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Interactive Games as Tools for Improving Social Interaction Skills in Children with Autism in Saudi Students

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Abstract

The purpose of this study was to find out the effectiveness of using interactive games to enhance children's social interaction skills within two weeks of the intervention. The study in general was conducted using a quantitative style, whereby the subjects involved were 60 Saudi students diagnosed with autism, in the experiment group and the control group. The subjects involved in the experimental group were made to play games that would help in improving their social interaction skills, whereas the control group was made to play normal group games. Observations of the teachers were used to gather data, and comparison tests of dependent variables, independent variables and analysis of covariance were utilized in the determination of the changes in social interaction skills. It was shown that the experimental condition led to improvements in the subjects' social skills compared to the control one. Lastly, the study proves that there is possibility and easiness when conveying social skills by using interactive games for children with autism, proposing the usages of such tool in early intervention and educational context. More future studies need to be conducted on the durability and maintenance of such improvements as well as ascertain the effectiveness of future designs of the interactive games.

Keywords: Interactive Games, Social Skills, Autism Spectrum Disorder, Educational Intervention, Quantitative Analysis

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Introduction

Play and social skills are critical elements of the developmental profiles of young children with autism. From such communication skills, the children with ASD experience a struggle in some of the following skills, which includes initiating conversation, comprehending social signals, engaging in play cooperatively among other ability skills (Abbot-Smith et al. , 2023). Developing of these skills enhances educational performance, fosters independence and subsequently quality of life (Budiharso & Tarman, 2020). Previous treatments; including behavioral therapy and social skills training might not be very effective yet can be time-consuming demanding one on one sessions and is costly (Yates, 2020). Video games have become popular in many arenas as a possible means for education and therapy. These may be online or offline based games and learning on games provides a fun filled environment and motivation to learn (Balakrishna, 2023). The feedback they give is immediate, they can be rehearsed severally and they can be targeted at specific students making them ideal for use with learners with an ASD (Carrington et al. , 2020). The study done revealed that fun based activities in games have a positive impact in developing functions associated with IO including readiness aptitude as well as having benefits in exercising social proficiencies through enabling make-believe social relations (Lorusso et al. , 2020).

Previous strategies in Saudi Arabia can be the special education programs and the behavior modification techniques that can be applied to facilitate the social interaction skills among children with ASD. Still, these methods have several issues, for example, the shortage of specialized personnel, cultural differences, and difference in the extent to which families accept a particular intervention (Papoudi et al. , 2021). First, there is insufficient literature exploring the usability of such intercessions amongst Saudi societies (Alqunaibet et al. , 2021).

Studies from other regions have established that there is improvement in social interaction skills in children with autism when exposed to interactive games. For instance, a study conducted by Soares et al. (2021) established that CBSST led to positive change in children with AS regarding their social conducts and anxiety. The same is suggested by Garcia-Garcia et al. 's (2022) study that analyzed the efficacy of interactive multimedia programs suggesting children with autism enhanced their emotion and social cue recognition abilities. These studies can, however, be enlightening regarding the possibilities of relaying learning through interactive games, though the Saudi Arabian context has not been factored in.

As it will be seen from the case of Saudi Arabia, education and therapy for learners with ASD depend on their culture and the available tools. In a study done by de Leeuw et al. (2020), the authors established that cultural attitudes towards autism together with the related discrimination mean that few children get access to and acceptance of intercession programmes. Also, Spain et al. (2022) pointed out that a lack of trained professionals and specialist services in autism is still limited which makes efficient implementation a challenge. Such challenges imply the necessity of culturally sensitive solutions that would nonetheless be feasible given the current framework.

There are friendly games that can be used interchangeably with conventional approaches and may prove to be effective when some of the challenges similar to those observed in Saudi Arabia are being faced. Furthermore, another study by Ke et al. (2022) has indicated that virtual reality and other interactive technologies can be easily customized to fit different cultural environments; therefore, they can be considered a rather useful tool when it comes to addressing the needs of children with autism. Additionally, Xie et al. (2020) discussed motivational functions of interactive games to improve the level of interest and compliance with interventions, which is crucial in the areas where raising awareness may be met with reluctance.

On the other hand, whereas these factors elaborate theoretical advantages related to using interactive games, there is a dearth of literature on the use of interactive games in Saudi particularly the assessment of their effectiveness. The works researched may be done in western countries, and may not have direct relevance to Saudi Arabia's educational setup and culture. For instance, the educational contexts, parents' engagement, and cultural norms towards autism in KSA are distinct from the western nations (Khalil et al. , 2020). Thus, there is a need to carry out localized research to establish the extent to which such benefits are obtainable within the Saudi Arabian context. Past studies conducted in other parts by now have found that the major emphases with interactive games are in the cognitive and affective outcomes, and less on the interactional effects (Antonopoulou et al. , 2022). Therefore, this study seeks to fill this gap with specific focus on the assessment of the effectiveness of solutions namely interactive games in improving social interaction skills, which are vital in the development and inclusion of children with AS. In this way, paying attention to the facilitation of the social skills in children, this research will contribute into the clarification of the possibilities of using the interactive games in a significant area of deficiency.

Problem of the Study

It is thus important to define ASD since it provides specific difficulties, especially in the sphere of social interaction, which is fundamental for the given children's development and inclusion to society. However, despite the offered variety of methods for developing social skills, many of them refer to time-consuming individual sessions and, therefore, are considered to be rather resource-intensive, which creates potential

difficulties where there is a lack of adequately qualified specialists and lacking facilities. In Saudi Arabia, the culture around autism as well as the social prejudices against the disorder again hinders provision and uptake of these practices. Some other underlying benefits include the use of interactive games in the treatment of autism affecting children in different other parts of the world; however, there are few studies pointing to the actual applicability of the subject in Saudi Arabia. This void in literature is pertinent as culture, social context, educational experiences that affect the successful implementation of such interventions. Thus, the aim of the present work is to assess the usefulness of the interactive games acting as the SSC for enhancing sociocommunicative abilities of Saudi students with autism and filling the gaps in the accessible and culturally sensitive methods.

Research Questions

1. Do interactive games significantly improve social interaction skills in children with autism?
2. Which specific social interaction skills are most improved through interactive games?
3. How do the improvements in social interaction skills through interactive games compare with traditional intervention methods in Saudi Arabia?

Significance of the Study

Said investigation is critical for the Saudi context and the field of autism education and therapy. As such, the present study's identification of the effects of interactive games may be useful to educators, therapists, and policy makers developing new interventions or considering the incorporation of such tools into existing ones. This research satisfies a significant literature gap by comparing the effectiveness and advantages of interactive games utilizing the cultural and learning environment of Saudi Arabia, which is not similar to the Western culture many studies have based their research on. The implications of this research are to generate enhanced, appealing and culturally sensitive interventions for children with ASD and enhance the quality of their lives. In addition, the study adds to the existing knowledge concerning successful implementation of innovative and flexible tools, such as the IA games with ASD children, regarding the challenges of resource scarcity and cultural stigmatization for better assessment and reception of effective autism interventions in Saudi Arabia.

Term of the Study

The whole research was executed within one year, from the planning and recruitment of the participants stage up to and including analysis of the data collected and writing of the report. The intervention phase in this study entailed the use of the interactive games and their monitoring and occurred for a period of six months. Since the intervention occurred for a number of weeks, it was enough in order to evaluate the dynamics of the studied aspect of social interaction among the subjects. At the beginning of the study, each participant was rated for social skills to build the pretreatment base line and then proceeded to play the interactive games and at the end, post treatment assessments were done to determine the results. Follow up sessions with the children were also incorporated with aims of assessing the durability of the achieved gains in their social competencies. This provided an all-around nearly real-time and a distant assessment of the impacts of the games in development of interaction abilities in children diagnosed with autism.

Limitations of the Study

While this study could help remedy the current glaring lack of empirical knowledge on this topic, it has limitations which must be recognized. Firstly, There was a small sample size collected because of the exclusion and inclusion criteria and the remote regions of Saudi Arabia which limited the access to the population. This may also restrict the generalization of the results to the larger systems of all the children with autism in Saudi Arabia. Secondly, the study relied on the cooperation of the parents and caregivers for the intervention, and this made the study to be in one way or the other influence by the interested or motivated parents and caregivers only. However, the rate of autism and the cultural and social beliefs of Saudi Arabia may affect the findings and

its analysis to some extent and therefore may not compared easily with other studies carried from other countries. Last, the study was limited to short–medium term, and although the sessions for follow-up were performed, the long-term maintenance of the changes in social skills cannot be considered proven conclusively. Such limitations give the cue for future studies to involve more participants, diverse and extend the duration of experiment to investigate the effect of interactive games on the social interactive skills among children with autism.

Literature review and Previous studies

The application of the games that enhance interaction abilities in children diagnosed with autism is based on several theories. Manginelli & Pandey 2015, stated that the Social Learning Theory developed by Bandura in 2021 integrates observation, imitation and modeling of interactive games. These games give the child a setting within which they can learn social behaviors without making real life stinging mistakes. Moreover, the Theory of Mind – the skills that embody the ability of individuals to place themselves into other people's shoes and understand their thoughts and feelings – is commonly underdeveloped in persons with autism (Williams, 2021). Video-based play that targets social context scenery can enhance Theory of Mind skills, as regularly and specifically required practice gives awareness of other people's feelings and their reactions (Hassan et al. , 2021).

Many real-life researches have also confirmed the possibility of the positive impact of games for kids with ASD. For instance, Soares et al. , (2021), were able to establish that computer-based social skills training positively impacted on social regarding and reduced anxiety in children with autism. The results indicated that children who played the computerized interactive game improved their observable social skills more than children in the usual social skills training group. Likewise, Rashidan et al. (2021) synthesized the design of an interactive multimedia program for educating children with ASD regarding emotion identification. The outcomes stated that the participants' performance in distinguishing between emotions and aspects of social interactions had developed considerably.

In a number of related researches, Gallud et al. , (2023) highlighted several works that focused on the application of technology-based intervention such as interactive game in children with autism. The findings indicated that such interventions play a role in boosting of several social and communication skills. The authors mentioned also several distinctions which come with the use of interactive games such as motivation, feedback and individualization of material based on the child's achievements.

In addition, we identified that Abu-Amara et al. (2021) examined the method of applying virtual reality for interactive autism therapy. In their research, they established that it was possible to design environments that would mimic real life social situations, thus helping children with autism rehearse and enhance their social skills in a manner that is tightly repeated. Consumer research was a central theme in the research and it demonstrated the use of virtual reality with different cultures, its potential on the global platform.

Studies of Saudi Context have brought out the special features of need satisfaction and development in autistic children. Alallawi et al. (2020) conducted a qualitative study on the community and cultural aspect of autism in Saudi Arabia. The researchers established that culture and autism related prejudices still exist and are barriers that discourages the delivery of and acceptance to intervention programs. Now, parents and caregivers stated that they faced challenges in terms of accessing and using relevant services for children, this indicates a potential for better and more culturally competent strategies.

Recently, Khan et al. (2020) made a good attempt to describe various services for children with ASD in Saudi Arabia. The study pointed out that despite the improvement in autism awareness and acceptance of people with this disorder, adequate services and qualified personnel remain scarce. The researchers urged that more resources should be devoted to increasing the effectiveness of those approaches which can be realistically delivered at the given organizational level.

Aldera et al. (2020) investigated on Clinical Features and Co-morbidity of Autism in KSA. Their conclusion was that Saudi children's autism symptoms are also comparable in severity and nature to those of other regions, meaning that Saudi children can also benefit from tested effective interventions if they were culturally adapted. This is in line with the increasing appreciation of features of interactive games as a versatile and fun approach to delivering the intervention.

Although the studies enumerated earlier offer some insights into mitigation of the problems faced by children with Autism through interactive games, no research has been conducted regarding the conditions in Saudi Arabia. Research carried out in western nations may not be as relevant to the Saudi educational system and the surrounding culture. For example, some of the factors that refer to the social context of autism in Saudi Arabia are educational settings, the role of parents, and attitudes to the disorder, which vary greatly from those observed in Western countries (AlQahtani & Efstratopoulou, 2023). Thus, only with local research one may find out if the same advantages achieved in other countries can be effective in Saudi Arabia.

The overall awareness about autism in KSA is on the rise and so is the focus on special needs education and therapy (Alshehri, 2023), so it is relevant to discuss novel approaches like using games. This research aims to establish the impact of the mentioned game concepts in enhancing social interaction skills among Saudi students with autism. Therefore, based on a critical evaluation of the existing literature regarding the opportunities and threats of interactive games, this study can help to bridge the identified gaps in the literature and provide useful recommendations to stakeholders such as educators, therapists, and policymakers in Saudi Arabia.

Methods

Interactive games is a quasi-experimental research design, specifically, the pretest-posttest control group design was used to evaluate the treatment effect on the subjects' social interaction skills. This experimental setup made it possible to compare an intervention group, that played interactive games to a control group, who received traditional interventions. As hypothesized, the choice of the pretest-posttest control group design was particularly suitable for this study because it allowed for measurement of the changes in social skills that could be directly attributed to the intervention and it provided control over extra variables that could potentially affect the results. Thus, based on the comparison of the obtained changes within and between the groups, the influence of the interactive games on the social skill improvement could be proven sufficiently strong.

Participants

The study entailed a sample of 60 children with diagnosed ASD of age between 7 and 14 years. These participants were learners in special education nationwide in different learning institutions in Saudi Arabia. Hence, this sample size though small proved relevant in generating statistically significant results from the study while at the same time not being unreasonably large from the logistical point of view. Participants were divided into two groups: The special control group was formed by 30 students while 30 students were enrolled in the experiment group. Some of the exclusion criteria that were employed were as follows, The participant must have a confirmed diagnosis of ASD and consent from the parents. Therefore, children who had moderate to severe physical limitations, or other diseases, which may influence their interactions with computer games were excluded. This helped in keeping off external influential factors thus enriching the sample and making it easy to compare the results before and after the intervention.

Intervention

In the present study, the intervention included a specific and strict made program of games that focused on promoting Saudi students with ASD's social interaction. Hence, the chosen games were based on the empirical literature and adapted to the cultural and developmental contexts of the participants. These games were

selected taking into account that games applied in similar conditions were effective, as well as they contributed to children's social and educational activity.

The intervention was planned to last for 12 weeks, where there was a plan of conducting 3 sessions per week with each session taking 45 minutes. This regular, specific and organised approach was intended to present frequent and routine practice together with specific ingredient practice. The sessions entailed the children using role-play where they recreated different scenes that are encountered in everyday life. Such activities were specified as role-play, the play with the changing of turns, and cooperative tasks, which were aimed at the practice in the initiation and continuation of the conversations, interpreting the signals of social noticeable signs, and cooperation with peers.

For instance, one game might involve mimicking a birthday party setting in which kids are placed through the practical exposure of how they greet others, share and respond to invitations in a bound environment. Another game could refer to a series of tasks that must be solved by a team with members communicating with each other. Thus, the context of the intervention was to create different social situations in which the children can be exposed, aiming to offer them experiences that could be applied to natural encounters.

The control group was maintained on the general interventions which included social skills training programs, occupational therapy, and speech therapy. These traditional practices sometimes entailed one-on-one or small peer group actualization techniques and taught skills such as – social story-telling, role-play and instructing. In order to preserve this consistent approach for the control group, the study attempted to give methodical answers to the following questions: ''Does the interactive approach possess more advantages if compared with the conventional one in relation with offering an improved impact in terms of social competencies of students? In order to identify the possible correlation between interactive game and/ or non-interactive game and the effects on children's social competencies, the control group of 36 students

Instruments

The study used several observation-based measures which afforded qualitative and quantitative data on the participant's social activity to evaluate the impact of the two games intervention.

Observations of behavior change was achieved through the use of checklists pre-developed by the teachers and therapists and the checklist focused on specific social behaviors of the children during the implementation of intervention. These checklists were intended to cover a variety of social skills such as initiation, appropriate and acceptable reaction to peer, and turn-taking and joining in group activities. Every checklist was further defined by several sub-points that indicated what kind of behaviors should be evaluated, for instance, frequency of peer initiation, quality of responses, and involvement to the group activities. Practioners were taught how to use these checklists in a standard way and with a high inter observer reliability to collect data. This training comprised of performing workshops and practice where participants are undertook lessons on how to rightly observe and document behaviors and how to manage increase or decrease in behaviors between settings/folk.

Besides direct session disciplines correspondences, parental questionnaires were also used to provide information regarding the social behaviors of the children in homes and communities. These questionnaires were aimed at assessing children's social communication behaviors in the context of family and peer activities different from the play sessions of the intervention. Interrogatives were presented with an intention to identify the shift in social functioning which included issues like social initiation, communication and perception and interpretation skills. Parents offered detailed descriptions of the children's behaviors during natural interactions, which supported observational data.

Procedure

In the context of the study, the social interaction abilities of all the participants were first evaluated to establish a starting point. This was done through the use of checklists that incorporated the systematic observation of

students and parental questionnaires. Parents, teachers, and other therapists were taught in the use of social recording and specific behaviors involving interactions with peers and engaging in group activities. These behaviors were observed and recorded with a lot of care so as to be able to build up a baseline of each child's social skills before the intervention was made. Parents also filled in the other questionnaires evaluating the frequency and types of their children's social behaviors in home environment and different community settings, which also give us comprehensive data about the children's social functioning.

Following baseline measures, the participants were randomly allocated into either the experimental group or control group to lessen the possibility of pre existent differences in demographic and other related factors affecting the results of the study. The subjects were randomly assigned to groups by the computer-generated random numbers to reduce the possibility of selection bias so that every child has the same likelihood of being assigned to the experimental or control group.

As for the experimental group, for the periods stipulated in the experiment, they played interactive games in an attempt to foster proper social interaction. These sessions were to be carried out three/ three for forty-five minutes each for twelve weeks. The given games were selected to address the main purpose of the sessions, which was to practice the skills of initiating and maintaining social interaction in a context that resembled real-life scenarios. For instance, the tasks may include games that involve assuming various parts in a society, problem solving activities, or games which are based on the turn-taking and sharing concepts. While the intensity of the two groups' traditional clinical intervention was comparable, the experimental group engaged in playful activities that stimulated their learning and enjoyment while the control group remained with the traditional social skills training programs, occupational therapy, and speech therapy. The traditional interventions included in the study were delivered at the same frequency and for the same time as the interactive game sessions to ensure that the clients were equally exposed to both intervention styles.

At least once a week during the 12-week intervention phase and before each individual's intervention, observers compiled observation checklists and session logs. The teachers and therapists were used as raters and they filled in the checklists during each session with specific behaviors and interactions noted. This constant data collection also made it possible to track small changes, which is essential to monitor constant progress in the context of the implemented interventions as well as to have the necessary feedback to know whether the given instructions were followed to the letter.

As a final measure of the improvement in social interaction skills, a post-intervention Social Interaction Scale was administered at the end of the 12 weeks' intervention. This assessment employed the same structured observation checklists and parental questionnaires administered during the first baseline assessment conducted at the parents' homes. This effectively determines the extent to which the individuals' social skills have been improved by analyzing data before the intervention by the interactive games and after the intervention. Teachers and therapists, for a second time, provided behavioral ratings of the children with reference to similar aspects of sociableness as before; parents also filled new checklists about the children's social behavior at home and in community arenas.

A reassessment was done six months after the real intervention to determine the sustainability of the changes sourced from the employees. This was done by administering the same assessment tool as the one used at the baseline and post-intervention evaluations enabling a comparison of the child's social interaction skills before, during and after the intervention program. The follow-up data were essential for establishing whether or not the increases in scores obtained from the immediate post-intervention assessment were sustained in the later period; thus, offering useful information regarding the effects of the interactive games on the target outcome, namely the children's social skills, in the long run.

Data Analysis

Quantitative analysis on the data was done in two levels; descriptive level and inferential level. Such characteristics include gender, age, and the nature of the observed changes in social interaction skills of the participants. Intraclass t-tests were used to compare the observed behaviours pre- and post-intervention within each group, and interclass t- tests were used to compare the pre- and post-intervention differences between, the two groups. To minimize confounding factors, and also for statistical control, the categorical data analysis was done using analysis of covariance (ANCOVA). Also, the index of Cohen's d was used to establish the size of the intervention on social interaction skills. Thus, the application of this comprehensive analytical approach offered a more detailed insight into the intervention's effectiveness.

Results

Table 1. Demographic Characteristics of Participants

Characteristic	Experimental Group	Control Group	Total
Gender			
Male	22	20	42
Female	8	10	18
Severity of Autism (CARS)			
Mild	10	9	19
Moderate	15	16	31
Severe	5	5	10

The following table shows demographic characteristics of the participants: Therefore the mean age founded for the experimental group was 9. 5 years (SD = 2.1) in the intervention group and 9 years in ANS control group. 7 years (volume or SD = 2.0). Identical criteria of inclusion, more precisely children aged between 7 and 14 years, were used in both groups. In the aspect of gender in autism, there were slightly more males than females, 70% and 30% respectively, which is common in most autism research because autism is more common in males. Autism severity did not significantly differ between the two groups based on the CARS, the majority of children, contrary to expectations, were moderately affected.

Table 2. Observed Changes in Social Interaction Skills (Pre- and Post-Intervention)

Experimental Group

Social Skills Dimension	Pre-Intervention Mean	SD	Post-Intervention Mean	SD	Mean Difference	SD
Initiating Interactions	3.2	0.8	4.1	0.7	0.9	0.9
Responding to Peers	2.9	0.7	3.7	0.8	0.8	0.8
Participating in Group Tasks	3.0	0.9	3.9	0.7	0.9	0.9

Control Group

Social Skills Dimension	Pre-Intervention Mean	SD	Post-Intervention Mean	SD	Mean Difference	SD
Initiating Interactions	3.1	0.9	3.2	0.8	0.1	0.7
Responding to Peers	2.8	0.8	2.9	0.8	0.1	0.8
Participating in Group Tasks	2.9	0.9	3.0	0.9	0.1	0.8

The results concerning the descriptive statistics highlight the overall positive effect of the interactive games intervention on the children's social interaction skills in the experimental group in the two-week period. Thus, meaningful development was noted concerning the initiation of conversations, utilization of coarse and fine cues for peer responses, and collaborative engagement in group work. For example, the mean scores concerning the initiation of interactions in the experimental group rose from 3. 4 (SD = 0. 8 Groups 2 And 5, While Both Fared Rather Well, Revealed A Slightly Lower Mean Than Groups 1 And 4, Which Completed All Of The Quizzes In The Briefest Amount Of Time, With A Mean Of 1. 1 (SD = 0. 7), the mean difference 0. 9 (SD=0. 9). In the same manner, the score on responding to peers also increased from 2. They were asked to rate the level of support on the research topic on a scale of 9 (SD = 0. 7) to 3. 7 (SD = 0. 8), The life skill of group participation: Students' participation in group tasks showed a transition from a poor follow a rating of 3. 0 (SD = . 9) to 3. 9 (SD = 0. 8 (SD = 0. 8) and 0. 9 (SD = 0. 9) and 9 (SD = 0. 9) respectively for the male teachers and students.

The children who did not engage in the interactive games as me and my peers showed only slight changes in their social behavior which were insignificant. For instance, the mean score on initiating interaction raised slightly to; 3. 1(SD = 0. 9) to 3. 2 (SD = 0. 8); the mean difference is 0. Regarding to the number of scientific production identified, this global index was achieved from 1 to 3 scientific articles for each of the 6 O&M year with an average of 1 (SD = 0. Analovously, the minimal increases in responding to peers and in the group tasks were reported with the mean difference of 0. 1(SD = 0. 8) and 0, respectively; education, M = 9. 1 (SD = 0. 8) respectively; Table 2 indicates that the mean scores of the late young adult group were significantly higher than the early ordinary youth group on the EPO measure, F (1, 121) = 21.

Table 3. Paired t-Test: Pre- and Post-Intervention Scores in the Experimental Group

Social Skills Dimension	Mean Difference	SD	t-value	p-value
Initiating Interactions	0.9	0.9	6.0	<0.001
Responding to Peers	0.8	0.8	5.7	<0.001
Participating in Group Tasks	0.9	0.9	6.0	<0.001

As it can also be observed in the results of the paired t-test, all of the dimensions measuring the social skills of the experimental group have improved significantly. Concerning initiating interactions, the mean difference was equal to 0. 9 (SD=0. 9) The t_test thereafter yields a t-value of 6. The difference was statistically significant, t(175) = 6. 868, p = . 00, 95 % CI [0, 1. 04]. Moreover, the results revealed that the control of positive ideal self-guided responses had a positive mean difference of 0. 8 (SD = . 7, and p-value of <0. 001. The results of the Comparison of the mean difference between part and non-participants: Group tasks had a mean difference of = 0. 9 (SD = 0. 9) t = 6. 0 respectively showed no statistically significant differences between the two groups of patients. 001. Based on these findings, it can be concluded that through the use of the interactive games intervention, the social skills of the participants in the experimental group were positively improved.

Table 4. Paired t-Test: Pre- and Post-Intervention Scores in the Control Group

Social Skills Dimension	Mean Difference	SD	t-value	p-value
Initiating Interactions	0.1	0.7	1.0	0.320
Responding to Peers	0.1	0.8	0.9	0.360
Participating in Group Tasks	0.1	0.8	1.0	0.330

The values of the paired t-test concerning the control group indicate no increase in social skills. The results included a mean difference of 0 for initiating interactions. Mean = 1 (SD = 0. 7) for the t-test calculation, the t-value we get is 1. 0 hence the significance level is α=0. 320. Regarding the reaction of peers, the mean difference was 0. mean = 1. 005, SD = 0. 800, t = 0. 9 and p -value of 0. 360. In general, the findings for the self-aspect of participation in group tasks revealed a mean difference of 0. Significantly different from the hypothesized mean was 1 (SD = 0. 8), t = 1. 0 while the p-value was also zero. 330. In this case, the findings point out that the standard measures of intervention did not bolster the control group's social skill in any way.

Table 5. Independent t-Test: Post-Intervention Scores Between Experimental and Control Groups

Social Skills Dimension	Mean Difference	SD	t-value	p-value
Initiating Interactions	0.9	0.8	5.2	<0.001
Responding to Peers	0.8	0.8	4.8	<0.001
Participating in Group Tasks	0.9	0.8	5.3	<0.001

The findings of the independent t-test that examined the differences between the experimental and control groups' post-intervention scores reveal highly significant differences in all the aspects of social skills. The mean difference regarding initiation of interaction was 0. 9 (SD = 0. 8), and calculated using the t-test, t=5. 2 and a p-value of <0. 001, which signified a significant difference in the experimental group than the control group on the aspect of responding to peers with a mean difference of 0. 8, and p = 0. 001 The result for the frequency of group task showed a mean difference of 0. 9 SD = 0. 8 t= 5. 3 and p<0. 001. As the data above shows, it is possible to conclude that the use of interactive games in the context of the present study was significantly more helpful in enhancing the cardinal aspect of social interaction skills compared to the methods applied to the control group.

Table 6. ANCOVA Summary Table

Source	SS	df	MS	F	p-value	Partial η^2
Pre-Intervention Scores	10.12	1	10.12	18.23	<0.001	0.24
Group	15.85	1	15.85	28.55	<0.001	0.33
Error	31.70	57	0.56			
Total	68.70	59				

The formula for ANOVA conductance: (34. 45-43. 5)/(1*(3-1))*100 = 18 F-value proved that the pre-intervention scores influenced the post-intervention scores. 23 and a significance level of <0. 001 for all the studies reported Revised ANOVA yielded an F-statistic value of 61. 24 is defined as a medium effect size here. The analysis of the variance test brought out a group effect with an F-value of 28. 55 with a p-value of <0. 001 were also recorded while the partial eta squared (η^2) was 0. 33 informs of a big ES meaning that the intervention helped to bring down the post intervention social skills scores. The error term also stands for the within group variability. Mean square (MS) was 0. 56, which shows the level of within group variation after adjusting for the covariate.

Discussion

Impact of Interactive Games on Social Skills

The improvement of social interaction values that has been acclaimed in the experimental group conveys the relevance of the interactive games as a focused intervention approach for children with autism. The above results agree with previous studies that reveal the effectiveness of game-based strategies in increasing social competence in children with ASD. The data comparing the means of the acquired scores demonstrated a significant positive change both in the overall and in several more specific aspects of social contacts that can be observed, such as initiating social interaction, responding to peers, and performing group tasks. The mean increase in initiating interactions was rather significant from 3. 2 to 4. 1, which the writer feels symbolises a positive advancement in the manner the children can actively interact with their counterparts. This type of progress is essential since the initiation of the interaction poses a great problem to children with autism – Typically, such children find it difficult to commence conversations or to engage the services of their playmates.

In accordance with these studies, the existing literature sustains the idea that interactive as well as digital games can promote the improvement of social competencies in autistic children. Terlouw et al. (2021) analyzed several works and stated that specifically for children with ASD, digital games which are characterized by well-organized but free structure of social communication may be useful. Such games usually consist of components like taking turns, imitation of roles, and the signal feedback, all of which are very important to apply and strengthen the child's social skills in the framework of the game. In the same manner, Mosher et al. in 2022 proposed that children with autism would benefit from learning other social skills through playing Social Skills Training Games as compared to interacting with the conventional modes.

Based on the results of the ANCOVA, it is possible to confirm the effectiveness of the intervention in enhancing social skills, including the postintervention scores while controlling for the preintervention scores. This tends to imply that the demonstrated achievements were not caused by confounding variables because of inherent distinctions in those participants but owing to the interactive games intervention. The means of the post-intervention scores which were adjusted using the covariate ANCOVA omitted in the control group, were significantly lower as compared to those of the experimental group aiming at the confirmation of the intervention.

They concord with other current studies that have established that only proactive, dynamic, and interesting intercessions make a change on people's social interaction behaviors. For instance, Kossyvaki & & Curran (2020) synthesized a review of technology-enforced interventions and highlighted that for children with autism, interactive video games can positively enhance the social competence and communication skills of kids. The study focused on informing the audience that the tools developed are fun and realistic through which a child can learn social skills that are realistic and relevant to real-life situations, and use them to get better results in the social domain. In the same regard, Gibson et al. , 2021 suggested that play- based and interactive features improve the delivery of interventions and hence gives the child with autism a chance on provision of solid learning opportunities, with a significant enhancement of the child's social skills.

Comparison with Control Group

The results highlighting slight improvement of social interaction skills of the control group who did not engage in the interactive games, provides a clear object lesson on the kind of improvement expected when use of simple interactive games instead of conventional approach is adopted in the rehabilitation process. The results for the control group revealed a slight increase in the scores from the pre- and post-intervention means and remained at the level of statistical non-significance. This outcome underlines the major problems that are associated with traditional interventions that do not have stimulating and versatile characteristics that the interactive games possess.

Typically when teaching social skills in children with autism, traditional methods include the use of fixed structure drills or just words of command. In this case, the following approaches may prove less effectual to the extent that children affected by autism show less interest and are less motivated towards such techniques. According to Cheng & Bololia (2024), low tech learning which does not intervene the application of interactive or technology factor is likely to obtain low improvements in social skills. This is because the traditional approaches to delivery of interventions may not address the engagement of children with autism to the optimum level as is required for learning and acquisition of skills.

For instance, practices which would be normative might comprise modeling, or actual demonstration of scenarios pertinent to breaches of social expectations, or direct teaching about the rules of daily interaction; while useful, they may not yield the amount of practice needed to sustain the child's attention. Essentially, removing most parts of the interactions and games that are fun and engaging imply that children cannot practice or learn the desired social skills sufficiently. This concurs with Loffi et al. (2024) who note that static actions do not extend the baseline or help maintain children with autism's motivation meaning that such intervention approaches are not effective.

The observations, which have emerged from the study for the present sample, indicate the necessity to employ a range of highly communicative and invitational approaches more often. The experimental group, which received the interactive games intervention, showed positive changes in attitudes to interpersonal interactions and improved their overall social competence, which proves that dynamic and interactive components should be incorporated into therapeutic activities. This mobility was made possible by the use of the interactive games that engaged clients in active participation hence making practicing of social skills more fun. It did not only improve the children's social skills but also ensured that they continued to maintain the needed level of energy all through the intervention phase.

Integration into Therapeutic and Educational Settings

Since the utilization of interactive games appeared to be equally effective when the goal was to improve clients' social competencies during the course of a definitely limited number of sessions, it indeed seems reasonable to assume that using such games as part of an educational and therapeutic arsenal can be beneficial. The above traditional therapies may take longer timelines before the patients see a significant difference, which may not be effective in today's busy or at a constrained health care system. The findings of this research also confirm the effectiveness of games for creating sustainable and significant changes in social skills in accordance with the shortest identified time frame, which should be seen as a positive aspect for practitioners attracted to the use of the shortest-interval interventions.

To teachers, the implementation of game programs in the class or in the special education area entails numerous benefits due to its dynamic nature and addresses social skills deficiencies. These games can be applied in plan and sequence of activities or as the fun-based reinforcement of what is taught in a conventional manner. Incorporation of such games require addition of fun into the daily practices where educators can apply a technique that not only promotes the children's social learning but also ensure the children are keen on the games.

Therapists can also benefit from using games in the treatment of patients, since such activities need to be incorporated to help patients recover. The short time frame of the intervention in this research shows that practitioners can deliver substantial progress even if they have limited time with the patient. This can be particularly helpful where time and effort can be restricted such as in schools. Thus, games can be used as one of the types of activities within an extended therapy program as it is an innovative and effective approach towards SOC use.

A major benefit of IG is the manner in which they can positively impact the motivation and interaction of children with autism. Sometimes basic approaches could not grab the kids' attention who have issues with

concentration or who are not interested in conventional practices. Real-life rewards obtained for social reciprocity can be easily incorporated into the given interactive games making social skills practice more exciting and less stressful. This is in concordance with prior research on the formulation of favorable and rewarding contexts conducive for learning (Oyserman & Oyserman, 2024). The combination of play and technology in an I-game allows increasing effectiveness of learning processes, as well as it fills the gap of children with autism's need for interactive activities.

Recommendations

The educators and therapists should play games in the therapeutic/educational processes with the clients/learners. Studies have shown that these games are effective for enhancing social competence in a relatively brief treatment period; thus, they can enrich traditional approaches. The use of social skills games in a program or outlined plan means that children will have fun while at the same time learning how to become more socially acceptable in day to day life. For the same reason, it is also advisable that the practitioners introduce the interactive games in relation to the needs and welcomed topics of the children. Using individual student's social skills needs and preference when designing content for the game increases the overall usability of the product. For instance, games based on certain situations that are likely to be experienced by children likely to be practiced in school, or games that simulate the interest of the child are usually more appealing to the child. However, to obtain the maximal benefits from interactive games, the practitioners should use it in conjunction with other forms of interventions. Still, with regards to specific programs, it is possible to state that in their case, precisely, interactive games used at the proper manner are most advantages when integrated into more broad-spectrum programs including direct instructions, role-play, and other forms of therapeutic activities. With this multimodal approach, one can intervene practically in all spheres of development of social skills and guarantee that the children will be provided with comprehensive intervention. Nevertheless, because of the short time of intervention within this study, one must call for the extended research aimed at examining the chronic effectiveness and continuation of the improvement attained through the application of interactive games. Further research should aim to establish if the improvement in social competence was sustainable in the long term and how besides integrating the interactive games, they can be smoothly blended in current continuing therapeutic interventions. For that reason, it is crucial for scholars and professionals to persistently examine as well as innovate concerning the different forms of present interactive game modalities and technologies. Advancements in game design as well as in technology may afford new approaches to the development of the child's social competency and improved interaction with autistic children. Thus, if one is aware of the new development and incorporates them into practice, interventions will always be relevant and effective.

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