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Exploring the Usage of Computer-Mediated Communication in Assisting Individual with Autism Spectrum Disorder to Communicate

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ABSTRACT

Impairments in social interaction are the primary characteristics of an individual with Autism Spectrum Disorder (ASD). In addition, communication becomes the main issue that people with ASD will be struggling with. Nowadays, technology has become a necessity for our daily life, and it provides convenience to people to communicate effectively. However, ASD individuals may experience a wide variety of communication challenges. Most of the parents were concerned that the usage of the technology may negatively impact their ASD child. Hence, by conducting this study, we will understand how technology may affect them. This research aims to explore the usage of computer-mediated communication (CMC) in assisting ASD individuals in communicating. A qualitative research method is chosen to conduct this research, and the phenomenological study served as the research design. The samples were selected through non-probability sampling. Researchers conducted in-depth interviews with parents with ASD children, Special Education teachers or caregivers, therapists, and instructional communication technology experts to gather insightful information about CMC and ASD individuals. Findings indicated that all the informants agreed the CMC, such as computers, phones, or TV, can encourage ASD individuals to communicate with others and helps in their education. Even though the CMC helps the ASD individual in communication and education, throughout learning and communication, the usage of the CMC should be monitored to avoid addiction.

Keywords: *Autism Spectrum Disorder, Computer-Mediated Communication, Social Interaction, Education, Non-Verbal Communication*

INTRODUCTION

Over the past decade, the prevalence of Autism Spectrum Disorders (ASD) has been gradually increasing. Autism Spectrum Disorder (ASD) is a disability of development in the brain. Many researchers do not have a clear and precise idea of what causes these distinctions for many people with ASD (Donaldson, 2015; Johnson & Myer, 2012). ASD individuals are usually facing with learning problem that falls in the categories of disabilities eligible for registration as persons with disabilities (Othman & Rahmat, 2020). It means that their knowledge is not predictable with their biological age. In addition, according to National Institute on Deafness and Other Communication Disorders (2020), people with ASD also have difficulty in social interaction and communication. ASD individuals sometimes self-absorbed and always live in a private environment with little capacity to communicate effectively and connect with others.

ASD individuals may be struggling to develop language skills and understand what others say to them (Mohd Yusof Zulkefli & Norfishah Mat Rabi, 2018). Since they have difficulty communicating verbally, they often have nonverbal communication with them through hand movements, eye contact, and facial expressions. The ability of ASD individuals to interact depends on their mental and social growth (Rabi, Ghazali, Rohaizad, & Zulkefli, 2018). Some ASD individuals may not communicate using language or voice, and some may have the inferior speaking ability. Besides, they may also not interpret body language and the significance of different tones of voice. Hence, those difficulties will affect the ASD individuals' ability to communicate with others.

Education is the only path that leads to having a better future (Johan & Harlan, 2014). Besides, education is to develop people's minds, thoughts, behaviors, and communication skills. Hence, education is essential for human life. Nowadays, technology also plays a significant role in helping disabled learners develop their competencies and abilities (Daud, Maria, Shahbodin, & Ahmad, 2018; Peterson-Karlan, 2011). According to Lewis (1998), there are two primary purposes in technology: increasing a person's abilities, counterbalancing the effects of the impairment, and offering an alternate mood for the task. Therefore, technology helps students compensate for or completely bypass their impairment (Daud, Maria, Shahbodin, & Ahmad, 2018). According to Mallin & Carvalho (2015), technology can carry out as an assist tool, foster a healing cycle, and as a language device for autistic children. Therefore, children with ASD can improve their social skills, communication skills, functional skills, and repetitive behavior by using technology.

Some existing technology is specially designed for ASD individuals, such as Virtual Learning Environment (VLE), Mobile Learning Apps, Edutainment, etc. Virtual Learning Environment (VLE) is an educational method to address recurrent social communication and imagination (Christina, Tsiatsos, Mavropoulou, & Karagiannidis,

2016). Other than that, it can be used as a treatment for ASD to handle real-world interaction and study how they behave according to the predefined social scenarios (Parsons, 2016). Besides, mobile learning apps had been broadly used for ASD individuals because it is a behavior modeling training to improve the functional communication of ASD individuals (Law, Neihart, & Dutt, 2018). Edutainment captures the attention of ASD individuals and improves their communication skills (Hussain, Abdullah, Husni, & Mkpojiogu, 2016).

ASD individuals are facing communication problems in their life because they do not know how to express themselves. Besides, they do not understand how other people are feeling and thinking about them. ASD is a complex condition that people diagnosed with ASD will have difficulties communicating with other people and behave differently (Norfishah Mat Rabi, 2016). For example, they will communicate, behave, or think differently from ordinary people. They need more full-time care and a unique facility for their daily life. ASD individuals always engage in behavior, interest, and activities repetitively and in a stereotypical way (Mohd Yusof Zulkefli & Norfishah Mat Rabi, 2018). For instance, they may focus seriously on a movement such as turning the wheels on a toy vehicle or arranging toys consistently, which will comfort and stabilizes their minds (Zwaigenbaum & Penner, 2018). Communication is an essential process in the growing development of a person. Still, ASD individuals tend to have a slower learning language, and many can not correctly pronounce a proper sentence to communicate with people (Mohd Yusof Zulkefli & Norfishah Mat Rabi, 2018). In addition, there is no medical detection of ASD, and it is a permanent disability (Zander, Sturm, & Bölte, 2014). They can have unprovoked aggressive behaviors, thus according to Stewart (2016), stated that it is essential for ASD individuals to have an early intervention to prevent heavy treatment in the future.

Advance technology is significant and supportive of people's living. People with the determination to use technology to improve the quality of living can bring benefits and make people's life easier. Technology is characterized as using logical information to the reasonable points of human life or, as it is now and then stated, to the change and control of the human environment (Irwin, Harstad, Deister, & Augustyn, 2019). It shows that technology's fundamental motive is to help people to enhance their life. For instance, some of the developers have invented technologies by scientific knowledge and technologies. They have apps, guidance machines, and communication machines to help people with ASD (Christina, Tsiatsos, Mavropoulou, & Karagiannidis, 2016). Utilizing the usefulness of the technology may help them communicate and bring benefits to their lives. Technologies may help in assisting ASD individuals in communicating. However, how many people such as teachers, therapists, caregivers, or even parents may utilize the benefit of the technology in assisting ASD individuals to communicate? Many of them will negatively connotate technology, such as technology, which will lead many people to negative behavior and make them anti-social.

Nowadays, technology has become a necessity for our daily life, and it provides convenience to people to communicate. People communicate through technology such as emails, mobile phones, chat messenger, and social media channels to exchange information, ideas, emotions, and thoughts (Sharma, 2021). The use of technology is taking an increasingly prominent role in Autism Spectrum Disorders (ASD) research. ASD individuals may experience a wide variety of communication challenges. Hence, by conducting this study, we will be able to understand how technology may assist ASD to communicate and, at the same time, will be able to help their parents to maintain their psychological and emotional wellbeing during the pandemic by utilizing the good things of the technology. Generally, this research aims to explore the usage of computer-mediated communication (CMC) in assisting ASD individuals in communication.

LITERATURE REVIEW

Issues of ASD

The prevalence of ASD is keeping rising globally. ASD is a lifelong developmental disability that affects how people interact with others and how they experience the world. Those diagnosed with ASD see, hear, and feel the world will differ from others (Stewart, 2016). ASD is characterized by varying levels of social behavior, communication, and ritual, and stereotype deficiencies. This group of disorders historically believed to be caused by the environment is now considered a vital component in neurodevelopment. Eventually, ASD is characterized by defects in impulsive, challenging behavior and psychopathology in much greater numbers than in the general population. Those deficits make people with ASD difficultly live independently (Matson & Kozlowski, 2011). Hence, difficulties with social communication and social interaction become the big issue of ASD.

Perspectives of ASD in Malaysia

According to the Centre for Disease Control and Prevention (2019) and Scutti (2018), around one in 59 children is diagnosed with ASD. In addition, boys are four times more efficiently get diagnosed with autism compared to girls. According to Zainudin (2018), it is shown in the national gross birth rate review; approximately 9,000 born every year may have autism in Malaysia. There is no official list in Malaysia regarding the number of people diagnosed with autism. It may be due to autism, and other cognitive and developmental disorders are classified under learning disabilities. Nevertheless, The World Health Organization (WHO) reports that one in 160 children has ASD, and its prevalence increases globally (Murad, 2019).

In Malaysia, children with special needs are selectively put into mainstream classes on a child-specific basis (Lee, Yeung, Tracey, & Barker, 2015). However, this placement is not mandatory, and the decision relates solely to the prerogative of the school administration based on the advice of the special education teachers at the school (Neik, Low, Chia, Chua, & Lee, 2014). According to the preschool and primary school, the children with ASD in Malaysia are included in the mainstream education after mutual decision between the parents and the school administration (Razali, Toran, Kamaralzaman, Salleh, & Yasin, 2013; Lee & Low, 2013). This laid-back approach towards inclusion is about to shift as 30% of children with special needs enroll in mainstream classes by 2015 and 75% under the National Education Blueprint by 2025 (Ministry of Education Malaysia, 2013).

ASD and Social Interaction

Social interaction is a complex sequence of social behavior among individuals or groups which alters their behavior and reactions because of actions by their partners. They distinguish social interactions into unintended, repeated, frequent, and controlled interactions (Milner, McIntosh, Colvert, & Happé, 2019). In addition, social interaction is a social exchange between two or more individuals. Impairments in social interaction are the primary characteristics of people with ASD. ASD individuals are struggling with social interaction because they are having difficulty communicating with others. In addition, social interaction, verbal and nonverbal communication, and repetitive behaviors become the main issue that people with ASD will be struggling with (Lee & Semenova, 2019).

ASD is a form of neural disorder where a person has social interaction difficulties and other communication issues related to interests and behavior. People with ASD lacked social communication with others. According to Norfishah Mat Rabi (2016), when someone attempts to interact with ASD children, they do not have eye contact with that person, and the person who does this may think it is a kind of a rude reaction for the very first time. Autistic people are susceptible and cannot accept a minor change in their surrounding environment (Mohd Yusof Zulkefli & Norfishah Mat Rabi, 2018). ASD children face complex problems because they do not know how to react depending on the situation. It sometimes becomes challenging to manage because if the environment changes in their surroundings, they can show their aggressive behavior or run away (Shoaib, Hussain, Mirza, & Tayyab, 2017).

ASD and Communication

Communication is a process involving information exchange, ideas, emotions, and thoughts. It allows a sender to send the message, transmit it to the receiver through the communication channel, process the information, and send the appropriate response via the same communication channel (Donaldson, 2015). Every form of sym-

bolic communication using words is considered verbal, whether it is spoken or not. Communication can be both nonverbal and verbal communication. Prelock & Nelson (2012) stated that communication includes the co-construction of meaning by communicating with partners who use gaze, non-symbolic gestures, facial expression, physical presence, voice tone, and other ways of para-linguistic modulation to enhance linguistic meanings and transmit the message's emotional tone, or to communicate without verbal symbolism.

There are many issues with social communication among children with ASD. For example, failure to make eye contact or answer questions and a propensity towards repetitive communication (Denworth, 2018). ASD individuals are frequently self-absorbed and tend to live in a private environment with little potential for good communication and contact with others. ASD individuals may be having difficultly building language skills and know what others talk to them. These also often have nonverbal communication difficulties, such as eye contact, facial expressions, and hand gestures (Centers for Disease Control and Prevention, 2019). 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 point of development. Many autistic children worry about something that is not quite right with their child's development due to regression and early delays in speech development (Denworth, 2018). Hence, communication is one of the issues that have always been a core feature of ASD.

The technology in assisting ASD to communicate

Technology can affect people's daily lives, and people can easily communicate in several ways. Technology is the sum of the techniques, expertise, methods, and processes used to manufacture goods or services or achieve goals (Hacker, Johnson, Saunders, & Thayer, 2019). Nowadays, people communicate through technology without face to face. In addition, it has rapidly changed the young generation to become more ignorant and lazier (Christina, Tsiatsos, Mavropoulou, & Karagiannidis, 2016). On the other hand, technology is used to enhance a person's quality of life, and it has been used to help ASD individuals to make their life easier. Nowadays, several technologies are being used to support ASD individuals in different ways. The technology can be used to help ASD individuals to understand their world in general, develop their expressive communication skills, social interaction skills, concentration skills, motivational skills, organizational skills, self-help skills, academic skills, and overall autonomous everyday function (Mohammad & Abu-Amara, 2019)

One of the most prominent autism research founders continues to support an Innovative Autism Technology Initiative initiated by Cure Autism Now to improve and accelerate the speed of autism research and treatment by promoting collaboration among technologists, designers, developers, and different stakeholders in the ASD

community (Bölte, Golan, Goodwin, & Zwaigenbaum, 2010). Few types of technology or application can help ASD as support tools and provide the benefits of their use, such as virtual reality applications, dedicated applications, telehealth systems, robots, and so on (Aresti-Bartolome & Garcia-Zapirain, 2014). Technologies can also help children with ASD address everyday stress directly, reduce overstimulation and provide learning and communication by using apple devices, locating devices, home security systems, and communication technologies (Long, 2018).

RESEARCH METHODOLOGY

Qualitative research was chosen as the methodology in this research. Qualitative research is used to understand underlying causes, opinions, and motivations (De-Franzo, 2021). The qualitative approach most suitable in this research is a case study that explores the technology usage that allows ASD children to communicate. Phenomenological research 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, 2020). Therefore, using phenomenological approaches in this study may help the researchers to find out more opinions about the usage of technology that allows ASD children to communicate.

Non-Probability sampling has been chosen for this research. The non-probability piece is defining as the researcher may select a sample based on the subjective judgment of the population (Taherdoost, 2016). In this research, all the informants should fulfill the requirements and needs upon the prior knowledge of overall response patterns. The samples requirement of this research is three parents that have ASD child, three Special Education teachers or caregivers, or therapist, which has at least five years' experience in handling ASD students, and an instructional communication technology expert. In this study, the researchers conducted an in-depth interview using semi-structured interviews to gather information from the participants. The researcher used an interview protocol as a research instrument for this research. According to Hunter (2012), the interview protocol serves as the guide to give direction and path to carrying out the data gathering process and follow-up by analysis. Researchers interviewed three people from each of the categories. The purpose of choosing an in-depth interview is to extract more accurate details, understand more profoundly and have a better relationship with the participant (Jamshed, 2014). During the pandemic of the COVID-19, face to face interview is not allowed. Therefore, the interview session conducted via Google Meet, and the interview session took about 30-45 minutes.

For accuracy, a validity and reliability process had been made. Validity in research is the extent to which the data is appropriate, justifiable, and relevant (Cypress, 2017). Firstly, researchers used descriptive validity to achieve high accuracy, and the transcribe notes were sent back to the participants for consensus purposes.

Therefore, Maxwell (1992) viewed descriptive validation as the agreement between both researchers and interviewees. Next is interpretive validity, in which researchers reflected researchers' ability to report interviewees' meaning, behavior, or emotions in the response. However, the interpretation process is based not only on the researchers' point of view but also on the participants' true feelings, such as anger, sadness, or romance (Thomson, 2011). For example, if the interviewees started to increase the pitch or tone to express his or her answer, the researchers could interfere with the informant's emotional experience. Afterward, the transcription outcome will also be reported back to participants for agreement purposes. If the participants find dissatisfaction with the interpretation, the researcher will need to re-interpret until consensus is achieved. Lastly is the theoretical validity, where the researcher forms a theory in the studied phenomenon and evaluates it with the researchers' own theorized perception. Thus, to validate, the obtained response, such as concepts and patterns, must be fitted into the pre-determined theory in the phenomenon to create a constructed idea for the theory (Hannes, Lockwood, & Pearson, 2010). Afterward, the researchers will be able to produce data that are aligned and support the pre-determined idea.

FINDINGS AND DISCUSSIONS

Based on the interview session, researchers found some common signs and symptoms of autistic children. The informants (parents, special education teachers, caregivers, and therapists) mentioned that most ASD individuals have poor eye contact, expression, repetitive behavior, and inappropriate social interaction. Thus, these are the problems of communication difficulties, emotional and social interactions with others. According to the informants (parents, special education teachers, caregivers, and therapists), the biggest problem is understanding the needs of ASD individuals. Besides, ASD individuals do not know how to express their feelings and emotions to others. It shows that ASD individuals struggled to develop language skills and understand what others talk to them and tell them to people.

Due to the difficulty of communicating with ASD individuals, most informants (parents, caregivers, and ICT instructors) agreed that technology such as computers, phones, or TV could encourage ASD individuals to communicate with others to help in their education. In-depth, researchers found that caregivers and parents mentioned that technology such as smartphones, tablets, and TV was good and very helpful to encourage ASD individuals to communicate with them. Using that tools, ASD individuals can express their needs and wants and build some knowledge and skills by using the technology. However, special education teachers and therapists do not specify which tools are the best tool for the interview session. All of them mentioned that any technology has its functions and benefits to ASD individuals. Therefore, they cannot choose which types of technology they prefer since the different techniques have different advantages.

Based on the interview session, it is also can be concluded that all informants agreed that technology is beneficial to ASD individuals. From the interview sessions, researchers concluded that computer-mediated communication (CMC) was helpful. According to parents and special education teachers, CMC boosts ASD individual confidence level to initiate communication. They also mentioned that there is some application may assist ASD individual in interacting with others. Each of the applications has its function to let them learn and improve their social interaction skills, facial expression, language skills, etc. For example, special education teachers, caregivers, and therapists use the tablet to show the variation of pictures to help ASD individuals to express their emotional wants and needs. According to the ICT instructor, to avoid any negativity of the technology, the parents, special education teachers, caregivers, and therapists need to guide the ASD individual. The guide should include the procedure and the step-by-step method to learn how to use the function in the gadget that the ASD individual has.

Parents and caregivers explained that many practices could be done using technology to help ASD individuals communicate. They mentioned that CMS could help ASD individuals to improve their social interaction skills, language, communication skills, and facial expression. They stated that the ASD individual was comfortable communicating by using visual support via tablet. According to special education teachers and therapists, visual support is non-verbal communication that refers to using a photo or other visible object to interact with a child who has trouble understanding or language use. In addition, it can include drawings, objects, photographs, written words, or lists. For example, the special education teachers and therapists showed many options such as demands and illustrations to their students with ASD and let them choose and pick the right word and image. The majority of the special education teachers and therapists mentioned that ASD individuals would learn the appropriate words to say during the process. Besides, most of the parents were also using such a way to help their children to interact such as they can press the picture, then it will reveal options of words, and a text will read the chosen phrase to speech.

However, the view on technology depends on how people take it because they can still teach them well before the advancement of technology. The development of communication for children with ASD occurs differently and more slowly due to the sensory problems associated with the condition. According to the ICT instructor, technology plays an important role in assisting ASD individuals in communicating. In addition, smartphones and tablets can be great tools for people with ASD of all ages. Many great applications concentrate on language development. Thus, it can greatly benefit ASD individuals who are having trouble learning the language and communication.

The functions of the CMC that can benefit ASD individual are;

Visual Support

ASD individuals may not recognize social signals as they communicate with others in their everyday activities. They cannot understand social norms, such as how to start a conversation, respond while others follow social approaches, or change actions based on unspoken social rules. Therefore, visual support can help teach social skills for children with ASD and use them in social settings independently (Autism Speaks, 2019).

Visual support is a non-verbal communication that refers to using a photo or other visible object to interact with a child with trouble understanding or language use. In addition, it can include drawings, objects, photographs, written words, or lists. Besides, it also may help the ASD individual communicate better with others, and parents can better communicate with their children with ASD (Autism Speaks, 2021). For example, they can share by picking the pictures and options on the tablets and show them to other students or teachers to express their needs and wants. In addition, there will be sets of options like requests, demands, illustrations for them to choose and pick the right words and pictures for others to see and know what they are trying to say. It will make their conversation more fun and meaningful, and they will learn the appropriate words to say during the process.

From the findings, researchers can conclude that ASD individuals tend to learn better on visual support. This research showed that visual aid is supporting well to help ASD individuals communicate because ASD individuals have difficulties understanding and expressing their needs and want. Therefore, visual supports are essential because they can help cope with their challenges, such as limited interest in social interaction and repetitive behavior (Baker, 2012). In addition, visuals can help to explain the expectations from both parties. It will reduce the frustration and can help to decrease the problem behaviors resulting from communication difficulties.

For example, ASD individuals may begin with matching object to object, and object to image, then image to image. They start by checking the actual thing to the same object, corresponding a picture to the object once mastered. It allows ASD individuals to understand that an image may represent an entity. In the end, a photo of an image will line up (Bennie, 2017). Hence, visual support can be a tool to help ASD individuals communicate with others by using smartphones and tablets.

Video Modelling

Video modeling is an evidence-based form of prompting used to improve positive behaviours among ASD individuals and aid in developing skills. It is a teaching method in which a person watches a video of someone performing an activity and mimics the action itself (Park, Bouck, & Dueñas, 2018). According to Brereton (2018), it is

shown that many people with ASD learn best through visual means. In addition, video modeling has proved to be a highly effective teaching method for all ASD individuals. It is because technology is a good way to encourage them to communicate with others. They may watch some video through mobile phone, tablet or TV-like Animal Planet or Cartoon through TV to let them build some knowledge and skills.

It was found that video modeling can be a very effective method that involves visual and teaching skills to ASD individuals. Besides, the video can be one of the ASD individuals performing a task or assignment. Thus, they will understand a situation better. For example, the brushing teeth steps that the ASD individuals can follow by watching the video. Hence, video modeling can help with various skills such as job tasks, hygiene, etc. It helps ASD individuals to learn new skills, concepts, emotional responses through video modeling.

ASD individuals also had difficulty communicating effectively and understand the cue from other people. ICT instructor also mentioned that there are many benefits to using technology to help ASD children communicate. There are four expected benefits of using technology in assisting people with ASD to communicate: language, social interaction skills, and confidence. The use of the CMC that can benefit ASD individuals is explained below.

Language

ASD individuals may be delayed in learning language skills, leading to disappointment as they cannot communicate with others and tell them what they need. Hence, they might avoid joining a group in social situations. ASD individual has fewer chances to learn language skills. Therefore, they usually have a complicated problem that requires more direct communication than difficulties with speech and language. Usually, ASD individuals may find it challenging to interpret social behavior. They are not willing to interact with others can be evident in the way they fail to make eye contact (Mohd Yusof Zulkefli & Norfishah Mat Rabi, 2018). Throughout the findings, researchers found that CMC is assisting ASD individuals in improving their language or speech. It is because it provides some application to let them learn, think, and interact with others. The application has its function to help them improve their language, communication skills, and facial expression.

Social Interaction Skill

Social interaction is a complex sequence of social activity between individuals or groups that alters their conduct and reactions because of their partners' actions. Social interactions are characterized by unintended, repeated, repetitive, and regulated interactions (Milner, McIntosh, Colvert, & Happé, 2019). Impairments in social interaction are vital features of people with ASD. ASD individuals are struggling with social interaction, as they have trouble interacting with others. Furthermore, social in-

teraction is becoming a big problem with which people with ASD can work (Boucenna et al., 2014).

Therefore, researchers found that using CMC can help ASD individuals to improve their social interaction skills. It is concluded that building up social interaction skills through practice can help enhance group engagement and promote results such as happiness and friendships by using the technology. Because there is a common misconception that ASD individual does not even make friends with others because they are anti-social. They want to make friends and speak to others, but they do not always know how to do it properly. Therefore, they fail to understand social interaction and keep eye contact with others (Autism Parenting, 2021).

Confidence

Confidence is essential for everyone and people with ASD. According to Alex (2015), the confidence of children and adolescents can cope better when things go wrong. In unfamiliar or unusual circumstances, they are less likely to be nervous. Besides, children and adolescents with low self-confidence can be distressed when faced with challenges and may be less likely to try new things. They are more likely to be harsh on themselves and think they cannot do something right, irrespective of their abilities. Confidence develops as children and adolescents succeed and learn they are good at things. Therefore, parents should pay careful attention to their children's strengths to build and improve their self-esteem and confidence. Thus, based on this study, the finding was also indicated that the usage of the CMC could help ASD individuals be more confident to express their emotions and social interaction skills.

CONCLUSIONS AND IMPLICATIONS

This research is focused on the identification of technological assistance for ASD individuals in communication. This study has effectively shown that computer-mediated communications are effective in interacting with people remotely. The uses of CMC for ASD individuals are increasing to encourage those who have faced challenges in communication. Furthermore, this study has effectively revealed the use of CMC in assisting ASD individuals in communication and the impacts of such tools on them. This study has further shown that a technology-oriented learning environment can facilitate ASD individuals to conduct direct communication with others. Technology in the education sector has the potential to improve the cognitive and knowledge base of ASD children.

This study can be considered adequate for identifying potential tactics to encourage ASD individuals for social gatherings. In terms of improving the moral values and self-confidence among ASD individuals, technological tools are proven effective. Speech support application, language devices are effective for helping speech deliv-

ery impairment. This study further concluded that CMC has an influential role in upgrading communication among ASD individuals. As this research has focused on interviewing parents, special education teachers, caregivers, therapists, and ICT instructors, increasing technological tools in the curriculum can be recommended. As highlighted in the literature review section, tools such as Edutainment and Virtual Learning Environment (VLE) effectively provide an attractive learning environment for ASD children. It is suggested to test how the technology may develop skills to understand the feelings and emotions of ASD individuals as they are unable to express their actual feelings. Along with that, to avoid the negative sentiments of using technology, the use of language devices for helping the ASD individual for proper sentence formation should be developed.

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