The Effectiveness of an Online Training Program in Increasing Awareness Among Mothers of Children with Autism Spectrum Disorder in the Kingdom of Saudi Arabia

فاعلية برنامج تدريبي عبر الإنترنت في زيادة الوعي لدى أمهات الأطفال ذوي اضطراب طيف التوحد في المملكة العربية السعودية

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Abstract:

There is limited research regarding Autism Spectrum Disorders (ASD) within the Kingdom of Saudi Arabia. This suggests a limited understanding of ASD, which may promote the acceptance of practices that are not research-based. This study aimed to assess the effectiveness of culturally appropriate educational training program in enhancing Saudi female caregivers' awareness of ASD. The online, group-based training sought to provide information regarding ASD, including its causes, symptomatology, misconceptions, and how to locate and access available services. In addition, an overview of the foundational, evidence-based interventions that emerged from the principles of Applied Behaviour Analysis (ABA) was provided. The study used a one-group pretest–posttest experimental design to assess changes in awareness of ASD after engaging in the online training. Pre-test results indicated some misinformation regarding the causal factors of ASD. Additionally, mothers showed a lack of knowledge of ASD evidence-based interventions and experienced difficulties locating and accessing ASD services. Furthermore, their decisions were often based on inaccurate information, making it difficult to source effective support. However, post-test results indicated an increase in participants' awareness of ASD. The programme procedures were presented and discussed, including suggestions for culturally appropriate content and the identification of possible barriers of implementation. Limitations of the study and future research directions were discussed.

Keywords: Autism Spectrum Disorders, Online Parental Training, Kingdom of Saudi Arabia.

الملخص:

يوجد أبحاث محدودة حول اضطراب طيف التوحد في المملكة العربية السعودية، مما يشير إلى وجود فهم محدود لهذا الاضطراب، وقد يؤدي ذلك إلى قبول ممارسات غير قائمة على البحث العلمي. هدفت هذه الدراسة إلى تقييم فعالية برنامج تعليمي ملائم ثقافيًا في تعزيز وعي مقدمات الرعاية السعوديات حول اضطراب طيف التوحد. سعى البرنامج التدريبي إلى تقديم معلومات حول اضطراب طيف التوحد، بما في ذلك أسبابه، وأعراضه، والمفاهيم الخاطئة المرتبطة به، وكيفية تحديد الخدمات المتاحة والوصول إليها. بالإضافة إلى ذلك، تم تقديم نظرة عامة على الممارسات المستندة إلى الأدلة العلمية، والتي تعتمد على مبادئ تحليل السلوك التطبيقي. استخدمت الدراسة تصميمًا تجريبيًا يعتمد على اختبار قبلي وبعدي لمجموعة واحدة لتقييم التغيرات في الوعي باضطراب طيف التوحد بعد المشاركة في البرنامج التدريبي. أظهرت نتائج الاختبار القبلي وجود بعض المعلومات الخاطئة فيما يتعلق بالعوامل المسببة لاضطراب طيف التوحد. أظهرت الأمهات نقصًا في المعرفة بالتدخلات القائمة على الأدلة الخاصة باضطراب طيف التوحد وواجهن صعوبات في تحديد خدمات اضطراب طيف التوحد والوصول إليها. علاوة على ذلك، استندت قراراتهن بشأن التدخلات العلاجية إلى معلومات غير دقيقة، مما جعل الحصول على الدعم الفعال أمرًا صعبًا. ومع ذلك، أظهرت نتائج الاختبار البعدي تغييرًا مهمًا في وعي المشاركات باضطراب طيف التوحد. تم عرض ومناقشة إجراءات البرنامج، بما في ذلك الاقتراحات الخاصة بتطوير محتوى مناسب ثقافياً، والعوائق المحتملة التي قد تواجه الأمهات أثناء تنفيذ البرنامج. كما تمت مناقشة حدود الدراسة والاقتراحات للبحوث المستقبلية.

الكلمات المفتاحية: اضطرابات طيف التوحد، تدريب الوالدين عبر الإنترنت، المملكة العربية السعودية.

Introduction

Parents are responsible for supporting their children and ensuring that their physical, emotional, and educational needs are met to help promote positive present and future outcomes (Sim et al., 2017). However, for parents of children with special needs, these responsibilities can be more challenging and create high level of stress for parents; this is especially true for families which include children diagnosed with Autism Spectrum Disorders (ASD) (Dieleman et al., 2018). Children with ASD often have significant impairments in communication and social skills, and restrictive and repetitive patterns of behaviour or interests throughout their lives (American Psychiatric Association, 2013). These impairments pose challenges across various aspects of a child's life, including their school, family, and community (Klaiman et al., 2015). The efforts of families raising children with ASD can be stressful and may negatively impact all aspects of their lives, including marital relationships, employment, and mental health (Likhitweerawong et al., 2020; Pearson & Meadan, 2018). For instance, research has linked high levels of parental stress because of inadequate ASD services with a lack of confidence in their ability to manage challenging child behaviours (Sim et al., 2017). Families worldwide have similar perceptions, experiences, and challenges, often leaving the needs of their children with ASD unmet (Alotaibi & Almalki, 2016; Jafarabadi et al., 2021; Marsack-Topolewski et al., 2020).

The worldwide scarcity of research-based, culturally appropriate resources and services to support children with ASD and their families has been recognized as a human rights concern by the World Health Organization (2014). This issue is even more severe in low-resource countries, where the lack of available services is particularly acute. When families must search for information and services independently, they are more likely to be exposed to inaccurate information and stereotypical myths (Barrio et al., 2019). However, the majority of ASD research and the subsequent provision of services addressing critical issues, such as ASD prevalence,

symptoms, and evidence-based interventions, have primarily taken place in Westernized countries with greater available resources (Lee & Meadan, 2021; Rice & Lee, 2017). Ensuring that research-based, culturally appropriate resources for children with ASD and their families are accessible across all countries and regions is essential to providing adequate support for both children with ASD and the families who care for them.

Autism Research in Saudi Arabia

ASD research is scarce within Saudi Arabia, which often leads to an inadequate understanding among families of children with ASD regarding its prevalence, causes, and management (Alnemary, 2017; Alrajhi, 2021; Kelly et al., 2016). However, misinformation—often influenced by cultural or religious beliefs and practices—can contribute to the acceptance and use of ineffective, non-research-based treatments and interventions for children with ASD (Alnemary, 2017). Common treatments sought include visiting traditional or religious healers, and diet-based therapies such as consuming honey, camel milk, vitamins, and dietary supplements (Klein & Kemper, 2016). In addition to potentially harming a child's well-being, these practices may hinder the acceptance of appropriate, evidence-based interventions. There is an urgent need for expanded, high-quality community resources to provide effective ASD services, including parental support, to enhance the quality of life for families (Alrajhi, 2021). Research demonstrates that when families have accurate perceptions and a clear understanding of the causes and effective treatments for ASD, they are more likely to seek out research-based interventions and accept support for their children (Kuravackel et al., 2018; Lee & Meadan, 2021). Therefore, appropriate and accurate parental education regarding the causes and symptomatology of ASD is essential for parents to effectively support their children's well-being (Oliver, 2018).

Parent training was proposed by Lovaas (1987) more than three decades ago as an effective way to support families and their children with ASD. Since then, the effectiveness of parent training in supporting children with ASD has been widely investigated (O'Donovan et al., 2019; Parsons et al., 2017). Substantial evidence indicates that

parents can successfully implement various ASD interventions with high fidelity, leading to positive behavioral outcomes in children (Akhani et al., 2021; Mueller & Moskowitz, 2020). Parent training is crucial because it extends beyond the educational setting, providing continuous support for children in their natural environments (Kuravackel et al., 2018). Furthermore, empowering families through effective training—which enables them to both understand ASD and provide appropriate support—has been shown to yield positive outcomes for families, such as increased self-efficacy and reduced stress (Iadarola et al., 2018; Leaf et al., 2018).

Culturally Appropriate Parental Training

Research conducted over the past decade suggests that, although there has been a focus on assessing the needs of families of children with ASD (Alallawi et al., 2020; Alnemary et al., 2017; Kelly et al., 2016), awareness of the disorder remains limited, evidence-based interventions are scarce, and there is an insufficient number of practitioners. This makes it difficult for families to receive appropriate training and support (Alnemary et al., 2017; Kelly et al., 2016). Furthermore, most parent training programs for families of children with ASD have been developed in Western countries, making it challenging to generalize them across diverse cultures (Barrio et al., 2019). Supporting families through culturally appropriate training and interventions increases the likelihood of correcting misconceptions about ASD and reduces reliance on non-evidence-based interventions. In this study, adaptations were made to the educational training in terms of content, method of delivery, and scheduling to align with the culture and lifestyle of the family. For instance, all instructional materials were presented in Arabic, and all pictures included in the materials were culturally sensitive. This included depicting individuals in traditional clothing, alongside familiar food and other culturally and/or religiously acceptable items. Additionally, both the trainer and participants were female, as this aligns with cultural norms within the Saudi context.

Effects of Covid-19 and Online Parental Training

Globally, families of children with ASD face challenges in accessing high-quality ASD services due to the disparity in available resources across countries. Their need for greater support has increased, particularly following the reduction in available services during the COVID-19 pandemic (Baweja et al., 2021). Nevertheless, families of children with ASD remain responsible for their care and must continue to seek ASD services even during crises. This ongoing responsibility has resulted in a scarcity of economic and emotional resources, increased stress, and social isolation (Althiabi, 2021; Baweja et al., 2021). Providing parental training through web-based technologies has proven to be an effective approach in addressing the unmet needs reported by families of children with ASD (McGarry et al., 2019; Tran, 2018). This online training can be highly beneficial when developing support systems to help families overcome common barriers, such as lack of transportation, or access to services in remote areas (Ferguson et al., 2022; Little et al., 2018). Additionally, delivering online training and support is generally cost-effective, allowing greater access to services that benefit both families and their children (Salomone & Arduino, 2017). Furthermore, providing culturally appropriate parental support and training through home-based or electronic communication methods has proven to be effective during the pandemic and should be considered for future implementation (Baweja et al., 2021). To address the unavailability of ASD services and ensure that children with ASD continue receiving support during future emergencies, long-term strategies must be developed to integrate accessible and sustainable digital solutions into ASD service delivery.

Problem of Study

ASD presents significant challenges for both children and their caregivers, particularly mothers, who play a crucial role in raising their children (Alallawi et al., 2020). Many mothers of children with ASD experience limited access to evidence-based educational resources, lack of professional guidance, and emotional stress due to inadequate support systems (Dieleman et al., 2018). Traditional in-person training programs are often inaccessible due to geographical, financial, and time constraints, making it difficult for mothers to acquire the necessary knowledge and skills to support their children effectively (Jafarabadi et al., 2021). For example, families of

children with ASD face challenges; however, the needs are particularly urgent in regions with limited access to research-based services and trained professionals, such as Saudi Arabia (Babtain et al., 2016). The emergence of online group-based educational training offers a potentially effective alternative to address these challenges especially during Covid-19 (Baweja et al., 2021). Online training can provide flexibility, accessibility, and professional support, allowing mothers to enhance their knowledge of ASD, intervention strategies, and available resources (Ferguson et al., 2022). Furthermore, families have the right to access research-based support that aligns with their cultural and religious beliefs (Blake et al., 2017).

However, despite the growing use of online educational platforms, limited research exists on the effectiveness of such programs in improving mothers' awareness, confidence, and practical application of ASD-related knowledge. According to research conducted by Alotaibi and Almalki (2016) on mothers of children with ASD in Saudi Arabia, mothers often struggle to understand how to access appropriate resources and services to support their children. This poses a significant challenge, as mothers may be more likely to make uninformed decisions regarding appropriate services and become vulnerable to the influence of practitioners with insufficient expertise in this area. Providing appropriate training and evidence-based information can increase mothers' awareness and help reduce the use of non-evidence-based interventions and treatments (Klein & Kemper, 2016). Furthermore, mothers who understand what services are available and know their children's rights are better positioned to advocate for their children. This study seeks to examine the effectiveness of an online group-based educational training program designed specifically for mothers of children with ASD. The research assessed whether participation in such a program leads to increased awareness, understand how their children can be correctly diagnosed and which types of treatment, and improved utilization of ASD support services. By addressing this research gap, the study aimed to provide empirical evidence on the potential benefits of online group-based educational training.

Purpose of Study

This study aimed to evaluate the effectiveness of culturally appropriate, electronically delivered parental training for Saudi female caregivers in improving their understanding of ASD symptomatology and causes and their ability to access appropriate support for their child and family. It is crucial to determine whether well-designed, home-based training programs that consider the specific characteristics of the family and community can provide a viable method for professionals to assist families (Wakeford, 2017). Families of children with ASD who have an accurate understanding of the disorder, can access appropriate services, and understand effective strategies to address their children's needs may experience an improved quality of life for both themselves and their children (Iadarola et al., 2018; Kuravackel et al., 2018).

Method

Research Design

This study used a one-group pre-test–post-test experimental design to assess changes in participants' awareness of ASD before and after attending an educational training program. The pre-test established a baseline measure of participants' awareness of ASD, while the post-test evaluated the impact of the intervention. A mixed-methods approach was employed, integrating both quantitative and qualitative data to provide a comprehensive understanding of the research questions. This approach allowed for a thorough analysis of participants' learning experiences and the effectiveness of the educational training (Johnson et al., 2007).

Before the training, participants completed a demographic questionnaire to ensure they met the study criteria (Ferguson et al., 2022; Leach, 2012; Shindorf, 2019). The survey was adapted from previous studies to align with the content presented in the educational training (Alnemary, 2017; Stone, 1987). Survey questions were administered both pre- and post-intervention to assess changes in participants' perceptions in three key areas: Causes and symptomatology of ASD, Community ASD resources and services, ASD treatments. The survey included 16 questions in three formats: a) Multiple choice, b) True or false, c) Yes or no, with space for further explanation. *See Table 1 for more information.*

Table 1

The Pre and Post-Test Survey

Questions	
Multiple Choice	1-Which of the following is the cause of autism?
	2- How can autism be diagnosed?
	3- What treatment do you think your child would benefit most from?
	4-What do you think is the best resource for information about autism?
True and False	5- Individuals with autism do not make eye contact.
	6- Autism is a developmental disorder.
	7- Autism affects boys more than girls.
	8- The prevalence of autism is higher among families who have lower socioeconomic status.
	9-Autism is a communicable disease.
	10- Autism symptoms are very different among individuals with autism.
	11- All individuals with autism are talented.
	12- There is one treatment to "cure" all individuals with autism.
	13-All individuals with autism are nonverbal.
Yes and No with Explanation	14- Do you think you are responsible for your child's condition? If yes, please explain
	15- Do you know the rights of a child with disabilities and their family according to Kingdom of Saudi Arabia special education laws?
	16- Are you confident in your ability to help your child?

Recruitment and Ethical Considerations

The participants were recruited through a public organization that provides services for children with ASD and their families in an under-resourced area of Saudi Arabia. This study was part of a broader research project that had previously obtained ethical approval (HRE2020-0386). Since one of the study's objectives was to assess the cultural appropriateness of the training within the Saudi Arabian context, only mothers who were Saudi Arabian citizens or long-term residents were contacted and invited to participate. All mothers who responded were provided with detailed study information, including a description of the training, time commitment, responsibilities, and potential benefits, enabling them to make an informed decision about their participation.

Participants

The participants met the study's eligibility criteria, which included: 1) Saudi females, 2) Long-term female residents with children with ASD, and 3) Mothers who had not previously received parental training regarding ASD. These inclusion criteria were specifically developed for this study to control study variables and accurately measure the effectiveness and cultural appropriateness of the training.

Participant Characteristics

The participants (n = 15) who enrolled in the study responded to a demographic questionnaire administered by the researcher via telephone. The results indicated that all participants (female primary caregivers of children with ASD) ranged in age from 25 to 44 years old, with varying education levels: Elementary school completion (n = 3), High school completion (n = 4), Bachelor's degree (n = 7), Postgraduate diploma (n = 1). Additionally, the self-reported economic status of the participants ranged from low to moderate income levels.

Measures and Procedure

Pre- and Post-Test

Before beginning the training, participants were asked to complete an online survey to assess their knowledge and understanding of ASD. The survey, presented in Arabic, the participants' native language, consisted of 16 questions and took approximately 30 minutes to complete. The same survey was administered again after the training to measure changes in participants' knowledge and perceptions.

Barriers and Support

Consideration of environmental and cultural factors was essential to ensure effective participant engagement (Blake et al., 2017). The training was delivered in an online, group-based format via the Zoom® platform, with session timings negotiated among the group to accommodate participants' schedules. This online format helped overcome potential barriers related to transportation. Furthermore, face-to-face training was unlikely to be successful, as the training took place during the COVID-19 pandemic.

Another barrier was the participants' varying levels of confidence and competence in using technology. Some participants lacked the knowledge and skills to operate devices or software for online training. To address this, additional individual tutorials were provided to support participants (n = 6) in correctly downloading and using Zoom®. These tutorials were conducted by the researcher via mobile phone and WhatsApp® calls or messages, as needed. Although customs and practices vary among families and locations in Saudi Arabia (KSA), gender segregation is commonly observed in many remote areas. Given this cultural context, it is important to note that in this study, which was part of a larger research project, both the participants and the trainer (researcher) were female. This was particularly relevant for the next phase of the training, which involved individualized training within the home. Some participants may not have been comfortable working with a male trainer, especially in their private household settings.

Content of Educational Training

The researchers developed educational training materials based on the needs of families of children with ASD in Saudi Arabia (KSA). Previous research has indicated that these families experience three primary challenges: Lack of understanding of ASD, difficulties managing their children's disorders, limited access to available ASD services (Alotaibi & Almalki, 2016; Alrajhi, 2021). To address these issues, the educational sessions provided relevant information and facts about ASD, including its causes and symptoms (American Psychiatric Association, 2013), as well as specific evidence-based interventions. Among these interventions, mothers were introduced to the principles of Applied Behavior Analysis (ABA), which support the management of challenging behaviors (Leach, 2012). Additionally, mothers received guidance on myths and common misconceptions about ASD and were taught how to locate local resources to support their child and family. See Table 2 for more details on session content.

Table 2
Training Session Content

Session	Content	Corresponding pre and post questions
Session 1	Introductions, training overview. Autism causes, symptoms, and prevalence	1, 5, 6, 7-11, 14
Session 2	Importance of early intervention using evidence-based behavioural interventions.	2, 3, 12
Session 3	Laws, regulations, and rights of individuals with disabilities in Saudi Arabia. Availability and accessibility of ASD services.	4, 15
Session 4	Overview of Applied Behaviour Analysis (ABA) principles.	2, 3
Session 5	Strategies to support appropriate behaviour, including daily/visual schedules.	3, 12
Session 6	Reinforcement: identification and use of appropriate reinforcers	3, 12
Session 7	Planned ignoring: appropriate use for non-aggressive behaviours.	3, 12
Session 8	Compliance: compliance strategies to increase cooperative behaviours.	3, 12
Session 9	Task analysis to increase self-care skills.	3, 12
Session 10	Data collection methods: using data to guide instruction.	3, 12

Structure of Training Sessions

The training was conducted over two weeks, consisting of 10 sessions, each lasting approximately one hour, for a total of 10 hours of training. All participants (n = 15) completed the full 10 hours; however, there were occasional absences in individual sessions due to family schedules, doctor appointments, or other unexpected circumstances. In such cases, the trainer arranged individual make-up sessions to ensure all content was delivered to all participants. The purpose of the first session was to allow the trainer and participants to introduce themselves and gain an understanding of the training, including the content to be covered and the expected benefits for their children and themselves. The remaining sessions were interactive, with the trainer presenting the session

topics using PowerPoint® slides, allowing opportunities for participant questions and discussions on related experiences. Each session concluded with interactive discussions, which served to clarify misconceptions and functioned as an informal session evaluation. These discussions also fostered collaborative peer-to-peer support by encouraging participants to share experiences and local resources. For sessions that included training on sourcing and utilizing specific resources, the trainer modeled how to find relevant links, complete required forms, and submit requests for information or services using the screen-sharing function. Additionally, the trainer incorporated video clips demonstrating key strategies—such as behavior management techniques—to facilitate participant engagement, questions, and discussion.

Results

This study aimed to determine whether culturally appropriate parent training, delivered through electronic means, can effectively support mothers of children with ASD. The findings revealed some misinformation regarding the causal factors of ASD. Additionally, mothers had limited knowledge of evidence-based ASD interventions and experienced difficulties locating and accessing ASD services. Post-test results indicated a notable increase in participants' awareness of ASD. *See Figure 1*

Figure 1
Participant Pre and Post-Test Survey
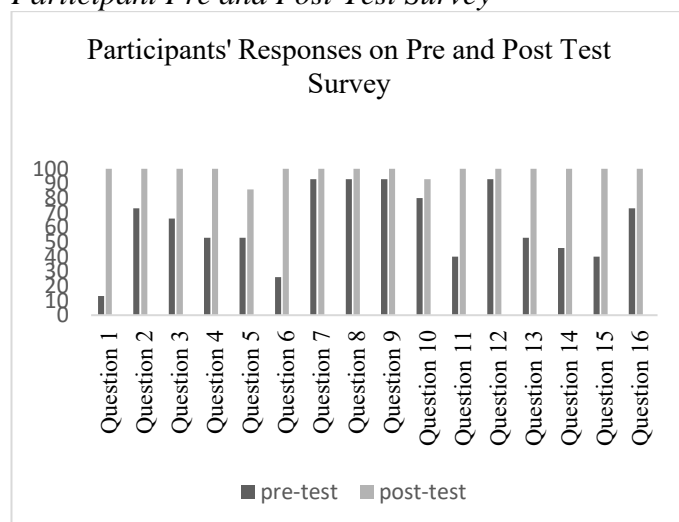
Causal Factors of ASD

Mothers of children with ASD need to have an accurate understanding of their child's condition

to provide effective support. Furthermore, if mothers do not understand the scientific causes of ASD, they may blame themselves or their actions and become more likely to seek out ineffective or even harmful practices (Alnemary, 2017). Overall, the mothers' pre-test responses indicated a general lack of understanding regarding the causes of ASD. Specifically, Questions 1, 6, 9, and 14 were designed to assess the mothers' understanding of ASD causality. Additionally, Questions 7 and 8 addressed the related issue of prevalence, asking whether mothers believed that: Autism is related to gender (Question 7) or autism is influenced by a family's socioeconomic status (Question 8)?

The mothers' responses, particularly to questions 1 and 6, indicated that they believed the causes of ASD were beyond their control or even a punishment for something they had done wrong, such as an act of God or allowing their children excessive screen time. The majority of mothers (73%) did not recognize ASD as a developmental disorder. However, in question 9, all but one (n = 14) correctly answered that ASD is not a communicable disease. A particularly concerning finding was observed in question 14. The mothers' responses were almost evenly split (n = 7 yes, n = 8 no) to the question: "Do you think you are responsible for your child's condition?" The mothers were further prompted to explain their reasoning. Those who answered "yes" provided responses that reflected a sense of guilt for their direct actions, such as: *"I did not take folic acid during pregnancy."* (Participant 4), "*I gave my child a vaccination.*" (Participant 9). Several responses also suggested feelings of inadequacy in their parenting skills, such as*: "I could not raise him."* (Participant 6), "*I have allowed my child to watch TV for a long time and neglected my child.*" (Participant 14), "I have allowed my child to watch TV." (Participant 15).

Regarding ASD prevalence, most participants (n = 14) answered "yes" to question 7, which asked if ASD is more prevalent in boys than in girls. However, most participants (n = 14) correctly understood that children from low socioeconomic backgrounds are not more likely to have ASD than those from higher socioeconomic backgrounds. The mother post-test responses are encouraging and indicate that the training effectively promoted significant changes in the understanding of the causes and prevalence of

ASD. The mothers responded 100% that ASD is a developmental disorder. It is caused by genetic and environmental factors, is not based upon gender or a family's socio-economic status and relinquished their guilt-inducing beliefs that their child may have ASD because of something they did or did not do.

Autism Symptomology

When mothers have a good understanding of the symptomatology of ASD, they can support their children, including making appropriate parenting and behavioral management decisions (Lee & Meadan, 2021). This may be because mothers with accurate perceptions of their child's progress and abilities have a clearer understanding of the diverse needs and capabilities of individuals with ASD (James, 2019). Furthermore, they are better informed about which specific ASD services their children may be eligible to receive and what types of programs would target specific symptoms of ASD. Evidence suggests that mothers who better understand ASD symptomatology and how to support their children are more likely to experience higher self-efficacy, improved mental health, and overall well-being (Iadarola et al., 2018; Lichtlé et al., 2020). The pre-post assessment included four questions designed to assess participants' perceptions and understanding of ASD symptomatology and its overall diversity. The questions targeted common misconceptions, including lack of ability to make eye contact (Question 5); The belief that all individuals with ASD have high levels of talent (Question 11); The misconception that all individuals with ASD are non-verbal (Question 13); The understanding that individuals with ASD exhibit diverse characteristics (Question 10).

Pre-test responses. indicated that most mothers understood the diverse nature of ASD, with 80% of participants (n = 12) correctly answering that "symptoms vary greatly among individuals with autism" (Question 10). However, their understanding of specific symptoms was less accurate. In three questions, responses were split, with approximately half answering correctly: 46% of mothers incorrectly believed that all individuals with ASD do not make eye contact. 60% of mothers answered "true" to the incorrect statement that all individuals with ASD are highly talented. 46% of participants believed that all individuals with ASD are non-verbal. Post-test

results demonstrated that the training effectively reduced misconceptions and misinformation. All mothers correctly answered Question 10, which addressed the diverse nature of ASD, and the percentage of correct answers for the three questions related to stereotypical ASD perceptions ranged from 86% to 100%.

Parental Ability to Identify and Source Community and Educational Resources

According to research conducted by Five questions were designed to assess mothers' perceptions about appropriate sources of information (Question 4), including diagnostic procedures (Question 2), effective treatment methods (Questions 3 & 12), and awareness of their child's rights (Question 15). Question 2 explored the appropriate method of diagnosis; in the pre-test, 73% of participants correctly responded that clinical observation is the best method of diagnosis, while 26% of the participants responded, "I don't know." Question 4 examined perceptions of the best sources of information about ASD. Only 53% of participants identified professionals as the best source, while the remaining responses were divided between the internet (26%) and other mothers (20%). Question 12, which addressed the heterogeneous nature of ASD, asked mothers to determine whether one treatment could be effective for all individuals with ASD. Only one mother answered incorrectly, while the majority (93%) correctly responded "false." However, responses to Question 3 were more concerning. When asked which treatment would be most beneficial for children with ASD: 66% of mothers chose behavioral therapies; 13% chose speech-language therapies; Two mothers listed camel milk as the best treatment; One mother identified the Quran as the most effective therapy for ASD. Additionally, Question 15 assessed mothers' knowledge of family and child rights under Saudi Arabia's special education laws. More than half (60%) of the mothers responded "no", indicating a lack of awareness regarding their legal rights and available support.

Post-Test Results. After the training, post-test results showed significant improvements in mothers' understanding of valid information sources and support services for their children. Responses to all five questions (2, 3, 4, 12, 15) were 100% correct. Finally, mothers were asked

about their confidence in supporting their children with ASD. In the pre-test, 73% of mothers expressed a positive response, but in the post-test, 100% of mothers stated they felt confident in effectively supporting their children. Overall, the mean of mothers' responses in the post-test was higher than in the pre-test. See Table 3 for more information.

Table 3
Comparison of Pre- and Post-Test Mean of Online-Based Educational Training Group

Group	Test	No.	Mean	Difference between Means	Variance	Pearson Correlation
	pre	15	9.375	5.4375	14.116 6667	
	post	15	14.8125		0.2958 3333	-0.0611675

Discussion

This study aimed to investigate the perceptions underlying the practices used by Saudi families with children with ASD and to provide them with educational training. When developing and delivering the online educational training, the culture and needs of Saudi families were carefully considered. As a result, virtual training for families of children with ASD was both effective and accessible. During the COVID-19 crisis, access to ASD services was limited, making online training a crucial support component. The findings of this study indicated a significant increase in participants' perceptions of ASD in the post-test compared to the pre-test after attending the educational training sessions. The outcomes of this study are encouraging, providing strong evidence that effective programs can be delivered to families online. However, future program developers should not overlook the importance of personalized, ongoing support from the trainer to families across various aspects, including technology use and continuous encouragement to stay engaged. Furthermore, peer social support provided through group training can be beneficial in multiple ways, including developing social networks for ongoing peer-to-peer support and enhancing families' overall mental health (Ault et al., 2021).

Several factors contributed to the successful completion of the study and influenced the participants' overall outcomes. This study was conducted during the COVID-19 pandemic, which posed many challenges for families, including limited availability of ASD services; Changes in healthcare service accessibility; Home lockdown conditions; Reduced social interaction; A cessation of global travel (Baweja et al., 2021). Although these challenges added stress and difficulties for families, they also served as motivation to engage and fully commit to the study activities, as there were few other available options. Similar to previous research findings (Ferguson et al., 2022; Little et al., 2018; Tran, 2018), online access to services and training proved to be a viable option for families of children with ASD living in rural areas. Additionally, it helped overcome barriers related to illness (e.g., COVID-19). Therefore, online, evidence-based training and interventions can be recommended for families in similar circumstances. However, it is important to acknowledge the significant role of trainer support in enhancing learning outcomes. Self-directed online training is unlikely to be as effective without ongoing guidance and interaction from a professional trainer.

Limitations and Implications for Future Research

This study involved a small sample size (n=15) in a remote area of Saudi Arabia. Therefore, the findings may not be generalizable to larger or different populations. Further research is needed to better understand how to support families of children with ASD living in remote areas and within their specific cultural context (Antezana et al., 2017). No specific criteria were established to measure the participants' attainment of knowledge and skills. A formative, qualitative assessment was conducted through a question-and-answer session lasting approximately 30 minutes at the end of each session to address questions, concerns, and uncover any misunderstandings. However, future research should consider incorporating a brief, individual assessment of the content of each session. This would provide more objective data on the participants' understanding of the material.

The participants in this study had varying levels of educational attainment. Those with lower levels of education struggled significantly with technology use and required additional support. This variable should be considered when planning future online-based training programs for mothers. There were varying levels of knowledge and understanding of ASD among the participants. Future research should

consider the length of time since diagnosis as a criterion for inclusion in similar studies.

Conclusion

Supporting families and their children with ASD is essential for helping them reach their full potential, as recognized by the United Nations Convention on the Rights of the Child (1989). Following an initial ASD diagnosis is a critical period for families, making early training after diagnosis—or even when learning that their child might be at risk for ASD—most beneficial (Landa, 2018). Timing is crucial, as early intervention plays a key role in achieving the best behavioral and educational outcomes. Developing supportive, evidence-based programs that incorporate appropriate psychological, educational, and behavioral components is essential. These programs should be tailored to the needs of Saudi families while also respecting their cultural values (Alnemary et al., 2017; Alotaibi & Almalki, 2016; Kelly et al., 2016).

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