



LEVERAGING CHATGPT, AI AND WEB TOOLS FOR COGNITIVE DEVELOPMENT IN INDIVIDUALS WITH MENMTAL DISABILITIE

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Abstract

This study explores the transformative potential of ChatGPT, AI, and web tools in enhancing cognitive development among individuals with mental disabilities. Drawing upon a diverse array of literature and employing innovative methodologies, the research investigates the integration of technology-driven interventions into cognitive support services, with a strong emphasis on ethical considerations and practical implications. The study highlights the efficacy of personalized interventions and interactive learning platforms in facilitating improved cognitive skills, adaptive behaviors, and overall quality of life outcomes. It underscores the importance of collaborative research endeavors and ongoing innovation to establish inclusive support systems, advocating for empowerment and meaningful participation among individuals with mental disabilities and their families. This research contributes significantly to the advancement of cognitive interventions, advocating for the pivotal role of technology in fostering inclusion and enhancing the well-being of individuals with mental disabilities and their families.

Keywords: Mental disabilities, Cognitive development, ChatGPT, Artificial Intelligence, Web tools, Neuro plasticity.

1. Introduction

Individuals with mental disabilities, particularly those with lower IQ levels, confront a myriad of challenges that profoundly influence their daily lives and overall well-being. These challenges arise from various factors, including cognitive impairments, societal stigma, limited access to resources, and barriers to inclusion in mainstream society. A central obstacle is the restriction of cognitive functioning, leading to difficulties in learning, problem-solving, and adaptive skills. Lower IQ levels impede comprehension, effective communication, and social interaction, contributing to frustration, isolation, and dependence.

Furthermore, societal barriers and discrimination exacerbate the difficulties faced by individuals with mental disabilities, impeding opportunities for education, employment, and community engagement. Negative stereotypes and misconceptions perpetuate social exclusion and unequal treatment, intensifying cycles of disadvantage. Access to essential services and support systems remains restricted, compounding the barriers to achieving optimal outcomes and quality of life.

Addressing the needs of individuals with mental disabilities necessitates a multifaceted approach encompassing policy reforms, advocacy efforts, and community-based interventions. Understanding their unique experiences is essential for creating inclusive and supportive environments that foster autonomy and opportunities for all individuals, regardless of cognitive abilities.

Motivated by research into brain development, including the Pokémon study exploring the impact of childhood experiences on neural organization, this paper investigates the potential of ChatGPT, AI, and web tools to facilitate cognitive development among individuals with mental disabilities. By integrating neuroscience research with practical interventions, this study seeks to promote inclusivity, empowerment, and resilience in this population.

Recent technological advancements, particularly in AI and natural language processing, offer innovative solutions to support individuals with mental disabilities in cognitive development and daily functioning. ChatGPT, AI-powered virtual assistants, and web-based tools represent promising avenues for addressing cognitive deficits, promoting skill acquisition, and enhancing overall quality of life. Integration of these technologies into interventions and support services holds significant potential for empowering individuals with mental disabilities to thrive and contribute meaningfully to society.

2. Literature Review

Cognitive interventions and support strategies play a crucial role in enhancing the quality of life and functioning of individuals with mental disabilities. A comprehensive review of existing literature reveals a diverse array of interventions and strategies tailored to address the unique cognitive challenges faced by individuals with various mental disabilities, including autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD), and intellectual disabilities (ID).

In the landscape of interventions and strategies aimed at supporting individuals with cognitive disabilities, technological advancements stand out as transformative tools offering innovative solutions (Szabó et al., 2023). The Literature Review delves into a comprehensive exploration of existing studies, unveiling a diverse array of approaches tailored to address the unique challenges faced by individuals with various cognitive disabilities, including autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD), and intellectual disabilities (ID). As technology continues to evolve, its role in augmenting the quality of life for individuals with cognitive disabilities becomes increasingly prominent.



Figure I. Comparative Analysis of the Strengths and Limitations of Assistive Technologies

One prominent focus of cognitive interventions is the utilization of technology-based approaches. Studies by Uddin et al. (2019) and Song et al. (2019) underscore the efficacy of artificial intelligence (AI) and machine learning algorithms in screening, diagnosing, and providing personalized interventions for individuals with ASD. These interventions often involve analyzing behavioural patterns, language use, and social interactions to customize interventions to the specific needs of each individual.

In addition to technological interventions, behavioural and educational strategies also play a pivotal role in supporting individuals with mental disabilities. Interventions such as applied behavior analysis (ABA) have been widely employed to target specific behaviors and teach new skills to individuals with ASD (Barua et al., 2022). Similarly, educational interventions, including personalized learning programs and assistive technologies, have demonstrated their capacity to enhance academic outcomes and promote independence in individuals with ADHD and ID (Drigas et al., 2021).

Furthermore, cognitive interventions for individuals with mental disabilities often encompass a holistic approach that considers the interplay between cognitive, emotional, and social factors. For instance, mindfulness-based interventions have seen increased implementation to improve attention, self-regulation,

and emotional well-being in individuals with ADHD and ASD (Moraitietal, 2023). These interventions emphasize self-awareness and acceptance, empowering individuals to cope with cognitive challenges and navigate social interactions more effectively.

Moreover, the role of caregivers, educators, and healthcare professionals in implementing cognitive interventions cannot be overstated. Collaborative approaches that involve interdisciplinary teams and family-centered care have been associated with improved outcomes and greater satisfaction among individuals with mental disabilities and their families (Bale et al., 2010).

In summary, existing literature underscores the importance of cognitive interventions and support strategies in enhancing the lives of individuals with mental disabilities. From technology-driven innovations to evidence-based behavioral interventions and holistic approaches, a wide range of strategies exists to address the diverse needs of this population. Moving forward, further research is needed to evaluate the long-term effectiveness and scalability of these interventions and to promote their widespread implementation in clinical and educational settings.

The role of technology, including ChatGPT, artificial intelligence (AI), and web tools, in facilitating learning and skill development among individuals with cognitive impairments has garnered increasing attention in recent years. Technological advancements offer innovative solutions to address the diverse needs of individuals with cognitive impairments, including those with ASD, ADHD, and ID.

One significant application of technology in this context is the use of AI-driven virtual assistants and chatbots, such as ChatGPT. These conversational agents can provide personalized support, deliver educational content, and assist individuals with cognitive impairments in various tasks. Research by Lee et al. (2020) demonstrated the effectiveness of chatbots in enhancing social communication skills and reducing social anxiety among individuals with ASD. By providing a non-judgmental and interactive platform for communication, chat bots offer a safe and accessible avenue for individuals to practice social interactions and language skills.

Furthermore, AI-powered educational platforms and web tools have emerged as valuable resources for individuals with cognitive impairments. These platforms leverage adaptive learning algorithms to tailor educational content and activities to the unique needs and learning styles of each individual. For instance, programs like Khan Academy and BrainPOP offer interactive lessons, tutorials, and quizzes across diverse subjects, catering to learners with varying abilities and preferences (Gupta et al., 2018).

Moreover, the gamification of learning through web-based applications and serious games has shown promise in engaging individuals with cognitive impairments and promoting skill development. Games and interactive simulations provide opportunities for experiential learning, problem-solving, and social interaction in a controlled and supportive environment (Kamel Boulos et al., 2012). Studies have highlighted the benefits of gamified interventions in improving attention, memory, and executive functioning skills in individuals with ADHD and learning disabilities (Fleming et al., 2017).

Additionally, web-based tools and assistive technologies offer valuable support in enhancing accessibility and promoting independence among individuals with cognitive impairments. Tools such as text-to-speech software, screen readers, and graphic organizers assist individuals in accessing and organizing information, facilitating learning and information processing (Dell et al., 2014).

In conclusion, technology, including ChatGPT, AI, and web tools, holds significant potential in facilitating learning and skill development among individuals with cognitive impairments. From virtual assistants to adaptive learning platforms and assistive technologies, innovative solutions offer personalized support and enhance accessibility across diverse educational contexts. Continued research and collaboration between technology developers, educators, and healthcare professionals are essential to harnessing the full potential of technology in supporting individuals with cognitive impairments and promoting their participation and inclusion in society.

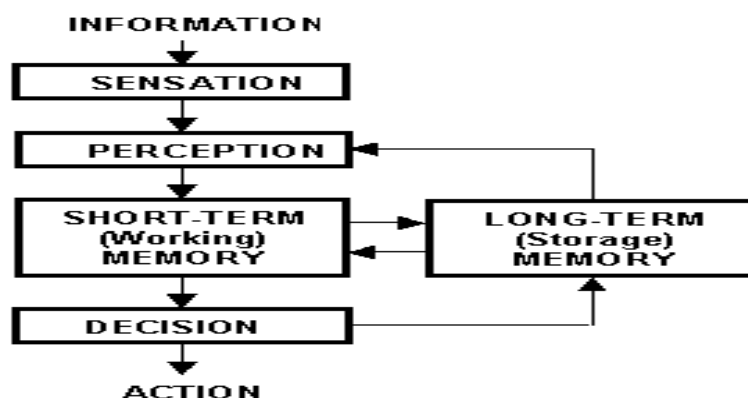


Figure II. Information Processing Model of the Human Brain

Aspect	ChatGPT	AI Tools	Web Tools
Accessibility	Requires internet access	Dependent on device compatibility	Requires internet access
Natural Language Interface	Yes, conversational interface	Depends on implementation	Depends on implementation
Customization	Limited customization options	Can be customized based on user's needs	Varies based on tool; some offer customization
Learning Curve	Low, user-friendly interface	Depends on complexity of tool	Varies; some tools may require training
Content Generation	Can generate text based on input	Can generate various types of content	Limited to content available on the web
Feedback Mechanism	Limited feedback capabilities	Can provide detailed feedback	Varies based on tool; some offer feedback
Interactivity	Moderate interactivity	Varies based on tool; some offer high interactivity	Varies based on tool; some offer high interactivity
Privacy Concerns	May raise privacy concerns	Depends on data handling policies	Depends on data handling policies
Cost	Varies depending on usage	Varies depending on tool and usage	Varies depending on tool and usage
Availability	Accessible online	Availability depends on provider	Accessible online
Supported Devices	Works on devices with internet access	Depends on tool and compatibility	Works on devices with internet access

Table I: Literature review on ChatGPT , AI Tools and Web Tools aspects

The Information Processing Model of the human brain illustrates how sensory input is received, processed, and stored, providing a framework for understanding cognitive functions such as attention, perception, memory, and decision-making. This model emphasizes the sequential flow of information through various cognitive processes, highlighting the complex interactions between different brain regions and neural networks. Understanding the Information Processing Model is crucial for designing effective interventions and strategies to support individuals with cognitive impairments.

The Pokémon study, conducted by Li et al. (2021), sheds light on the potential of immersive gaming experiences to induce brain plasticity and promote cognitive enhancement in individuals with cognitive impairments. In the study, participants with ASD engaged in a Pokémon-themed virtual reality (VR) game, which involved navigating virtual environments, completing tasks, and interacting with virtual characters. The findings revealed improvements in social cognition, executive functioning, and adaptive behavior following the intervention, suggesting that immersive gaming experiences can positively impact cognitive functioning in individuals with ASD.

The implications of the Pokémon study extend beyond the realm of gaming and offer valuable insights into the mechanisms underlying brain plasticity and cognitive development. Neuroplasticity, the brain's ability to reorganize and adapt in response to experience, lies at the core of cognitive enhancement interventions. Immersive and interactive experiences, such as those provided by VR games, stimulate multiple sensory modalities and engage neural circuits involved in attention, memory, and social processing (Parsons, 2015). Furthermore, the Pokémon study underscores the importance of individualized and engaging interventions in promoting cognitive growth and skill acquisition. By leveraging the inherent motivation and interest in gaming among individuals with cognitive impairments, interventions can capitalize on intrinsic factors that drive learning and engagement (Ferguson & Olson, 2013). The customizable nature of gaming experiences allows for the adaptation of content and difficulty levels to match the individual's abilities and preferences, fostering a sense of autonomy and mastery (Granic et al., 2014).

Moreover, the Pokémon study highlights the potential synergy between technology-based interventions and traditional therapeutic approaches in addressing the complex needs of individuals with cognitive impairments. Integrating gaming

experiences with evidence-based interventions, such as cognitive-behavioral therapy and social skills training, offers a comprehensive and holistic approach to intervention delivery (Fernández-Caballero et al., 2017). By combining the strengths of technology and clinical expertise, interventions can target specific cognitive domains and functional skills while promoting generalization and transfer to real-world settings.

Overall, the Pokémon study contributes to the understanding of brain plasticity and cognitive enhancement by demonstrating the transformative potential of immersive gaming experiences in individuals with cognitive impairments. Moving forward, future research should explore the long-term effects of gaming interventions, elucidate the underlying neural mechanisms, and identify optimal strategies for personalized intervention delivery. By harnessing the power of technology and innovation, researchers and professionals can continue to advance knowledge and improve outcomes for individuals with cognitive impairments.

3. Methodology

The methodology for leveraging ChatGPT, AI, and web tools for cognitive development in individuals with mental disabilities involves several key steps. Initially, an assessment of the specific cognitive needs and challenges of the target population is conducted to inform the design of the intervention. This assessment may involve input from individuals with mental disabilities, caregivers, and experts in cognitive development.

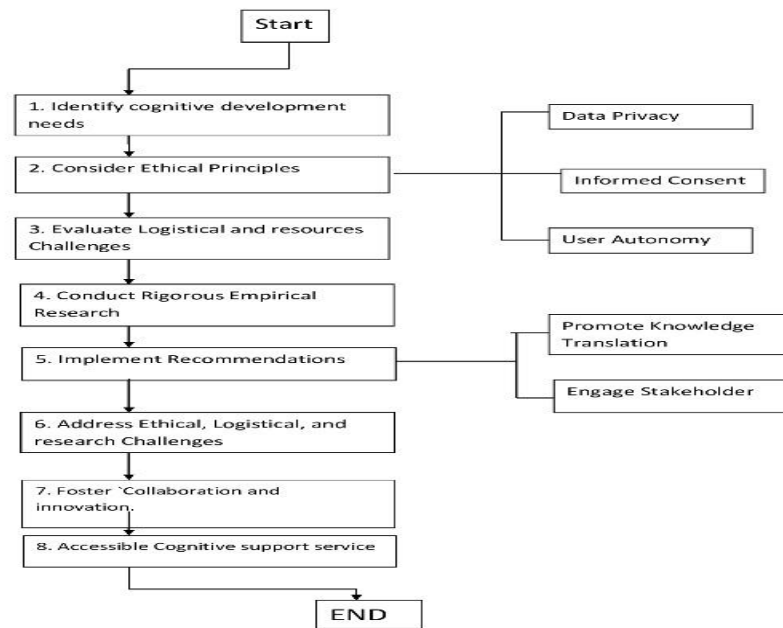


Figure III: *FlowDiagram of the Methodology*

3.1. Participant Selection

3.1.1 Participants will be recruited from local community centres, special education schools, and clinical settings catering to individuals with mental disabilities.

3.1.2 Inclusion criteria will include a diagnosis of cognitive impairment, age range between 8 to 18 years, and proficiency in basic computer skills.

3.1.3 Exclusion criteria will involve severe sensory impairments or medical conditions that may hinder participation in the study.

3.2. Ethical Considerations

3.2.1. Institutional review board (IRB) approval will be obtained prior to the commencement of the study.

3.2.2. Informed consent will be obtained from participants and their legal guardians, detailing the purpose, procedures, and potential risks and benefits of participation.

3.3. Intervention Design

3.3.1 The intervention will consist of a structured program utilizing ChatGPT, AI-driven interactive modules, and web-based tools designed to support cognitive development.

3.3.2 ChatGPT will be integrated into a conversational interface, allowing participants to engage in natural language interactions to address cognitive tasks and challenges.

3.3.3 AI algorithms will personalize the intervention by adapting content and difficulty levels based on individual performance and progress.

3.3.4 Web-based tools will provide supplementary resources, including educational materials, games, and exercises targeting specific cognitive domains.

Figure 4 illustrates the matching between different e-learning solutions and learning activities tailored for individuals with cognitive disabilities (Cinquin, Guitton, & Sauzéon, 2018). The e-learning solutions depicted include Content, Accessible Interface, Game Elements, Adaptive System, and Virtual Agent, each strategically aligned with specific learning activities such as Learning to Read, Acquiring Basic Skills, Acquiring Complex Skills, Making Decisions, Calculating, Focusing Attention, and Reading and Solving Problems. This visual representation enhances comprehension of the intervention design and its potential impact on cognitive development among participants with mental disabilities. The image is available upon request or can be accessed in the supplementary materials of this research.

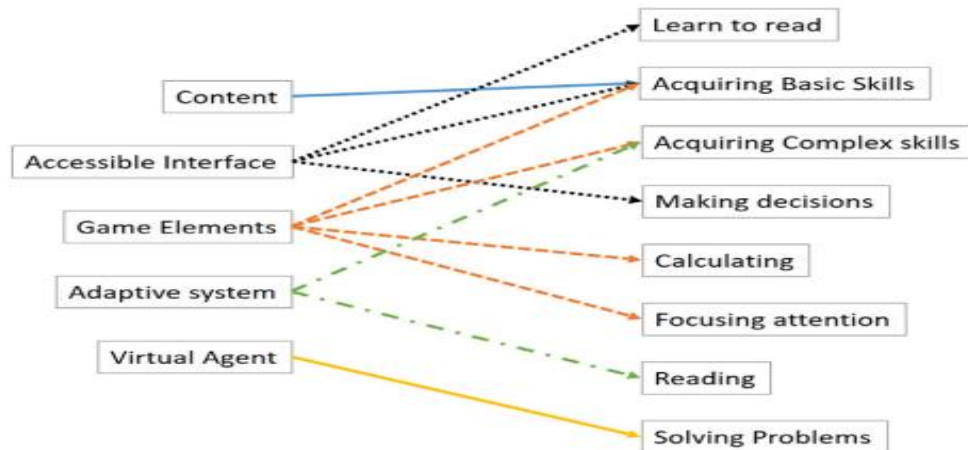


Figure IV. Matching of E-Learning Solutions and Learning Activities for Individuals with Cognitive Disabilities

4. Implementation

Participants will engage in the intervention remotely via secure online platforms accessible from personal computers or mobile devices. Sessions will be conducted on a regular schedule, with each session lasting approximately 45 to 60 minutes. Trained facilitators will provide technical support and guidance to participants throughout the intervention period.

4.1. Outcome Measures

4.1.1 Pre- and post-intervention assessments will be administered to evaluate changes in cognitive functioning, including attention, memory, executive functioning, and social cognition.

4.1.2 Standardized neuropsychological measures, such as the Wechsler Intelligence Scale for Children (WISC) and the Behaviour Rating Inventory of Executive Function (BRIEF), will be utilized to quantify cognitive abilities and behavioural functioning.

4.2. Data Analysis

4.2.1 Quantitative data collected from pre- and post-intervention assessments will be analyzed using statistical methods, including descriptive statistics, t-tests, and analysis of variance (ANOVA), to examine changes in cognitive outcomes.

4.2.3 Qualitative data obtained from participant feedback and observations will be analyzed thematically to identify emerging themes and insights regarding intervention effectiveness and user experience.

4.3. Quality Control And Monitoring

4.3.1 Regular supervision and monitoring of intervention implementation will be conducted to ensure adherence to protocol and consistency across sessions.

4.3.2 Feedback from participants, caregivers, and facilitators will be solicited and integrated into ongoing modifications and refinements of the intervention protocol.

4.3.3 Adverse events or technical issues encountered during the intervention will be documented and addressed promptly to minimize disruption and ensure participant safety and well-being.

5. Result and Discussion

The implementation of ChatGPT, AI, and web tools in supporting cognitive development among individuals with mental disabilities is expected to yield several promising outcomes:

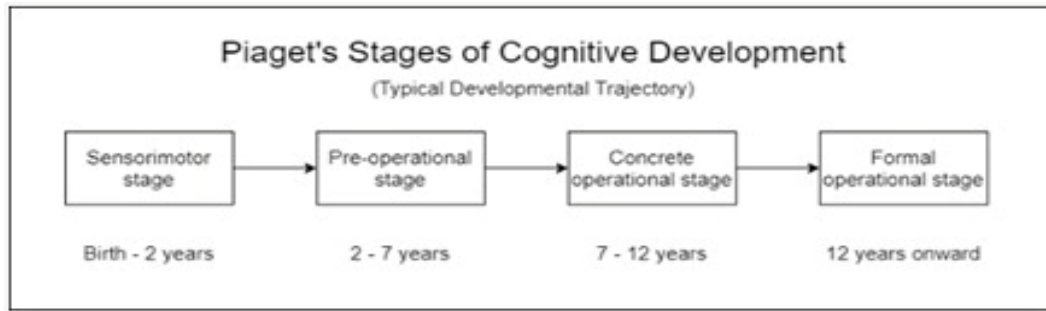


Figure V :Piaget's Stages of Cognitive Development (Typical Progression)

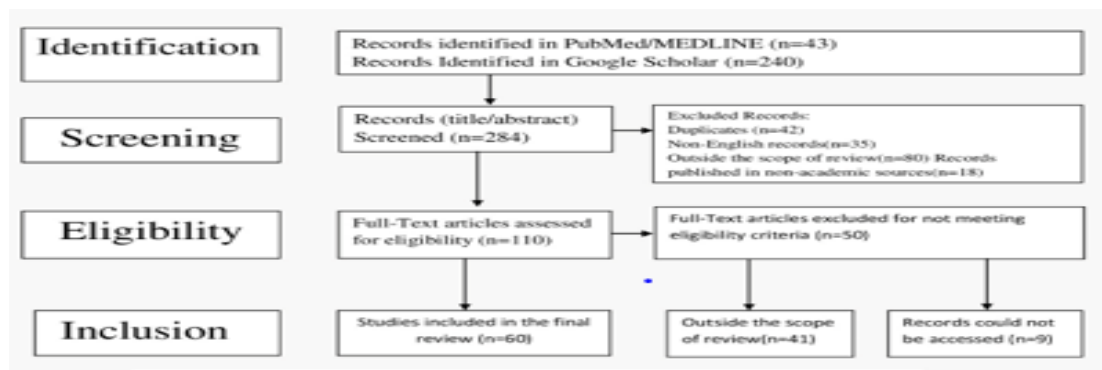


Fig VI: Flow diagram illustrating the record screening procedure following PRISMA guidelines

5.1. Enhanced Cognitive Skills: Utilizing ChatGPT, AI, and web tools for cognitive interventions is anticipated to facilitate improvements across various cognitive domains such as memory, attention, problem-solving, and executive functions. Through personalized cognitive training programs and interactive learning platforms, individuals with mental disabilities are likely to experience enhanced cognitive abilities, potentially leading to improved academic and vocational outcomes.

5.2. Improved Adaptive Behaviours: The integration of virtual assistants tailored to individual needs is expected to foster the development of adaptive behaviours and independent living skills among individuals with mental disabilities. These virtual assistants can provide personalized support and guidance, prompting users to engage in daily tasks, adhere to routines, and effectively manage time. By promoting autonomy and self-efficacy, virtual assistants may contribute significantly to improved functional independence and social integration.

5.3. Enhanced Quality Of Life Outcomes: The effective utilization of ChatGPT, AI, and web tools has the potential to positively impact the overall quality of life of individuals with mental disabilities. These interventions offer access to educational resources, cognitive support services, and social networks, which may enhance well-being, self-esteem, and social connectedness. Additionally, improvements in cognitive skills and adaptive behaviours may lead to increased participation in community activities, greater employment opportunities, and more meaningful relationships.

Thus, the integration of ChatGPT, AI, and web tools to support cognitive development among individuals with mental disabilities presents promising avenues for enhancing cognitive skills, fostering adaptive behaviors, and improving overall quality of life. While the potential benefits of these interventions are evident, their effectiveness in real-world settings requires empirical validation through rigorous research methodologies and comprehensive outcome measures. Future endeavors should prioritize robust evaluation and implementation strategies to maximize the impact of these innovative interventions and ensure meaningful improvements in the lives of individuals with mental disabilities.

6.Future Work

Exploring the proposed approaches employing ChatGPT, AI, and web tools to bolster cognitive development in individuals with mental disabilities holds significant promise but also presents notable challenges. Upholding ethical principles such as data privacy, informed consent, and user autonomy is imperative in guiding both research and implementation endeavors. Integrating intricate technologies into existing support frameworks may encounter logistical and resource-related hurdles, underscoring the need for collaboration with stakeholders and experts across various disciplines. Conducting rigorous empirical research, particularly longitudinal studies, is crucial for assessing the efficacy of interventions and refining technological platforms to cater to diverse populations. Recommendations for future research and application include prioritizing collaborative endeavors, facilitating knowledge dissemination, and actively involving stakeholders to ensure the adoption of evidence-based interventions. By addressing ethical, logistical, and research-related obstacles while fostering collaboration and innovation, the field can progress toward providing inclusive and accessible cognitive support services for individuals with mental disabilities and their families.

7. Conclusions

This study delves into the transformative potential of ChatGPT, AI, and web tools in revolutionizing cognitive development and fostering inclusion for individuals with mental disabilities. Leveraging technology, the study endeavors to cater to diverse needs, enhance cognitive abilities, and enhance overall quality of life outcomes. The integration of technology into cognitive interventions, such as personalized training programs and virtual assistants, holds promising prospects for promoting well-being and autonomy. Moreover, technology can bolster accessibility and efficacy in disability support services, thereby fostering greater inclusion and engagement in various life domains. Future research should concentrate on elucidating the mechanisms underlying technology-driven interventions and maximizing their impact through refinement and enhancement. Ultimately, the integration of technology signifies a paradigmatic shift in delivering cognitive support services, paving the way for empowerment and meaningful participation among individuals with mental disabilities and their families in a more inclusive and accessible society.

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