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"I am Tongue-tied": The Usage of Technology to Assist ASD Individuals in Social Interaction

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Abstract

This research aimed to investigate the usage of technology to assist individuals with autism spectrum disorder (ASD) in social interaction**.** The research objective is to descriptively analyse the impact of technology on ASD individuals with communication difficulties. This qualitative research involved 12 participants that work with ASD individuals. This case study was based on interviews and analytical documentation in collecting the data. The instruments used were interview protocol and progress reports for data collection. After collecting the data, the documentation data were descriptively analysed, whilst interview data was thematically transcribed. The finding of this study shows that the usage of technology help ASD individual to communicate. Conclusively, technology usage also shows the positive impact of technology in improving the ASD individual in terms of language, social interactions skill, and emotion. The implications of this study may serve as a basis for providing an alternative model for ASD children upon which educators and parents may try new intervention methods using technology among ASD teenagers in related cases.

Keywords: ASD, Technology, Communication, Social Interaction, Assist

Introduction

The prevalence of ASD keeps rising globally. Autism Spectrum Disorder (ASD) is a lifelong developmental disability that affects how a person interacts with others and how they experience the world around them. Those diagnosed with ASD see, hear and feel the world will differ from others (National Autistic Society, 2016). Varying levels of social behaviour, communication, and ritual and stereotypes deficiencies characterise ASD. This group of disorders, historically believed to be caused by the environment, is now considered a vital component in neurodevelopment. Eventually, ASD is characterised by deficiencies in impulsive, challenging behaviour and psychopathology in much greater numbers than the general population. Those deficits make people with ASD to difficultly live independently (Matson & Kozlowski, 2011). Hence, difficulties with social communication and interaction become a big issue of ASD. In addition, impairments in social interaction are the primary characteristic of people with ASD. Individuals with ASD struggle with social interaction because they struggle to communicate with others. Furthermore, social interaction includes

verbal and nonverbal communication, and repetitive behaviours become a prominent issue that people with ASD will be working with (Rabi, 2016).

Nowadays, there are several ways human beings communicate with each other. Communication is a process involving information exchange, ideas, emotions and thoughts. It allows a sender to send the message and then transmit it to the receiver through the communication channel, process the information, and send the appropriate response via the same communication channel (Afshari et al., 2009). Symbolic communication using words is considered verbal, whether spoken or not. However, communication can be both nonverbal and verbal communication. Communication includes the co-construction of meaning by communicating partners. For example, they use gaze, non-symbolic gestures, facial expressions, physical presence, voice tone, and para-linguistic modulation. It enhances linguistic meanings, transmits the message's emotional tone, or communicates without verbal symbolism (Prelock & Nelson, 2012). ASD is a neural disorder where a person has social interaction difficulties and other communication issues related to interests and behaviour. People with ASD lack social communication with others. When someone attempts to interact with ASD, they do not have eye contact with that person, and the person who does this may first think of a rude reaction. It sometimes becomes arduous to manage because if the environment changes in their surroundings, they can show aggression or run away. ASD individuals are compassionate and cannot accept minor changes in their environment. ASD individual also faces complex problems because they do not know how to react depending on the situation (Zulkefli & Rabi, 2021a).

Leo Kanner published his first paper on Autism in 1943. He observed many issues with the social communication of children with ASD. For example, failure to make eye contact or answer questions and a propensity towards repetitive communication (Denworth, 2018). Children with ASD are frequently self-absorbed and tend to live in a private environment with little potential for good communication and contact with others. Children with ASD may struggle to build language skills and know what others say to them. These also often have nonverbal communication difficulties, such as eye contact, facial expressions and hand gestures (National Institute on Deafness and Other Communication Disorders, 2020). However, there are wide-ranging and significant variations in how people communicate with ASD individuals (Denworth, 2018). The knowledge of human communication is central to the theory and clinical practice in the field of ASD. Milestones in language and communication play significant roles in defining ASD at almost every development point. Many parents of autistic children start to worry about something that is not quite right with their child's development. It is related to regression and early delays in speech development (Zulkefli & Rabi, 2021b). Hence, communication issues have always been seen as a core feature of ASD.

Nowadays, technology also plays a significant role in helping disabled learners develop their competencies and skills. According to Kamarga (2016), technology has two primary purposes. The first is to increase an individual's abilities, counterbalancing the effects of the impairment, and the second is to offer an alternate mood for the task. Therefore, technology helps students compensate for or completely bypass their impairment (Zulkefli & Rabi, 2021a). According to Mallin (2015), technology can act as an assist tool, foster a healing cycle and act as a language device for autistic children. Therefore, by using technology, individuals with ASD can improve their social, communication, functional, and repetitive behaviour. Some existing technology specially designed for ASD include Virtual Learning Environments (VLE), Mobile Learning Apps, Virtual Reality (VR), Edutainment, etcetera. For example, VLE is

an educational method in social stories to address recurrent gaps in social communication and imagination (Zulkefli et al., 2022). Besides, mobile learning apps have been broadly used for ASD because it is behaviour modelling training to improve the functional communication of people with ASD (Zulkefli & Rabi, 2021a). Edutainment is to capture the attention of ASD individuals and improve their communication skills (Hussain et al., 2016). Virtual reality can be used as a treatment for ASD to handle real-world interaction and to study how they behave according to predefined social scenarios (Parsons, 2016; Zulkefli & Rabi, 2021c).

In recent years scientists and clinicians have noticed the incredible advantage of technology as therapeutic and instructive devices for individuals with ASD (Zulkefli & Rabi, 2021a). Successful innovation-based projects for tending to social, correspondence, social, and versatile aptitudes in those with ASD are increasing among researchers and professionals. For example, computerised learning (Brite, 2018). It can provide quick, unsurprising, and repeatable reactions. It showed that the importance of assistive innovation for individuals with ASD had been built up by the way that this innovation can be utilised in restoration for everyday exercises. Hence, what is the impact of technology in assisting the ASD individual in communicating? How does it work? Therefore, the objective of this study is being carried out is to descriptively analyse the impact of technology on ASD individuals with communication difficulties.

Literature Reviews

Autism Spectrum Disorder (ASD)

ASD is five times more prevalent among boys than girls (National Institute on Deafness and Other Communication Disorders, 2020). ASD affects people of all races, ethnic groups and socioeconomic history. Nothing about how individuals with ASD look separates them from others. However, they may convey, interface, carry on, and learn in manners that are not quite the same as most others. The picking up, thinking, and critical thinking capacities of individuals with ASD can extend from skilled to test seriously. Nevertheless, a few people with ASD need much help daily (Rabi, 2016). ASD affects people in various ways and can vary from mild to severe. Those with ASD share similar symptoms, such as social interaction issues. However, there are variations in when the symptoms begin, how tough they are, the number of symptoms and whether there are other problems. The signs and severity of these will vary over time.

Individuals with ASD are self-absorbed and tend to live in a private environment where they cannot communicate effectively with others. Besides, people with ASD may also struggle to improve their language skills and understand what others say to them. They also have difficulties interacting nonverbally through hand gestures, facial expressions and eye contact (National Institute on Deafness and Other Communication Disorders, 2020) (Denworth, 2018). People with ASD may struggle to develop language skills and understand what others say. These often have nonverbal communication problems, such as hand movements, eye contact and facial expressions. The ability of people with ASD to interact and use language depends on their mental and social growth. Some individuals with ASD may not be able to communicate using language or voice, and some may have abysmal speaking abilities (Fernell, Eriksson, & Gillberg, 2013). Besides, they may also be unable to interpret body language and the significance of different tones of voice. Hence, those difficulties will affect the people with ASD's ability to communicate with others.

Special Education System Malaysia

Special education focuses on helping children with disabilities to learn, such as autism spectrum disorder. Special education has a wide range, which concerns any essential assistance or approach for kids with different incapacities. However, it also involves the learning of talented youngsters and other underestimated kids (Yusof et al., 2015). Lately, considering people with handicaps has become an advancement motivation for some nations, and one of the channels to accomplish this mission is through an instructive arrangement for kids with handicaps and special needs (Brewer, 2019). In Malaysia, special education has developed dynamically since its presence. Therefore, it is increasingly essential for guardians to look for treatment from The National Autism Society of Malaysia (NASOM) or private elements because of the long waiting list in the open places.

Malaysia has a long history of training kids in different classifications of handicaps, particularly regarding essential and auxiliary instruction (Muhamad, 2016). For example, Seed Autism Services Malaysia provides home-based and community-based Applied Behaviour Analysis (ABA) treatment, supervision, workshops and preparation for kids with ASD. In their projects, the proof-based act of ABA and the Verbal Behavior (VB) approach will help improve ASD individuals' social skills (Keenan et al., 2015). Simultaneously, there is an absence of information on ASD among many parents in Malaysia (Kunicova, Govindasamy, & Sondergaard, 2018). As an outcome, individuals with ASD will miss the golden period to detect their disabilities. Due to that, The Malaysian Service of Education came out with the Literacy and Numeracy Screening (LINUS) program to check whether they got any disabilities (Kunicova, Govindasamy, & Sondergaard, 2018). Under this program, understudies related to learning challenges would allude to clinical experts for further determination. Therefore, it is workable for kids with ASD to be analysed through this course, but it is often too late at this age. However, this program has been discontinued because schools will determine their ways to tackle learning difficulties faced by their students (No more Linus programme in schools next year: D-G, 2018)

ASD and Technology

Regarding communication, individuals with ASD usually have difficulty communicating a proper sentence because of language disorders. Advanced devices such as contact screen telephones, tablets, portable figuring devices and the internet can support youngsters and grown-ups with mental imbalance. It makes them more independent and helps them express their true feelings (SpielKatta et al., 2019). These devices can help them gain confidence and improve their communication skills. In addition, computer technology and the internet are improving their life by assisting to make up for verbal and communication issues and encouraging trade between individuals with ASD, specialists, and others (Zwaigenbaum & Penner, 2018). Computers-helped guidance has also demonstrated interest in close-to-home advice for certain people with ASD (Zulkefli & Rabi, 2021a). For example, a gathering of people with ASD was found to communicate more enthusiasm for computers than toys and was inclined toward computer guidance over individual guidance.

The theory of social learning is widely cited as an integral component of the sustainable management of natural resources and encouraging positive change in behaviour (Lalitha, Javidi, & Sarwate, 2018). In a social learning theory, the learners will learn from others from interactions in a social context. Separately, people acquire similar behaviour by observing others' behaviours. In addition, people imitate the behaviour of others after following,

especially if it is the positive of observational experiences. According to Bandura, imitation behaviour includes replicating the observed motor activities (Schunk & DiBenedetto, 2020). Social Learning Theory has perhaps been one of the most influential theories of learning and development. It is grounded in many of the traditional theories of learning principles. This theory has also been considered a bridge between theories of behavioural learning and cognitive learning as it involves memory, motivation and attention (Esau & Mpofu, 2017). However, Bandura believes all forms of education cannot be accounted for by direct reinforcement. Therefore, he incorporated social elements in his theory, arguing that people will learn new behaviours and knowledge by watching others.

There are three basic concepts for learning from each other: observation, modelling and imitation. Based on these three concepts, learning can take place without changing behaviour. However, knowledge has to be represented by the behaviour of permanent change. Therefore, social learning theory can help in this research because communication technology, such as online apps, is helpful in the development of communication skills in ASD individuals. The individuals being watched are called models, and the way toward learning is called modelling (Sng et al., 2014). This theory clearly described how they set communication technology as a model that they can learn valuable skills by observing the model they developed. For example, according to Valencia, Rusu, Quiñones & Jamet (2019), games that utilise technology generally show individuals theoretical information and aptitudes. For instance, simple games, gamification, and e-learning can be modelled to help ASD individuals learn by observing and playing them).

Methodology

A qualitative research approach was chosen as the methodology for this research. Qualitative research is used to understand underlying causes, opinions, and motivations (Sileyew, 2019). The research design o this study is by utilising the case study approach. A case study is an approach where the researcher can provide a deep insight into researching a limited number of cases in the most significant depth of expectations (Bacon-Shone, 2022). Therefore, using a case study in this study can help analyse the impact of technology on ASD individuals with communication difficulties. The sample used in this study is purposeful or judgmental sampling. Following Reddy & Kannamani (2016), purposive sampling refers to the researcher seeking out the participant dimension to satisfy the narrow and relevant details. In this study, the 12 participants should fulfil the stated requirements and need prior knowledge of overall response patterns. The requirements are (1) three parents to the ASD individuals, (2) Special Education Teachers (one from public and private schools) with five years of experience handling ASD students, (3) one therapist, (4) one caregiver and (5) two instructional teachers. These participants agreed to be the participants. All the details of the informants will not be revealed to fulfil their privacy.

For this study, researchers conducted in-depth interviews to gather information from participants. An in-depth interview aims to extract more accurate details, understand more profoundly and have a better relationship with the participant (Jamshed, 2014). Researchers choose the semi-structured qualitative interview as a primary data collection in this study. The semi-structured interview is likewise a mixture of structured and unstructured interviews. The researchers developed some questions and guided the participants in a semi-structured interview. Generally, the goals were addressed by the questions raised as guidelines and

further study to explore more in-depth knowledge even for researchers. In addition, the informal dialogue with participants was conducted in semi-structured interviews.

Findings and Discussion

As for semi-structured interview findings, analysis is based on the nine participants that were coded as P01 (Parent 1), P02 (Parent 2) and P03 (Parent 3), GT (Government Teacher), PT (Private Teacher), Tx (Therapist), CG (Caregiver) and IT (Instructional Teacher). In addition, the presented analysis uses thematic analysis coded manually. Following is the analysis of the finding based on the research question.

As for this study, this research is focused on technology to assist autism spectrum disorder (ASD) individuals in social interaction. In this regard, primary qualitative data collection was carried out, and the findings and discussions were thematically analysed. As highlighted in the findings and discussion, information and communication technology has opened various ways to disable people, especially the ASD individual, to improve their interaction and socialisation.

Interaction Difficulties

From the interview responses, it has also been found that communication technology is effective in improving the interaction difficulties of ASD individuals.

All informants affirmed that it is, indeed, they faced difficulty interacting with ASD children. Educators such as Gt, PT, GT, and Tx mentioned that they faced the most significant problem at the first stage because they did not know and understand what people with ASD are asking for. Thus, in building rapport phases, they need to fine-tune to get to know the ASD children better. Interaction difficulties always happen because people with ASD do not know how to express their feelings and emotions to others.

Yeah, sometimes, because we normal people don't understand what they mean by it. For example, sometimes, they do not know how to express their feelings with certain words. So, they tend to keep quiet and keep their feelings to themselves. So, I need to guess what they need at the moment, but after some time, I can roughly get what they are trying to say.
(Instructional Teacher)

Yes, because sometimes I don't know what he asks for and wants. I can only guess what he is asking about or what he wants. So, they need to be more patient since they don't know how to express themselves.
(Caregiver)

Ya, sometimes I am not sure what they are trying to say, I need to guess few options and pick the right one by asking them one by one. But as time passed, I could get what they meant in most situations.
(Special Education Teacher)

According to the (National Institute on Deafness and Other Communication Disorders, 2020), people with ASD may struggle to develop language skills and understand what others say. These have nonverbal communication problems, such as eye contact, hand gestures, and facial expressions. The ability of people with ASD to use language to interact depends on their

stages of diagnosis and social growth. ASD children can find it challenging to communicate with others using language and may have limited speaking ability. On the other hand, others will have a rich vocabulary and be able to say in great detail about specific topics. Besides, there were many issues with the rhythm and meaning of sentences and words. They also cannot know the body language and the significance of different vocal tones. Therefore, these affect the ability of people with ASD to communicate with others, particularly people of their age.

In order to reduce the struggle of the interaction, all informants use the same mechanics to communicate with ASD individuals. One method is that they always communicate with people with ASD using hand gestures (more than body language). Besides, in terms of verbal communication, they always keep the sentence short and simple while communicating with the ASD child.

I normally communicate with him with some simple hand gestures to let them fully understand my meanings. Because to let them understand what I am talking about, I need to keep it short and simple. So, the tips I use to communicate with them is make my sentence and words simple and precise to avoid misunderstanding and misleading.
(Instructional Teacher)

Talk with the simple word and keep it short that can let them understand what I am talking about. If they don't understand, I will try to use hand gestures to let them know.
(Therapist)

By keeping my words short and simple in order to let them be clear and understand what I try to talk to them.
(Special Education Teacher)

Using hand gestures and simple speech is a common way for people to communicate with autistic children. Hyman et al (2020) developed the minimal speech approach to enable children with ASD to communicate. This approach involves the caregiver using simple language, consisting of one to three words, usually nouns, and nonverbal communication (Zulkefli & Rabi, 2021b). Frequently using single words can be more effective than using sentences. It shows that simplifying language allows people with ASD to understand the language better, positively affects behaviour, and encourages more communication and reactions.

Furthermore, hand gestures also serve an essential function for people with ASD. It can communicate with them by demonstrating the word's meaning. Besides, hand gestures also provide a way for children with ASD to express themselves before he or they can speak out verbally.

Assisting Devices

Further, from the interview, it has been understood that communication technology tools such as mobile phones, computers, and televisions have an influential role in assisting ASD individuals to communicate and initiate social interaction with others.

All informants conclude that technological tools are adequate for influencing ASD children to communicate. GT, PT, IT and Tx have mentioned that they were well aware that

the effectiveness of communication technology can be enhanced by introducing it to ASD students and guiding them for usage. Besides, one parent's response (P03) has highlighted that a particular application helps describe the feelings of his ASD child. In addition, IT mentioned that a technological application is practical for ASD students to show what they are trying to express. Besides this, technological tools can also improve the parents' ability to understand the expressions of autistic children.

Contrary to CG, technology alone could not help ASD children. CG mentioned that educators are required to play an influential role in understanding the use of technology to avoid the misuse of the gadget because it would be challenging in the home setting. It is because it would be difficult to monitor.

As I mentioned, tablets or TV can help them communicate. But I prefer TV because I can watch with my child and create a simple and common language to let them understand. It also can help to encourage them to interact with us.
(Parent 01)

Technology can help children with ASD understand their world and develop expressive communication, concentration, motivation, social interaction, organisational, self-help, academic, and overall autonomous everyday function (Mohammad & Abu-Amara, 2019). Therefore, it can be generalised that technology plays a vital role for children with ASD. It is a good way that can be used as a tool to encourage and support them to communicate effectively, increase knowledge, improve their language or speech, and express their thought, needs and wants. Technology is used to enhance the quality of life of a person, and it has been used, in particular, to help children with ASD make their life easier.

Smartphones and Tablets

According to Zulkefli & Rabi (2021a), people with ASD face many challenges and issues daily, such as struggling with social interaction and communication. For example, people with ASD do not understand the social rules and feel difficult to carry on a conversation about how far to stand from someone else or make friends with others. Based on this finding, researchers found that smartphones and tablets are significant, as the informants mentioned that it is a helpful way to assist ASD in communicating.

Yes, because technology is an excellent way to encourage them to communicate with others such as let them watch video through mobile phone, tablet or TV like Animal Planet or cartoons to let them build some knowledge and skills.
(Parent 03)

Ya, this should be helpful in a way, for example, my school got some education purpose tablets for them to use and we can get some useful data and message from that. They can communicate by picking the pictures and options on the tablets and show it towards other students or teachers to express their needs and wants.
(Instructional Teacher)

There are many types of tools for them, in my school they use tablets and picture books for them learn and express their thoughts

(Special Education Teacher)

I always guide them the right procedure and steps whenever they are using the tablets and I will monitor throughout the process of learning and communication
(Caregiver)

Nowadays, it seems the whole of the world appears to be revolving around smartphones, tablets, and the internet. According to Zulkefli & Rabi (2021c), smartphones and tablets can be great tools for people with ASD. It can also motivate people with ASD, such as iPad. Many great applications concentrate on language development. In particular, many parents and teachers are interested in helping their children and students with ASD learn to talk using smartphones or tablets. It can be a great benefit to those people with ASD who are having trouble learning the language. Hence, researchers have found some functions that can benefit children with ASD using smartphones and tablets.

Conclusion

Based on this study, it was found that most people with ASD face difficulties communicating with others. According to this study's findings, people that matter to ASD individuals, such as parents and special education teachers, have experienced using technology to help their children or student with ASD communicate with others. There are positive impacts of technology that help ASD individuals communicate, such as improving their language, social interactions skill, and emotions and making them more confident by using the technology. Therefore, technology usage has become relatively important to people with ASD. Technology serves many functions for them to interact with others, improve their language and social interactions skills, express their needs and wants and so on. In this research, the primary concern is the social interaction among ASD individuals, and thus whole research strategy has been formulated. It has been found that this research has not focused on the treatment or support interventions for improving the daily life activities of autistic individuals. Therefore, in future, this study can be expanded to identify the role of technology in the behavioural improvement of ASD children. Furthermore, future researchers can also conduct research to identify supportive treatments for ASD based on neurology, physiology and psychology.

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