A Systematic Review of Computer-Based Interventions for Students with Intellectual Disabilities: Enhancing Skill Development and Learning Outcomes

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Abstract

People with mental impairments have diverse abilities and characteristics; thus, their learning capacity and social maturity vary. Programmed instruction in the 1960s, computer-assisted education was created to assist youngsters in improving their language and intellectual abilities. In recent years, professionals have been especially interested in the role of information and communication technologies (ICTs) in enhancing the everyday living skills of students with intellectual impairments. This systematic review focused on digital learning and disabilities studies to examine the significance of computer usage in developing language, academic, and cognitive skills in disabled students. Three databases (Google Scholar, Science Direct & Studies Gate) were rigorously examined to discover qualitative, empirical research during 20142022 on intellectual disability in students. 13 types of study were reviewed after scanning 587 studies collected from search engines. Three key concepts are discussed: Using the computer to enhance the Child's language, academic, and cognitive skills. This study promotes the development of programs and services to assist individuals with mental illnesses in improving their abilities and community participation, enabling them to become self-sufficient citizens.

1. Introduction

Information and communication technologies (ICTs) are being used increasingly in education. Much research (Benmarrakchi et al., 2015, Rello et al., 2012, Skiada et al., 2014) has shown that using ICT is essential for kids who have trouble learning in specific ways. With the use of information and communications technology, students' motivation, self-competition, and self-esteem may be enhanced. Regarding self-esteem and academic aspirations, students with disabilities often have low expectations. The use of ICT to assist disabled children is readily apparent. Using ICT to increase students' self-confidence, motivation, and self-esteem is likely to affect learning positively. Applications built precisely to the requirements of students can engage pupils and assist them in overcoming learning obstacles. According to (Benmarrakchi et al., 2016), ICT may be crucial in facilitating target users' more active participation in education. It strives to improve and generate user-friendly interactive experiences and may inspire users. People with ID are one of the minority groups recognized as having significant difficulties using these technological advancements (Li-Tsang et al., 2005, Li-Tsang et al., 2007, Wehmeyer, 1998, Wehmeyer, 1999). There has been very little consideration given to the needs of persons with disabilities when commercial gear and software have been developed for the general public (Abascal and Nicolle, 2005). The goal of the systematic review was to investigate what was previously known about explanations of computer development skills from the viewpoint of individuals with intellectual disabilities who are unable to learn or evaluate; the systematic review synthesized information from empirical research that investigated explanations of persons with intellectual disabilities. As a result, the study answered the research question: What is the role of computers in improving the learning process of the mentally disabled? 2) What function does the computer play in developing people with language abilities (listening, conversing, reading, and writing)? 3) What function does the computer play in the educational process of mentally challenged children? After presenting the findings, we assess how they contradict those from self-reported studies with students within the general population who can overcome their intellectual limits by applying digital technologies.

2. Methodology

This systematic review was executed by implementing PRISMA-P guidelines (Page et al., 2021). Three bibliographic databases were identified in light of the available literature searched in January 2022:
- Google Scholar
- Research gate
- PubMed (public/publisher Medline)

Each database was searched using all permutations of the phrases 'intellectual disabilities, 'computer usage, and ''language, academic 'and' cognitive skills Search phrases were constructed by looking at relevant systematic review search terms and

employing recommended alternatives in the databases. An example of a database-specific search strategy (Google Scholar) is presented in Table 1; the exact search phrases were used across the databases.

Table 1: Example search terms

Intellectual disability	intellectual-disability	mental disabilities
computer usage	assistive technology	cognitive skills
academic skills	language skills	computer access
developmental disability	ICTs	Information & communication technology
students		

Search parameters were changed to ensure results only comprised peer-reviewed publications from 2014 to 2022. Initial feasibility searching revealed that, notwithstanding developments in grasping the use of computers in managing intellectual impairment. The search was restricted to English language articles; screening also removed non-empirical research.

Inclusion/Exclusion Criteria

Titles and abstracts were first reviewed, then complete papers were reviewed based on the inclusion/exclusion criteria—details about who qualifies and who doesn't may be found in Table 2. Research on the use of computers in helping those with intellectual disabilities has shown mixed results at best. Study team members ultimately agreed to eliminate studies that may introduce variability to results; this decision is discussed in further depth in the subsequent discussion section. Researchers asked participants' friends, coworkers, teachers, and family members in several studies to rate their attributions. Therefore, this study relied heavily on qualitative information from individuals with intellectual disabilities.

Table 2. Inclusion and Exclusion Criteria

Inclusion Criteria
Peer-reviewed research
Articles that are published in English language and full text.
Qualitative studies- Interviews, Surveys, Questionnaires.
Task or performance-based studies.
Data published from 2014-2022
Exclusion Criteria
Articles published before 2014.
Studies that provide heterogeneity to results of the investigation.
Not-peer reviewed.

| Non-English language articles. |
| Unclear result or status. |
| Those studies do not define intellectual disabilities. |

3. Quality Assessment

Methodological rigor was evaluated using the most used instrument for qualitative research, the Critical Appraisal Skills Programme (CASP) (Ferreira and Patino, 2018) Qualitative Research Checklist (Majid and Vanstone, 2018). Goals, methods, design, recruitment, data collection, ethics, reflexivity, analysis, validity, and rigor are all covered throughout the 10 questions. Answers to the questions might be "yes," "no," or "can't tell." Each "yes" earned a study a point; a perfect score of 10 indicated a very high-quality investigation. Tabular records of quality assessments allowed for a critique of the resulting decisions. Examples may be found in Table 3.

Table 3: Example Quality Assessment table

Author & Year: (Silvera-Tawil et al., 2018).				
Title: "Talk to Me: The Role of Human-Robot Interaction in Improving Verbal Communication Skills in Students with Autism or Intellectual Disability"				
Questions	Yes	Can't tell	No	Comments
Did the review address a focused question?	✓			Clearly stated
Did the authors look for the correct type of papers?	✓			Yes, exploring 28 students
Do you think all the essential, relevant studies were included?		✓		Yes, most of the potential studies were included in the study

Did the review's authors do enough to assess the quality of the included studies?	✓			Yes
Was it reasonable to do so if the review results have been combined?	✓			Yes- Qualitative studies and interviews conducted
What are the overall results of the review?	✓			The results are justified according to the theme of the study
How precise are the results?	✓			Demonstrated with clear and justified statements
Can the results be applied to the local population?		✓		I don't know because the study was specific to intellectual disability.
Were all important outcomes considered?	✓			Yes
Are the benefits worth the harms and costs?		✓		Valuable but not clear

3.1 Data extraction and analysis

A separate data sheet was created for analysis and synthesis focused on using ICT to improve pupils' intellectual abilities. (For a breakdown of the data, see Table 4.) We used an iterative method in which we read and reread the data to discover themes inductively; the research findings informed the development of the articles rather than the other way around. Before aggregating the data into potential topics, it was coded extensively. Frequency in the whole data set and importance given to each study individually were used to determine a topic's predominance. The study staff was given access to the principal investigator's first topic categorization. Discussion led to removing a few entries since the data revealed these were best understood as related sensations of computer use. This kind of introspection allowed for the development of overarching and supporting themes that more closely tracked the underlying facts. The data was looked at to ensure the final analytic themes properly mapped the results onto the study topic.
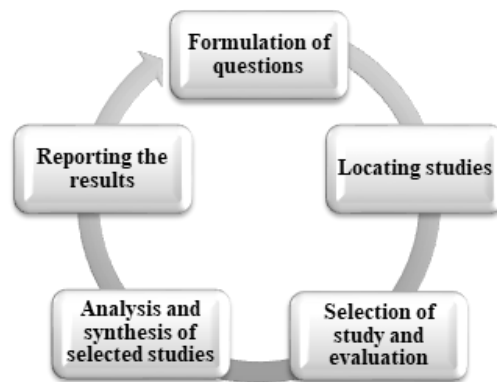
3.2 RESEARCH DESIGN

Figure 1 Research Design

4. RESULTS

587 papers were obtained from databases, and 138 relevant articles were retrieved from various websites, organizations, and pre-existing citations in the databases. The papers that did not fall under eligibility criteria were eliminated from the study (n= 82). Abstracts and titles were examined to sort the relevant themes, and complete articles were retrieved and evaluated based on eligibility criteria if the abstract and title offered adequate information. In addition, they were excluded and not recovered due to inaccessibility and eligibility rules. After retrieving several reviews (n=39), a total of (n=13) articles were selected to be included in this review, as shown in Figure 2.
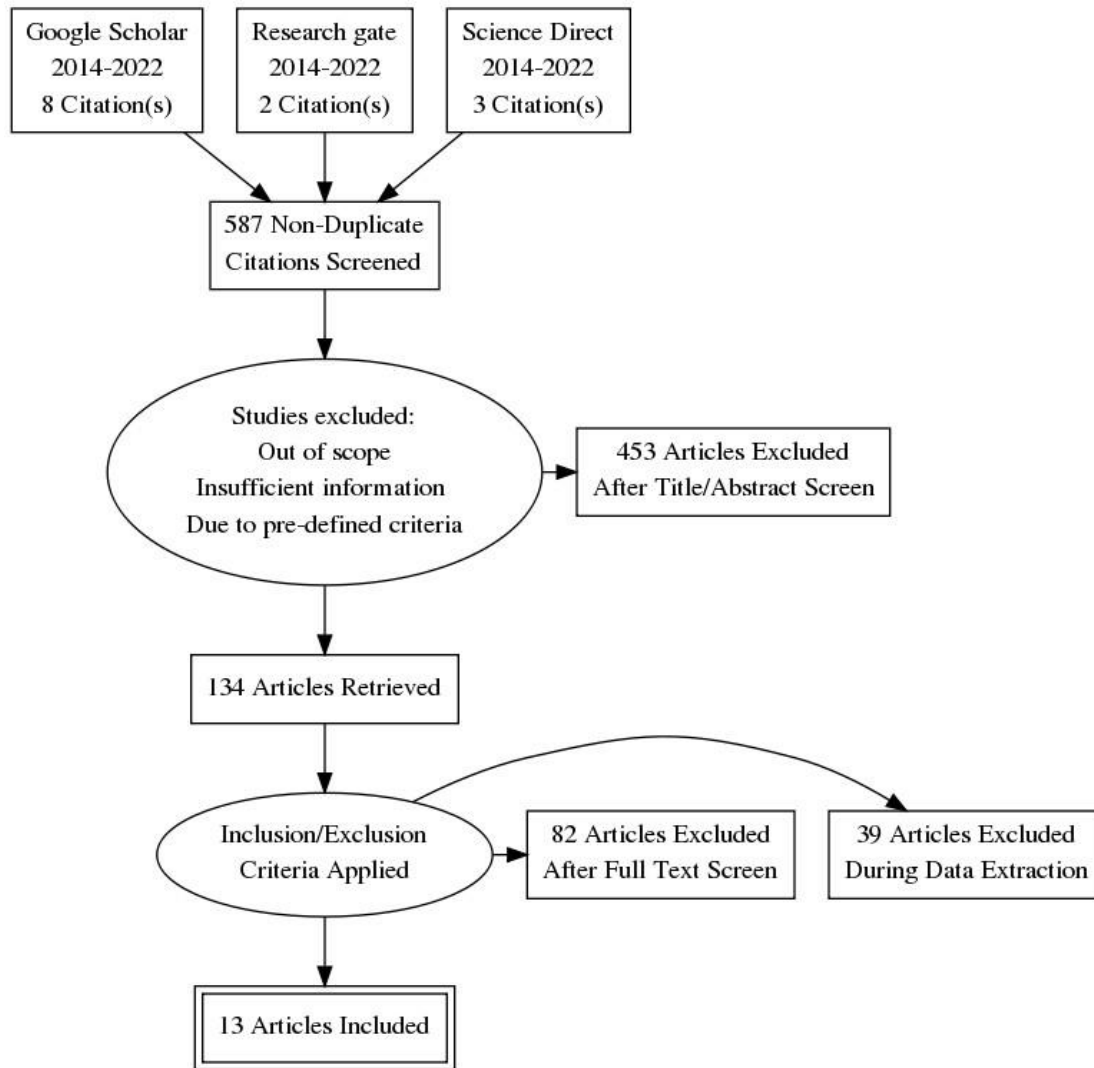
Figure 2: The PRISMA flow diagram

All 13 studies examined the experiences or perspectives of students with intellectual disabilities about digital technology in improving their language, academic, and cognitive skills. Six studies were conducted about the learning of academic skills by using digital technology. Four studies taught language skills, and three were conducted on cognitive skills.

Table 4: Data Extraction and summary of the 13 studies with intellectual

disabilities

Author/year	(Bagon et al., 2018).
Title	"Information Communication Technology Use among Students in Inclusive Classrooms"
Country	Slovenia
Sample size	Not Defined (Study on comparison between male and females
Aims	To explore the use of ICTs among students with intellectual disabilities
Methodology	Quantitative Survey
Findings	Students with special needs (SN) and their peers use computers more frequently for leisure activities than for school activities No correlation was found between the presence of SN and a student's desire to use a computer or a student's opinion on whether computer use improves learning success.
Scoring	6
Author/year	(Silvera-Tawil et al., 2018).
Title	"Talk to Me: The Role of Human-Robot Interaction in Improving Verbal Communication Skills in Students with Autism or Intellectual Disability"
Country	China
Sample size	28 Students
Aims	To explore the impact of robots on the verbal communication skills of secondary-aged students with moderate to severe intellectual disabilities and autism
Methodology	Qualitative study- Interviews conducted
Findings	Results show that humanoid robots can provide benefits in articulation, verbal participation, and spontaneous conversation in these young adults.
Scoring	7
Author/year	(Baglama et al., 2018)
Title	"Technologies Used in Education Hearing Impaired Individuals"
Country	Turkey
Sample size	Not Defined
Aims	This study aims to examine the technologies used in the training of hearing-impaired individuals.
Methodology	Qualitative research- Document analysis technique

Findings	The findings of the study were presented as technologies that contribute to the development of academic and linguistic skills of hearing-impaired individuals.
Scoring	6
Author/year	(Kang and Chang, 2019)
Title	"Using a motion-controlled game to teach four elementary school children with intellectual disabilities to improve hand hygiene"
Country	Taiwan
Sample size	4 students
Aims	The study aims to explore the motion-controlled game and its impact on children having intellectual Disabilities.
Methodology	Non-current multiple baseline design- Questionnaires
Findings	All four participants increased their percentage of correct task steps, data shows. Parents saw the video game as positive and said it helped their children learn hand cleanliness.
Scoring	8
Author/year	(McMahon et al., 2016)
Title	"Augmented Reality for Teaching Science Vocabulary to Postsecondary Education Students With Intellectual Disabilities and Autism"
Country	Washington
Sample size	1 (Autism). 3 (Intellectual Disability)
Aims	The purpose of this study was to examine the use of an emerging technology called augmented reality to teach science vocabulary words to college students with intellectual disability and autism spectrum disorders.
Methodology	Multiple probe technique.
Findings	According to the data, all students have learned scientific language definitions and labels.
Scoring	8
Author/year	(Satsangi and Bouck, 2015)
Title	"Using Virtual Manipulative Instruction to Teach the Concepts of Area and Perimeter to Secondary Students with Learning Disabilities"
Country	USA
Sample size	3 participants

Aims	This study aimed to address the absence of empirical evidence on area and perimeter therapies for secondary students with a math-learning problem.
Methodology	Multiple-baseline design (Virtual Manipulatives)
Findings	The use of virtual manipulatives improved the mathematical problem-solving abilities of all three participants while calculating area and perimeter.
Scoring	7
Author/year	(Kourakli et al., 2017)
Title	"Towards the improvement of the cognitive, motoric and academic skills of students with special educational needs using Kinect learning games"
Country	Greece
Sample size	20 children
Aims	To improve the cognitive, motoric, and academic skills
Methodology	Pre and post Questionnaires
Findings	Research found that these games improve children's academic performance and cognitive, physical, and intellectual skills.
Scoring	8
Author/year	(Lin et al., 2016)
Title	"Augmented reality in educational activities for children with disabilities"
Country	Taiwan
Sample size	21 Students
Aims	This research integrates Aurasma, a free mobile augmented reality (AR) program, with activities for children with impairments.
Methodology	Mobile Application
Findings	The results suggest AR technology might help students solve puzzle games independently. AR display technology helps players solve puzzle games more effectively than paper-based methods. According to performance data, augmented reality may boost special-needs children's learning motivation and frustration tolerance.
Scoring	7
Author/year	(Adebisi et al., 2015)
Title	"Using Assistive Technology in Teaching Children with Learning Disabilities in the 21st Century"

Country	Nigeria
Sample	
size	Not Defined
Aims	To expose the meaning and benefits, and answer why the use of assistive technology for
Methodology	Assistive technology tools
Findings	It determined that assistive technology can enhance the lives of children with learning impairments and eradicate their learning challenges.
Scoring	6
Author/year	(Alnahdi, 2014)
Title	"Assistive Technology in Special Education and The Universal Design for Learning"
Country	Saudi Arabia
Sample	
size	Not Defined
Aims	Explains the significance of assistive technology in UDL, academic skills, and transition services and its many positive outcomes.
Methodology	Assistive Technology tools
Findings	The outcomes of the study determined that assistive technology tools help students who have an intellectual disability learn academic skills.
Scoring	6
Author/year	(Koraneekij and Khlaisang, 2019)
Title	"Students' Beliefs Regarding the Use of E-portfolio to Enhance Cognitive Skills in a Blended Learning Environment"
Country	Thailand
Sample	
size	360 students
Aims	To enhance the cognitive skills among students with intellectual disabilities
Methodology	Quantitative study-Questionnaires
Findings	The top five outcomes of students' perceptions regarding e-portfolios in the BLE were: (1) learning through generating work, (2) boosting creativity, (3) enhancing problem-solving ability, (4) enhancing critical thinking, and (5) enhancing genuine assessment. Using e-portfolios to improve cognitive abilities in the BLE is mediocre, but the needs are significant.
Scoring	9
Author/year	(Jdaitawi and Kan'an, 2022)
Title	"A Decade of Research on the Effectiveness of Augmented Reality on

	Students with Special Disability in Higher Education"
Country	Jordan
Sample	
size	36 Studies
Aims	To explore the effectiveness of Augmented Reality on
Methodology	Four-phased processes of systematic review
Findings	The bulk of studies found AR to be successful with disabled kids.
Scoring	7
Author/year	(Pashapoor et al., 2018)
Title	"Effectiveness of Cognitive Computer Games on Attention Span of Students with Intellectual Disability"
Country	Iran
Sample	
size	20 students
Aims	To evaluate the effectiveness of cognitive computer games on the attention of students with intellectual disability
Methodology	Quasi-experimental method
Findings	The study outcomes were better performance, improved working memory, cognitive focus, and increased flexibility.
Scoring	7

4.1 Using the computer to improve a child's language skills

Bagon Špela (2018), in her study, found that inclusion has pushed diversity in the classroom into the 21st Century, posing new challenges for teachers who must adapt their courses to a diverse student population. According to research of a similar kind, ICT may be used to provide individualized instruction and promote a sense of belonging among students. Students in inclusive classrooms were polled about their use of computers for coursework and personal use. Examined were the frequency of computer usage, the types of activities enabled by ICT, and the attitudes of computer users. According to our findings, consistent with prior research, students with special needs (SN) and their peers use computers more often than schoolwork for leisure activities. Students with SN use computers less often and with more reluctance than their peers. Neither the desire of pupils to use a computer nor their view that computer use improves learning outcomes were associated with SN's presence. A male and female survey revealed that male students use computers more often and believed that computer use improves academic success. This study examines ICT integration in inclusive classrooms in personalized learning in all three domains (cognitive, affective social, and psychomotor). The study's key results assist instructors in planning their use of ICT in inclusive classrooms to enhance students' mental, social, and emotional growth (Bagon et al., 2018). David Silvera-Tawil (2018), in his study, found that autism is

characterized by a wide variety of impairments in social, communication, and behavioral domains. Children with autism often struggle with verbal communication, social cognition, and nonverbal cues. Developmentally delayed children confront the same hurdles as their classmates. A recent trend in robotics is the development and deployment of robots to help treat and educate children with learning difficulties. Despite promising results showing that these technologies may be beneficial, there has been a preliminary study on the long-term impact of robots on the verbal communication skills of children with autism or developmental delay. The effect of robots on the oral communication skills of students with moderate to severe intellectual disabilities and autism spectrum disorders (ASD) is investigated in this paper. According to the research results, robots may assist these young kids with their articulation, verbal participation, and spontaneous communication (Silvera-Tawil et al., 2018). Basak Baglama (2018), in his study, found that using assistive technology for the deaf facilitated student learning. The study's findings indicate that the technologies deployed in teaching deaf individuals have been utilized to develop the highest levels of literacy and academic skills. The results suggest that the use of technology in the instruction of deaf students endures a significant desire to increase student participation. Examining new technology to improve one's language and speaking skills sometimes leads to discovering an alternative method for achieving this objective. According to this research, several web-based or mobile applications are designed as an alternative to signing language. It is also because hearing-impaired individuals assist others in learning how to communicate (Baglama et al., 2018). Ya-Shu Kang (2019), in his study, used Kinect V2 to design interactive games to encourage hand hygiene training for children with intellectual impairments (ID). All four individuals in this study improved their overall task performance after the intervention. The gaming system is error-prone while being a promising and well-acclaimed educational tool for schools. Participants would be more motivated and perform better on tasks if the system was technically sounder and included more engaging games. This would remove the need for parents or caregivers to urge their children extrinsically and let field researchers assess the system's effectiveness (Kang and Chang, 2019).

4.2 Using the computer to improve academic skills

[Don D. McMahon](#) (2016), in a study, found that AR marker-based technology was used in this study to examine the influence of science-related vocabulary word acquisition on students with intellectual impairments and autism spectrum disorders (ID/ASD). Using visual analytic methods, the AR educational intervention helped all students acquire scientific terminology. Effect size averages showed that AR instructional intervention was an effective method for teaching scientific vocabulary. There were significant gains in the students' capacity to describe and identify scientific ideas when AR vocabulary training was used on new vocabulary items and scientific content (McMahon et al., 2016).

Rajiv Satsangi (2015) in his study found that individuals with learning difficulties may find advanced math courses, such as algebra and geometry, extremely difficult. Due to the increasing emphasis on problem-solving and higher-level thinking skills in these disciplines, students with a learning disability in mathematics usually lag

behind their peers in general education. Effective therapies for teaching the concepts of area and perimeter to secondary students with a learning disability are seldom supported by empirical evidence. Virtual manipulatives were shown to be an effective tool for learning and keeping the concepts of area and perimeter using a multiple baseline design. According to the results of this study, this study may teach complex mathematical ideas via virtual manipulatives to persons with learning disabilities (Satsangi and Bouck, 2015).

Maria Kourakli (2017), in his study, found that Motion Kinect-based instructional games for children with unique educational needs are being developed regularly. The physical activity and cognitive training challenges these games offer are especially effective for this particular demographic. There were 20 students in two primary schools with special educational needs who utilized the Kinems suite, a collection of movement-based instructional games, as part of a pilot research project in inclusive classroom settings. In-depth studies of kinetic and learning analytics and data collected from pre-and post-test questionnaires and interviews demonstrated that these games had a good effect on students' academic performance and the development of their cognitive, motor, and intellectual abilities in youngsters (Kourakli et al., 2017).

Chien-Yu Lin (2016), in his study, examines ways to include contemporary display technologies in the education of children with various disabilities. A free, interactive, and instructive mobile augmented reality (AR) application was developed to assist learners in comprehending geometry. There was an experiment involving twenty-one elementary school children. Findings indicate that the AR system may help students complete puzzle games without instructors' assistance. Using AR technology, participants could finish puzzle game activities more efficiently than traditional paper-based methods. Children with special needs may benefit from using Augmented Reality (AR) technology, which has been shown to boost learning motivation and frustration tolerance (Lin et al., 2016).

Rufus Olanrewaju ADEBISI (2015), in his study, observed that students with special needs might benefit from AT, which has shown its value and use in the classroom. Students with learning disabilities may benefit from technology in a variety of ways, including (1) increasing their academic and occupational independence, (2) engaging in classroom discussions, and (3) obtaining access to peers and teachers. Students should anticipate achieving high levels of self-directed learning, collaboration with peers, mastery of challenging academic tasks, and participation in community and recreational activities. Individuals with learning disabilities may have satisfying and successful lives if they learn to maximize their strengths and minimize their weaknesses (Adebisi et al., 2015).

Ghaleb Alnahdi (2014), in his study, found that technology has altered and will continue to alter people's lives, so it is only reasonable that it will have a comparable impact on the education of children with disabilities. Students with impairments may be able to engage in classroom discussions, fulfill academic and job responsibilities, and complete complex academic tasks using assistive technology (Alnahdi, 2014).

4.3 Using the computer to improve cognitive skills

Koraneekij (2019), in his study, observed that each student with Internet access to a computer yet found students' opinions about the usage of e-portfolios in the BLE were overwhelmingly positive: (1) learning via production, (2) increased creativity, (3) improved problem-solving, and (4) improved critical thinking. However, a middle ground exists between the current situation and the increased need for e-portfolios to improve BLE students' cognitive skills (Koraneekij and Khlaisang, 2019).

Malek Turki Jdaitawi (2022), in his study, observed based on previous studies the use of AR technology for special education needs in higher education settings. In the literature, the vast majority of studies revealed positive outcomes. It verified the potential of AR to contribute to and satisfy special education needs, particularly for children with learning and other disabilities. AR has also been found to assist those with visual impairments and to inspire and motivate disabled individuals to participate in social and daily activities. The capacity of AR to help children with special needs develop as people and as members of their communities was also identified as a positive aspect of the study's results (with peers and teachers, etc. Therefore, we may conclude that AR has the potential to assist individuals with special needs in learning and enhancing their skills (social and academic). However, it is advantageous to use AR technology to help individuals with disabilities develop new skills and encourage them to engage in society so they may live an everyday social life (Jdaitawi and Kan'an, 2022).

Loabat Pashapoor (2018) found that utilizing video games as a source to develop cognitive abilities in impaired students significantly impacted their better performance, increased attention and behavior, improved working memory, mental focus, and flexibility in children with attention deficit hyperactivity disorder (ADHD), and also improved visual acuity performance and enhancing visual focus tactics (Pashapoor et al., 2018).

5. DISCUSSION

Consideration of the PRISMA (2020) standards for publishing a systematic review and the use of the CASP (2018) checklist to rigorously evaluate the quality of the studies ensured the systematic review followed a rigorous methodology. A second reviewer verified the thoroughness of the screening and selection procedure, as well as the accuracy of the quality rating; the themes and results were also discussed.

In response to this review's study into the reasons why individuals with intellectual impairments struggle with learning, cognitive, and academic skills. In this study, three key topics are covered, and digital technology was employed to solve the obstacles they presented. Four studies highlighted the significance of digital technology that may assist individuals with intellectual impairments in overcoming their learning difficulties. Six research highlighted the significance of Gamification, Assistive technology, and Augmented reality in enhancing students' academic abilities. Three studies highlighted the significance of video games and other digital technologies in overcoming cognitive skills deficits.

Since the 1980s, educators have been using computer technology (CT). It is critical to have a solid understanding of the degree to which students' use of technology influences their level of academic success as computers become more prevalent as instruments for education and learning. Our meta-analysis adds to the body of previously collected knowledge by exploring the beneficial benefits of cognitive therapy (CT) on the academic performance of persons who suffer from mental illnesses. An up-to-date literature review is the only way for us to account for the enormous shifts that have taken place over the last two decades in terms of the technological capabilities and educational applications that are available. According to one study, a significant number of children with intellectual impairments have difficulties with communication, academic performance, and adaptability.

Furthermore, these children have a low frustration threshold and poor memories. According to our observations, digital technology has a discernible impact on developing all of these talents. It would seem that using a computer makes it simpler for humans to grasp objects effectively. The primary objective of this research was to determine the "ingredients" necessary for the successful use of technology in academic settings for children with mental problems. However, the results of our meta-analysis show that using technology to enhance educational outcomes for children with impairments is, on the whole, beneficial. We are sure that our essential components will successfully drive future academics to examine the why behind practical technology usage to enhance linguistic, academic, and cognitive abilities.

6. LIMITATIONS AND FUTURE RESEARCH

This meta-analysis is subject to the same limitations as all others. Meta-analysis cannot be conducted experimentally, revealing our inability to control sample sizes and missing data. The sensitivity of data analysis is diminished when sampling is limited to a small number of individuals. Restoring just a little level of sensitivity by weighting effect sizes based on sample sizes is possible. No meta-analysis can assess or code the quality of program design (in our example, a CT intervention) applied in primary research. In other words, we have no control over the impartiality and accuracy of an intervention. The conclusions of a meta-analysis investigating the effectiveness of a specific intervention are likely to be affected in the absence of this information. In addition, even though the CT types used in this study were adapted from previous review studies, we emphasize that the categories are broad and that alternate usage may be beneficial or harmful for specific purposes. It is anticipated that future research will include how individuals use technology. In addition, the moderate CT effects seen in children with particular needs should be explored further. However, the scope of our study prevents us from undertaking a more in-depth investigation of students with special needs. ' Future research should include complete evaluations of the usage of CT with kids with special requirements (such as disabilities), taking into consideration the variety of CT applications (e.g., drill and practice, remediation, instructional enhancement, and differentiated instruction).

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Designing, executing, analyzing, and writing this article were the responsibilities of all contributors.

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