Iranian Journal of Organizational Psychology
University of Sistan and Baluchestan
IJOP

The Effectiveness of Teacher-Led Cognitive Rehabilitation-Based Play Therapy on Anxiety Sensitivity and Cognitive Processing as Predictors of Future Academic-Vocational Readiness in Students with Reading Difficulties

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ARTICLE INFO

Article type:
Research Article

Article history:
Received:26 May 2026
Revised:30 May 2026
Accepted:31 May 2026

Keywords:
Play Therapy,
Cognitive Rehabilitation,
Anxiety Sensitivity,
Cognitive Processing,
Reading Difficulties,
Teacher.

A B S T R A C T

The present study aimed to determine the effectiveness of teacher-led cognitive rehabilitation-based play therapy on anxiety sensitivity and cognitive processing in students with reading difficulties. The research utilized a quasi-experimental design with a pre-test, post-test, and follow-up, including a control group. The statistical population comprised all students with reading disorders in the second elementary cycle in Sirjan during the 2024–2025 academic year. A sample of 30 students (15 per group) was selected through convenience sampling based on the diagnosis of reading disorder; participants were age-matched and randomly assigned to experimental and control groups. Participants completed the Anxiety Sensitivity Index-Revised (ASI-R; Taylor & Cox, 1998) and the Cognitive Processing Scale (CPS; Cruise et al., 1999) during the assessment phases. The intervention, based on cognitive rehabilitation play therapy, was conducted individually in 16 sessions of 60 minutes each. Data were analyzed using Repeated Measures Analysis of Variance (RM-ANOVA) via SPSS-22. The results indicated that teacher-led cognitive rehabilitation-based play therapy had a significant reductive effect on anxiety sensitivity ($p<.001$). Furthermore, the intervention had a significant enhancing effect on cognitive processing ($p<.001$). The findings highlight the vital mediating role of teachers in implementing cognitive-based games to improve mental processing infrastructures and reduce anxiety sensitivity in students with reading difficulties. Consequently, integrating this interventional protocol into primary schools and teacher empowerment programs is recommended as a modern strategy to simultaneously promote the mental health and academic performance of these students.

Introduction

Learning can be considered the most fundamental process through which a helpless being, over time and in interaction with physical growth, evolves into a developed individual whose cognitive abilities and intellectual power know no bounds (Gbaje, 2025). However, some individuals encounter difficulties in the normal process of learning and education. One such group consists of students with learning disabilities (Slomowitz et al., 2025). Reading is one of the domains that creates significant challenges for students with learning disorders, especially considering that one of the primary goals of elementary education is to cultivate active, motivated, and self-regulated students in reading—the most essential tool for learning. Nevertheless, some students, despite having normal intelligence, appropriate educational opportunities,

DOI: https://doi.org/10.22111/ijop.2026.55540.1086

Publisher: University of Sistan and Baluchestan

How to Cite: Mahmoodabadi, N., & Akhlaghi Yazdinejad, F. (2026). The Effectiveness of Teacher-Led Cognitive Rehabilitation-Based Play Therapy on Anxiety Sensitivity and Cognitive Processing as Predictors of Future Academic-Vocational Readiness in Students with Reading Difficulties. *Iranian Journal of Organizational Psychology*, 3(3), 1-10. https://doi.org/10.22111/ijop.2026.55540.1086

and the absence of emotional disorders, struggle with reading to the point where a weakness in reading skills can be traced in most of their academic failures (Gaab & Duggan, 2024). Reading disorder, or dyslexia, is characterized by difficulties in recognizing letters, words, and sentences, incorrect comprehension of text meanings, and poor reading comprehension. Studies have shown that the prevalence of dyslexia among children worldwide varies widely, ranging from 3% to over 27% (Alkhateeb, 2025). Its most distinct features include deficits in phonological awareness, verbal memory, and verbal processing speed. Dyslexia is a persistent condition and does not represent a transient developmental delay (Nas Özütemiz et al., 2025).

Anxiety and anxiety sensitivity are common problems among students with reading difficulties, significantly impacting their learning process and academic performance. Anxiety sensitivity refers to biases in retrieving and processing information related to anxiety-provoking stimuli, leading an individual to avoid situations involving high physiological arousal (Taylor, 1998). It is defined as an overreaction and excessive concern regarding anxiety symptoms, such as increased heart rate, sweating, or rapid breathing. This sensitivity can exacerbate general anxiety and even create a vicious cycle where the student experiences more stress due to the fear of anxiety symptoms. Consequently, this state affects concentration and the brain's information-processing capacity, worsening reading difficulties (McHugh, 2019).

Another fundamental challenge in the field of learning is reading problems in students, known as reading learning disability. This disorder affects not only linguistic abilities but also cognitive processing skills. Cognitive processing encompasses a set of mental functions such as attention, working memory, information processing speed, and linguistic abilities that contribute to the formation of reading skills. A deficit in any of these processing components can lead to serious reading difficulties. Therefore, cognitive rehabilitation, aimed at enhancing these foundational skills, is considered an effective strategy for improving reading performance in students with reading difficulties (Jain et al., 2024).

Timely diagnosis and treatment of this disorder can prevent many subsequent problems for those affected. One indirect method used to enhance various skills in children with learning disabilities is computerized cognitive games. The popularity of computerized cognitive games has permeated almost all aspects of human life and is rapidly growing. Teacher-led cognitive rehabilitation-based play therapy is an educational-therapeutic approach in which the teacher strengthens the student's cognitive processes, such as attention, working memory, processing speed, and problem-solving, through purposeful and structured games. In this method, games are designed or selected to improve foundational learning-related skills while fostering motivation and active participation. The key feature of this approach is the implementation of the intervention by the teacher within the natural classroom context, integrating it with daily educational activities (Vostanis et al., 2013).

Cognitive rehabilitation methods are based on retraining cognitive functions through practice, adaptation, and implicit and explicit learning of coping strategies. This method is founded on the information processing system and provides feedback on individual capacities and self-efficacy; thus, an appropriate educational program can be designed according to the individual's strengths. Computerized cognitive training programs provide tools that help individuals improve basic mental processes essential for high-level learning (Fish & McKnight, 2022). Programs such as the computerized cognitive rehabilitation program used in this study operate based on the principles of neuroplasticity and brain self-repair; this means that by repeatedly stimulating less active brain regions, they create stable synaptic changes. Childhood is the most suitable sensitive developmental period, during which neuroplasticity is at its highest flexibility, and cognitive training during this period can yield the best results (Bergen & Woodin, 2017).

Previous research supports the fact that cognitive rehabilitation-based computer games, by targeting neurodevelopmental infrastructures, play a key role in restructuring information processing pathways in children with reading difficulties. Since deficits in cognitive processing components (such as working memory, sustained attention, and processing speed) are consistently associated with high levels of anxiety sensitivity and an inability to manage emotions, these games provide an opportunity for guided exposure to mental challenges through a safe and interactive learning environment. In fact, cognitive play therapy, relying on the principle of neuroplasticity, not only improves accuracy and speed in phonological

encoding and reading skills but also, through reward systems and immediate feedback, enhances the individual's cognitive appraisals of their own abilities. Consequently, it significantly reduces anxiety sensitivity resulting from academic failure experiences (Derikvand et al., 2022; Chegini et al., 2022; Bomyea et al., 2025; Robledo-Castro et al., 2023; van de Ven et al., 2016; Shao et al., 2015).

Students with reading difficulties, in addition to experiencing academic problems, often face a range of cognitive and emotional challenges, including deficits in cognitive processing, heightened anxiety sensitivity, reduced confidence in their own abilities, and diminished active engagement in educational settings. These factors not only undermine their current school performance, but may also disrupt their academic, social, and developmental trajectories, as well as their readiness to assume future vocational and professional roles. In this regard, the teacher, as the closest and most influential educational agent within the school environment, plays a crucial role in the early identification of difficulties, the design of supportive learning experiences, and the implementation of interventions tailored to the developmental and cognitive needs of these students. Teacher-led cognitive rehabilitation-based play therapy, by providing an active, motivating, and developmentally appropriate context, may contribute to the improvement of cognitive functioning, the reduction of stress and concerns associated with academic failure, and ultimately the strengthening of components predictive of future academic-vocational readiness. Therefore, the present study aimed to determine the effectiveness of teacher-led cognitive rehabilitation-based play therapy on anxiety sensitivity and cognitive processing in students with reading difficulties.

Method

Sample and Sampling Method

The research method was quasi-experimental, employing a pre-test, post-test, and follow-up design with a control group. The statistical population included all second-cycle elementary school students with reading disorders in Sirjan during the 2024-2025 academic year. The statistical sample consisted of 30 students (15 per group) selected through convenience sampling based on a diagnosis of reading disorder. Participants were randomly assigned to either the experimental or control group after age-matching. Inclusion criteria were: diagnosis of reading disorder, absence of other learning disabilities, no history of psychiatric disorders, chronic physical illness, or physical disability, and enrollment in second-cycle elementary school. Exclusion criteria included: diagnosis of comorbid learning disabilities, receiving concurrent treatments or medications, having comorbid neurodevelopmental disorders such as ADHD, or developing psychiatric or chronic physical conditions during the study.

Tools Used

Anxiety Sensitivity Index-Revised (ASI-R)

The **Anxiety Sensitivity Index-Revised (ASI-R)**, developed by Taylor and Cox (1998), consists of 36 items across six subscales: Fear of Cardiovascular Symptoms (6 items), Fear of Respiratory Symptoms (7 items), Fear of Publicly Observable Symptoms (8 items), Fear of Gastrointestinal Symptoms (4 items), Fear of Dissociative and Neurological Symptoms (6 items), and Fear of Cognitive Control Loss (5 items). Items are rated on a 5-point Likert scale (0 to 4). In the study by Moradimanesh et al. (2007), the reliability of the ASI-R was calculated using internal consistency, test-retest, and split-half methods, yielding coefficients of 0.93, 0.95, and 0.97, respectively. Concurrent validity was established through a correlation of 0.56 with the SCL-90-R.

Cognitive Processing Scale (CPS)

The Cognitive Processing Scale (CPS), developed by Cruise et al. (1999), comprises 40 items evaluating six domains: Visual Processing, Auditory Processing, Sequential/Logical Processing, Conceptual/Abstract Processing, Processing Speed, and Attention. Responses are recorded on a 5-point scale, where 1 indicates an obvious problem and 5 indicates an obvious ability (3 represents average skill or uncertainty). In Naeimi's (2014) study, Cronbach's alpha was used to determine reliability, with coefficients of 0.76 for auditory, 0.72 for visual, 0.77 for sequential, 0.73 for conceptual, 0.79 for speed, 0.77 for attention, and 0.89 for the total scale. Validity was confirmed through correlations between subscale items and total scores, ranging from 0.37 to 0.77.

Captain's Log Cognitive Rehabilitation Suite

The Captain's Log software was first developed in 2000 by the American company "BrainTrain." It contains approximately 2,000 exercises designed to improve cognitive abilities in individuals aged 6 and older (Royatvand Ghiasvand & Amiri Majd, 2018). The exercises target attention, concentration, memory, hand-eye coordination, basic numerical concepts, and problem-solving/reasoning skills, and are used for populations with ASD, ADHD, learning disabilities, and brain injuries (Robledo-Castro et al., 2023). In this study, the program was implemented in 16 individual 60-minute sessions led by a teacher:

Session 1: Assessment and Establishing Psychological Safety

The core objective is initial screening and assessment. Acting as a clinical evaluator, the teacher reviews psychiatric records to understand the history of the disorder while creating a secure, welcoming environment. Through effective verbal communication, the teacher assesses the child's basic digital literacy to lay the foundation for subsequent interventions.

Session 2: Therapeutic Alliance and Roadmap Clarification

The teacher functions as an instructor and structurer to form a strong therapeutic alliance. By providing clear instructions, the teacher introduces games such as "Where is the Car?" and "Fire-Breathing Dragon," explaining the clinical rationale (prioritizing foundational skills before higher-order functions) to parents. The teacher serves as a bridge between treatment and family, ensuring continuity through "home-based versions" of tasks.

Session 3: Training Attention and Working Memory

The focus is on restructuring the infrastructures of attention and concentration. As a cognitive coach, the teacher challenges the child using variable visual grids and symbolic lists. By guiding games like "Bird Wings" and "Smart Detective" and monitoring responses, the teacher strengthens auditory and visual memory. Parents are then instructed on replicating these exercises at home.

Session 4: Stabilization and Compensating for Weak Functions

The teacher acts as a performance analyst. While repeating previous exercises, the teacher manages incentive-based games like "Finding Lost Objects" and "Be Fast" to compensate for cognitive weaknesses. By adjusting the difficulty of "Target Exercises," the teacher optimizes the child's selective attention and redesigns home tasks based on individual needs.

Session 5: Enhancing Sustained Attention and Vigilance

Using protocols related to response speed, the teacher implements the "Pop Not Zap" game. The teacher's role is to continuously monitor the child's mental stamina toward variable visual stimuli. The child is taught how to maintain focus over extended periods, while the teacher provides timely feedback to increase response accuracy.

Session 6: Integration of Selective and Focused Attention

The teacher creates a multi-faceted environment by combining "Happy Hunter" and "Smart Detective." Serving as a facilitator, the teacher helps the child improve upon weak performances from previous sessions. Additionally, the teacher trains parents on how to monitor the *quality*—rather than just the quantity—of gameplay.

Session 7: Visual-Spatial Memory and Conceptual Reasoning

The intervention enters more complex cognitive domains, including visual associations and classifications. By managing "Concentration" and "The Great Hunt," the teacher guides the child through visual imagery and rule-based target identification, acting as a strategic leader to help the child link symbols with spatial locations.

Session 8: Restoring Memory and Attentional Functions

This session is dedicated to consolidating visual-spatial memory. Through active repetition and encouragement, the teacher aims to minimize cognitive errors seen in previous sessions. As a supportive figure, the teacher boosts the child's confidence in facing complex challenges and formulates an intensive home-training schedule.

Session 9: Recognition Memory and Resilience in Sustained Tasks

The teacher challenges recognition memory and sustained attention through "Mouse Hunt" and "Misleading Paths." As a coach, the teacher monitors the child's ability to maintain appropriate responding during repetitive tasks and teaches them to ignore distractors. The child's precision in remembering the order and color of stimuli is closely tracked.

Session 10: Advancing Reasoning and Problem-Solving

The teacher focuses on higher-order cognitive skills such as reasoning and recognition through the "Power Puzzle" game. Acting as a problem-solving facilitator, the teacher encourages the use of mental strategies to overcome challenges and redefines home exercises to be more targeted based on past performance assessments.

Session 11: Motor Control and Multi-Sensory Recognition

The teacher strengthens the link between cognition and motor skills through "Alomo's Memory" and "Pop Not Zap." As a precise observer, the focus is on fine motor control and the inhibition of impulsive reactions. By presenting auditory and visual stimuli, the teacher helps the child synchronize response times with central processing speed.

Session 12: Processing Speed and Motor Memory Integration

Using "Puzzle" and "Don't Be Late," the teacher focuses on accelerating mental and motor processing. The teacher encourages the child to improve speed without sacrificing accuracy. Compensatory strategies are taught for previously weak areas, and parents are briefed on supporting these skills at home.

Session 13: Numerical Skills and Visual-Spatial Classification

The teacher introduces mental calculations and shape classification. By managing "Playing with Pieces," conceptual reasoning and sustained attention are engaged. The teacher acts as an instructor for prerequisite math skills, teaching the child to categorize and calculate target stimuli based on set rules.

Session 14: Visual Perception and Selective Attention Reinforcement

Through repetition and the "Puzzle" game, the teacher works on the child's perceptual accuracy. Serving as a retrieval coach, the teacher helps the child identify image details with greater speed and precision. Progress is shared with parents to align home exercises with the child's current level.

Session 15: Numerical Discrimination and Spatial Sequencing

The teacher introduces complex concepts of numerical discrimination and spatial distribution through "City Lights." As a cognitive guide, the teacher instructs the child on following rules to locate boxes containing specific images and numbers, elevating the child's conceptual reasoning and classification skills.

Session 16: Final Stabilization and Functional Integration

In the final session, the "Countdown" game is used to integratively test all learned skills, including working memory, attention, and conceptual reasoning. As a final evaluator, the teacher analyzes overall progress, stabilizes strengths, and provides parents with a comprehensive summary and recommendations for maintaining cognitive gains in the future.

Procedure

Following proposal approval, a call for participants was issued in schools. After obtaining informed oral consent, demographic questionnaires were sent online. Based on inclusion/exclusion criteria, 30 students were selected and randomly assigned to groups. Pre-tests were administered to both groups. The experimental group received the cognitive play therapy intervention, while the control group received no treatment. Post-tests and a one-month follow-up were conducted for both groups. For ethical considerations, the control group was offered the intervention after the study concluded. Data were analyzed using descriptive statistics (Mean and SD) and Repeated Measures Analysis of Variance (RM-ANOVA) via SPSS-22, with significance levels set at 0.05 and 0.01.

Results

The cognitive rehabilitation-based play therapy group consisted of 5 girls (33.33%) and 10 boys (66.66%). The control group included 7 girls (46.67%) and 8 boys (53.33%).

Table 1. Mean, Standard Deviation, and Shapiro-Wilk Statistic for Anxiety Sensitivity and Cognitive Processing Scores

Variable	Phase	Group	Mean	SD	Shapiro-Wilk	p-value
Anxiety Sensitivity	Pre-test	Play Therapy	60.58	1.95	.919	>.05
		Control	59.00	1.77	.926	>.05
	Post-test	Play Therapy	48.13	2.79	.953	>.05
		Control	59.20	1.69	.888	>.05
	Follow-up	Play Therapy	45.93	3.23	.934	>.05
		Control	59.00	2.00	.933	>.05
Cognitive Processing	Pre-test	Play Therapy	59.00	5.05	.973	>.05
		Control	60.13	5.22	.933	>.05
	Post-test	Play Therapy	68.73	5.50	.971	>.05
		Control	61.00	4.81	.921	>.05
	Follow-up	Play Therapy	69.06	5.76	.968	>.05
		Control	61.13	4.89	.916	>.05

Table 1 presents the mean, standard deviation, and Shapiro-Wilk statistic for the participants' scores in both the teacher-led cognitive rehabilitation-based play therapy group and the control group across three assessment phases: pre-test, post-test, and follow-up. As observed, the pp-values for the Shapiro-Wilk test for all variables across all stages were greater than 0.05, indicating that the data distribution is normal. This satisfies the primary assumption for conducting parametric statistical analyses, such as the Repeated Measures Analysis of Variance (RM-ANOVA).

Table 2. Results of Repeated Measures Analysis of Variance (RM-ANOVA) for Anxiety Sensitivity and Cognitive Processing

Variable	Source	SS	df	MS	F	p-value	η2
Anxiety Sensitivity	Between-group	1529.34	1	1529.34	104.70	.001	.789
	Time Effect	664.15	1.77	374.67	441.83	.001	.940
	Interaction (Time*Group)	710.42	1.77	400.776	472.61	.001	.944
Cognitive Processing	Between-group	893.02	1	893.02	4.36	.046	.135
	Time Effect	306.87	2	153.43	209.68	.001	.882
	Interaction (Time*Group)	339.31	2	169.65	231.85	.001	.892

As shown in Table 2, the teacher-led cognitive rehabilitation-based play therapy had a significant reductive effect on Anxiety Sensitivity ($p<.001$). The main effect of time also indicated a significant decrease in anxiety sensitivity scores compared to the pre-test phase ($p<.001$). Furthermore, the significant Time*Group interaction effect ($p<.001$) demonstrates that the reduction in anxiety sensitivity in the experimental group was significantly greater than that in the control group. Regarding Cognitive Processing, the results indicated that the intervention had a significant enhancing effect ($p<.001$). The main effect of time showed a significant increase in cognitive processing scores over the assessment phases ($p<.001$). Most importantly, the significant Time*Group interaction ($p<.001$) confirms that the

teacher-led cognitive rehabilitation-based play therapy effectively improved cognitive processing indices in students with reading difficulties compared to the control group.

Discussion

The present study aimed to determine the effectiveness of teacher-led cognitive rehabilitation-based play therapy on anxiety sensitivity and cognitive processing in students with reading difficulties. The findings indicated that implementing "teacher-led cognitive rehabilitation-based play therapy" led to a significant reduction in anxiety sensitivity and improvement in cognitive processing indices among these students. These results are consistent with previous research (Derikvand et al., 2022; Chegini et al., 2022; Bomyea et al., 2025; Robledo-Castro et al., 2023; van de Ven et al., 2016; Shao et al., 2015), demonstrating that integrating cognitive games with purposeful teacher guidance is an efficient strategy for moderating emotional challenges and enhancing mental infrastructures in educational environments.

In explaining the effectiveness of this intervention on anxiety sensitivity, one can refer to the Cognitive Appraisal Theory and the construct of Self-efficacy. Due to repeated failures, students with reading difficulties often exhibit catastrophic interpretative biases toward physiological symptoms of anxiety (such as palpitations or shortness of breath during reading). When the teacher manages this intervention, the classroom environment is transformed from a stressful, evaluative space into a secure and supportive one. In the role of a "cognitive facilitator," the teacher uses computer games to break down difficult tasks into smaller, manageable, and successful steps. This process allows the student, under the supervision of an authoritative yet supportive figure (the teacher), to internalize successful experiences. According to Bandura's (2018) theory, this increase in self-efficacy shifts "outcome expectations," preventing the student from interpreting anxiety symptoms as signs of failure or inability. In fact, the teacher's presence as the interventionist facilitates "real-time cognitive restructuring"; by providing positive corrective feedback during the game, the teacher reduces the student's sensitivity to anxiety cues through guided exposure and increases their tolerance for ambiguity.

From a neuropsychological perspective, anxiety sensitivity is linked to amygdala hyperactivity and deficits in the regulatory inhibition of the prefrontal cortex. Cognitive rehabilitation play therapy strengthens inhibitory neural pathways by engaging executive functions (Smid et al., 2023). The key element here is the "teacher-led" nature of the intervention; based on attachment theory in educational settings, a positive teacher-student relationship acts as an "emotional buffer." When a teacher implements cognitive games, the socio-emotional interactions in the classroom facilitate oxytocin release, which in turn reduces sympathetic nervous system stress responses. By adjusting the game's difficulty level based on the Zone of Proximal Development (ZPD) (Vygotsky, 1978), the teacher prevents the student from experiencing anxiety flooding. This external regulation by the teacher gradually evolves into internal self-regulation within the student. Furthermore, since neuroplasticity is at its peak during childhood, consistent teacher-guided training stabilizes synaptic changes in regions associated with emotional control. Thus, the reduction in anxiety sensitivity in this study is not merely a result of the game itself but the synergistic interaction between cognitive technology and the teacher's emotional-professional support.

Regarding the improvement in cognitive processing, the findings can be explained through the Processing Capacity Theory and the Working Memory Model. Students with reading difficulties typically exhibit deficits in processing speed and the temporary maintenance of information, leading to cognitive overload during reading. The computer games used in this study target processing sub-components (such as visual accuracy, response inhibition, and mental flexibility), thereby automating basic mental processes (Melby-Lervåg & Hulme, 2020). The teacher's pivotal role involves managing "extraneous cognitive load"; by directly monitoring the game process, the teacher organizes tasks from simple to complex, ensuring the student does not stall at the "cognitive command" stage. Within the classroom context, the teacher bridges abstract game tasks and concrete reading activities. This mediation ensures that cognitive skills enhanced in the game are rapidly generalized to the academic learning context. In essence, teacher guidance directs the student's attentional resources away from distracting stimuli toward key textual features, significantly enhancing the information processing system's efficiency in phonological encoding and retrieval (Sweller et al., 2019).

Neuropsychologically, improved cognitive processing results from shifts in prefrontal cortex activity patterns and enhanced sensory-motor integration achieved through repetitive cognitive play. Applying the concept of the Zone of Proximal Development (Vygotsky, 1978) suggests that the teacher, acting as a "cognitive coach," bridges the gap between the student's current information-processing ability and their ultimate potential. By providing mental scaffolding during gameplay, the teacher prevents learned helplessness and maintains the student in a state of "optimal arousal" necessary for neuroplasticity. Unlike purely computer-based interventions that may lack human interaction, the teacher-led approach allows the teacher to use verbal feedback and metacognitive strategies (such as "thinking aloud") to teach the student how to monitor their own thought processes. This strengthens synaptic connections in the brain's attentional networks and improves the speed of neural transmission in regions associated with visual-auditory processing.

Based on these findings, it is recommended that the Ministry of Education and learning disability centers design comprehensive "Cognitive Rehabilitation Instructor" courses for teachers in inclusive and special education schools. Cognitive games should be integrated not as ancillary activities, but as part of a "remedial curriculum." Furthermore, cognitive rehabilitation software suites with teacher-customization features should be provided to schools to allow for difficulty and reward adjustments tailored to each student's cognitive profile. It is also advised that teachers act as ambassadors in parent-teacher meetings, familiarizing parents with principles for transferring cognitive skills from the game environment to daily activities. Finally, establishing "cognitive playrooms" in schools under the direct supervision of trained teachers could serve as a preventive strategy to moderate anxiety sensitivity and enhance information processing efficiency across the educational structure.

A primary limitation of this study was the use of convenience sampling and the restriction of the statistical population to second-cycle elementary students in Sirjan, which warrants caution in generalizing findings to other educational levels, cultural contexts, or larger cities. Additionally, while the sample size met the minimum requirements for quasi-experimental designs, 15 participants per group may have limited the statistical power to detect subtle intervention effects. Furthermore, the inability to fully control environmental variables in different schools and individual differences in teachers' implementation of the protocol (despite training) are other factors that may affect internal validity.

Conclusion

In conclusion, the "teacher-led cognitive rehabilitation-based play therapy" model acts as more than a simple educational tool; it serves as a supportive-developmental ecosystem that bridges cognitive technology and human emotion. The findings demonstrate that the effectiveness on anxiety sensitivity and cognitive processing is not solely the product of the student-computer interaction, but stems from the "professional mediation of the teacher." By understanding the student's individual nuances, the teacher provides a secure environment for reconstructing self-efficacy beliefs. Acting as an "emotional regulator," the teacher prevents cognitive challenges from becoming anxiety-inducing experiences and, by guiding mental processes step-by-step, restructures neural pathways associated with reading. This approach proves that when rehabilitation interventions are moved from abstract clinical settings to the natural classroom environment under the guidance of the teacher—the most accessible emotional-educational authority—the sustainability of cognitive gains and the reduction of anxiety reactions are maximized. Consequently, this model not only improves processing deficits but also, by reducing stress sensitivity, strengthens the long-term mental health foundations of students with reading difficulties.

Acknowledgements

The authors would like to thank all the students who participated in this study for their participation and sincere cooperation. This research received no financial support from any governmental, public, commercial, or private organization.

Conflict of interest

The author of this research has no conflicts of interest.

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