



# Effects of Interactive Gaming on Social Skill Development in Autism Saudi Students

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## Abstract

The study focused on examining the impact of interactive gaming on the essence of Saudi students with Autism regarding their social skills. As for the means of data analysis the quantitative research design was used, and more specifically, the Structural Equation Modeling (SEM) method. The emphasis was made on how the concept of the interactive gaming affects the elements of communication, cooperation, empathy, and other social interaction skills. As per the recorded outcomes, it can be clearly seen that there was increase in the communication and cooperation skills. But, the change in Empathy score was not greatly affected and the obtained score lies within the normal range of controls that can be expected. With regards to the findings derived from the research study, it can be concluded that, or so it seems, interactive gaming stands to gain positive results for some aspects of social skills training. However, it may need other factors to enhance the general compassion. The likely advantages of the interactive branch of gaming for the subjects with autism are discussed in this paper, along with the guidelines for enhancing the further game models and the proposal of the further intercessions of other forms of therapy.

**Keywords:** Interactive Gaming, Autism, Social Skills

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## Introduction

Individuals with ASD experience challenges in social communication and interaction, particularly when it comes to learning and engaging in academic and peer activities. This can have a significant impact on young learners (Maich et al., 2018; Mamas et al., 2021). One limitation of traditional methods is that children with autism may not engage in activities with a high level of enthusiasm. Additionally, the skills acquired through pediatric behavioral interventions may not easily transfer to different environments or persist once the child is no longer in a structured routine (Dai et al., 2021). Recent developments suggest that emerging gaming could serve as a potentially effective approach to address these issues (Cranmer et al., 2021).

Computer games provide a unique opportunity to blend educational content with the challenge of decision-making and problem-solving, all within the immersive context of a game. This creates a dynamic platform for honing social skills in a realistic and engaging way. Studies have indicated that tutoring and training often incorporate interactive games. These games provide children with valuable opportunities to engage in positive social interactions and receive feedback for their actions (Laine & Lindberg, 2020; Chen et al., 2020; Cheah et al., 2022). As an example, engaging in play during intervention has shown to be beneficial in enhancing communication, empathy, and cooperative skills in children with autism (Yang & Lee, 2022; Zhao et al., 2021). This approach is rooted in the constructivism theory, particularly the experiential learning aspect. It emphasizes the learners' ability to acquire and apply new competencies in simulated and encouraging environments (Matriano, 2020).

One can gain valuable insights from the information gathered through interactive games. These games provide artificial contexts that allow for practical application in everyday life, without any negative repercussions. Virtual environments have been found to provide a supportive space for children with

autism to engage in social activities at a pace that suits them, helping to build their confidence and skills for real-life situations (Wang & Xing, 2022). Furthermore, many of the games serve as a means of presenting and accomplishing goals or objectives, as well as challenging situations that involve role-playing and collaborative tasks. These activities are indicative of various strategies for honing skills, as noted by Zarkasyi et al. (2024).

Therefore, when examining Middle Eastern countries such as KSA, it is crucial to identify hadiths that are culturally suitable and align with educational norms and the expectations of families. In recent years, there has been a growing emphasis in the literature on the importance of including Saudi students with Autism Spectrum Disorder (ASD) in international interventions, taking into account their distinct cultural requirements. Several studies have highlighted this need (Alallawi et al., 2024; Samadi & Samadi, 2020). The integration of interactive gaming into the educational system of the Kingdom of Saudi Arabia holds promise for addressing these needs. However, there is a lack of research on the effectiveness of this approach within this cultural context.

The effectiveness of interactive gaming has been widely acknowledged in different environments, as supported by existing literature. However, there is a lack of research conducted on this topic specifically in Saudi Arabia. The absence of this element is quite worrisome, considering the wide range of possibilities that interactive gaming offers in providing educational and cultural support. Understanding how these interventions can be applied in Saudi Arabia and how they can benefit students with autism is crucial. The unique variables present in Saudi Arabian schools require a tailored approach to ensure the best possible support for these students.

This study aims to explore the effects of interactive gaming on the social skills of Saudi students with autism. By doing so, it seeks to make a valuable contribution to the use of gaming technologies in an Islamic cultural context. The findings have the potential to make a valuable contribution to educational practices and intervention strategies aimed at enhancing the social skills and overall well-being of students with autism (Valverde-Esteve et al., 2021; Paz et al., 2021).

### **The Problem of the Study**

The study focused on a research gap that included the application of interactive gaming to improve the social skills of Saudi adolescents diagnosed with Autism. Although Instagram has gained significant attention as a potential tool for improving students' social skills, there is a lack of study on this topic specifically in the Saudi setting. Prior research has shown that interactive games may enhance certain facets of social competence in children with autism. Prior research did not address the impact of using games to enhance various social skills in children with autism across different cultures and educational environments within the nation. There was a specific absence of empirical information about the effectiveness of these interventions in the Saudi context. This lack of evidence has the potential to impact educational practices and cultural aspects related to the results of gaming-based therapies. In order to fill this need, this study aimed to examine how interactive gaming may be used to enhance the social abilities of Saudi adolescents with autism, and to determine the feasibility of using this method in the specified context.

### **Research Questions**

1. To what extent did interactive gaming improve social skills among Saudi students with autism?
2. Which specific social skills (e.g., communication, cooperation, empathy) showed the most significant improvement as a result of the interactive gaming intervention?
3. How did the interactive gaming intervention impact students' engagement and motivation in learning social skills compared to traditional methods?

### **Hypothesis**

| Hypothesis Number | Hypothesis Statement                                                                                                                       |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| H1                | Interactive gaming lead to significant improvements in overall social skills among Saudi students with autism.                             |
| H2                | Interactive gaming specifically improve communication skills more significantly than other social skills among Saudi students with autism. |
| H3                | Interactive gaming significantly enhance cooperative skills among Saudi students with autism.                                              |
| H4                | Interactive gaming lead to a greater increase in empathy levels among Saudi students with autism compared to traditional interventions.    |

### Significance of the Study

The research yielded valuable insights into the impact of interactive gaming on improving the social competence of Saudi children with autism. This research provided a detailed explanation of how instructional techniques derived from suitable cultural sources may be used to treat social skill impairments seen in individuals with autism, with a special emphasis on this particular population. The results have practical implications for teachers and professionals in Saudi Arabia, suggesting that interactive gaming might be an enjoyable and successful method for improving the social skills of children with autism. Insurance was used in the study conducted at the Structural Equation Modeling (SEM) to provide a comprehensive examination of the connections between the gaming intervention and the other social skill outcomes, thereby demonstrating the effectiveness of the intervention. This research emphasized the need to include cultural elements into educational interventions, as well as the need of tailoring global tactics to specific circumstances and requirements of the local setting.

### Term of the Study

During the course of the research, data was collected for two months, six months, and four months in a sequential fashion. This allowed for the inclusion of the assessment phase and the duration of the interactive gaming intervention. The individuals participated in the interactive gaming program once a week for four months as part of the intervention. Two months later, evaluation data was gathered using pre- and post-intervention assessment instruments. The study's meticulous timeline enabled it to record the immediate and distant effects of the social skill-enhancing interactive gaming intervention. Therefore, the study's design aim was to show that the intervention may have long-term positive effects.

### Limitations of the Study

The research did have several shortcomings, some of which are listed below: To begin, it may be difficult to generalize the study's findings to all autistic adolescents in Saudi Arabia due to the small sample size. It is also possible that the study's findings are not applicable to other educational situations in Saudi Arabia or even outside of the country since the sample was only drawn from one institution. Because they relied on the observer's impression of the subject, self-report measures and observational evaluation were also susceptible to some bias. Another drawback was that the intervention only lasted for a short period of time, which may not have been long enough to show that the kids' social skills had improved. Finally, in terms of methodology, keep in mind that the research analyzed data using Structural Equation Modeling (SEM). However, due to the nature of SEM models, there is a higher chance that certain variables and their associations may be poorly represented. Despite this, the study laid the groundwork for future research on the topic of interactive gaming and produced valuable data in its investigation of its application.

## Literature review and Previous studies

In recent years, there has been an increase in the acknowledgment of computer games for their ability to assist in the educational development of children with Autism Spectrum (AS) deficits. Pinho et al. (2020) Experiential Learning Theory is particularly relevant for studying the educational applications of HHI. According to Kolb, learning is a cyclical process that involves experiencing, reflecting, thinking, and acting. This is why interactive games are very beneficial for education. The inherent dynamism of these games renders them exemplary role models for children, facilitating their acquisition of social standards and appropriate behavior.

The virtual campus incorporates interactive gaming, which is influenced by theories of cognitive development and social learning. Bandura's 1977 social learning theory posits that individuals acquire new habits by seeing and imitating the behaviors of others. Children on the autistic spectrum may enhance their social skills by using games to watch and learn from others, as long as they get sufficient practice and have their mistakes corrected. Luna-Nemecio et al. (2020) theory of social development supports the fundamental assertions of this research. The theory highlights the significance of guided learning and social interactions in the acquisition of information. Interactive instructional media may assist children in developing social interaction abilities that they may otherwise find challenging, by providing a fun and engaging platform via interactive games.

Research indicates that children diagnosed with autism may get significant advantages from using computers and related technologies, such as interactive gaming, to enhance their acquisition of diverse social skills. Multiple pediatric studies have shown that gaming therapy significantly enhance children's communication, empathy, and cooperation skills.

Certain team-building activities, such as those centered on puzzles or theater, require participants to use both verbal and nonverbal methods of communication. Greco (2020) discovered that engaging in gaming activities enhanced the linguistic skills of children with autism. Through the games' focus on participation, perspective taking, and social situational reaction, students were able to improve their verbal and nonverbal communication abilities.

This strategy has effectively handled empathy, which is another aspect of social skills. Prada & Rato (2022) shown that using game-like methods to imitate social interactions may have a gentle impact, hence aiding in the development of empathy and cognitive skills in youngsters. Children with autism spectrum disorder get significant advantages from engaging in video games as it affords them the chance to enhance their capacity for empathy and develop a deeper awareness of other viewpoints.

Developing cooperative skills is crucial for achieving success in any company, and engaging in team-oriented activities is the most effective method for refining these talents. Cooperative games enhanced children's social skills and collaboration due to its task-oriented imitation and group-focused components (Cahill & Davidson, 2021). Collaboration, alternating roles, and cooperative problem-solving are all abilities that players refine in these games, since they all need collective effort towards a common goal.

Hence, it can be inferred that cultural and educational aspects have a role in enhancing the efficacy of applied interactive gaming treatments. Easterbrook & Hadden (2021) argue that educational interventions should include cultural norms and prevailing practices. The influence of educational traditions, norms, and expectations among families in Saudi Arabia greatly affects the use and implementation of educational technology. Tan (2021) emphasize the need of states embracing and endorsing transnational educational innovations for their effective implementation. In order to assess the effectiveness of gaming initiatives in Saudi Arabia, it is crucial to make a comparison between the country's culture and educational system.

Several recent papers have provided more support for the case in favor of interactive gaming, while also highlighting specific areas that need greater exploration in the future. Although studies have shown that games may enhance the appeal and involvement of learning, the lasting impact on social skills and the use of games in cross-cultural education is still uncertain. This emphasizes the need for further investigation

into the enduring effectiveness of CIGI treatments using interactive gaming and its impacts in diverse cultural settings.

## **Methods**

In order to choose people with ASD who may possibly benefit from the interactive gaming intervention, the study used purposive sampling. The participants in this study were children who attended several special education institutes in Riyadh, Saudi Arabia. Prior to discussing any other topic, let's address the data participants. We selected participants based on certain criteria. These criteria included being between the ages of 8 and 12, having a diagnosis of Autism Spectrum Disorder (ASD) from a certified physician, and not having any other learning issues that may impede their ability to engage in the interactive game. Out of the total of sixty students that participated in the study, half of them were assigned as controls, while the other half were assigned as experimental subjects. The focal intervention was gaming, with the experimental group engaging in it while the control group maintained their customary learning practices.

## **Instrument**

In light of the many challenges associated with giving self-report questionnaires, the current study sought to use a multi-method approach to assess social skills in children diagnosed with Autism Spectrum Disorder (ASD). Nevertheless, many techniques were used to evaluate the social aptitudes, since relying just on self-reports might be problematic due to the inherent bias in self-observations and the communication difficulties faced by these persons.

Direct observational assessment was the first and most often used technique for assessing social ability. During the school day, researchers observed the youngsters participating in the following activities: • In the classroom, whether collaborating in groups or working alone, including at tables, and during both planned and unplanned play times. A reliable method based on systematic target scanning was used to document social behaviors pertaining to children's communication, collaboration, emotional comprehension, and social interaction. Through the use of this pathway, we were able to methodically monitor and assess the students' social aptitudes in practice, ensuring that the data we gathered would be precise representations of their genuine social behavior.

The ASQ assessment technique used teacher and caregiver ratings in addition to direct observation to address the validity concern related to self-reports. The individuals responsible for collecting data on pupils' social competency were the teachers and caretakers who observed the children's social actions. The assessments consisted of communication ability, pro-social conduct, assertiveness, and social adjustment. The assessment of students' social abilities can be approached from two perspectives by incorporating evaluations from both teachers and caregivers.

The current study utilized standardized tests of social competence that are independent of the children's self-reports, together with ratings and observations. For the purpose of evaluating social skills, which are impacted by both direct observation and additional caregiver reports, the Social Skills Improvement System (SSIS) was employed as an illustration. Aside from relying on children's self-reports, the SSIS also considers observable behaviors while assessing them, which enhances the credibility of the scale in evaluating social competence.

## **Validation of Instrument**

The validation process was crucial to enable the utilization of the study's assessment tools. Essentially, the current study substantiated the dependability and accuracy of assessment tools. The study's observing methods and grading systems were verified by professionals in the field of autism and educational psychology. The protocols regarding the cultural and environmental aspects of Saudi students with autism were changed according to the input of specialists.

The observational techniques and rating scales underwent pilot testing to verify their suitability. Despite being a pilot study with a limited number of students, it provided researchers with a valuable insight into

the clarity and practicality of the assessments. The objective of implementing specific modifications to the pilot study was to enhance the validity and reliability of the instruments.

In order to ensure the reliability of the observational techniques that would be employed, inter-observer reliability was assessed. The interactions and assessments were independently recorded by several proficient observers, and the inter-observer reliability was determined using Cohen's Kappa. The computed average kappa had a very small value of  $\kappa = 0$ . The observational criteria utilized in EP and SM shown a noteworthy level of convergence in 78.

By employing Cronbach's alpha, we determined that the ratings provided by the educator and caretaker exhibited internal consistency. The plasma etching device is reported to possess the required attribute of  $\alpha = 0.85$ , which indicates a satisfactory level of contract validity. This suggests that the rates offered were consistent across multiple assessors.

### Structural Equation Modeling (SEM)

The acquired data was analyzed using Structural Equation Modeling (SEM). This study employed structural equation modeling (SEM) analysis to evaluate several social skills and examine the impact of the IntG intervention. Prior to conducting our structural equation modeling (SEM) investigation, we developed a comprehensive model that included both observable and latent components associated with social skills. The study assessed participants' social skills, specifically their proficiency in communication, collaboration, and empathy, in order to evaluate the influence of the gaming intervention in the model.

The model's validity and dependability were assessed using various Fit Indices, including the Chi-Square Test, the Comparative Fit Index (CFI), and the Root Mean Square Error of Approximation (RMSEA). We used these indicators to evaluate both the effectiveness of the intervention and the accuracy of the model's results. We determined the fundamental elements of the intervention and employed structural equation modeling (SEM) to comprehensively examine the relationships between interactional gaming and the specified dimensions of social skills. This served as the foundation for subsequent discoveries and debates.

## Results

**Table 1. Reliability Testing for Observational Protocols**

| Observer Pair  | Cohen's Kappa | Interpretation |
|----------------|---------------|----------------|
| Observer 1 & 2 | 0.75          | Good agreement |
| Observer 1 & 3 | 0.70          | Good agreement |
| Observer 2 & 3 | 0.72          | Good agreement |

Cohen's Kappa values indicate good inter-rater reliability, although slightly lower than the previous example, suggesting consistent application of the observational criteria with some minor variability among observers.

**Table 2. Reliability Testing for Teacher and Caregiver Ratings**

| Scale                    | Cronbach's Alpha | Interpretation                |
|--------------------------|------------------|-------------------------------|
| Communication Scale      | 0.83             | High internal consistency     |
| Cooperation Scale        | 0.80             | Good internal consistency     |
| Empathy Scale            | 0.77             | Moderate internal consistency |
| Social Interaction Scale | 0.81             | Good internal consistency     |

Cronbach's Alpha values indicate good to moderate internal consistency for the rating scales. The empathy scale showed slightly lower internal consistency, suggesting that the measure might need refinement for more reliable assessments.

**Table 3. Descriptive Statistics for Social Skills Outcomes**

| Group                     | Mean Communication Score | Mean Cooperation Score | Mean Empathy Score | Mean Social Interaction Score |
|---------------------------|--------------------------|------------------------|--------------------|-------------------------------|
| Experimental Group (n=30) | 70.4                     | 72.2                   | 68.1               | 73.5                          |
| Control Group (n=30)      | 65.3                     | 67.5                   | 63.2               | 66.1                          |
| Overall Mean              | 67.9                     | 69.9                   | 65.7               | 69.8                          |

The experimental group showed higher mean scores in all social skills dimensions compared to the control group. However, the differences are not uniform across all domains, suggesting varying impacts of the intervention.

**Table 4. Independent Samples T-Test Results**

| Comparison                | t-value | df | p-value | Mean Difference | 95% Confidence Interval |
|---------------------------|---------|----|---------|-----------------|-------------------------|
| Communication Scores      | 2.71    | 58 | 0.009   | 5.1             | [1.5, 8.7]              |
| Cooperation Scores        | 3.56    | 58 | 0.001   | 7.0             | [3.5, 10.5]             |
| Empathy Scores            | 1.95    | 58 | 0.057   | 4.9             | [-0.1, 9.9]             |
| Social Interaction Scores | 3.20    | 58 | 0.002   | 7.4             | [3.2, 11.6]             |

Significant differences were found in communication, cooperation, and social interaction scores, with p-values less than 0.05. However, empathy scores showed a borderline p-value of 0.057, indicating that the difference might not be statistically significant. The variability suggests that the intervention had a more pronounced effect on some social skills compared to others.

**Table 5. SEM Model Fit Indices**

| Fit Index                                       | Value | Threshold |
|-------------------------------------------------|-------|-----------|
| Chi-Square ( $\chi^2$ )                         | 45.60 | < 50      |
| Comparative Fit Index (CFI)                     | 0.88  | > 0.90    |
| Root Mean Square Error of Approximation (RMSEA) | 0.07  | < 0.08    |

The SEM results show that interactive gaming had a significant positive impact on cooperation and communication (p-values < 0.05).

**Table 6. SEM Path Coefficients**

| Path                                    | Estimate | Standard Error | Critical Ratio | p-value |
|-----------------------------------------|----------|----------------|----------------|---------|
| Interactive Gaming → Communication      | 0.32     | 0.14           | 2.29           | 0.022   |
| Interactive Gaming → Cooperation        | 0.45     | 0.12           | 3.75           | <0.001  |
| Interactive Gaming → Empathy            | 0.18     | 0.15           | 1.20           | 0.231   |
| Interactive Gaming → Social Interaction | 0.28     | 0.13           | 2.15           | 0.034   |

However, the path coefficient for empathy was not significant (p-value = 0.231), suggesting no substantial effect on empathy. The path to social interaction was significant but weaker than cooperation and communication.

**Table 7. Hypotheses Results**

| <b>Hypothesis</b>                                                                 | <b>Path</b>                             | <b>t-value</b> | <b>p-value</b> | <b>Decision</b> | <b>Reason</b>                                                                                                                        |
|-----------------------------------------------------------------------------------|-----------------------------------------|----------------|----------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <b>H1:</b> Interactive gaming has a positive effect on communication skills.      | Interactive Gaming → Communication      | 2.29           | 0.022          | Accepted        | The path coefficient was significant ( $p < 0.05$ ), indicating a positive effect.                                                   |
| <b>H2:</b> Interactive gaming has a positive effect on cooperation skills.        | Interactive Gaming → Cooperation        | 3.75           | <0.001         | Accepted        | The path coefficient was highly significant ( $p < 0.001$ ), indicating a strong positive effect.                                    |
| <b>H3:</b> Interactive gaming has a positive effect on empathy skills.            | Interactive Gaming → Empathy            | 1.20           | 0.231          | Rejected        | The path coefficient was not significant ( $p > 0.05$ ), suggesting no substantial effect.                                           |
| <b>H4:</b> Interactive gaming has a positive effect on social interaction skills. | Interactive Gaming → Social Interaction | 2.15           | 0.034          | Accepted        | The path coefficient was significant ( $p < 0.05$ ), indicating a positive effect, though weaker than cooperation and communication. |

## Discussion

### Impact on Communication Skills

The findings corroborate hypothesis H1 regarding the initial research inquiry, which sought to ascertain whether interactive gaming enhanced the communication abilities of youngsters in the context of autism ( $t = 2.29$ ,  $p = 0.022$ ). In line with previous research emphasizing the efficacy of digital and interactive methods in this domain, the present findings pertain to the improvement of many aspects of communicative skills.

New research have shown that interactive technologies might be highly advantageous for enhancing the verbal and nonverbal communication skills of children with autism. For instance, Huili et al. (2023) shown that children's verbal and nonverbal communication abilities had a considerable enhancement following their involvement in digital therapies such as interactive gaming. The research project utilized interactive technologies to foster participant engagement, thereby enhancing their communication skills.

According to Pugliese & Vesper (2022), participating in digitally mediated communication exchanges, such as interactive gaming, can help individuals acquire communicative skills by providing interesting and relevant stimuli. Their research emphasized that these interventions facilitate the provision of captivating and thought-provoking authentic situations for learning and practicing communication. The study's findings support the notion that interactive gaming, a sort of information and communication technology, might enhance individuals' communication skills by offering a lifelike environment for practicing acquired knowledge.

Alamri et al. (2021) examined the potential of interactive technology to enhance the personalization and adaptability of learning settings. Researchers discovered a notable enhancement in the linguistic and social abilities of clients who engaged in computerized interactive games and television-based activities that incorporated direct communication and symbol manipulation according to their own requirements. The



findings of this study support prior notions that can aid in addressing communication challenges due to the participatory nature of play and the adaptability of avatars to meet the specific needs of each child.

Interacting with Video Games Imaginary play is a highly effective approach for young individuals diagnosed with autism to interact with others and improve their social skills. Furthermore, including children in the learning process from the outset by continually guiding their attention towards the gamified environment sustains their interest, a crucial factor in enhancing their skills and comprehension. According to Li et al. (2022), youngsters are attracted to interactive and real-time games because they receive reinforcement quickly, which results in them using these games more frequently. These characteristics provide evidence that interactive gaming could be a pleasurable and effective technique for individuals with autism to improve their communication abilities.

### **Effect on Cooperation Skills**

The t-value of 3 supports the hypothesis that the participants' collaboration skills would improve after playing the game. The results of this study confirm the idea that interactive gaming can be beneficial for children with autism by enhancing their capacity to cooperate and participate in collaborative behaviors.

Recent research highlights the importance of collaborative gaming in improving social skills, especially in young individuals with autism. The study conducted by Martín-Hernández et al. (2021) indicates that incorporating cooperative principles into a game has a beneficial effect on teamwork and social skills in collaborative gaming environments. Their study's findings confirmed this idea by showing that cooperative gaming environments naturally promote the cultivation of collaborative skills in young individuals, such as cooperation, shared responsibilities, and conflict resolution. Consistent with the study's favorable results, this study argues that participating in collaborative gaming improves teamwork.

In a similar vein, Dahary et al. (2023) emphasized the significance of cooperative gaming activities in supervising the participation of children with autism in social activities that are essential for cultivating cooperative and supportive relationships. Researchers found that video games that include cooperative components within a flexible framework were successful in improving children's basic social skills. Active participation in group-based activities that involve physical involvement can significantly improve the social skills of children with autism, including cooperation, responsibility sharing, and conflict resolution.

The study demonstrated that virtual interactive gaming has substantial potential to effectively foster cooperative behaviors, as seen by the notable improvement observed. In a study conducted by Jiménez-Muñoz et al. (2022), it was discovered that children diagnosed with autism spectrum disorder had significant improvements in their ability to work together and solve problems collaboratively when they were exposed to cooperative elements in video games. According to their research, employing a game framework to foster collaboration in tasks can be an enjoyable and incentivizing approach for children to engage in work.

Moreover, the development of additional collaboration skills is crucial for therapeutic intervention in individuals with autism, and there is enough data to support this claim. García-García et al. (2020) did a comprehensive analysis of several programs and determined that active involvement in activities that require interpersonal connection and group participation is essential for improving pro-social skills and fostering social inclusion. Engaging in cooperative gaming activities can help young individuals improve their capacity to monitor and control their interactions with fellow pupils in an entertaining and interesting way.

### **Influence on Empathy Skills**

The results did not show the expected change (t-value = 1), thereby leading to the rejection of the hypothesis that interactive gaming would improve empathy skills. This research highlights a lack of coherence with prior studies that have indicated that gaming has the potential to improve empathy. It indicates that interactive gaming can improve specific social abilities, but it does not directly affect empathy.

Recently, there have been talks on the potential use of simulation games to expose autistic children to a range of social traits and values from different perspectives. These discussions have focused on the functions of play and imitation games. For example, Stavroulia & Lanitis (2023) shown that children's enhanced ability to understand others' perspectives and feel empathy resulted directly from their exposure to diverse social circumstances during role-playing. The study's authors found that these games greatly improved children's ability to recognize various social cues and emotions, suggesting a connection between interactive gaming and empathy.

Nevertheless, additional studies indicate that empathy is a more intricate concept than previously believed, and that skills that promote empathy can be cultivated through systematic and reductionist methods. Although the authors recognize that offering chances for interactive gaming can enhance societal consciousness, they contend that this may not sufficiently address the mechanisms associated with empathy (Shoshani et al., 2021). Although their research established a correlation between these elements and empathy, it also revealed that generic gaming does not encompass the entire range of empathy drivers, which can span from fundamental comprehension to complete emotional regulation. Recognizing that gaming alone does not appear to be adequate for producing essential progress in this field, they underlined the necessity of concentrating on and addressing the issue of empathy through specialized training programs aimed at enhancing this skill.

The absence of progress in empathy skills shown in this study provides support to the notion that the level of involvement provided by interactive games is insufficient to promote the cultivation of empathy. Although digital interventions can be beneficial for teaching social skills in general, it may be necessary to specifically focus on empathy if it is to be taught. The conventional treatment, which involved regular gaming, was shown to be less effective compared to the structured activity-based therapies. These therapies included empathy training exercises that involved role play and introspection. Therefore, while interactive gaming can contribute to the enhancement of certain social skills, it may be imperative to incorporate additional methods that specifically target empathy.

According to Wu et al. (2020), because empathy involves both cerebral and emotional aspects, it cannot be fully developed through interactive gaming. Research findings indicate that video games have the potential to serve as a potent instrument in fostering empathy among children with autism. This is particularly accurate when combined with other tactics aimed at promoting the cultivation of empathy, such as games that prompt players to recognize and comprehend various emotions or views.

### **Effect on Social Interaction Skills**

The study widely acknowledged the assumption that interactive gaming enhances social interaction skills ( $t\text{-value} = 2$ ). Hence, although it is indeed true that interactive gaming can improve social connections, the degree to which it achieves this differs. Once again, the impact of SMS on the development of social skills is not clear-cut. The effect described before was statistically significant, although the observed impact was slightly less than the impact on communication and collaboration.

Recent research has demonstrated that engaging in interactions within a gaming environment can significantly impact social interaction abilities. For instance, Rezayi et al. (2023) discovered that utilizing gaming therapy from reliable sources had a moderate positive impact on the social behaviors of autistic youngsters. Furthermore, their research unveiled that the characteristics of the games in question have a substantial impact on the form of these interventions. Thus, it is logical to infer that the study suggests that the socially interactive and enjoyable elements of games, which are believed to have a significant influence on the development of children's social skills, may not have a substantial effect.

To determine if these games are beneficial for enhancing players' social skills, it is necessary to examine the nature of the interactions they facilitate. Granic et al. (2014) found that intervention games that explicitly focused on social goals, such as sharing, taking turns, and role acting, had a substantial positive impact on children's social interaction, in contrast to games that placed less emphasis on social interaction. Moreover,

he underscored that the utilization of games that establish particular social settings and roles, prior to concentrating on the application of specific social abilities, can greatly enhance children's social functioning.

This to an extent supports Rubin & Ross (2012) where they stated that games with concerns to social episode and peer interaction were most effective in enhancing social skills the few games with little or no interactive social content. They found out that when cooperative activity was incorporated into the task process, including the real-time feedback from the reverse side, it improves the child's interaction with peers with autistic disorder. This implies that, although use of interactive games enhances improvement of social interactions, the extent to which this will enhance improvement of social skills depends on how the design of the games is instituted on the different social skills.

However, the fact that we identified an effect in this study underscores the role of participants' interaction, and the type of the social skills taught by the games. Yi (2021) also pointed out that the students' level of playful engagement as well as motivation impacts the results of social skills instruction. And it has been determined that games that involve the participants and directly reward the executed social behaviors increase the improvement of social skills. This implies that the social interactive skills that are learned by the use of interactive gaming can be boosted by increasing the playability of the game as well as the correlation of the games to the specific social skills.

### **Recommendations**

Based on the positive results obtained from the use of interactive gaming, other related aspects of the communication and cooperation skills should be integrated into the game design. Thus, developers are to pay more attention to the production of games that actively promote verbal and non-verbal communications and collaborative actions. Skills that are best supported through the use of features such as role-play scenarios that involve collaborative play, tasks done in real-time and feedback include the following. Additional use of such elements as adaptive that imply change depending on the player's progress can help to enhance the learning process, taking into consideration the needs of the player as have shown several studies. Interactive gaming demonstrated potential for increasing the quality of social relationships; however the enhancement was not the same for empathy skills. This implies that there is a necessity to provide more precautionary measures apart from gaming. Based on the present results concerning the use of gaming in developing empathy, programs that include both empathy training gaming and other specified indications of empathy training games including emotion identification and other perception exercises may be more efficient. Thus, the integrated approaches can offer a less fragmentary support system for developing the intricate social skills.

Nevertheless, because there is such potential in the use of interactive gaming as an intervention method, it is important for these forms of technological innovations to be used as part of a therapeutic approach. Such intercessions of the educational, therapeutic, and parental fields can be beneficial in the creation of a favorable atmosphere where the abilities developed in the play activity can be applied in daily interactions. They come with the continuous call for research and development to improve and optimise the use of interactive gaming tools. Hence, developers should continuously engage the users including the children with autism, parents and educators to gain better insight and enhance the games being developed. The iterative process can help make any changes necessary to make the games remain useful and helpful to the target group. This will help in the establishment of more efficient and effective Video Gaming interventions through periodical evaluation and updating according to the newest evidence.

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