

Construction and Intervention Study of PRT Method in Electronic Game Models for Children with ASD

Huili She Sr, Wenzhu Cai 2nd, Tianyang Xu 3rd, Wenpei Zhang, Dongmei Luo, Xinye Liao, Yuxin Yang, Minghui Wang, Ting Deng

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Abstract

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Objective: This study aims to develop an intervention framework that integrates Pivotal Response Training (PRT) into electronic games for children with Autism Spectrum Disorder (ASD) and evaluates its effectiveness in enhancing the socialization.

Methods: The intervention involved integrating PRT into electronic games, including content design, interactive design, and offline generalization training. An experimental framework was established, and five game content sets were optimized to create a functional game. Fourteen children with mild to moderate ASD participated in an 8-week empirical evaluation. They were randomly assigned to the experimental group (PRT + game training) or the control group (regular games + conventional training).

Results: The results showed a significant interaction effect between group and time in interpersonal relationships and imitation skills ($p < 0.05$), while moderate effects were observed in emotional response, relationships with inanimate objects, sensory responses, non-verbal communication, and activity level ($p < 0.1$). Within-group analysis revealed that the experimental group demonstrated significant improvements starting from the fifth session ($p = 0.0315$), with an overall significant effect ($p = 0.00167$).

Conclusions: The experimental group outperformed the control group in interpersonal relationships, imitation, and showed notable advantages in emotional response, perceptual abilities, and activity level. These findings suggest that factors like game difficulty progression, simplified interaction, itemized interventions, and timely feedback play a crucial role in the effectiveness of PRT integrated with game therapy for children with ASD.

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Original Manuscript

Construction and Intervention Study of PRT Method in Electronic Game Models for Children with ASD

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Conclusion: The experimental group outperformed the control group in interpersonal relationships, imitation, and showed notable advantages in emotional response, perceptual abilities, and activity level. These findings suggest that factors like game difficulty progression, simplified interaction, itemized interventions, and timely feedback play a crucial role in the effectiveness of PRT integrated with game therapy for children with ASD.

Keywords: Pivotal Response Training, Autism Spectrum Disorder, electronic games, socialization, intervention, game therapy

1 Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by significant impairments in social communication, language interaction, emotional regulation, and behavioral patterns. Since Dr. Kanner first introduced the concept of autism in 1943 (Kanner, 1943), extensive research has been conducted to understand the disorder. However, the precise cause of ASD remains unclear, and no universally effective clinical medication has been identified. As a result, education and rehabilitation training remain the primary approaches for alleviating symptoms and improving quality of life. Research suggests that early interventions, during periods of heightened brain plasticity,

are crucial for enhancing the social, linguistic, cognitive, and adaptive behaviors of children with ASD (Vivanti & Zhong, 2020; Magiati et al., 2014).

Various intervention methods grounded in different theoretical frameworks have been developed for the education and rehabilitation of children with ASD. Among these, Applied Behavior Analysis (ABA) is one of the most established approaches. A notable derivative of ABA, Pivotal Response Treatment (PRT), has gained widespread recognition for its effectiveness. PRT emphasizes learning in naturalistic settings and targets core developmental impairments. By focusing on pivotal areas, such as motivation and responsiveness to external stimuli, PRT enhances children's cognitive abilities and promotes improvements in essential skills like language and social interaction. Its efficacy has been well-documented, leading to its inclusion in the National Autism Center's "National Standards Project, Phase Two" as one of 14 evidence-based intervention methods (National Autism Center, 2015).

This study seeks to integrate PRT techniques into digital interactive game design, tailoring visual elements, game content, and interaction strategies to meet the unique needs of children with ASD. The goal is to enhance socialization through targeted generalization training, ultimately developing a scalable and replicable rehabilitation training method.

2 Intervention Method

This study recruited 14 children with mild to moderate ASD who demonstrated basic cognitive abilities and facial emotion recognition skills. To assess the effectiveness of integrating Pivotal Response Treatment (PRT) into electronic games, participants were randomly assigned to either an experimental group (7

participants) or a control group (7 participants). The experimental group received interventions through electronic games incorporating PRT principles, along with supplementary training, while the control group engaged with standard electronic games combined with conventional training. All experiments were conducted in familiar classroom settings commonly used by children with ASD, and no participants withdrew during the study.

Throughout the intervention, therapists applied a moderate intervention approach (Eikeseth, 2009), following a "child-led with teacher assistance" model (Bitoy, 2021). This approach allowed children maximum autonomy and control during gameplay, with therapists providing necessary guidance and support as needed.

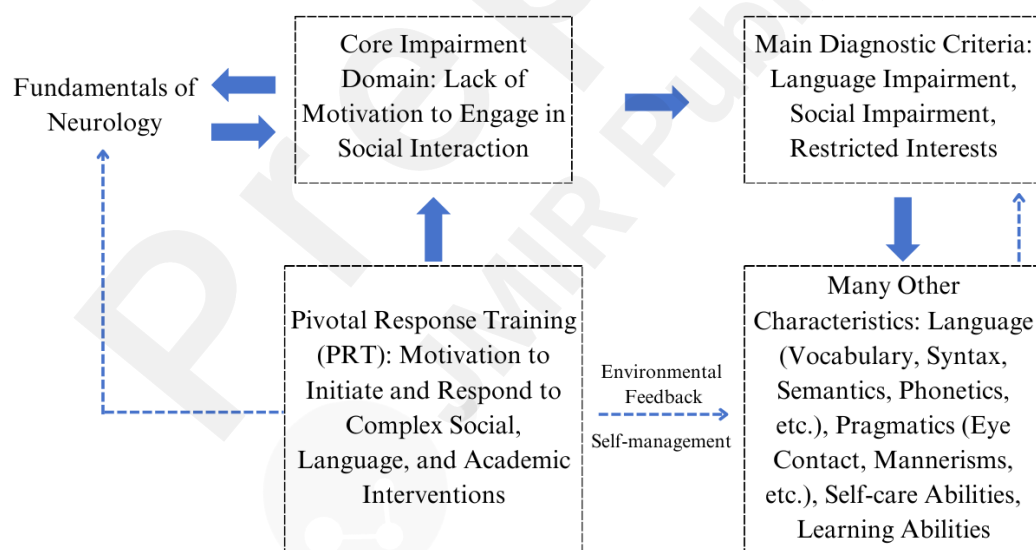


Figure 1 Pivotal Response Treatments Intervention mode

The research procedure consisted of the following steps: participant recruitment, preliminary research on integrating PRT into electronic games for children with ASD, design translation and practical game design, intervention

experiments, and result analysis.

3 Preliminary Research

3.1 Participants

This study was approved by the local special education school, with no conflicts of interest reported. Participants were publicly recruited within the school, and both guardians and participants provided written informed consent after receiving a thorough explanation of the study's purpose and procedures. The inclusion criteria for participants were as follows:

- (1) Chronological age between 8 and 12 years old.
- (2) A confirmed or provisional diagnosis of Autism Spectrum Disorder (ASD) issued by a hospital.
- (3) A Childhood Autism Rating Scale (CARS) score indicating mild to moderate autism, as assessed by a hospital or therapist. (CARS consists of 15 items with a total score of 60 points; scores between 30–35 indicate mild to moderate autism, while scores above 36 indicate moderate autism.)
- (4) Normal vision.
- (5) No prior participation in similar learning-related experiments.

To assess participants characteristics, the study employed both questionnaires and on-site observations, including evaluations using the Childhood Autism Rating Scale (CARS), which covers key domains such as speech, behavior, and sensory perception. Given the heterogeneity of symptoms and abilities among children with ASD, the use of standardized rating scales provided a reliable assessment framework. A total of 14 children were randomly assigned to either the control group (regular electronic games) or the experimental group (PRT-

integrated electronic games). Pre-tests, conducted through questionnaires and behavioral observations, evaluated participants' language and motor skills to establish a baseline for engagement and anticipated outcomes.

Table 1 Participant Basic Characterization Status (desktop Serious Game group)

Number	gender	age	Interactive Responses	Verbal Communication	Emotional response	desktop Serious Game	Other issues	Baseline Test Score	
								① 60	② 60
1	M	9	nothing	nothing	unstable	NO	Tube curtains stereotypical behaviours	38	35
2	M	10	seldom	nothing	stable	YES	have a blank stare	37	38
3	F	9	seldom	seldom	stable	YES		38	35
4	F	8	seldom	often	stable	YES		38	35
5	F	8	seldom	often	stable	YES		38	36
6	F	9	often	often	stable	NO		35	36
7	F	8	nothing	nothing	unstable	YES		38	36

Table 2 Pivotal Response Treatments Intervention in Theme Design for ASD desktop Serious Game

Number	gender	age	Interactive Responses	Verbal Communication	Emotional response	desktop Serious Game	Other issues	Baseline Test Score	
								① 60	② 60
1	M	9	seldom	nothing	unstable	YES	have a blank stare	39	32
2	F	8	often	often	stable	NO		36	34

3	F	9	seldom	seldom	stable	NO	sensitivity	37	33
4	F	9	seldom	seldom	stable	YES		37	34
5	F	10	seldom	often	stable	YES		37	34
6	F	12	nothing	nothing	stable	YES	Stereotypic hand biting behaviour	39	35
7	F	10	nothing	nothing	unstable	YES	Screaming stereotypical behaviour	37	36

Explanation: ① "Nothing" indicates a complete unwillingness to communicate, "Seldom" reflects infrequent verbal communication, and "Often" represents a willingness to actively engage in communication. This table presents the pretest survey results for the participants. While variations exist within the language proficiency levels of both the control and experimental groups, the distribution of individuals across different levels is approximately balanced between the groups.

② "Stable" refers to a calm and regulated emotional state, whereas "Unstable" indicates frequent intense emotional responses, such as anger, anxiety, shouting, or other heightened reactions.

To ensure the accuracy of baseline measurements and mitigate potential errors from a single test, two baseline assessments were conducted.

3.2 Design Objectives

Pivotal Response Training (PRT) is a naturalistic, behavior-based intervention method designed to enhance children's social functioning by targeting key developmental areas, including motivation, social interaction, emotional regulation, and cognitive skills. Drawing on the unique characteristics of children with Autism Spectrum Disorder (ASD), the research team categorized the games

into four primary types: social interaction, emotional management, cognitive education, and motor enhancement. During the design process, interventions were carefully tailored to address specific developmental needs, with a series of electronic games created according to PRT principles. The overarching goal was to enhance critical social functions and promote generalization to real-life scenarios through engaging, interactive gameplay.

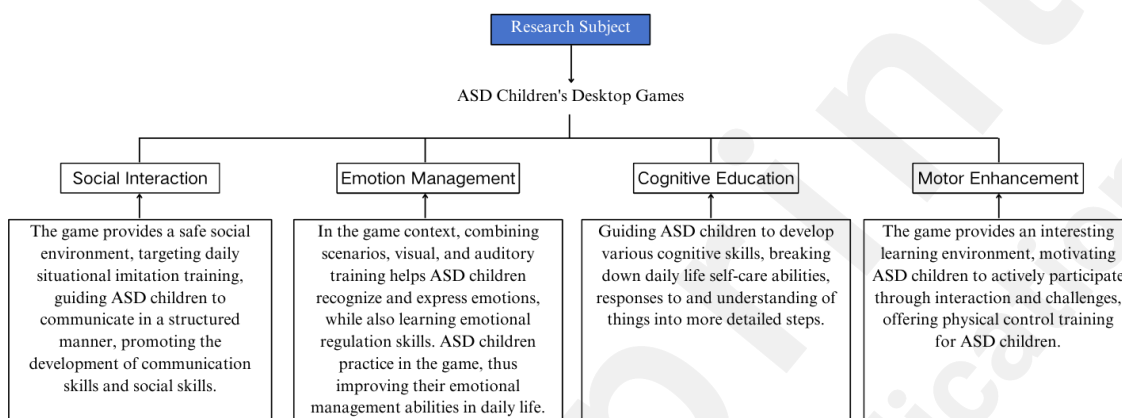


Figure 2 Pivotal Response Treatments Intervention in Theme Design for ASD desktop Serious Game

3.3 Appeals and Strategies

Given that children with ASD often encounter psychological barriers and struggle to build peer relationships, game design required a comprehensive and empathetic approach. Using the team-developed game *Star Shopping* as an example, the game framework was structured into four segments: game entry, guidance design, reward settlement, and feedback design.

Before designing the electronic games for children with ASD, researchers grouped the 14 participants based on their individual characteristics and adopted a flexible, multi-faceted approach to meet diverse needs. For instance, the "simplicity principle" from Gestalt theory was applied to design game visual

elements, simplifying visual presentations to facilitate children's information processing and memory retention (Guberman, S. 2017). Studies show that children with ASD have significantly weaker responses to eye gaze and head-turning cues compared to arrow or pointing cues. Therefore, the guidance design incorporated more directional indicators to enhance cognitive processing and support learning (Jones & Carr, 2004; Hermens et al., 2017).

Table 3 Claims and Strategies for Pivotal Response Treatments Intervention in desktop Serious Gam for Children with ASD.

4 Design

Reason	Basis	Countermeasure	
Unwilling to communicate, lack of motivation		Personalized settings based on the interests and preferences of children with ASD	(1) Meet visual preferences (2) Allow children to make choices in the game (3) Set up a reward mechanism
Inability to integrate into the environment, lack of cognition, refusal to socialize	Simplicity principle	Apply daily scenarios, design tasks from easy to difficult	(1) Combine games with daily scenarios (2) Diversify scenarios (3) Diversify tasks
Key skill training and personalized feedback	Guided design	Multi-skill training and data evaluation	(1) Meet visual preferences (2) Simple interactive design (3) Adjust intervention strategies based on performance assessment

Translation

The process of integrating Pivotal Response Training (PRT) into electronic games requires close collaboration between designers and therapists. Designers combine PRT principles with game design methodologies, using visual and interactive elements to create products that children with ASD can engage with directly. This process forms a core component of digital research in art therapy based on PRT, bridging behavioral intervention with interactive media.

The successful integration of PRT into electronic game design hinges on selecting appropriate situational contexts and targeting key developmental skills. The research is structured into two levels, which are mapped onto interactive design, animation design, and audiovisual elements within the game. After the game development phase, training sessions are conducted to reinforce core skills through the interweaving of newly acquired and previously learned abilities. These sessions can be delivered collectively under the guidance of a therapist or independently, within real-life scenario models embedded in the game, facilitating the generalization of skills to everyday situations.

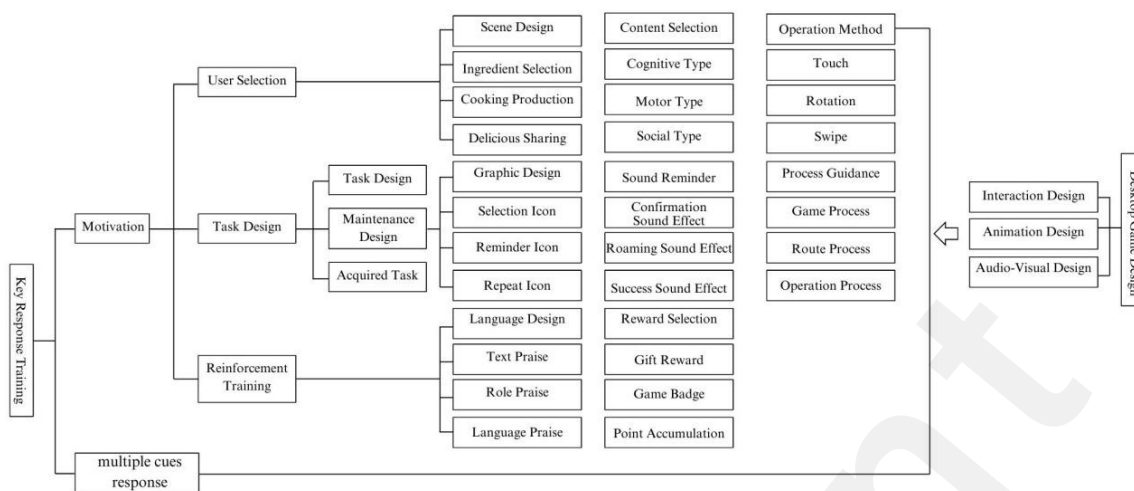


Figure 3 Design Translation of Electronic Game

5 Information Architecture

In this study, an iPad — a commonly used device among children with Autism Spectrum Disorder (ASD) — was chosen as the platform for the functional games. After completing the electronic game, children with ASD undergo generalization training in real-life scenarios aligned with the game's theme to reinforce their learning. Upon first login, new users are required to create a personal profile, complete pretest assessments through validated scales, and select reinforcers while conducting a behavior self-assessment.

The game's home page serves as the central hub for all operations. The second level includes access to various game categories, gameplay records, and personalized user settings. The third level delivers in-game knowledge acquisition, operational guidance, and real-time feedback on performance. After

the gameplay session, generalization training and evaluations are conducted to assess progress and promote skill transfer to real-world contexts.

The integration of Pivotal Response Training (PRT) into electronic games requires close collaboration between designers and therapists. Designers incorporate PRT principles with game design methodologies, using visual and interactive elements to create engaging products tailored to children with ASD. This process lies at the heart of digital research on art therapy grounded in key response training.

The successful integration of PRT into game design depends on carefully selecting appropriate situational contexts and targeting essential skill-building activities. The research is divided into two interconnected levels, mapped onto interactive design, animation, and audiovisual components. Following game completion, additional training is conducted to reinforce core skills through the structured interplay of newly acquired and previously learned abilities. These training sessions can take place collectively under therapist supervision or independently within scenario-based models embedded in the game environment.

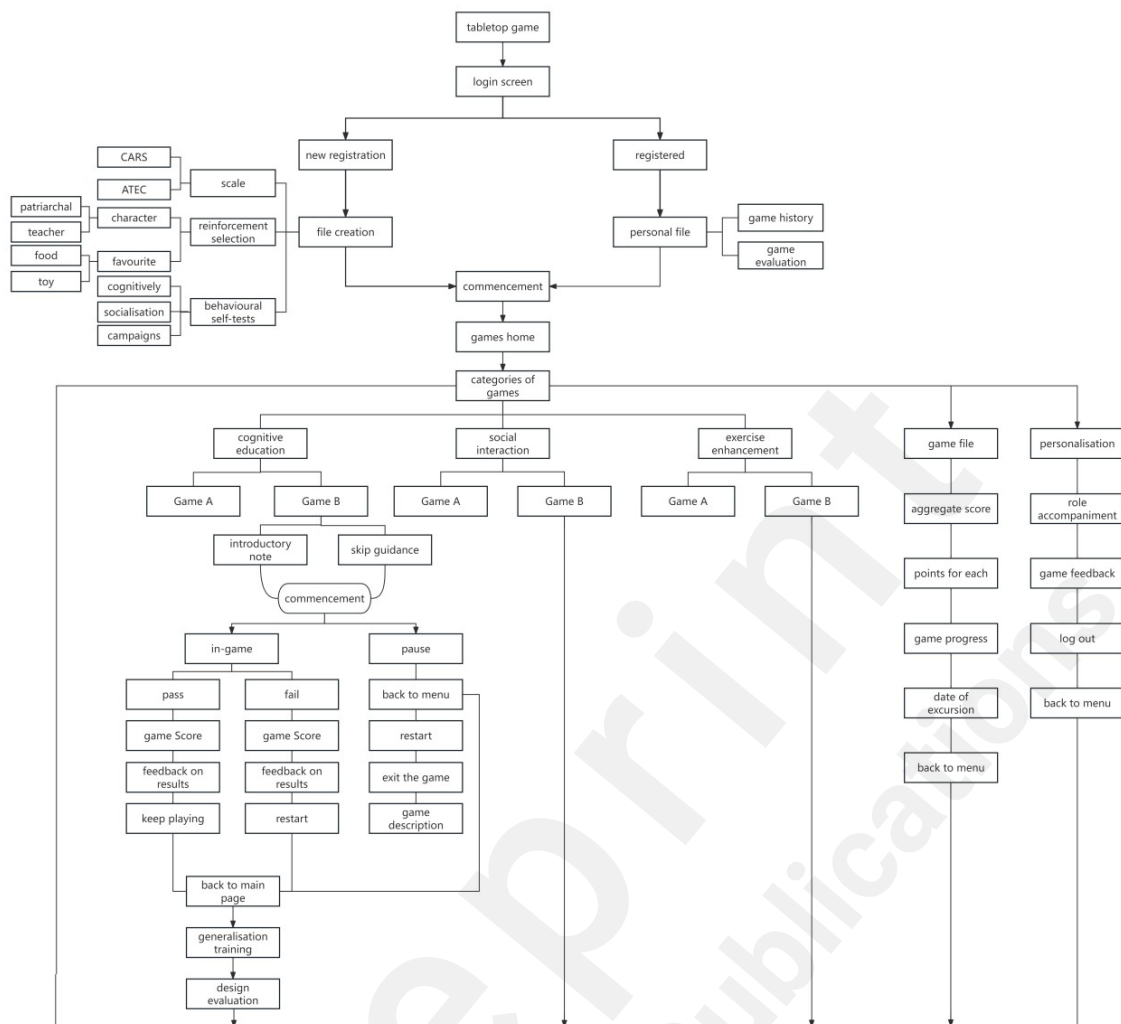


Figure 4 Information Architecture Diagram

6 Game Design Analysis and Effectiveness

Building on preliminary research findings, the team designed game characters and scenes tailored to the cognitive characteristics and preferences of children with Autism Spectrum Disorder (ASD) to enhance intervention and training outcomes.

6.1 Character Design

Research shows that children with ASD exhibit varying sensitivities to different visual styles, taking longer to recognize emotional facial expressions and struggling to track visual cues compared to typically developing children. They tend to prefer cool tones like blue and green, though their color preferences are

more nuanced, with a notable affinity for composite colors such as orange and pink. Additionally, children with ASD often excel in visual perception, processing visual information more effectively than auditory input, making visual-based interventions especially impactful.

Based on these insights, the game characters were designed as cartoon-style boys and girls with rich, exaggerated facial expressions to aid in emotional recognition. The color palette primarily features composite hues like pink, gray-purple, gray-brown, and cyan-blue, aligning with their preferences while providing a visually engaging experience.

6.2 Scene Design

The design of game scenes — including visual style, color schemes, and the hierarchy of visual information — is equally vital. Studies indicate that graphics can enhance semantic understanding in children with ASD, which is why rehabilitation institutions often use two-dimensional illustrations to simplify abstract three-dimensional objects. These simplified graphics make it easier for children to identify and understand everyday items.

Since children with ASD are prone to anxiety, separation distress, and a strong need for spatial stability, abrupt environmental changes can trigger emotional instability, self-harming, or aggressive behaviors. To mitigate this, the game environments were carefully chosen from familiar settings like bedrooms, kitchens, and supermarkets, all rendered in a concrete, cartoon-style two-dimensional format.

Although children with ASD favor cool tones, their ability to distinguish color differences improves as preference for a specific color decreases. Thus, the color scheme strategically balances various hues to nurture diverse color

perception and aesthetic awareness. To support cognitive processing, the scene design emphasizes clear visual hierarchies: contrasting background colors direct attention to interactive elements. For instance, a composite yellow background (a less preferred color) is paired with cool-toned buttons to draw focus to key elements, characters, and interaction points. Scene elements, such as vegetables, fruits, beverages, and food, are presented as simplified two-dimensional graphics with corresponding color schemes, reducing visual processing demands and enhancing comprehension.

6.3 Reward Mechanism

Reward systems play a critical role in reinforcing learning and sustaining motivation (Constantin A et al 2017), with immediate rewards being particularly impactful (Eisenberger and Cameron 1996; Lai 2011; Wolters, C. A., & Benzon, M. B. 2013). To leverage this, the electronic game design incorporates verbal praise after completing each level, while real-world scenario games provide both verbal encouragement and tangible rewards, reinforcing positive behaviors and enhancing the learning experience.



Figure 5 Star Shopping High-Fidelity Process Flow Diagram



Figure 6 Generalization Training and Game playing

7 Intervention and Analysis of the Intervention Experiment

7.1 Experimental Design

This study employed a pretest-posttest controlled experimental design to compare the effects of PRT-integrated video game activities (experimental group) with ordinary video game activities (control group). Fourteen children with Autism Spectrum Disorder (ASD) from the same grade were randomly assigned to either the experimental or control group.

To evaluate the intervention's effectiveness, assessments were conducted using both the Childhood Autism Rating Scale (CARS) and on-site observations. Prior to the experiment, participants in both groups completed the CARS questionnaire as a baseline measure. During the intervention phase, sessions were structured into video game experiences paired with supplementary activities, with each session lasting 40 minutes. Throughout these sessions, participants' behaviors and engagement levels were carefully observed and recorded. After completing the intervention, both groups repeated the CARS assessment to measure post-intervention outcomes.

7.2 Data Analysis

This study utilized a randomized controlled experimental approach to evaluate the real-world effects of PRT-integrated video game interventions. The experimental procedure followed a pretest-intervention-posttest model, using the Childhood Autism Rating Scale (CARS) to assess symptom changes in

children with ASD before and after the intervention.

To minimize confounding variables, the experimental and control groups received equal intervention durations and were supervised by the same personnel, ensuring that no additional play interventions were introduced outside of the study.

For data analysis, a 2 (group: experimental vs. control) $\times$ 2 (time: pretest vs. posttest) repeated measures ANOVA was conducted on all questionnaire results to determine the statistical significance of the intervention effects. All participants completed both the pretest and posttest assessments, with a disengagement rate of 0%, indicating that the experimental design was engaging and well-structured for sustained participation.

Table 4 Statistical values of the variables

Variable	Control Group		Experimental Group		F	P	η^2
	Pretest	Posttest	Pretest	Posttest			
	t						
1.Relating to people	3.14 (0.38)	1.86 (0.38)	3.14 (0.38)	2.29 (0.49)	25.00	0.03	0.92
2.Imitation	3.14 (0.38)	2.29 (0.49)	3.14 (0.38)	2.57 (0.53)	25.00	0.03	0.92
3.Emotional response	1.86 (0.38)	2.43 (0.53)	1.86 (0.38)	2.14 (0.38)	9.000	0.09	0.81
4.Body use	2.57 (0.53)	1.86 (0.38)	2.43 (0.53)	2.29 (0.49)	3.600	0.19	0.64
5.Object use	2.43 (0.79)	1.86 (0.38)	2.43 (0.53)	2.14 (0.38)	9.000	0.09	0.81
6.Adaptation to change	2.29 (0.49)	1.86 (0.38)	2.29 (0.49)	2.29 (0.49)	1.000	0.42	0.33
7.Visual response	2.57 (0.53)	1.57 (0.53)	2.57 (0.53)	2.14 (0.38)	6.250	0.13	0.75
8.Listening	2.71	2.00	2.86	2.43	6.400	0.12	0.76

response	(0.49)	(0.58)	(0.38)	(0.53)		7	2
9.Taste,	1.86	2.43	1.86	2.14		0.09	0.81
touch, &	(0.38)	(0.53)	(0.38)	(0.38)	9.000	5	8
smell use							
10.Fear or	2.71	1.57	2.71	2.57		0.32	0.45
nervousness	(0.49)	(0.53)	(0.49)	(0.53)	1.653	7	3
Verbal	1.86	2.29	1.86	2.00		0.18	0.66
communicati	(0.38)	(0.49)	(0.38)	(0.58)	4.000	4	7
on							
12.Nonverbal	2.43	2.14	2.43	2.29		0.09	0.81
communicati	(0.53)	(0.38)	(0.53)	(0.49)	9.000	5	8
on							
13.Activity	2.57	2.00	2.57	2.29		0.09	0.81
level	(0.53)	(0.58)	(0.53)	(0.49)	9.000	5	8
14.Consisten							
cy of	2.00	2.00	2.00	2.00	—	—	—
intellectual	(0.00)	(0.00)	(0.00)	(0.00)			
response							
15.General	3.29	2.29	3.29	2.86		0.13	0.75
impressions	(0.49)	(0.49)	(0.49)	(0.38)	6.250	0	8

8 Analysis of Results

During the 8-week intervention experiment, which consisted of 6 sessions in total, the group analyzed the data from the behavioral records of the two experimental groups for each intervention activity. The study's results showed that children with ASD made significant progress in various areas. Fifteen different aspects of the children's performance were assessed through a questionnaire. Higher scores on the three options—Emotional Response, Proximate Sensory Response, and Verbal Communication—indicated better socialization, while lower scores on the remaining options were associated with less severe autism symptoms and improved socialization.

The data was analyzed using repeated measures ANOVA with a 2x2 design (group: experimental group vs. control group; time: pre-test vs. post-test). The analysis revealed a strong significant interaction between group and time ($p < 0.05$) for interpersonal relationships and imitation skills. A stronger, yet marginally significant interaction ($p < 0.1$) was found for affective response, relationship with inanimate objects, proximity sensory response, nonverbal communication, and activity level. Further simple analyses showed that, first, no significant difference was found between the scores of the two groups during the pre-test, which supports the validity of the randomized grouping. Second, when comparing the pre-test and post-test results, significant improvements were observed in interpersonal relationships and imitation ability.

In terms of interpersonal relationships, the experimental group scored significantly lower than the control group after the intervention. This suggests improved performance in interactions with others, including active attention, eye contact, expressive responses, and gesture interactions. The results indicate that the intervention group showed better improvement in interpersonal relationships than the control group.

Regarding imitation ability, the experimental group scored significantly higher than the control group post-intervention. This index reflects the ability to observe and imitate others' movements, behaviors, voices, or expressions—such as physical imitation, voice imitation, and play imitation. These results indicate that the experimental group's initiative and imitation abilities improved significantly during the intervention.

For emotional response, the experimental group showed significantly higher scores post-intervention compared to the control group. This indicator reflects

the ability to understand, react to, and express emotions appropriately. The results suggest that the experimental group had a slightly better intervention outcome in terms of emotional response compared to the control group.

For the relationship with inanimate objects, while the experimental group's score post-intervention did not differ significantly from the control group, the experimental group scored higher before the intervention. This indicator pertains to understanding and utilizing objects' functions, such as expanding the use of toys, stationery, and electronics. The results suggest that the intervention effect for the experimental group in this area was slightly better than for the control group.

In terms of proximity sensory response, the experimental group showed a slight improvement over the control group post-intervention. This indicator relates to the normalization of touch perception in close distance, such as responses to body contact, object contact, and near-distance hearing. As a result, the experimental group's intervention effect in this area was slightly better than that of the control group.

In non-verbal communication, the experimental group scored slightly higher than the control group post-intervention. This indicator primarily reflects improvements in understanding facial expressions, reducing stereotypical behaviors, increasing purposeful behaviors, and enhancing coordination in hand movements during art activities. These results suggest that the experimental group experienced slightly better intervention effects in terms of non-verbal communication and activity level compared to the control group.



Figure 7 P-value Line Chart for the Experimental Group

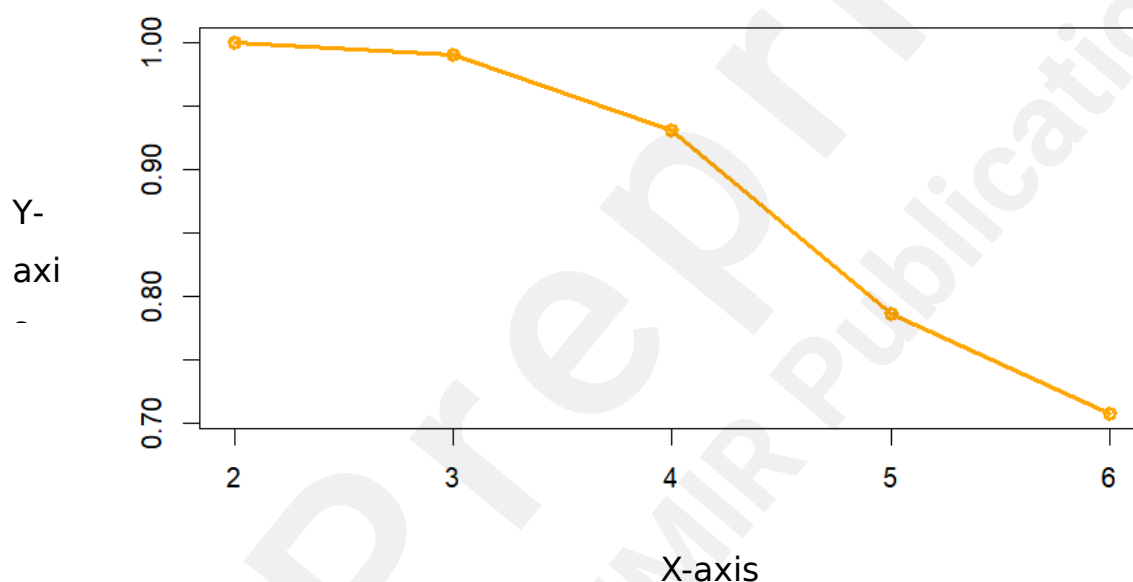


Figure 8 P-value Line Chart for Control Group

Through intra-group analysis, the experimental group showed a significant effect from the fifth intervention, with a p-value of less than 0.05 ($p=0.0315$), indicating that the intervention began to have a notable impact at this point, and the overall effect was significant ($p = 0.00167$). In contrast, the control group showed only minor effects starting from the fifth session, but the overall p-value was greater than 0.5 ($p = 0.663$), indicating that the effect was not statistically significant.

The combined results revealed that the experimental group performed significantly better than the control group in interpersonal and imitation skills. However, the control group showed more significant improvements in emotional response, perceptual skills, and activity level. The control group's intervention, based on traditional games, primarily focused on free play and art activities, which lacked targeted training for specific skills and lacked coherence, resulting in children engaging in mechanical memorization across multiple contexts.

In contrast, the experimental group utilized the PRT method in video game interventions for children with ASD. The game content was more focused and purposeful, and post-game art activities were closely aligned with the game content. The knowledge acquired in the game could be repeatedly practiced in real-life situations, with immediate rewards for the participants. As a result, the intervention effect in the experimental group was more significant.

9 Discussion

This paper explores the integration of PRT critical response training into art therapy to enhance the social functioning of children with ASD, from the perspective of digital art therapy research. Due to the intuitive and interactive nature of art, the key design elements of this approach can serve as valuable references for researchers working on similar products. Psychological research plays a crucial supporting role for the team, and its data preliminarily validates the therapeutic potential of the design. The experimental group significantly outperformed the control group in interpersonal relationships and imitation ability, while the control group showed more significant advantages in emotional response, perceptual ability, and activity level.

In summary, the PRT approach embedded in the video game intervention model

(comprising video game, electronic interactions, and picture book art activities) significantly enhanced the learning and intervention effects of children with ASD, particularly in terms of activity level, perceptual skills, and affective responses, all of which showed marked improvement. These findings suggest that the PRT-based critical response training intervention in video game design is highly effective for both the intervention and learning of children with ASD.

From these results, we can infer that the educational intervention elements of the PRT method for ASD children in video games include the following: Content design should feature themes that align with the cognitive characteristics of children with ASD, focusing on familiar or life-related topics, with difficulty levels that gradually increase; Generalization training should involve realistic game scenarios that enable children to practice skills in natural environments; The interaction process should be simplified using easy-to-understand graphics and gestures to ensure that children with ASD can better comprehend and engage with the game; Clear goals and intervention content should be set to ensure each session has a specific training purpose, which enhances the effectiveness of the intervention; Lastly, a timely feedback and reward system is essential to motivate children with ASD to continue participating, reinforcing positive behaviors and boosting their motivation to learn. These factors are considered core elements of play therapy for children with ASD.

10 Limitations and Prospects

This study has several limitations. The relatively small number of art activities for children with autism restricts the sample size, and the results obtained require further validation. In future studies, increasing the sample size and expanding the scope of research will be crucial to verifying the long-term

effectiveness and adaptability of this intervention method. Additionally, future research could explore how this intervention method applies to children with ASD at varying levels of severity, as well as investigate the use of other types of art therapy techniques. Researchers could also integrate other educational theories and methods, such as scenario-based teaching and virtual reality, to further enhance the effectiveness and applicability of video games for children with ASD.

Furthermore, there is a need to strengthen the evaluation and monitoring of video games designed for children with ASD. Continuous optimization and improvement of game design and intervention strategies will provide more scientific and effective support for digital education and design tailored to children with ASD.

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Author contributions□ SH ,DT, and ZW: experimental design and thesis writing. XT ,LX,and CW : thesis writing and interactive game design.LD, YY, and LY: experimental test and analysis. All authors provided critical feedback, reviewed, and approved the final manuscript.

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Consequence

This study received support from local special education schools, which became a collaborative research base for the team and provided long-term funding. Healing activities have officially been included in the regular curriculum of the school.

Ethics statement

The studies involving humans were approved by the Ethics Committee of the Maanshan Psychological Society [Appronal No. SB-AHUT-REC-2023-03-HS02]. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

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Supplementary Files