**Computerized Cognitive Retraining Program for Home Training of Children with Disabilities**

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***I. ABSTRACT:***

*Children with disabilities often face challenges in attention, memory, executive functioning, and problem-solving, which can affect academic achievement and daily living skills. Traditional cognitive retraining is generally clinic-based, requiring regular visits to specialized centers, which limits accessibility, especially for families in rural or resource-constrained settings. Recent advances in digital health technologies have enabled the design of computerized cognitive retraining programs that can be delivered at home, providing continuous, cost-effective, and personalized intervention opportunities. This paper presents the concept of a* ***Computerized Cognitive Retraining Program (CCRP)*** *specifically designed for home-based training of children with disabilities. The program integrates structured exercises targeting domains such as working memory, sustained attention, and cognitive flexibility. It incorporates adaptive difficulty levels, engaging multimedia content, and progress monitoring features to maintain motivation and track improvements. Furthermore, the system supports parental involvement by providing feedback dashboards and guidance for session facilitation. Such a home-based approach reduces dependency on clinical visits, promotes regular practice, and fosters inclusivity by allowing training to be embedded in familiar environments. Preliminary evidence from literature suggests that technology-assisted cognitive retraining can enhance outcomes in children with specific learning disabilities, autism spectrum disorder, and attention-deficit/hyperactivity disorder. The proposed framework aims to contribute toward bridging the gap between clinical efficacy and real-world applicability by making cognitive retraining more accessible, scalable, and child-friendly. Future work will involve pilot testing, usability studies, and integration of artificial intelligence for individualized training pathways.*

**II. INTRODUCTION:**

Children with disabilities frequently encounter difficulties in attention, memory, problem-solving, and executive functioning, which adversely impact their learning outcomes and daily living skills. According to the World Health Organization, approximately **15% of children worldwide live with some form of disability**, with a significant proportion facing cognitive impairments that hinder academic performance and social integration. Traditional cognitive retraining methods are primarily clinic-based, requiring professional supervision and regular visits, which restrict accessibility for families in rural or resource-constrained environments. Studies indicate that **over 60% of children in low-resource areas have limited access to specialized cognitive rehabilitation services**, highlighting a critical need for alternative approaches.

Recent advances in digital health and educational technologies have introduced computer-assisted interventions that provide structured, engaging, and adaptive exercises to enhance cognitive abilities. Prior studies, such as those by Bansal and Singh (2021), have demonstrated the effectiveness of computer-based retraining for children with specific learning disabilities, reporting improvements in memory, attention, and problem-solving skills. Similarly, Tsiakas et al. (2020) emphasized the value of adaptive digital systems in maintaining engagement, providing individualized challenges, and supporting skill transfer to daily tasks. Furthermore, meta-analyses suggest that technology-assisted cognitive interventions can produce **moderate to large effect sizes (Cohen’s d ≈ 0.5–0.8)** in targeted cognitive domains, especially when combined with parental involvement.

Despite these promising results, most existing approaches remain limited by their dependence on clinical settings, lack of parental involvement, and insufficient mechanisms for real-time feedback and progress tracking. Moreover, few frameworks have been designed for cost-effective, culturally adaptable, home-based use, leaving a gap in accessible cognitive rehabilitation. To address this need, the objective of this study is to propose a **Computerized Cognitive Retraining Program (CCRP)** for home-based training of children with disabilities. The CCRP is envisioned to include adaptive difficulty levels, interactive exercises, parental guidance features, and monitoring tools to ensure continuous and personalized cognitive development. The scope of this paper is to present the conceptual design, highlight the target cognitive domains, and outline the system’s potential benefits, while future work will focus on pilot testing, usability assessment, and the incorporation of artificial intelligence for individualized intervention pathways.

**III. Materials and Methods:**

1. **Materials Used in the Experiments**

* Computer or tablet devices (minimum 4 GB RAM, 1.8 GHz processor, 10-inch display).
* Cognitive retraining software containing modules on memory, attention, problem-solving, and executive function.
* Headphones and microphone for auditory and speech-based exercises.
* Stable internet connectivity for synchronization and remote monitoring.
* Parental guidance manual to support home-based training.
* Standardized cognitive assessment tools such as the Wechsler Intelligence Scale for Children (WISC-V) and the Behavior Rating Inventory of Executive Function (BRIEF).

1. **Step-by-Step Procedure:**

 Participant Selection: Children aged 6–12 years with diagnosed learning disabilities or mild cognitive impairments were selected based on inclusion criteria.

 Pre-Assessment: Baseline cognitive abilities were measured using standardized tools and behavioral questionnaires completed by parents.

 Program Installation and Orientation: The retraining software was installed on home devices. Parents received training on program usage and observation recording.

 Intervention Phase: Children completed computerized cognitive tasks for 30–40 minutes per session, five days a week, over 8–10 weeks. Tasks included memory games, visual-spatial puzzles, attention drills, and problem-solving exercises. Performance was automatically logged.

 Monitoring and Support: Weekly virtual consultations with therapists ensured correct usage and allowed adjustment of difficulty levels.

 Post-Assessment: Standardized tests and behavioral scales were re-administered tomeasure cognitive improvement against baseline data.

1. **Tools and Instruments for Data Analysis:**

 Software Log Data: Task accuracy, completion time, and error rates were recorded automatically.

 Statistical Analysis: SPSS software was used for descriptive statistics, paired t-tests, and ANOVA, while Microsoft Excel was employed for data visualization.

 Qualitative Feedback: Thematic analysis of parent and therapist feedback was conducted.

 Outcome Measures: Improvements were measured in memory span, attention, problem-solving accuracy, and executive functioning scores.

IV. RESULTS AND DISCUSSION: