Open Access Research Journal of
Science and Technology
Journals home page: https://oarjst.com/
ISSN: 2782-9960 (Online)

OARJ OPEN ACCESS RESEARCH JOURNALS

(Review Article)

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# DIGITAL TECHNOLOGIES FOR MEMORY AND ATTENTION PROBLEMS IN TODDLERS

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Open Access Research Journal of Science and Technology, 2026, 18(01), 025–033

Publication history: Received on 31 July 2026; revised on 02 September 2026; accepted on 08 September 2026

Article DOI: https://doi.org/10.53022/oarjst.2026.18.1.0083



## ABSTRACT

The usage of information and communication technologies (ICTs) has recently changed how kindergarten affects kids' development. Today, ICT is acknowledged as a tool that may encourage knowledge and experiences at this critical age, and it is deemed important to support children who have difficulties when they are in kindergarten. In this research, we give a ranking of the most useful tools and e-tools over the past ten years (2005–2015) for young children with memory and attention issues. We look at the function and importance of these instruments in children's growth. Investigations are also done into these tools' efficacy.

**Keywords:** Attention Difficulties, Memory Problems, Preschool Education, Tools

## 1 INTRODUCTION

Although it is well acknowledged that technology touches practically every area of daily life, it seems to be present everywhere. The role that ICT (Information and Communication Technologies) will play in education, however, has also evolved in the society [1]. Given the advantage of using technology-specific tools to help their assignments, students today appear to be more engaged in their studies [2]. Because they entail learning with technology rather than just learning about it, ICT in education can increase the effectiveness and efficiency of teaching and learning [3]. Early childhood educational programs seek to promote a variety of ideas, abilities, and attitudes; the ideas to be learnt, the abilities to be acquired, and the attitudes to be instilled should all be age-appropriate. The tools that are typically employed tend to have music, icons, motion, or any combination of these because the majority of preschoolers do not have or have limited reading skills [4]. The emergence of visuals, the presence of noises, and the presence of various graphical aspects are specific features of early childhood instructional software that seem appropriate [5]. Early childhood education settings require software that is developmentally appropriate and can be integrated into lessons using the proper pedagogical strategies [6]. To ensure that benefits are realized, early childhood educators must choose which software to employ and how to implement it in their classrooms [7]. The involvement of the teacher is crucial because they must select the right software for the class and step in when necessary. However, it is advised that all instructors and specialists who work with young children receive the proper training in the use of ICTs to enhance learning. Even the best software must be utilized carefully because the computer is merely a tool that has the capacity to enhance the teaching and learning process [8]. In addition, experts in the domains of psychology, medicine, science, and education have emphasized the significance of the years between birth and five for learning. These early years are especially important if there is any chance of issues [9] because research in the past has shown the value of early identification and intervention. One benefit of early detection and intervention is that it establishes a foundation for subsequent learning, which may improve at-risk children's chances of academic achievement in the future. Early detection also reduces the need for future, more comprehensive educational assistance and promotes more inclusive programming, which can help prevent secondary problems from developing [5]. On the other hand, there has been an increasing emphasis on educating kindergarten children who need special education with the support of ICT and thus this fact has reinforced the use of technology as a way of overcoming barriers to their learning. According to recent studies, including ICTs in pre-school special education can give kids more chances to engage in rich learning activities that are appropriate to their developmental needs and have a favorable impact on their learning issues. Early intervention, however, is dependent on accurate diagnostic data; it is not sufficient to merely know that a kid has learning difficulties; it is also required to comprehend the issues and the underlying reasons of a student's learning behavior. Therefore, an effective intervention should be created using this information [10].

There are numerous learning processes and academic success factors in kids that are closely related to memory abilities. Professionals have been conducting extensive research on the memory abilities of children with special needs over the past few years since data suggests that children with weak memory are less likely to progress normally in their many areas of need [11]. The significance of technology for people with cognitive issues is significant in the domains of based applications and neural networks, however it is generally known that computerized programs seem to be a promising new approach to memory therapies [12]. Given the foregoing, it has been strongly advised that children with memory issues be identified early and get help. Many researchers think that observable behaviours in children very often indicate potential learning problems in preschool including hyperactivity, coordination problems perseveration, impulsivity, processing deficits, distractibility, and memory problems [6]. Additionally, memory is a crucial aspect of cognition and a crucial factor in cognitive development. Long-term memory and short-term memory are two types of memory. Working memory makes up the majority of short-term memory, while the declarative, procedural, and perceptual representation systems make up long-term memory. The perception of one's personal past and social interactions might both suffer from memory problems. Additionally, these deficiencies may have an impact on academic achievement, particularly in math, and may lead to low self-esteem. Furthermore, a lack of working memory is a major contributor to many attentional issues and is frequently connected to Attention Deficit/Hyperactivity Disorder (ADHD) [13]. Contrarily, ADHD is a psychiatric diagnostic that identifies kids who display excessive levels of inattention, hyperactivity, or both [14] and is linked to academic failure or other learning problems [15]. One of the most common issues that surface throughout a child's time in school is focus challenges, which are typically defined by poor attention skills and/or hyperactive and impulsive behaviors. These issues typically surface in infancy, more specifically before the age of seven, when a diagnosis is frequently made. One prevalent assumption concerning kids with attention issues is that they aren't paying attention and can't concentrate for long enough. Because ADHD typically persists into adulthood, this increased risk for subpar academic performance suggests that many students with attention difficulties require a precise diagnosis and successful intervention measures [16]. According to research, effective management and behavior modification of this disease frequently depend on an integrated program of medical interventions and behavioral approaches, while involving parents and teachers in these interventions is a key component for this goal [17]. Because of the aforementioned assertions, our study is based on national and international publications as well as the findings of the most significant studies conducted over the past ten years that concentrate on the use of tools and e-tools to evaluate kindergarten students with memory and attention issues. These tools appear to diagnose kindergarteners' problems and take appropriate action to assist them. This essay will attempt to compile a list of the most significant educational resources and online tools that target the diagnosis and intervention of toddlers with memory and attention issues who require evaluation.

Finally, we want to emphasize the value of digital technologies in all of the fields of education. ICTs enable universal education, provide new techniques for effective teacher training, enhance memory retention, promote cooperation, increase transparency, develop learner-centered strategies, develop new teaching techniques, and quicken learning. Additionally, through virtualization, mobility, artificial intelligence, and new learning environments/worlds, give new instruments for knowledge representation and support educational activities and methodologies. More specifically, ICTs are very effective and productive in ADHD training, facilitating and improving the assessment, intervention, and educational procedures via mobile devices that bring educational activities everywhere [43] and through a variety of ICT applications that are the main supporters of education [44-48]. While games turn education into a multimodal, incredibly amiable, and enjoyable interaction, the use of AI, STEM, and ROBOTICS raises educational procedures into new levers of adaptation, creativity, and performance [49-54]. Additionally, the adoption, enhancement, and blending of ICTs with theories and models of metacognition, mindfulness, meditation, and emotional intelligence cultivation [55-60] brings the mental abilities to the center of the educational procedures and policies, and as a result, accelerates and improves the educational practices and outcomes, particularly in minority children with ADHD, treating domain and its practices like assessment and intervention.

## 2 DIGITAL TOOLS FOR MEMORY PROBLEMS ASSESSMENT IN PRESCHOOL CHILDREN

Numerous professionals in the fields of psychology and medicine now advocate memory training. They are assisting people of all ages in succeeding in areas of their lives that are defined by weak memory skills and have introduced an important method into practices and schools all around the world [18]. In general, memory is regarded to be essential for focus, problem-solving, and impulse control. It is also directly tied to fluid intelligence and a powerful predictor of success in both school and the workplace. However, a lack of memory, and particularly a lack of working memory, is the root of many attention-related issues and is frequently connected to attention deficit hyperactivity disorder (ADHD) and other learning impairments [11]. As a result, memory training tools and e-tools for kindergarten students have become more and more popular in recent years. These interventions promise improved IQ, creativity, grades, and a decrease in daily attentional slips. The Automated Working Memory Assessment (AWMA)[19] is a computerized test that educational professionals can use to evaluate people between the ages of 4 and 22 for working memory issues in order to identify and assist kids who have these issues. The automated working memory assessment (AWMA), a standardized computerized tool that can identify memory issues, was introduced by Alloway, as mentioned above. The AWMA is designed to give educators a quick and efficient tool for identifying and supporting students who have memory impairments. Findings show that working memory abilities in kids with memory problems are typically constant throughout the school year. With a simple interface, this application makes it possible for psychologists and teachers to evaluate students' memory abilities. Additionally, AWMA has three levels of assessment and is intended for children who may have challenges with working memory in particular. In general, the AWMA is a computer-based test that offers three measurements of each of verbal short-term memory, visuo-spatial short-term memory, verbal working memory, and visuo-spatial working memory. Specifically, AWMA- short form (AWMA-S) is used for screening learners who are suspected to have memory deficits, but the specific area of their difficulties is not known and AWMA- long form (AWMA-L) which is suitable for confirmation of working memory problems for learners identified as having working memory problems in the classroom. The test's creators claim that it contains 12 subtests for verbal short-term memory, including Digit Recall, Word Recall, and Nonword Recall, as well as visual short-term memory, including Dot Matrix, Block Recall, and Mazes Memory, verbal working memory, including Backward Digit Recall, Listening Recall, and Counting Recall, and visual working memory, including Mr. X, Spatial Span, and Odd-One-Out. Last but not least, the AWMA is the first standardized test that non-specialist assessors, including general education instructors, can use to rapidly and efficiently screen their students for serious working memory issues..

Additionally,[20] developed a set of Internet-based programs that function as a battery of cognitive ability screening tests that can identify children as young as preschool age and school age who are at risk of learning difficulties as well as provide teachers with a profile of mental abilities useful for selecting and creating individualized programs. This study assessed the new computerized battery of cognitive tests' capacity to forecast reading performance. The MAPS (Mental Attributes Profiling System) battery specifically addressed eight key language independent test domains: short-term visual memory, short-term auditory memory, auditory discrimination, visual discrimination, lateral awareness, categorization, sequential processing, and navigational ability. The research's findings support the idea that five domains—lateralization, auditory memory, categorization, sequencing, and auditory discrimination—may be potent indicators of subsequent reading difficulties and that this exam can identify memory issues in youngsters. The study's findings support the assertion that MAPS can identify a child's learning capacities and challenges, screen for memory issues in very young children, as well as in bilingual or multilingual children, and provide an evaluation of a wide range of cognitive processes.

The Cognitive Profiling System (CoPS), a computerized psychometric assessment system that evaluates the cognitive strengths and difficulties for kindergarten and primary school children, is also one of the most popular software tools [21]. Phonological awareness, auditory discrimination, short-term visual memory, and auditory verbal memory are among the eight assessments that make up the CoPS. The test, which is utilized in British schools all over the world and in the UK, Scotland, and the UK, has a maximum assessment time of twenty minutes. The children are also assessed in auditory, color, and phonological awareness, as well as sequential and associative memory, the developers claim, giving a picture of the child's level of development at the time of school. Although this tool not primarily intended for diagnostic purposes, however can show children who are weak in various aspects of learning, included in memory, and thus can be used to in decision-making about appropriate teaching and learning approaches for such children. Since severe requirements had to be met in order to be approved by the Qualifications and Curriculum Authority for use in English schools, this alternative approach is an on-entry assessment program for children ages 4:0 to 5:6. The early learning curriculum's four main areas of assessment were outlined by these criteria: communication skills, reading, mathematics, and personal and social development. At the time of school admission, CoPS Baseline gives a snapshot of the child's level of development in each of the component categories. CoPS Baseline Assessment should not be confused with the similarly called application Lucid Cognitive Profiling System (CoPS), which was created particularly for diagnostic purposes [21]. Moreover, another promising tool that was designed to support students at-risk for learning disabilities that might also face and memory difficulties and can be used by the students under the teacher's, special educator's or speech pathologist's supervision [22] is the APLo. APLo system is intended to be used in assessment and diagnostic phases of children’s oral speech and language abilities. It is an online system created to make learning and strengthening oral language accessible to students who are having trouble, as well as, when appropriate, to other non-experts working in clinical and professional settings. APLo system is able to evaluate children with developmental delays, autism, and mental retardation while examining the domains of [22] articulation, phonological, fluency, and language impairments. The researchers found that teachers can increase phonological exercises by choosing and incorporating appropriate digital activities that can be employed in a preschool context or at the beginning of school. The young students at-risk of learning disorders, that are entering the world of knowledge, can interact with the computer ensuring undiminished interest on the learning activities. Through an interdisciplinary and experiential approach the aim is to enhance phonological awareness and communication skills and accomplish the best learning outcomes. According to relevant research, the software activities don't just replicate traditional exercises that are displayed on a computer; they also take advantage of the benefits of technology such moving visuals, animations, sound, and interactivity that provide a fun, engaging, and effective learning environment. [22] The user of APLo answers questions about the child's speech and language symptoms in sections like demographics, medical/communication history, verbal communication, non-verbal communication, oral examination, articulation/phonology, language structure, psychomotor development, sound discrimination, and memory. This information is then used to create a detailed report on the child's speech and language symptoms. Finally, the researchers claim that this tool was developed in accordance with educational standards and recent technical advancements in order to serve as a learning aid.

However, it is well known that people with special needs require extra care, therefore early education paves the way for later development. According to a study [23], Young Digital Planet began developing applications that were intended to aid kids in rekindling their sense of wonder and keep learning fun, interesting, and difficult. Young Digital Planet supports the idea that early prevention is crucial; the intervention tool edu- Sensus was created for speech therapists and combines intuition with market-communicated educational needs. The creators claim that this program has been used in Poland for almost ten years and has shown to be an indispensable tool for early education and the prevention of special needs. One benefit of the eduSensus product line, which addresses all developmental needs, is that it was developed in collaboration with therapists, teachers, parents, and kids. Additionally, the eduSensus Team discusses a wide range of themes including the use of ICT tools to promote the development of kids who have particular challenges, such as kids who are at risk for dyslexia and deal with other issues like memory and attention issues, developmental disorders, etc. Last but not least, the creators of eduSensus assert that this platform introduces kids to the world of ICT, helps kids learn vocabulary and communicative skills through digital programs, and supports kindergarten-aged kids who struggle with learning. Additionally, St Clair-Thompson [24] asserts that using computers to teach and practice memory techniques is one method of delivering training in memory techniques. A computer game called Memory Booster teaches memory techniques over the course of six to eight weeks. Memory Booster [25] is a fun adventure game for kids that teaches and promotes the use of rehearsing, visual imagery, constructing stories, and forming groups, and which, in accordance with multiple studies, produces appreciable increases on working memory tests [24]. The opening story of Memory Booster is followed by instructions on how to use the rehearsing technique. The next step is to ask each child to recall a vocally defined item. After a number of trials instructions about visual imagery are provided and then players are asked to remember two objects on each trial using this strategy. The third memory technique, making stories, is then explained, and trials involving remembering three things are then given. If a youngster successfully completes the program, the levels rise to four, five, or six items to recall. Children that perform very well move on to learning the grouping strategy. Children in Memory Booster hear verbal encouragement and feedback from the computer throughout the game, and they earn rewards by watching cartoons after finishing each level. The phonological loop and central executive components of working memory are said to be significantly improved by using Memory Booster, according to researchers. A Working Memory Test Battery standardized for children (WMTB-C) also offers various evaluations of both verbal short-term and working memory [26]. WMTBC [27] contains four verbal short-term memory tests: word matching, non-word matching, digit recall, and word recall. The memory items are verbally presented in each of the four measures, with the first three assessments requiring quick spoken recall. Due to the low demands on phonological and articulator production skills, word list matching requires the kid to determine whether two spoken sequences are same or not. Scores on all four measures are used to create a standardized verbal memory composite score, which is particularly useful for use with kids who have speech-motor difficulties. Three verbal working memory tests (listening recall, counting recall, and reverse digit recall) are also included in the WMTB-C, and the results of these tests are combined to provide a mixed working memory score. Three tests of visuo-spatial short-term memory are included in the WMTB-C (matrix, maze memory, and block recall).

In a computer-designed probabilistic game, a recent study examined how preschoolers reacted to the mathematical concept of most probable utilizing their memory and cognitive abilities. Children have the opportunity to participate in and determine the most likely result among many circumstances with structural changes in the sample space's composition by playing the random game "Shoes and Squares". Children are put to the test to see how their predictions change over time as the analogies and item distribution change [28]. Preschoolers, according to the developers, were actively involved; they provided estimates and appeared to be impacted by structural changes in the sample area. They also claim that children's cognitive abilities, such as memory and attention, have improved. These findings have educational ramifications for how probabilities are taught and constructed in preschool settings, as well as for how technology is used in the classroom.

Not to mention, Toki et al. [29] produced a piece of software that was intended to assist students who could be at risk for learning impairments. While the instructor chooses and includes appropriate activities in a digital environment for students to engage in throughout the learning activities, the kids can use this tool while being watched over by the specialist. The goal is to improve phonological awareness and communication skills through an alternative and experiential method in order to achieve the optimum learning outcomes. According to relevant studies [29], the software activities can assist students from the benefits of technology including moving visuals, animations, sound, and interactivity that produce an entertaining, playful, and effective learning environment. Therefore, it can be said that this study helps to build specialized educational software for young children who are at risk of learning difficulties. Although these digital activities concentrate on phonological awareness issues, they do so in a multimedia interactive and playful environment that engages students and adapts to their needs and abilities in order to achieve the desired learning outcomes while also fostering their creativity and communication skills.

## 3 DIGITAL TOOLS FOR ATTENTION PROBLEMS ASSESSMENT IN PRESCHOOL CHILDREN

Working memory (WM), the cognitive mechanism in charge of the temporary storage and manipulation of information, is said by several researchers to be crucial for keeping focused behavior in everyday circumstances [30]. Individuals with attention and attention deficit hyperactivity disorder (ADHD) frequently experience issues with working memory [31]. A diagnosis of attention issues and attention deficit hyperactivity disorder is given to people who exhibit a high level of problematic behaviors that are either inattentive, hyperactive/impulsive, or both. It is markedly impaired in inhibitory behavior and WM, especially for visuospatial information, and is closely related with executive function deficiencies [32]. Children with attention deficit hyperactivity disorder (ADHD) go beyond the diagnostic criteria in terms of their interpersonal issues and peer rejection. According to the setting, male to female ratios might range from 4:1 to 9:1 among school-aged children who have ADHD. Technology is considered to be one potential tool that provides these adolescents with ADHD promising results, despite the fact that little study has been done on its effectiveness. By allowing students to actively participate in their education and boost their enthusiasm and self-confidence, technology enables teachers to design lessons for kids with short attention spans [33]. Recent research confirm that children with ADHD prefer to read brief texts and watch short films with few words, which is consistent with the aforementioned claims and with relation to computer assistance instructions (CAI). Additionally, verbal material should only be utilized to explain; visual aids should be used to demonstrate and reinforce verbal information; and the presentation's pace should be gradual. In order to focus on work, low lighting are recommended for ADHD [34] rather than bright lights.

Cogmed, a tool, was developed to help kids with memory and attention issues, however [35]. This program is offered as a professional practice for the treatment of ADHD and has been promoted in schools to help kids' performance. Their creators assert that Cogmed training significantly enhances working memory capacity as well as attention, concentration, focus, impulse control, social skills, and complicated reasoning. There are three types of Cogmed training; for preschoolers and older children which include several visuo-spatial and verbal memory tasks that have been embedded in videogames, each of which is performed for roughly 40 min a day, 5 days a week, for 5 weeks. Cogmed JM and Cogmed RM are respectively designed for preschoolers and older children. Specifically, an example of a visuo-spatial task that is included in Cogmed training is “Asteroids” which presents a field of several free-floating asteroids, a subset of which lights up, one-at-a-time and the child must reproduce the sequence via mouse click. In addition, "Input Module" serves as an illustration of a verbal task. In this task, a youngster must reverse a sequence of auditory digits using a number pad that is exposed on a robot's arm. Cogmed is a successful intervention tool, according to preliminary studies, however additional research is required because there are certain validity issues. Cogmed is an unsupported technique, according to some studies, hence building theoretically motivated explanations of working memory training should receive more attention in future study [35]. Moreover, a recent study [36] resents the effects of a proposed CAI Module in Numeracy for kindergarten children with attention problems. This developmental research study's main objective was to create a CAI Module to improve kindergarteners with ADHD's numeracy skills using the ARCS Model of Motivational Design by Keller & Keller and the ADDIE Model of Instructional System Design by McArdle. The program gives each student twenty minutes to work with the Module during each session, asks them to choose and complete an assignment from the CAI Module, and captures their body language and verbal responses. This study came to the conclusion that, despite the fact that there is still room for improvement, technology is aligned with the inattention, impulsivity, and hyperactivity symptoms of students with attention deficit disorder and ADHD.

Another CAI intervention was investigated by Clarfield and Stoner [37], who looked at how the online reading software Headsprout affected the academic performance of ADHD children. Male kindergarten and first-graders with ADHD who were also deemed at risk for reading difficulties by their instructors made up the study's participants. The results of this study showed that CAI had positive benefits on oral reading fluency for all pupils, increased active engagement time, and reduced off-task behavior in kids. Overall, the evidence was favorable to the idea that Headsprout would be a suitable and successful intervention for young readers with ADHD. An AR alphabet book, an Augmented Reality-based book that teaches preschoolers the alphabet, is also a technology that appears promising for helping young children who struggle with attention. Children could observe the overlay virtual alphabet in a fun and interactive way using the patterns as an interaction tool when used with a camera and computer. Teaching young children can be challenging in general because their focus differs from that of older people and they can only sustain attention for little periods of time. However, by implementing this kind of instruction, teachers might capture the interest of kids and improve their learning and teaching experiences. Fun learning includes learning through play, songs, painting, drama and the use of information and communication technology (ICT). In addition to the use of flashcards, studies have shown that enjoyable learning increases one's capacity to retain and comprehend an idea. The interactive learning is introduced by the tactile nature of flashcards, which can lead to enjoyable and engaging learning. However, by utilizing augmented reality (AR) technology, students will have the chance to view 3D models of objects that start with each alphabet character while each alphabet is displayed in response to the presentation of its related pattern marker. Last but not least, the outcomes of the children's behavior observations point to the potential of AR books as a tool that may foster a positive and enjoyable learning environment, particularly for children of this age [38].

A study program was also created by Re & Cornoldi [39] with the goal of creating screening and intervention tools for kindergarteners who struggle with attention issues and ADHD. In order to encourage regulated attention and working memory, they specifically created two rating scales (one for teachers and one for parents), two neuropsychological tests, and an intervention program. The name IPPDAI, which stands for "Identificazione Precoce del Disturbo da Deficit di Attenzione/iperattivita" per Insegnanti (Early Identification of ADHD for Teachers), is an acronym for "Early Identification of ADHD for Teachers" and refers to a teacher rating scale for the early identification of kids at risk for ADHD. The IPDDAI rating scale consists of 18 items: 7 items related to inattention, 7 items related to hyperactivity/impulsivity, and 4 extra items related to risk factors. These final points discuss four factors (poor family, difficult home circumstances, limited cognitive ability, emotional and relational issues) that can worsen children's bad behaviors. The Italian population's IPDDAI scale has been standardized and verified, and it exhibits strong psychometric characteristics and predictive validity [40]. Furthermore, IPDDAG [41] is an acronym for the Italian expression 'Identificazione Precoce del Disturbo da Deficit di Attenzione/ iperattivita` per Genitori' (Early identification of ADHD for parents). IPDDAG is the complementary form of IPDDAI, because it is the parent version of a rating scale for early identification of children at risk for ADHD. It is feasible to learn about a child's behaviors in the two rating scales' most significant circumstances. It is simple to identify those youngsters who are likely to acquire ADHD in the future by comparing assessments from parents and teachers. In a pilot investigation with parents, the 14 symptoms deemed to be most representative and discriminative were included in the IPDDAG, which is similar to the IPDDAI (Riello et al., 2005). Similar to IPDDAI, the test consists of 19 items: 7 for inattention, 7 for hyperactivity/impulsivity, and the final 5 are for "risk factors." Poor cognitive functioning, language barriers, aggressive behavior, emotional issues, and relationship issues are risk factors.

Additionally, the paper and pencil exam known as "Walk/No walk" assesses attentional control and reaction inhibition. Children are instructed to follow a sequence of instructions and to halt an ongoing reaction when a certain signal appears as part of the test. Two A4 sheets of paper with 20 stairs and a small frog at the bottom are part of the test. Every time he hears the "GO" signal, the youngster is instructed to cancel a step; however, every time he hears the "STOP" signal, he is instructed to stop. The ''GO'' signal and the ''STOP'' signal are quite similar, however the ''STOP'' signal ends differently. There are obviously several go signals and just one stop signal for each path. There are two training trials that can be used several times until the child demonstrates understanding of the task. The assignment is challenging since the stop signal is made up of two parts, the first of which sounds like the go signal. The youngster must therefore wait until they have heard the complete sound before responding in order to determine if it is a go or stop signal. Three different kinds of mistakes, though, can appear. First of all, a youngster cannot halt the ongoing response since he "goes" even while the stop signal is present. Second, a youngster "stops" before the stop signal appears, and third, the child is unable to pay attention throughout the trial and move in time with the sounds. The first form of error, which represents a loss of inhibitory control, is typically the most common. The second kind of inaccuracy might be a sign of stress. The absence of regulated extended attention is described by the third type of error, which is also common [41]. Last but not least, a recent study evaluated children's capacity to regulate information in working memory and to suppress irrelevant information using the Dual Request Selective Task (DRST), a visual spatial working memory tool. 16 cells make up the test, which is based on a 4. 4 matrix. The matrix is blank with a red square, situated always in the same position. DRST requires the examinee to remember the first position indicated by the experimenter and to clap hands when the experimenter indicates the red square. There are 10 trials, which are ranked according to difficulty based on how many cells the frog touches. Each level has two trials available. The whole assignment must be finished by the kid. The scientist suggests some practice trials in which the frog is only moved through two cells before beginning the experimental session, and he only does so after being absolutely certain that the youngster has comprehended the task. A trial is only deemed successful if the youngster successfully completes both tasks—clapping hands and remembering the first position—in the allotted period of around 10 minutes [42].

## 4 CONCLUSION

The goal of this review study was to highlight some of the most important diagnostic and interventional tools and e-tools for preschoolers with memory and attention issues. This article's goal was to provide a list of physical and digital tools that educators, experts, and parents use to identify and evaluate memory and attention issues in kindergarten students. A quick overview of the role of various diagnostic and intervention tools that are employed across the globe in various nations was presented. Despite the fact that the list is a good representation of the most significant tools used globally, it is clear that more tools, both with and without ICT support, are needed to assist children with such issues. Despite the fact that we did not have a sufficient number of results, our study demonstrated that there is a need for more research. Additionally, there is a widespread belief that the use of ICTs in learning and teaching plays a vital role in assuring and strengthening the learning skills of kindergarten students who struggle with memory and attention. The reliability and validity of diagnostic ICT tools, adaptations of diagnostic and intervention tools to the various needs of children and therapists, and the creation of more programs in various languages for the aforementioned areas at this age are all areas that need further research. Last but not least, while we think that the findings of the current study are positive, we believe that additional research is necessary in the field of pre-school education and the area of a pre-school child's development in general.

## STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

### *Acknowledgments*

The Authors would like to thank the SPECIALIZATION IN ICTs AND SPECIAL EDUCATION: PSYCHOPEDAGOGY OF INCLUSION Postgraduate studies Team for their support.

### *Disclosure of conflict of interest*

The Authors proclaim no conflict of interest.

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