.
28. Nawahdah M, Ihmouda W. Implementing a serious game to improve communication and social skills for children with autism. CollabTech Soc Comput. LNCS vol 11677. Cham: Springer. 2019;175-88.
29. Ribeiro P, Lomba de Araujo BBP, Raposo A. ComFiM: a cooperative serious game to encourage communicative skills in children with autism. In: Proc Braz Symp Comput Games Digit Entertain. Porto Alegre (Brazil). 2014;112-9.
30. Terlouw G, Kuipers D, van 't Veer J, Prins J, Pierie J. Escape room-based serious game to trigger social interaction in children with autism. JMIR Serious Games. 2021;9(1):e19765.
31. Grossard C, Grynspan O, Serret S, Jouen AL, Bailly K, Cohen D. Serious games to teach social interactions and emotions to individuals with ASD. Comput Educ. 2017;113:195-211.
32. Caruso F, Peretti S, Barletta VS, Pino MC, Mascio TD. Recommendations for developing immersive VR serious games for autism. IEEE Access. 2023;11:74898-913.
33. Almurashi H, Bouaziz R, Alharthi W, Al-Sarem M, Hadwan M, Kammoun S. Augmented reality and serious games for ASD: a systematic review. Sensors. 2022;22(4):1250.
34. Barajas A, Al Osman H, Shirmohammadi S. Serious game as a tool for play therapy in children with autism. In: Proc IEEE Int Conf Serious Games Appl Health (SeGAH). 2017;1-7.
35. Marchi E, Schuller B, Baird A, Baron-Cohen S, Lassalle A, O'Reilly H, et al. ASC-Inclusion

perceptual serious gaming platform for autistic children. IEEE Trans Games. 2019;11(3):225-36.
36. Vallefuoco E, Bravaccio C, Pepino A. Serious games in autism spectrum disorder: personalised design. In: Proc 12th Int Conf Software Technologies (ICSOFT). 2017;567-72.
37. Chung US, Han DH, Shin YJ, Renshaw PF. A prosocial online game for social cognition training in adolescents with autism. Neuropsychiatr Dis Treat. 2016;12:651-60.
38. Fernandes T, Alves S, Miranda J, Queirós C, Orvalho V. LIFEisGAME: a facial character animation system. In: Cruz-Cunha MM, Varajão J, Powell P, Martinho R, editors. CENTERIS 2011. CCIS vol 221. Berlin: Springer. 2011;423-32.
39. Löytömäki J, Ohtonen P, Huttunen K. Serious game "The Emotion Detectives" improves social–emotional skills. Br J Educ Technol. 2023;55:1126-44.
40. Garcia-Garcia JM, Penichet VM, Lozano MD, Fernando A. Using emotion recognition technologies to teach emotions to children with ASD. Univ Access Inf Soc. 2021;20:1-17.
41. Carvalho AP, Braz CS, dos Santos SM, Ferreira RAC, Prates RO. Serious games for children with autism spectrum disorder: a systematic review. Int J Hum Comput Interact. 2024;40(14):3655-82.
42. Stasolla F, Curcio E, Passaro A, Di Gioia M, Zullo A, Martini E. Serious games and virtual reality in adolescents with ASD: a scoping review. Technologies. 2025;13(2):76.
43. Hassan A, Pinkwart N, Shafi M. Serious games to improve social and emotional intelligence in children with autism. Entertain Comput. 2021;38:100417.
44. Talebi Azadboni T, Nasiri S, Khenarinezhad S, Sadoughi F. Effectiveness of serious games in social skills training: a systematic review. Neurosci Biobehav Rev. 2024;161:105634.
45. Ghanouni P, Jarus T, Zwicker JG, Lucyshyn J. Interactive serious game targeting perspective-taking skills in ASD. Behav Inf Technol. 2021;40(17):1716-26.
46. López-Bouzas N, del Moral-Pérez ME. Gamified environments and serious games for students with ASD. Rev J Autism Dev Disord. 2025;12:80-92.
47. Arzone C, Mottan K, Saad KM. Relationship between gamification and emotional intelligence in children with autism. In: Proc Int Conf Spec Educ Southeast Asia Reg. 2020;424-33.
48. Boucenna S, Narzisi A, Tilmont E, Muratori F, Pioggia G, Cohen D, et al. Interactive technologies for autistic children: a review. Cogn Comput. 2014;6(4):722-40.
49. Aresti-Bartolome N, Garcia-Zapirain B. Cognitive rehabilitation system using serious games: a pilot study. Biomed Mater Eng. 2015;26(1):S811-24.
50. Walsh O, Linehan C, Ryan C. Do games promote social skills training for autistic children? Autism. 2025;29(2):329-43.
51. Whyte EM, Smyth JM, Scherf KS. Designing serious game interventions for individuals with autism. J Autism Dev Disord. 2015;45:3820-31.
52. da Silva Freitas ÉV, Panceri JAC, da Luz Schreider S, de Oliveira Caldeira EM, Bastos Filho TF. Cognitive serious games for ABA therapy in children with autism. Int J Emerg Technol Learn. 2024;19(5):80-92.
53. Kirst S, Diehm R, Bögl K, Wilde-Etzold S, Bach C, Noterdaeme M, et al. Parent-assisted serious game for socio-emotional competencies: an RCT. Behav Res Ther. 2022;152:104043.
54. Bossavit B, Parsons S. High-functioning autistic teens co-designing a serious game. In: Proc 14th Int Conf Interact Des Child. 2016;195-204.
55. Zakari H. A review of serious games for children with autism spectrum disorders. In: Serious games and edutainment applications. London: Springer. 2014;149-68.
56. El-Sattar H, Omar M, Mohamady H. Participatory research framework through serious games for children with autism. Front Educ. 2024;9:1453327.

Cite this article as: Syriopoulou-Delli KC, Hatzigiannakoglou P, Margariti E. The use of serious games to develop social skills in children with autism: a literature review. Int J Sci Rep 2026;12(2):83-93.