

ORIGINAL ARTICLE

Receptivity of Technology-Based Interventions Among Parents of Children with Autism Spectrum Disorder (ASD)

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ABSTRACT

Introduction: As the prevalence of children with Autism Spectrum Disorder (ASD) continues to rise, the demand for effective interventions has grown. Technology-based interventions, including smartphone applications and web-based platforms, have garnered attention for their potential to support children with ASD. However, little is known, especially in Malaysia, about parents' receptivity to incorporate these digital solutions into their children's therapy and daily routines. Therefore, this study aimed to understand the receptivity of technology-based interventions among parents of children with ASD. **Methods:** Five focus group discussions were conducted using a phenomenological qualitative design. All data were transcribed verbatim and analysed using qualitative content analysis. **Results:** Four themes emerged from the analysis: (i) attitudes; (ii) concerns; (iii) perceived benefits; and (iv) perceived barriers. Findings showed that parents' attitudes towards technology-based interventions were supportive but were hindered by their concerns regarding the downsides of technology, including safety and privacy issues. Parents perceived multiple benefits of technology-based interventions, including skills acquisition, the ability for technology to be tailored to children's preferences and the enhancement of intrinsic motivation. However, parents also perceived that the barriers to adopting technology-based interventions are closely linked to resource management, user experiences, support and technical challenges. **Conclusion:** By clarifying these factors, this study provides valuable insights towards the development of technology-based interventions in terms of design, implementation, improvement and support needed for parents of children with ASD.

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INTRODUCTION

In the new century, global adoption of technology has grown rapidly. Technology helps in delivering the intervention to children with Autism Spectrum Disorder (ASD). There is increased research investigating the use of technology-based interventions for supporting and treating children with ASD, including computer-based, digital health, computer-assisted and digital innovation (1). Various technology-based interventions

have been conducted using smartphones, robotics, computers, tablets and wearable electronics (2). Since the technology-based interventions are predictable, consistent and without social contact, it may be advantageous to children with ASD, who frequently enjoy computer interactive applications (1). A few studies have reported that most children with ASD show a natural affinity and favourable attitude towards technology-based training and intervention (3,4). It has proved to be helpful in improving the communication, academic, social and emotional skills of children with ASD (5,6). This type of intervention has been developed and researched over time in various areas, including behaviour analysis, mental health and classroom education (6).

Therapy services that are more practitioner-independent and culturally acceptable could expand access for those who do not have access to trained and competent experts. Therefore, delivering interventions via smartphones, websites, computer programs, and other media increases the flexibility and accessibility of where and when the program can be done (7). Technology-based interventions for parents can also include texting, email, and applications, which can enhance communication between parents and practitioners to evaluate and deliver needed interventions (7). By utilising technology to deliver services, families or caregivers can learn new skills and lessen their dependency on healthcare professionals. Either through web-based or mobile apps, technology allows them to find and maintain intervention resources for their children (8). Various technology devices have been employed to help parents with children with ASD. They range from the specific parent training programs offered remotely via technology to other digital resources (e.g., computer programs, robotic interventions, mobile apps and DVDs) that parents can use to engage with their children with ASD (9,10). Ninety-four studies reported that there is improvement of skills among children with ASD with the help of technology-based interventions (11). This type of intervention has increased the possibility of accessing evidence-based treatments at lower costs and at convenient times (12). It is aligned with the aims of the medical community and major policy initiatives to involve parents and caregivers in intervention plans (13). Previous studies have revealed that technology-based interventions for children with ASD are acceptable and feasible (9,14–16).

Despite the advantages and effectiveness of technology-based interventions for children with ASD, the successful adoption and implementation of these interventions depends on the parents' receptivity and engagement. It has been reported that pre-existing attitudes towards technology are a significant determinant of parents' receptivity (17). Parents who have technology proficiency and perceive technology as beneficial are more likely to utilize these interventions (17). Positive parents' attitudes towards the use of technology have also been reported, especially when parents perceived developmental benefits for their children (18,19). Besides, parents' receptivity to technology-based interventions can be influenced by the specific needs and characteristics of their child, such as the severity of the condition and interest in technology (17). It is reported that personalized interventions that address the child's needs are more likely to be adopted by parents (17,20). In addition, parents' perceptions of usability are another primary determinant for receptivity of technology-based interventions (17,21). Usability depends on features like smooth navigation, intuitive interfaces, and minimal technical complexity, while complex designs and technical problems can lead to frustration and abandonment (21). Furthermore, some studies identified

that research evidence, recommendations by others, cost, availability and accessibility of the technology-based interventions influence the receptivity of parents (22–25).

While existing literature has explored parents' receptivity to technology-based interventions for children with ASD, most studies have been conducted worldwide, focusing on regions where access to healthcare systems, digital devices, and intervention structures differ significantly from Malaysia. Although some research has examined factors influencing parents' attitudes towards these interventions, there remains a notable lack of empirical data specifically examining Malaysian parents' receptivity to adopt technology-based interventions. Without a comprehensive understanding of these factors, it is difficult to develop culturally relevant and accessible interventions that meet the needs of Malaysian families. Addressing this gap is crucial to ensure that technology-based interventions are effectively integrated into therapy and daily routines for children with ASD. To bridge the gap, this study is designed to answer the following research question: How is parents' receptivity towards technology-based interventions for children with ASD shaped in Malaysia? By providing empirical evidence on these factors, the study aimed to inform the development of technology-based interventions that are more accessible, user-friendly, and responsive to the needs of parents of children with ASD.

MATERIALS AND METHODS

Study design

A phenomenological qualitative design was employed to address the objective of this study. A qualitative design offers an in-depth understanding of phenomena by exploring the underlying reasons behind observations, assessing complex interventions, and focusing on their improvement (26). This design allows the exploration of underlying reasons for parents' attitudes and perceptions towards technology-based interventions, resulting in rich and contextualized data, which is essential for developing interventions that address the parents' needs and preferences. Focus group discussions (FGD) were chosen to explore the receptivity of parents towards the use of technology-based interventions among children with Autism Spectrum Disorder (ASD). It is useful for understanding a target group's experiences and perceptions regarding an idea, an issue, or a phenomenon (27). According to Hennink & Kaiser (28), a common starting point is three to six FGD, each with six to twelve participants to reach data saturation. This range provides a balance between obtaining rich data and practicality (28). A total of thirty participants in five focus groups were recruited in order to reach data saturation for this study.

Ethical approval from the ethical review committee of Universiti Teknologi MARA (UiTM) was obtained

(REC/09/2023 (PG/MR/366)). The purpose, procedure, and study risks were explained to the participants and stated in the subject information sheet and consent form. The anonymity and confidentiality of the participants will be guaranteed.

Participants

Participants consisted of thirty parents of children with ASD divided into five focus groups. They were recruited using purposive sampling in which they will be included if; (i) they are parents or caregivers of children with ASD aged between three and nine years old and (ii) they can communicate and understand English or Malay. Parents of children with ASD were excluded if; (i) their child had been diagnosed with multiple underlying conditions such as seizures, attention deficit hyperactive disorder and other neurodevelopmental disorders. Verification of ASD diagnosis was obtained through parents' reports, and all children had a confirmed diagnosis established by a qualified healthcare professional, such as a paediatrician, child psychiatrist, or clinical psychologist.

A strategic recruitment approach was employed to maximize participant recruitment and ensure a diverse sample. This involved online recruitment through social media platforms, including targeted advertisements and posts in relevant groups, and dissemination of targeted email invitations to the local Community-Based Rehabilitation (CBR) centres and the National Autism Society of Malaysia (NASOM). Recruitment materials comprised a brief study information, eligibility criteria, and contact information for inquiries. Informed consent was obtained prior to participation.

Procedure and Data Collection

Participants who agreed to participate and fulfilled the inclusion criteria of this study were recruited. They were given the information about the study and consent form before the focus group discussion. Then, the selected participants were put together through a moderated focus group discussion. The first author (Master's degree holder) led the conversations while the second, third, fourth, fifth and sixth authors participated as observers and reflected on points that the first author might have forgotten to mention.

The focus group discussions were guided by a pilot-tested semi-structured interview guide consisting of open-ended questions about parents' receptivity towards technology-based interventions. The interview was conducted at the participants' preferred time and location. Examples of the open-ended questions are; "What are your initial thoughts and feelings about using technology-based interventions for your child with ASD?", "Can you share any positive experiences or outcomes you have observed or heard about from using technology-based interventions?" and "Are there any specific factors that make it difficult for you to use these interventions consistently?". All interviews, which

ranged from 45 to 60 minutes, were audio-recorded with participants' permission and transcribed verbatim before the analysis.

Data analysis

Data were analysed using qualitative thematic analysis with an inductive approach, in which the themes were not set in advance but progressively emerged during the analysis (29). Thematic analysis provides a highly adaptable approach that can be changed for the needs of studies, providing a rich and detailed description of data (29). It is a helpful technique for analysing various participants' points of view, emphasising similarities and differences, and summarising key elements of the data (29).

The original transcript containing the data was read repeatedly as part of the initial step of the analysis procedure. The second phase was de-contextualizing the data into meaning units, which involved marking and extracting relevant words and sentences from the text. The third step involved condensing and coding the meaning units while concurrently reading the original transcript to make sure its essential elements were intact, which is a crucial component of credibility. After that, the codes were carefully grouped during re-contextualization according to their similarities and differences. In order to ensure the trustworthiness of the interpretations, the researchers moved back and forth between the whole original text and its parts during the analysis process (29). Threads of meaning slowly emerged from the group of codes and developed into eleven sub-themes that were further interpreted and abstracted into four themes. To ensure credibility, all research team members reviewed the similarities and differences and agreed on how to code the same content. The codes, sub-themes, and themes were systematically discussed with all research team members, and a consensus was reached among the research group.

RESULTS

This study conducted five focus group discussions. Thirty parents of children with Autism Spectrum Disorder (ASD) were involved. Demographic information of the participants is shown in **Table I**.

The analysis identified four overarching themes related to the receptivity of parents towards the use of technology-based interventions for children with ASD: (i) attitudes, (ii) concerns, (iii) perceived benefits, and (iv) perceived barriers. Within these themes, several sub-themes emerged, highlighting the complexity of parents' perspectives. Attitudes toward technology-based interventions varied, with some parents expressing supportive attitudes, while others remained neutral. Parents' concerns on the use of technology-based interventions were primarily centred around the downsides of technology usage, and issues

Table I: Demographic Information of Participants

Participants	Gender	Age (year)	Educational Level	Work sector	Child's age	Child's gender
Focus Group Discussion 1						
P1	Female	35	Higher Education	Government	5	Male
P2	Female	32	Secondary School	Unemployed	6	Female
P3	Male	36	Higher Education	Government	5	Male
P4	Female	37	Higher Education	Unemployed	5	Male
P5	Male	36	Secondary School	Government	6	Male
P6	Female	57	Secondary School	Private	7	Female
Focus Group Discussion 2						
P1	Female	35	Higher Education	Government	3	Male
P2	Male	40	Secondary School	Private	4	Female
P3	Female	28	Primary School	Self-Employed	5	Male
P4	Female	32	Higher Education	Unemployed	6	Female
P5	Male	45	Higher Education	Government	7	Male
P6	Female	30	Secondary School	Private	8	Female
Focus Group Discussion 3						
P1	Male	40	Higher Education	Self-Employed	9	Male
P2	Female	38	Primary School	Unemployed	3	Female
P3	Male	33	Secondary School	Government	4	Male
P4	Female	27	Higher Education	Private	5	Female
P5	Male	42	Secondary School	Self-Employed	6	Male
P6	Female	34	Primary School	Unemployed	7	Female
Focus Group Discussion 4						
P1	Female	29	Higher Education	Government	8	Male
P2	Male	37	Higher Education	Private	9	Female
P3	Female	36	Primary School	Self-Employed	3	Male
P4	Female	31	Secondary School	Unemployed	4	Female
P5	Male	39	Higher Education	Government	5	Male
P6	Female	25	Higher Education	Private	6	Female
Focus Group Discussion 5						
P1	Male	41	Secondary School	Self-Employed	7	Male
P2	Female	33	Higher Education	Unemployed	8	Female
P3	Male	38	Primary School	Government	9	Male
P4	Female	27	Secondary School	Private	3	Female
P5	Male	38	Higher Education	Self-Employed	4	Male
P6	Female	26	Higher Education	Unemployed	5	Female

related to safety and privacy. Despite these concerns, parents acknowledged several perceived benefits, such as the potential for skill acquisition, the ability to tailor interventions to individual preferences, and the enhancement of intrinsic motivation in children. However, several perceived barriers were also noted, including challenges related to resource management, user experiences, lack of support and information, and technical difficulties. **Table II** shows the overview of themes and sub-themes in this study.

To support the emergence of these themes and sub-themes, direct quotes from participants are provided. Participant quotes are integrated throughout this analysis, providing rich and direct perspectives that illustrate the themes and sub-themes. These participant narratives serve to reinforce the qualitative findings and provide a deeper understanding of experiences and perceptions that shape parents' receptivity towards technology-based interventions.

Theme 1: Attitudes of parents on the use of technology-based interventions among children with ASD

Table II: Themes and Sub-Themes Emerged from the Analysis

Themes	Sub-Themes
Attitudes of parents on the use of technology-based interventions among children with ASD	Supportive attitudes
	Neutral attitudes
Concerns of parents on the use of technology-based interventions among children with ASD	Downsides of technology usage
	Safety and privacy of technology usage
	Acquisition of skills
Perceived benefits on the use of technology-based interventions among children with ASD	Ability to be tailored to the preferences of children
	Enhancing intrinsic motivations of children
	Resources management
Perceived barriers on the use of technology-based interventions among children with ASD	User experiences
	Lack of support and information
	Technical Challenges

The parents' receptivity to the use of technology-based interventions among children with ASD is influenced by their attitudes. This theme consists of two sub-themes: supportive attitudes and neutral attitudes.

Supportive Attitudes

The majority of parents were supportive of the use of

technology-based interventions among children with ASD because of the improvements they have seen in their children.

"In my opinion, I wholeheartedly support technology as a tool for my child's development. Interactive games have proven to be engaging and effective in facilitating my child's understanding and acquiring various skills essential to their developmental progress." (FG1, P6)

"I have had a positive experience with technology in treatment. My child has been using specific applications and games that have aided in his learning and development." (FG3, P5)

"I have experience with technology-based interventions. My child uses specialised applications to aid in learning and communication. I find it helpful in improving my child's language and communication skills." (FG4, P4)

Neutral Attitudes

However, there are some of the parents remained neutral on the use of technology-based interventions among children with ASD due to the effects of technology usage and the need for balanced use.

"I acknowledge the potential benefits of technology-based interventions for children with autism; however, I emphasise the importance of utilising them thoughtfully and not solely relying on technology for treatment." (FG1, P3)

"I agree with Participant 5. The use of technology needs to be balanced with opportunities for real social interaction. Children need to learn to interact with humans directly as well." (FG4, P6)

"I am concerned about the potential side effects of technology on my child. However, at the same time, I am open to trying anything that can help them." (FG6, P4)

Theme 2: Concerns of parents on the use of technology-based interventions among children with ASD

The receptivity of parents towards the use of technology-based interventions among children with ASD is influenced by their concerns of parents. This theme consists of two sub-themes: downsides of technology usage and safety and privacy of technology usage.

Downsides of technology usage

Most parents are concerned about the downsides of technology usage, such as addiction to technology, impacts on children's health and reduced social interaction.

"My worry lies in the possibility of my child developing

an addiction to screen time." (FG1, P1)

"I am concerned about the potential side effects that may arise from using this technology, such as vision problems or addiction to electronic devices." (FG3, P5)

"I am also worried about the potential for excessive use of technology that isolate children with ASD from real social interactions and disrupt their development of social skills." (FG4, P2)

Safety and privacy of technology usage

Besides that, parents are also concerned about the safety and privacy of technology usage, such as the suitability of contents and protection of personal data.

"I am particularly concerned about the access my child has on the device and the possibility of encountering inappropriate and unsuitable content." (FG1, P5)

"One of my concerns is regarding data security. Many applications require personal information about my child, and I worry if that information is not adequately protected." (FG2, P3)

Theme 3: Perceived benefits on the use of technology-based interventions among children with ASD

The parents' receptivity to use technology-based interventions among children with ASD is also shaped by perceived benefits. This theme consists of three sub-themes: acquisition of skills, ability to be tailored to children's preferences, and enhancing intrinsic motivations of children.

Acquisition of skills

Parents perceive multiple benefits from using technology-based interventions, including the acquisition of skills such as social and communication skills and functional skills.

"In my opinion, technology-based treatment can overcome communication barriers. My child uses a technologically-assisted communication device, which greatly helps him interact more effectively and expressively." (FG2, P5)

"In my opinion, I believe that technology-based interventions can be beneficial such as in teaching activities of daily living skills, as they offer a more visual approach." (FG1, P5)

Ability to be tailored to children's preferences

Other than that, parents perceive that technology-based interventions are beneficial because they can be tailored to children's preferences based on their needs and interests.

"I agree with Participant 1. Technology-based interventions can be tailored to individual needs,

allowing for a more personalised and effective approach in helping autistic children manage symptoms and reach their maximum potential." (FG6, P2)

"I agree that technology-based interventions are highly beneficial, as children are more drawn to visual and interactive approaches." (FG1, P6)

Enhancing intrinsic motivations of children

Parents also perceived that technology-based interventions are beneficial in enhancing intrinsic motivations of children because it creates enjoyable learning experience and support learning opportunities. "In my opinion, technology-based interventions provide a more enjoyable way of learning. It reduces stress and allows my child to learn in a comfortable environment at their own pace." (FG2, P2)

"Indeed. Technology-based treatment opens doors to various learning and growth opportunities for children with autism. With ongoing technological support, they can develop the skills needed to function more effectively in society." (FG5, P6)

Theme 4: Perceived barriers on the use of technology-based interventions among children with ASD

Parents' willingness to adopt technology-based interventions for children with ASD is shaped by perceived barriers. This theme consists of four sub-themes: resource management, user experiences, lack of support and information, and technical challenges.

Resource management

Parents ruled out a few barriers, including resource management issues such as the high cost of technology and time constraints.

"One of the challenges I face is the high cost of acquiring quality devices or applications. There are many options on the market, but not all of them are affordable for us." (FG2, P1)

"For me, time constraints are also a challenge. Parents may not have enough time to learn new technology or to manage their child's use of technology effectively." (FG3, P3)

User experiences

Besides, components of user experiences comprised of technology accessibility, suitability, data safety, and privacy are other barriers that influence parents' receptivity to the use of technology-based interventions.

"Accessibility limitations are also a challenge. Not all places or institutions provide access to the necessary technology, and this can be a barrier to implementing treatment." (FG2, P5)

"I find it challenging to choose the right applications or

devices that meet my child's needs. There are so many options on the market, and finding the most suitable one can be complicated." (FG4, P3)

"I agree with Participant 1. Additionally, concerns about safety and privacy can also be a challenge. Parents may worry about the risks of using technology and its impact on their child's privacy." (FG3, P2)

Lack of support and information

Parents also reported on the lack of support and information on the technology is one of the barriers towards the receptivity of technology-based interventions.

"The lack of support or training in using technology can also be a challenge. Parents might need additional guidance and support in integrating technology-based treatment." (FG3, P4)

"In my opinion, one of the main challenges is the lack of knowledge and expertise in using the technology. Many parents may not have sufficient background or experience in using the appropriate applications or electronic devices." (FG5, P1)

Technical challenges

Furthermore, parents conveyed technical challenges as barriers they might face when implementing technology-based interventions. Technical challenges include installing and maintaining applications and devices, compatibility and connectivity issues, and technical proficiency.

"I often struggle with installing or configuring apps or devices. I am not very tech-savvy, so I sometimes get stuck when trying to solve technical issues." (FG2, P2)

"Additionally, compatibility between the devices or applications and the existing devices at home can also be an issue. Sometimes, an application might not be compatible with our operating system or devices." (FG4, P5)

"For me, the difficulty in understanding and using technological applications or software is a significant challenge. Some applications may require a high level of knowledge or skills to be used effectively." (FG3, P3)

DISCUSSION

This study aims to understand the receptivity of technology-based interventions among parents of children with autism spectrum disorder (ASD) in Malaysia. The findings reveal that parents' receptivity is shaped by four primary themes: (i) attitudes, (ii) concerns, (iii) perceived benefits, and (iv) perceived barriers. These results provide deeper insight into parents' receptivity to adopt technology-based interventions.

Findings showed that parents are more supportive towards technology-based interventions when they have observed the improvements made by their children or if they have heard from others in their community about its benefits. This is consistent with the study that stated parents were more inclined to embrace such interventions when there is a broader adoption of technology aimed at ASD from passionate parents (30). It is highlighted that parents who had experiences with technology-based interventions are more favourable towards the use of technology among children with ASD (30). Parents also reported positive feedback about their perceived interest and accessibility in using technology-based intervention, which is video modelling (VM), to develop self-help skills in children with ASD (31). They are willing to learn about VM and believe that it will improve their children's skills (31).

However, some parents maintained a neutral attitude towards technology-based interventions in general, emphasizing the importance of a balanced approach when providing interventions to children with ASD. This aligns with the integration of technology into the conventional therapeutic approach for children with ASD, which parents find more acceptable compared to completely technology-based interventions (32). Besides, the effects of technology usage on their children are other factors that resulted in neutral attitudes. The lack of study on the long-term effects of technology on children with ASD should be explored further to fully understand the factors that make parents more vulnerable to adopting the use of technology (30).

The receptivity of technology-based interventions is influenced by parents' concerns about its use. Most parents are concerned about the adverse effects of technology usage, which is addiction to technology. It is one of the main issues associated with long screen time, especially for children with ASD, who are more attracted to screens (33). Another parent's concern is the impact on children's eye health from the long usage of technology. It is stated that the negative side effect of screen time on vision is that children are at a higher risk of developing myopia (34). Furthermore, parents are also concerned about the reduced social interaction if children with ASD become dependent on technology. It is emphasised that although technology-based interventions are engaging for users to learn social interaction skills, it is still not a replacement for real-life human interaction for children with ASD (34). Lastly, parents' concern with technology is the safety and privacy of their children. The possibility of children encountering inappropriate content online is another worrying aspect for parents. Research has shown that children are particularly vulnerable to exposure to harmful content (35). Technology-based interventions pose potential risks such as exposure to unregulated content, data privacy breaches, and overstimulation from immersive environments (35,36). Therefore, it is crucial for technology developers to implement strong privacy

and security measures, such as parental controls, content filtering, ad-free platforms, secure authentication, and human supervision, to prevent misuse and ensure a safer digital environment (32,36).

Findings reported that parents perceived skills acquisition as one of the benefits of technology-based interventions. Social and communication skills can be taught through well-designed technology. A study proved that technology-based intervention using Android tablets has improved social interaction skills for children with ASD (35). Parents conveyed that functional skills for daily activities are one of the benefits of technology. Technological devices such as iPads and other portable devices have been proven to teach functional daily living skills to children with ASD (37). Furthermore, parents perceived that technology's ability to be flexible and tailored to the needs and interests that are unique to each child is advantageous. Given that technology is a diverse platform, it can be customised to each child's needs while incorporating exciting effects for a higher level of personalisation (30). However, for optimal effectiveness, technology should be integrated with human support, including parental guidance, therapist interventions, and structured real-world applications that reinforce learning beyond digital platforms (30).

Parents also stated that technology-based interventions can enhance intrinsic motivations by creating an enjoyable learning experience and supporting learning opportunities. Putnam et al. (30) supported the importance of pleasant experiences with technology for their children with ASD. Intrinsic motivation is enhanced through engaging, interactive, and personalized technology experiences that encourage active participation (30). These elements help sustain motivation without the need for external reinforcement (30). It is also highlighted that the flexibility of technology to alter the complexity level and repetition of tasks is important to provide supportive learning opportunities to children (38). Adaptive learning platforms can provide personalized content and challenges, ensuring that children are appropriately engaged and motivated (39).

This study showed different barriers influencing the use of technology-based interventions among parents of children with ASD. Parents reported a few barriers, including resource management, such as the high cost of technology and time constraints to use technology-based interventions. Financial constraints greatly limit the implementation of technology-based interventions. It emphasises the financial burden that parents of children with ASD face, which includes medical costs, non-medical costs, developmental costs, and indirect costs (40). Time constraints are another barrier to the implementation of technology-based interventions. It is found that parents frequently need help finding time to engage in telehealth programs, which limits their ability to participate fully (41).

Components of user experiences comprised of accessibility of technology, suitability of technology and data safety and privacy are other barriers that influence the receptivity of parents to the use of technology-based interventions. Access to technology is a major barrier, especially in rural areas. It is reported that parents who lack access to technology may be unwilling to participate in technology-based interventions (42). Concerns regarding data security and privacy serve as significant barriers. It is stated that data safety and privacy concerns may discourage parents from implementing technology-based interventions (43). This highlights the necessity of parental support and training in selecting suitable technology for their children (19). Proper training equips parents to identify and implement appropriate interventions effectively. Parents also highlighted the need for greater support and information, as the lack of these resources remains a barrier to adopting technology-based interventions. Adequate training and assistance are crucial for the successful implementation of such interventions. Emphasising comprehensive training ensures that participants can effectively utilise the technology (44).

Technical challenges include installation and maintenance of application/device, compatibility and connectivity issues, and technical proficiency are other barriers parents highlight. Device compatibility is a major issue. It is stated that older devices may not be compatible with current applications (44). Thus, it is vital to provide directions and instructions adapted to the user's device. Unstable internet connections can reduce the efficacy of technology-based interventions. It was discovered that poor internet quality was a frequent challenge pointed out by parents (45). The coverage of the internet services or the unstable internet may cause the participants to face this technical challenge. A lack of technical support might restrict parents from effectively implementing technology-based interventions. Mois et al. (44) emphasised the need for accessible assistance in troubleshooting issues.

The findings of this study provide a further understanding that directly addresses the existing gap in the literature regarding Malaysian parents' receptivity to technology-based interventions for children with ASD. Unlike previous research that primarily focused on global perspectives, this study offers a localized understanding of the key elements that shape parents' receptivity, including attitudes, concerns, perceived benefits, and barriers. By clarifying these factors, the results not only validate previous findings on parents' receptivity but also extend the knowledge by highlighting context-specific challenges and facilitators unique to Malaysian families. This study may inform the development of more accessible, user-friendly, and culturally relevant technology-based interventions, ensuring their successful integration into therapy and daily routines for children with ASD in Malaysia. These insights

provide a foundation for future intervention design, policy development, and further research focusing on enhancing the adoption and effectiveness of technology-based interventions for children with ASD.

Limitations and recommendations for future study

While this study provides valuable insights into Malaysian parents' receptivity to technology-based interventions for children with ASD, some limitations must be acknowledged. Using a qualitative phenomenological approach allowed for rich, in-depth perspectives but limited the generalizability of the findings to broader populations. Future research could benefit from quantitative or mixed-method approaches to validate these findings across a larger and more diverse sample. Additionally, this study focused solely on parents' perspectives without incorporating insights from children, therapists, or educators, who also play a crucial role in implementing technology-based interventions. Future studies should adopt a multi-stakeholder approach to obtain a more comprehensive understanding of the barriers and facilitators influencing the use of technology-based interventions. By addressing these limitations, future research can contribute to the development of more inclusive, effective and widely applicable technology-based interventions for children with ASD.

CONCLUSION

This study concluded that parents' attitudes towards technology-based interventions were supportive but were hindered by their concerns regarding the adverse effects of technology and the safety and privacy issues. Parents perceived multiple benefits of technology-based interventions, including skills acquisition, the ability for technology to be tailored to children's preferences and the enhancement of intrinsic motivation. However, parents also perceived that the barriers to adopting technology-based interventions are closely linked to resource management, user experiences, support and technical challenges.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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