

## Digital Screening Tools for Autism Spectrum Disorder: Opportunities and Challenges

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### *Abstract*

The use of e-learning should be planned to increase possibilities for and involvement by students with impairments. For those with complex requirements, such as Autism Spectrum Disorder (ASD), schools play a crucial role. An increasing number of school children with ASD are diagnosed for a variety of reasons such as intellectual disability, eligibility for aid or monitoring progress. recognizing and properly assisting individuals with ASD requires a comprehensive and structured evaluation that includes both formal and informal assessment methods. Subsequently, the

purpose of this article is to provide information to assist professionals and other practitioners in completing a valid assessment of a child with ASD. A systematic research is required to show robust useful digital approaches to diagnosis and real-world treatments, analyses ASD assessment, and improve access to care. Hence, this paper covers characteristics of ASD, assessment of ASD, digital assessment, and assessment instructions to select, plan for and complete a standardized assessment. Overall, valid assessments are needed for the development of child action strategies, the development of effective support, the development of tracking, the strengths of assessment and needs of ASD children and the information or confirmation of diagnostic results.

**Keywords:** Autism Spectrum Disorder, Opportunities, Challenges.

### Introduction

Autism Spectrum Disorder (ASD) is a multifaceted disorder with symptoms ranging from mild to serious social, communicative, affective and adaptive impairments (Di Renzo et al., 2021). Autism is one of today's most renowned and debated human diseases (Fauziyah et. al, 2019). Its growing prevalence has attracted the attention of the public in the USA and now is world famous (Lord et al. 2020). The ADDM Network reported ASD for approximately 1 out of 54, or 1, 85% of eight year-olds (ADDM, 2020). Each girl was diagnosed with ASD with four kids. According to ADDM, 74 percent of children aged 4 years with ASD underwent developmental evaluations by age 36 months. This is 84% of children aged 4 years with ASD in this category in 2016. More children born in 2012 received an ASD diagnosis as compared with children who were born in 2008 (1.02%) at four years old (0.83%). Some autistic children and teens have ordinary or superior intelligence and require few work supports (Mohd et al., 2020). Since the United States has grown to 1 child in 59 children with ASD, public schools have increased their pressure to educate kids with ASD by increasing the number of children with ASD (Baio et al., 2018). The increasing prevalence of autism (Maenner et al., 2020) has increased demand for effective education and healthcare services, and intervention science gathers proof of best practices.

In the area of digital medicine, the use of the technologies as measuring tools and intervention for human health is concerned (Coravos et al., 2019) and may facilitate the development of better ASD therapies. Children's diagnosed with autism frequently experience a significant prevalence of visual perception difficulties, leading to challenges in recognizing, retaining, arranging, and comprehending visual stimuli. Consequently, they often encounter confusion when confronted with

educational materials incorporating written or pictorial symbols (Mohd et al., 2019). Evidence suggests that a range of interventions for children with ASD can improve social communication (Locke et al., 2013; Watkins et al., 2017). While these efficient interventions were studied in the school environment, their implementation is somewhat impaired by the fact that schools are seeking to provide a growing number of students with ASD with specialized education needs.

Autism is associated with a person's behaviour as a result of unidentified biological brain dysfunctions that have an impact on how the brain develops or responds to information (Ramachandiran et al., 2015). Autism has a different effect on people, because this is a spectrum disorder. Young children cannot interact with others or regard people as objects in difficult situations. It is difficult to learn and interact with others in the asymptomatic individual and it is difficult to respect other people's thoughts and perceptions. In the last few decades, technological interventions have exponentially developed as a real way of treating people living with ASD and its caregivers in order to increase their health and quality of life. The importance and development of their adult transition has become increasingly significant as more children are diagnosed with ASD. ASD young people will use their skills and neurodiversity if properly positioned (Dilly & Hall, 2019).

The question of whether autism should be seen as a State or as a number of unique characteristics which can be considered as assets was considered (Urbanowicz et al., 2019). ASD-persons are highly at risk of not going to school and finding work after high school. While discussions on the need for culture and the workforce in the area of neurodiversity have increased, the current picture of post-secondary education and employment is not encouraging for persons with ASD. ASD people and their families are in urgent need of assistance, training and vocational training for their health, training and social needs (Hyman et al., 2020). Therefore, in order to articulate a guideline for ASD digital assessment, this review examines the literature for its alignment of child action strategies, effective assistance, tracking, the strengths of assessment, the needs of ASD children, and information or confirmation of diagnostic results, as well as discussed, their interrelationship with one another.

### **Autism Spectrum Disorder (ASD)**

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strategies, effective assistance, tracking, the strengths of assessment, the needs of ASD children, and information or confirmation of diagnostic results, as well as discussed their interrelationship with one another.

### **Characteristics of Autism Spectrum Disorder (ASD)**

ASD is characterized by three things: language delay, interaction between people and communication and recurring activity or interests. It is one of the world's most common environmental and genetic conditions (Almandil et al., 2019). Children with ASD require greater attention from those around them (Andarwulan et al., 2021). Each individual in the autism spectrum has various strengths and capabilities which can be directly associated with their diagnosis. Therefore, following an individualized approach and building on these strengths to encourage people to develop as much as possible. It is crucial. Clinical symptoms can vary widely in complexity and severity. Persons with ASD have a wide range of comorbidities in the neurological, mental and medical field (Di Renzo et al., 2021). In the early stages of their development, people must be diagnosed with ASD that impair their daily function in school, home and in the community (La Roche et al., 2018).

Early symptoms of ASD have to do with children's social experiences. In ASD people, communication deficiencies are common, such as misinterpretation of nonverbal interactions, improper response to discussions, and difficulties in building appropriate friendships with people with age. Furthermore, ASD individuals can be too routine dependent, too sensitive to environmental changes, or too focused on inappropriate artefacts. Again, people with ASD may have a wide range of symptoms, with some people having mild symptoms and others having much more severe symptoms. Specific differences in signs and attitudes can be accounted for using this spectrum. Although language and motor milestones are often tracked, typical children's social communication and interactions often have milestones. This domain encompasses the use of movements and social skills. Gestures are commonly used by developing children to communicate and connect nonverbally (Dilly & Hall, 2019). As infants and young children develop, gestures begin to not only be used for objects (for example, reach, point) or conventionally (for example for waving, kissing), but also to describe behaviour (e.g., pointing to a spacecraft taking off, pretending to place their hand on a steering wheel to drive). These are some of the early ways in which children with ASD can interact and develop communication skills later in life. It is frequently the first sign in a child of an ASD. Their social experiences and communication are intermittent as the children with ASD advance through school. Children who have ASD are usually unrecognizable by their peers during their first six months of development. Parents must ensure that they test and diagnose their children when they discover developing disorders. After six months of age, the first symptoms of decreased social contact appear. After about

six months of age, infants with ASD exhibit declining gaze to ears, synchronized smiles, and social vocalizations (Chawarska et al., 2013; Jones & Klin, 2013; Ozonoff et al., 2010) as shown in Table 1.

**Table 1. Early milestones in social and communication**

Age (months)	Social milestones	Communication milestones
9	With eye contact, smiles and laughs at others.	Repetition of consonant vowels (e.g., mamama and bababa)
12	Peek-a-boo and patty cake are two social games she enjoys. Responds when their name is called	First words are spoken (e.g., mama, uh-oh) Makes motions with his hands and arms.
18	Simple role-playing (e.g., feeding a baby doll)	Shows love for people he knows. Imitates the language and behaviour of adults. At least 16 movements are used (e.g., pointing, shaking head "No," smiling, kissing) More than ten words are used
24	In games such as chase, he shows an interest in other children.	Quick phrases (e.g., "More juice") are used. At least 50–100 terms are used.
36	Conversation is rotated. Plays make-believe games with others. Shows empathy for those who are angry.	Speaks in short phrases. Follows instructions in two to three steps.

### **Challenges Associated with Autism Spectrum Disorder (ASD)**

ASD Students with ASD often exhibit uneven learning profiles marked by “scatter” in skill development. Such students may function at or above age level in some areas, but well below age level in others. The effects of having an ASD in a child can have several effects on parents, including increased parenting stress (Meadan et al., 2010), increased mental health concerns (Karst & Van Hecke, 2012), increased marital relations problems (Gau & Al., 2011), feelings of anxiety and depression (Factor et al., 2018; Kheir et al., 2012). Other challenges faced by parents in searching for speech therapy may include difficulty in locating intervention centres and establishing a good rapport with the professionals (Liptak et al., 2006). Moreover, when their children were receiving speech and language interventions, some parents may face other obstacles, such as failures in interacting efficiently with professionals (Stoner et al., 2005). This pattern also results in a scattered

profile of results on formal testing measures, as well as inconsistent performance within individual subtests that will affect not only test results but instructional programming as well. Coupled with inconsistent skill acquisition, students with ASD also exhibit inconsistencies in responding, even for skills that have been mastered. Such difficulties are frequently referred to as problems with generalization.

Despite having acquired given skills, individuals with ASD often have difficulties “showing what they know” in the evaluation setting and fail to demonstrate skills that they can successfully perform in the home and/or at school. Generalization difficulties also can manifest as an inability to demonstrate a skill under different conditions than those in which the skill was learned (e.g., with different materials and/or verbal instructions). Deficits in skill maintenance are also characteristic of children with ASD; children may “lose” skills if they are not consistently practiced and/or used in the child’s daily life. Again, these difficulties have implications for the testing setting, as parents often proclaim that the child possesses skills that were not exhibited during the evaluation session. This is often an accurate statement; however, difficulties with generalization and maintenance of skills have direct relation to instructional programming. Skills that have been “mastered” but cannot be demonstrated across people, settings, and materials should take first priority as instructional goals and objectives.

Challenges may also be displayed in areas associated with the core deficits of ASD. For example, there may be significant problems with orienting to the examiner and task materials and distractibility. Further, attention and persistence may vary significantly across tasks with reduced motivation for no preferred activities. Individuals may also be hypersensitive to sounds and visual stimuli in the environment, display self-stimulatory behaviours, and become preoccupied by oral exploration of items. Difficulties with tasks requiring sequential steps or that have multiple stimuli and stimulus over selectivity may also be observed. Over selectivity refers to the tendency of individuals with ASD to focus on a restricted range of available environmental cues, such as focusing on one feature of an object while ignoring other equally important features. For example, a student may respond to extraneous and/or irrelevant details (such as the model of the car in a picture) and fail to pay attention to the more salient and important aspects of stimuli on which the task depends (such as object identification, colour identification, and/or object function). Over selectivity will have a significant impact on behaviour during both assessment and instructional tasks.

### **Assessment of Autism Spectrum Disorder (ASD)**

ASD is diagnosed by examining a person's actions and growth. By the age of two, ASD can typically be accurately diagnosed. Many who are concerned should seek evaluation as soon as possible so that a diagnosis

can be made and care can begin. Evaluation can be recommended for children with ASD for a range of reasons, including diagnostic confirmation, intellectual or behavior slowing evaluation, recognition of problems of language or behaviour and potential contributing factors, assessment of progress, outcomes of interventions and/or a clearer understanding of the strengths and needs of the children. Different approaches to improving the quality of life for ASD patients were used. The feasibility of standardized testing in schools is often questioned for children with ASD; however, standardized evaluations for children with ASD may be conducted correctly (Reisinger et al., 2014). The symptoms, common challenges, and co-morbidities of ASD can help clinicians to select effective assessment strategies and to plan for and perform an evaluation that maximizes the likelihood of a valid evaluation. A variety of factors must be considered when choosing the appropriate standardized assessment for children with ASD. The questions of reference and child properties such as chronological and mental age, verbal ability and expertise are all important factors to consider. Age, standards, time, expenses and training are all the test characteristics. The verbal assessment requirements need to be taken into consideration, since speech impairments are covered by the ASD Diagnostic Criteria (APA, 2013). This is also true of non-verbal assessment levels, when poor verbal ability is associated with poor results (Lennen et al., 2010). Standard ways of encouraging commitment during the evaluation can be used for example to smile and to support effort instead of precision, but children with ASD may have less success than students with ASD (Reisinger, et al., 2014). Anyone identified with specific behavioural problems before the evaluation will be able to benefit from the assistance of an associate, such as a consultant or a professional associate.

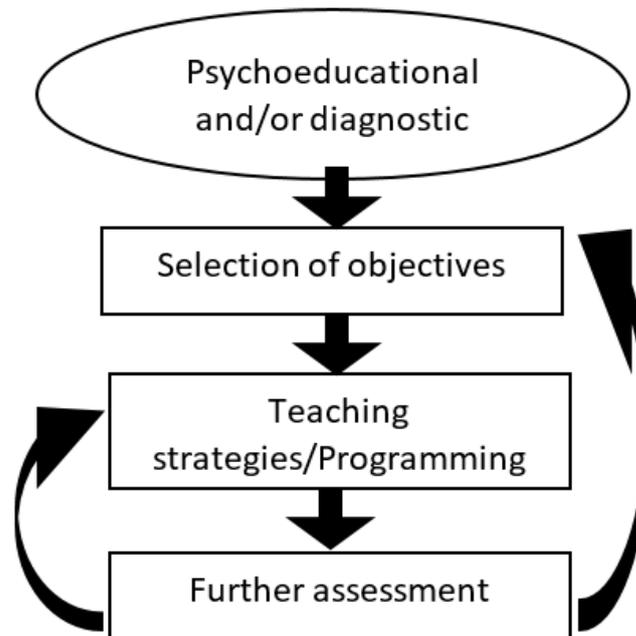
#### **Assessment Guidelines for Autism Spectrum Disorder (ASD)**

Recognizing and properly assisting individuals with ASD requires a comprehensive and structured evaluation that includes both formal and informal assessment methods. Individuals with ASD should be evaluated to see how they compare to other children their age, as well as to see what specific signs, skills, and challenges they have. In addition, changes of the development of the individual over time, such as skills mastered, skills acquisition rate and maintenance and generation of mastered skills, should be reported. Lastly, a consistent strategy should be established from the beginning to link evaluation results with intervention planning and programme monitoring.

The conception behind a process-oriented assessment is that a feedback mechanism or a circular process is used to return (or feed) some of the system's output to the input system (Durocher, 2011). Figure 1 shows an overview of an evaluation for ASD students that focuses on processes. The objective of a process-oriented evaluation is to follow a student's

progress and performance over time, allowing data to control goals and programming indefinitely. This approach is therefore particularly appropriate for ongoing data collection and analysis. This method involves (a) identifying goals that fit student strengths, weaknesses and styles; (b) instruction that is clearly determined to achieve observable goals; and (c) ongoing evaluation of student success in relation to goals and (d) based on student success input, changes in target selection, instructions.

**Figure 1 Process-Oriented Assessment for ASD Students**



Assessment entails more than just giving and receiving checks. In contrast to testing, evaluation is a much broader concept that can be described as a formal process of data collection in order to take diagnostic, legal and/or educational decisions. ASD students must complete tests as part of the overall planning of their curriculum. However, during formal evaluation, ASD students are more likely to pose particular challenges that could have an effect on the progress of the evaluation process and the usefulness of the assessment results. Table 2 shows the levels of performance, priority educational needs and potential target skills for intervention. There are four priority educational needs which is 1) Cognitive Skills, 2) Receptive Language, 3) Expressive Language and 4) Fine Motor Skills. It shows the explanation levels of performance based on priority educational needs and their potential target skills.

**Table 2. Levels of Performance, Priority Educational Needs and Potential Target Skills**

<b>Levels of Performance</b>	<b>Priority Educational Needs</b>	<b>Potential Target Skills</b>
Can sort objects by category; match shapes, colours, and pictures; identify uppercase letters; and read a few words	Cognitive Skills	<ul style="list-style-type: none"> <li>• Lowercase letter identification</li> <li>• Letter and word matching</li> <li>• Sight word recognition</li> <li>• 1:1 correspondence</li> </ul>
Can respond to simple one- and two-step commands and recognise body parts and colours.	Receptive Language	<ul style="list-style-type: none"> <li>• Receptive vocabulary: nouns, verbs, object functions, and prepositions</li> <li>• Two-step unrelated orders (hang up your backpack and sit down)</li> </ul>
Short (two- to three-word) phrases are used, and can tag pictures of things	Expressive Language	<ul style="list-style-type: none"> <li>• Raise the length of utterances to three to four words</li> <li>• Use pronouns in spoken language</li> <li>• Develop expressive vocabulary for verbs (action words)</li> </ul>
Can copy shapes and cut 1-inch strips of paper	Fine Motor Skills	<ul style="list-style-type: none"> <li>• Cut paper strips of 2 to 3 inches in length</li> <li>• Cut shapes</li> <li>• Use uppercase letters to write her name.</li> </ul>

### **Digital Assessment for Autism Spectrum Disorder (ASD)**

Diagnosing ASD can be difficult as there is no specific test to diagnose this condition. While online tests may help identify ASD characteristics, they are not diagnostic tools. Only an autism specialist can diagnose ASD with assessments, although online tests may help. Year after year, online educational innovations progress. When it comes to knowledge assessment, paper testing is losing its value and necessity as students become more accustomed to them. Autism research has implemented a few stages to evaluate developments in flexibility of ASD persons (Moon et al., 2020). There are many advantages of using educational technology for student evaluations, including the ability to save time, make the learning process more detailed and user-friendly, provide immediate feedback, and so on. Teachers and students benefit from digital evaluation tools. With new technology, students can receive answers to their questions without being disturbed. In the educational environment there are numerous digital evaluation methods for various purposes. Teachers will benefit by monitoring their progress and by providing their students with more targeted input and skills. Controlled

trials with careful assessment of the risks and advantages of digital therapies may influence potential negative consequences such as dependency, increased social isolation and a further delay in the development of language (Pandina, 2021). Hence, the following discusses digital techniques along with suggestion of existing applications that could be adopted towards the development of assessment tool for ASD.

#### Gamifying the Answers

More game-like activities and entertaining features should be introduced to the application based on therapist recommendations to make it more appealing to children. Gamification in education refers to the use of strategies inspired by videogames and games to inspire students and support their growth (López Carrillo, 2019). One of the most common digital game-like assessment tools is Kahoot. One aspect of a game that may be used to draw children attention and get them involved in an activity is rewarding (Fadhli, 2020). By generating multiple choice questions or using pre-existing games, this gamification tool assists teachers in improving the learning experience in the form of a game. Employing time pressure feature which limits the period for answering questions (Söbke & Weitze, 2016), Kahoot exhibits active user participation. The teacher can create a one-of-a-kind game by uploading media files and images, or he or she can download ready-made content. To pass the test, each student must work on their own computer. As all questions are displayed on a common screen and answerable if necessary, this is a great community activity. According to teacher feedback from the United States. In order to win, students must completely immerse themselves in the competitive atmosphere using Kahoot in the classroom.

#### Giving Instant Feedback

Instant feedback not only quick and effective, but it also gives students access to information that is otherwise hard to find. Games have the ability to record precise information about student performance and give students rapid feedback (Rushton & Corrigan, 2021). Implementing instant feedback with infinite bonus points can boost students' enthusiasm to study (Aryulina, 2020). Succeeding, Socrative is an excellent resource that contains a variety of features that educators can use for a variety of purposes. Quizzes, short questions, exit passes, and other activities are also available. Socrative has a colorful and user-friendly interface, as well as software for students and teachers. Educators can use the platform to get real-time feedback on their students' comprehension because they can make quizzes in seconds and share them with other teachers.

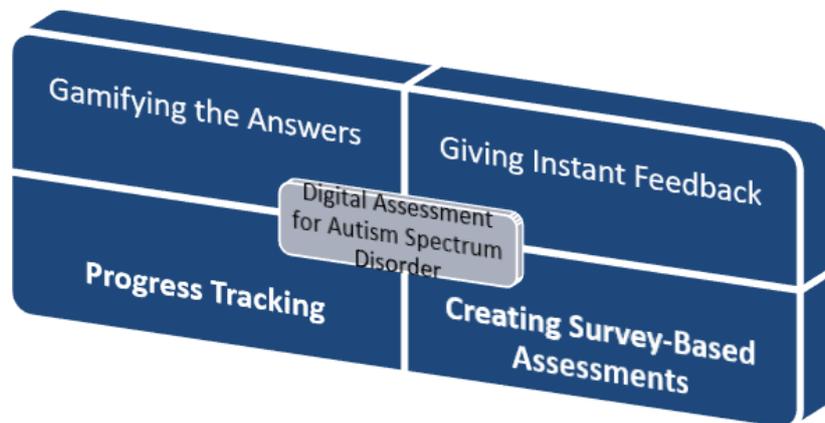
### Progress Tracking

Assessing the degree to which students' competences are being formed allows for the organization of progress tracking. Students will be able to track their progress, locate resources and activities, pinpoint subtopics where they struggle and compare their success to that of their classmates (Jayashanka et al., 2022). Thus, Plickers is an educational app for gathering data for an assessment in real-time. It is a systematic method which helps teachers to determine the success of their students. Even though Plickers is a serious tool for digital evaluation, it is a fun game many students consider to be easier to study. There are two modes of finding: student and graphical mode. The Graph mode enables teachers to examine students' choices and students' mode allows them to track their correct and incorrect answers.

### Creating Survey-Based Assessments

The relevance of assessment can only be supported to a great extent by student-based assessment (Setiawan et. al, 2019). Requirements of an assessment tool include assessment items creation and organization, tests collection, assessments performance, and management results compilation. Google Forms is a popular student assessment tool. Teachers can generate questions in a few minutes by means of a survey and improve them by using Google Formulae with photos and videos. They can also add collaborators and work on a survey of their Google Forms.

**Figure 2. Digital Assessment Guideline for ASD**



### Parents' Influence in Autism Spectrum Disorder (ASD) Digital Assessment

After an ASD assessment, parents may have difficulty accepting an ASD diagnosis. This is a factor that may influence the motivation of parents to seek intervention then, to cooperate with speech, learning, therapy (SLT) in therapy, and to use clinical methods at home. It is considerably

harder for parents of children with special needs to deal with the issues or come up with solutions (Gül & Gür, 2022). This may affect their motivation to do so (Chu et al., 2018). In view of their absence of widely available diagnostics and limited access to and evidence for effective treatments, technical developments promise to support earlier and more accurate diagnosis, better displays, access for treatment and planning and improve outcome and quality of living for individuals with ASD (Pandina, 2021). In the school environment podiatrists play a critical role in advocating special health needs for children and youths, including ASD. Many people, from healthcare professionals to educators to community supporters, work together for or on behalf of children. This ensures that all children with ASD will be recognized and connected as soon as possible with the services they need. Students are entitled to free and adequate education (Hyman et al., 2020).

To advise their test collection, planning and administration, a doctor should have the clearest understanding of ASD and the specific child in order to ensure an effective assessment for a student with autism. Families, teachers and clinicians can benefit from reducing the worry of autistic children in order to undertake technological intervention (Hosseini & Ghazvini, 2016; Oberleitner et al., 2006). The diagnosis of autism affects not only the life of the autistic child but also the lives of members of families in many ways. The family with an autistic child can face challenges because the child needs extra attention from their parents and routines can be changed (Almandil et al., 2019). Stress may adversely affect the marital relations of parents, increase their financial burden and promote social isolation. Studies show that mothers are stressed more than fathers by caring for autistic children (Dabrowska &

Pisula, 2010). In addition, if one parent decides not to work to support the autistic child, it naturally leads to financial stress, since the other parent supports the whole family (Autism Society, 2011). With any single arrangement, technology, or upgrade there must be a great deal to develop so that it is a bigger arrangement for target users. So the creation of further contents that are insightful, pleasing and enjoyable, which can be of a great interest is one of the enhancements that can better understand the contents of the book. The student's care needs are high, impact parents and siblings and require important community resources (Hyman et al., 2020).

### **Conclusion**

Valid assessments are needed for the development of child action strategies, the development of effective support, the development of tracking, the strengths of assessment and needs of ASD children and the information or confirmation of diagnostic results. In addition, evaluation reports and feedback should recognize and deal with the use of reinforcement agents, the observation of disruptive conduct and the assessment impact. More systematic research is required to show

robust useful digital approaches to diagnosis and real-world treatments, analyses ASD assessment, and improve access to care. This can be achieved through further collaboration between stakeholders in Malaysia and Indonesia. This cooperation can take place at several levels, example in NGOs with strong parental support, and also at the academic levels of research. Efforts and support should extend beyond infancy so that ASD people can become valuable members of our community one day. Finally, the authors hope to contribute to further research on ASD in Asia in the future, as its standard of living in all aspects is continuing to rise.

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