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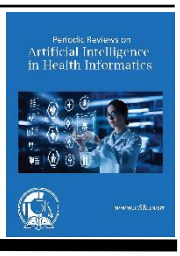

Research Article

Technology-Assisted Parent Training Programs for Autism Management

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ABSTRACT

The developmental condition known as autism spectrum disorder (ASD) is defined by recurring behavioural patterns and challenges with social communication. Taking care of a kid with impairments presents parents with a lot of emotional and practical obstacles that might affect their family's arrangements. This article examines the integration and efficacy of technology-based parenting interventions for addressing ASD, focusing on how these programs are developed, which technologies are used, and how they affect parent-child relations and success rates. The phenomenology design, a qualitative research approach, was used to analyse the experiences of primary school students with disabilities in virtual education activities after the global pandemic 2020. The design allowed for a comprehensive understanding of students' perspectives and solutions. Face-to-face training techniques are effective but cannot reach all families due to transport, money, and time issues. Distance-based training and technology-assisted training solutions provide a solution by disseminating high-quality, evidence-based training to a broader audience. The results show that ADEPT and the PLAY Project are examples of potential supports involving the application of digital tools to provide parents with essential training content to create proper home conditions for further child development. Evaluating the success of these initiatives is crucial to assessing their impact and potentially modifying them. Scientific methods like randomised controlled trials or longitudinal studies provide insights into the efficacy of technology-supported training. At the same time, measurable quantities like parent-child interaction or behavioural changes prove its effectiveness.

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1. Introduction

Autism spectrum disorder (ASD) is a developmental disorder characterised by difficulties in social communication and recurrent patterns of behaviour, which significantly impact a person's ability to interact with others and perform routine tasks. Parents face emotional and practical difficulties as they must care for a child with disabilities, which can take time, effort, and professional help to solve (Arredondo-Urtiz et al., 2023). Technology-assisted parent training programs have become helpful in helping families manage ASD, providing accessible and flexible training options to fill the gap between home-based care and clinical interventions (Pi et al., 2021).

Autism Spectrum Disorder (ASD) is a lifelong neurodevelopmental disorder that shows through various symptoms in different people. To manage it, parents must understand what it entails and how it influences their daily existence. Primary symptoms include impairments in social communication and the presence of repetitive behaviours. Patients diagnosed with ASD often have difficulties comprehending gestures, conversing, or building friendships (Bradshaw et al., 2022; Pawar et al., 2017). The degree of such symptoms can essentially differ, with some facing severe problems with communication while others may face mild ones. Parent training programs are vital because they provide information on addressing behaviours, enhancing communication, and promoting social engagement. Through these programs, parents can improve their capacity to establish

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a nurturing and well-organized environment for their children and decrease the stress involved with childcare. Technology-facilitated parent training programs present innovative developments for addressing ASD (Pan et al., 2023).

Online modules, mobile applications, and virtual reality tools offer practical, convenient, and individualized tools for child developmental assistance. As ASD continues to reach more families globally, the need for high-quality, evidence-based, cost-efficient, and accessible training has remained more important than ever (Kenworthy et al., 2023). Technology-mediated parent training supports branching from the typical usage of information and communication technology to improve parents' abilities and knowledge in dealing with ASD. Technology-assisted parent training programs are designed to equip parents with the necessary knowledge and skills to manage ASD using technology. These programs include online lessons, mobile applications, and virtual reality, which use role-play to create a real-life environment. The ultimate goal is to ensure parents can access information to help them use research-based and proven methods at home (Pacione, 2022).

Examples of technology-assisted parent training programs include the Autism Distance Education Parent Training (ADEPT) and the PLAY Project (Pi et al., 2021). ADEPT focuses on online modules dealing with behavioural approaches, while PLAY uses videos to coach parents on promoting social skills. These programs include posted materials, individualized approaches, and continuing care to enhance parents' initiatives as primary educators. Implementing technology-assisted training programs requires planning and cooperation to impact families managing ASD positively. The process includes identifying the training needs of the target group, involving autism, technology, and education specialists, as well as informal stakeholders such as parents or caretakers. Curriculum development, choosing the best technologies, and testing the program before large-scale implementation are crucial phases (Pacione, 2022; Shanok et al., 2021).

Delivery methods for technology-assisted training programs include online websites and mobile applications, typically incorporating structured learning requiring little physical involvement (Kenworthy et al., 2023). Mobile apps allow users to utilize resources anytime and anywhere, while online platforms contain more materials like videos, quizzes, and discussion boards. Successful cases of TATP provide evidence of the potential effects of technology-assisted training on families with ASD, such as the ADEPT program, which has shown effective results in enhancing parent-child communications and challenging behaviours. The implementation of technology-assisted training programs, such as the ADEPT program, can significantly improve the lives of families with ASD. The program development process involves identifying the target group's training needs, involving autism, technology, and education specialists, and involving informal stakeholders like parents or caretakers. Curriculum development, choosing the best technologies, and testing the program before large-scale implementation are crucial steps (Pacione, 2022; Pi et al., 2021).

Technology-assisted training programs, including online websites and mobile applications, can be implemented in various forms. These programs typically incorporate structured learning, allowing parents to access resources anytime and anywhere (Suparjoh et al., 2020). Mobile apps allow users to access resources anytime and anywhere, while online platforms contain more resources like videos, quizzes, and discussion boards. Case studies and examples of successful TATP cases provide evidence of the potential effects of technology-assisted training on families with ASD. For instance, the ADEPT program has effectively enhanced parent-child communication and challenging behaviours. These individual cases demonstrate the program's format, methods of implementation, and outcomes, providing recommendations for further development of effective practices (Arredondo-Urtiz et al., 2023; Sourander et al., 2022).

This article investigates how well technology-based parenting treatments integrate and work to manage ASD. It examines the creation of these programs, the technology employed, and their effects on success rates and parent-child relationships. To address the potential benefits and drawbacks of such programs, this article examines the body of current literature as well as particular situations. A thorough guide on how technology may support families with ASD and aid in parent education is available for readers.

2. Literature review

ASD is a developmental disease that often manifests in childhood. The diagnosis of ASD is predicated on the presence of persistently confined, repetitive patterns of behaviour or interests, as well as evidence of deficits in social communication and social interactions (Kincaid et al., 2017). A meta-analysis of prevalence studies found that the true male-to-female ratio for children with autism spectrum disorder (ASD) is closer to 3:1, rather than the commonly assumed 4:1. The study analyzed 54 studies, with 13,784,284 participants, with 53,712 having ASD. The overall pooled MFOR was 4.20, with substantial between-study variability. High-quality studies had a lower MFOR, while studies that screened the general population for pre-existing ASD diagnoses had a lower MFOR (Loomes et al., 2017). The increasing prevalence of autism spectrum disorders (ASD) necessitates increased clinical attention for effective treatment. ASD's characteristics cause impairment for both the child and their family. Parental involvement in treatment improves skill generalizability and increases intervention. Numerous benefits have been observed when parents are involved. This paper discusses the impact of ASD on parent-child relationships, treatment outcomes, and the advantages of including parents in treatment. It also discusses parents' roles and provides clinicians with practical ways to involve them (Burrell & Borrego, 2012).

Research shows that caregiver training can improve social interaction, communication, play, positive behaviour, and skills in autistic children. Telehealth-based interventions have shown similar positive outcomes as face-to-face training. Telehealth innovations, particularly during COVID-19, have shown cost-effectiveness and increased accessibility. However, more research is needed to determine different populations'

feasibility, acceptability, and effectiveness. This review highlights recent caregiver skills training interventions for autism that have been successfully adapted for telehealth delivery. Scalable, adaptable, caregiver-mediated, open-access, and delivered as part of a stepped-care model could address the global treatment gap for autism families (Pacione, 2022). A review examines the effectiveness of engagement strategies in technology-assisted parenting programs targeting adverse childhood experiences (ACEs) in addressing youth mental health problems. A systematic review of 13,973 articles found preliminary evidence for a reliable association between five engagement strategies: involving parents in program design, delivering the program online, using personalisation features, user control features, and providing practical support. Three strategies (professional support features, use of videos, and behaviour change techniques) did not have a reliable association with engagement outcomes. The review comprehensively assesses engagement strategies and measures in technology-assisted parenting programs but acknowledges heterogeneous definitions and insufficient data (Aldridge et al., 2024).

 About 1% of people have autism spectrum disorder (ASD), which poses a serious healthcare problem because of scarce resources, particularly a clinician shortage that makes it difficult to diagnose and treat ASD in children promptly. The study investigates the use of machine learning in detecting and managing Autism Spectrum Disorder in children, focusing on primary stakeholders' experiences during and after the COVID-19 pandemic. It identifies critical adoption factors and potential investors' insights. Stakeholders acknowledge the importance of technology, but their attitudes towards adoption show divergent trends. The study emphasises the need for human-centered approaches and ethical considerations to enhance ML adoption (Kohli et al., 2024).

The literature explains ASD, along with its drawbacks and issues. The benefits of technology assistant programs and distance learning are also covered. Additionally discussed is the benefit of VR for students with ASD. This article's goal is to investigate how well technology-based parenting treatments integrate and work to manage ASD. It will examine the creation of these programs, the technology employed, and the effects they have on success rates and parent-child relationships. To address the potential benefits and drawbacks of such programs, this article will examine the body of current literature as well as particular situations. A thorough guide on how technology may support families with ASD and aid in parent education is available for readers.

3. Materials and methods

The phenomenology design, a qualitative research approach, was used to analyze the experiences of primary school students with disabilities in virtual education activities after the global pandemic. The study examined the integration and efficacy of technology-based parenting interventions for addressing ASD. It focused on how these programs are developed, which technologies are used, and how they affect parent-child relations and success rates.

The research involved ten general education primary school teachers selected through a purposeful sampling technique. Participants had at least one student with officially diagnosed disabilities in their class and voluntary participation. The researchers assigned each participant a code name, C1. Information about them is provided in Table 1.

Table 1. Necessary details for participants as subjects.

caregiver No	caregiver gender	Caregiver Age	Child Gender	Child Age
C 1	Female	31	Male	5
C 2	Female	30	Female	6
C 3	Female	28	Female	5
C 4	Female	34	Male	7
C 5	Female	35	Male	7
C 6	Female	32	Female	6
C 7	Female	35	Female	8
C 8	Female	29	Male	5
C 9	Female	30	Female	6
C 10	Female	32	Male	5

Research methods include randomized controlled trials (RCTs) and case studies to measure the efficiency of technology-supported training. Key metrics and outcomes for success include increased quality of parent-child interactions and decreases under challenging behaviours and other family functioning. Researchers and practitioners use inventories like the Autism Parenting Stress Index and behavioural observation protocols to assess these outcomes. The caregivers, mainly mothers and a volunteer per caregiver, were trained by master trainers, who later interacted with the children. The master trainer was always in the loop, monitoring the whole procedure. Fig. 1 clarifies the whole training procedure.

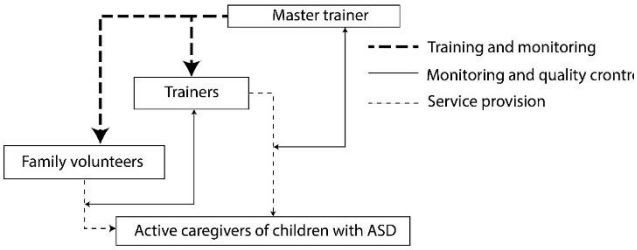

Fig. 1. Technology-Assisted Parent Training Programs for ASD follow-up procedure.

Data analysis techniques, such as regression analysis of variance (ANOVA), were applied to test the significance of the intervention. Qualitative data, including parent feedback and interviews, were also used to provide a more nuanced understanding of the findings. Using quantitative and qualitative data offers a more nuanced understanding of the findings, as numbers are only accompanied by people's self-reported changes.

4. Results and discussions

The study examined how primary school-aged children participated in virtual education programs, how inclusion and follow-up procedures were handled, how they behaved at home, how volunteer parents collaborated, and how they suggested solutions. The integration of pupils, keeping an eye on their extracurricular activities and assignments, and encouraging collaboration between volunteer parents and other caregivers were found to be the three primary themes.

4.1. Findings Regarding Collaboration between Teachers and Parents

The participants ran into a variety of issues when working with parents and trainers to coordinate virtual schooling and teaching activities for children with impairments during the pandemic. They came up with several answers for the issues they ran into. Two sub-themes regarding the primary theme- trainer-parent collaboration and problems with cooperation rose in this setting. Fig. 2 displays the pertinent primary and supporting topics. The explanations of each sub-theme follow.

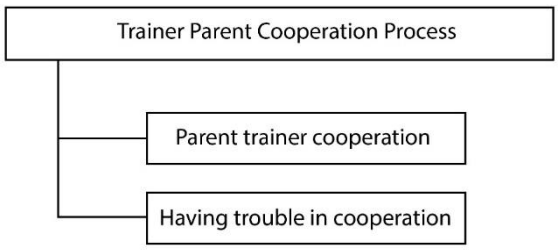

Fig. 2. Trainer-parent cooperation process.

The study participants reported difficulties in collaborating with parents after the pandemic. They communicated with parents and guided student characteristics and development. They also mentioned that EBA support points are active for families facing school problems and benefit their children. The participants also discussed the importance of support for families during difficult times, such as boredom and reluctance to do homework.

However, they also noted that crowded classrooms and a lack of communication between parents and students with disabilities led to problems. The government provided mobile devices for parents to connect to virtual courses, but families in need did not use these support points. Parents' level of knowledge also contributed to the problems, with some feeling helpless and unable to find solutions. The participants also expressed a desire for more support from parents, as they felt helpless and unable to have valuable teacher-parent cooperation. The study highlights the need for improved communication and support for families dealing with school-related issues.

4.2. Findings Regarding the Process of Following the Virtual Course Activities

Multiple instructors believe that their disabled pupils struggle to complete their assignments and participate in virtual course activities. Fig. 3 displays the primary and supporting themes of this theme. The explanations of each sub-theme follow.

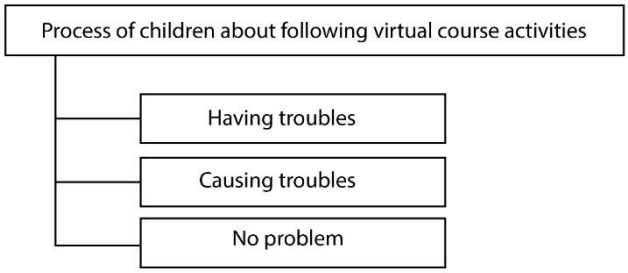

Fig. 3. Process of Following the Virtual Course Activities.

The sub-theme of the text discusses the difficulties faced by children with disabilities in following virtual course

activities. Children with disabilities often dislike watching EBA TV, as the interaction is low and there is less entertaining content during teaching. Trainers in disadvantaged school districts frequently face difficulties following virtual course activities and homework due to parents' inability to use technology, being illiterate, and facing internet connection problems. Some trainers report that children with disabilities do not have issues following virtual course activities and homework, as homework follow-up is fully ensured, subjects are completed, and students with disabilities receive high grades in exams after returning to in-person terms. For example, children with disabilities received the highest score of 100 in almost all exams during the first semester.

However, some parents and trainers have reported that children with disabilities do not have problems following virtual course activities and homework, as their families try to support their homework as much as possible. They regularly share their studies and assignments with the trainers, which has not caused any problems. The text highlights the need for more one-on-one support and engaging learning environments for children with disabilities.

4.3. Findings Solution Suggestions for Problems occurring the training activities

Two sub-themes, the solutions used and the solutions proposed, emerge from the primary topic of the solution recommendations made by the participants for the issues that arose in the virtual education activities conducted following the pandemic. Fig. 4 displays the main and subsidiary themes that were discovered. Each of the sub-themes is described below.

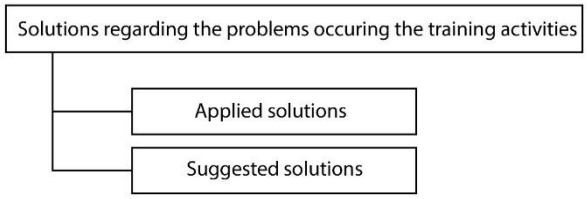

Fig. 4. Solution Suggestions for Problems occurring in the training activities.

Teachers often face unique challenges when dealing with students and families with disabilities. They frequently resort to various solutions tailored to each student and family. One example is a hybrid education model, which allows students to follow lessons from home when their parents cannot attend due to illness. Another approach is to support education on any convenient day and time through interviews with the student's family. For students learning to read and write, the teacher asks families for short video recordings during home studies to evaluate their progress.

Suggested solutions include phone calls to support students who do not want to attend the course and their parents and frequent phone calls to motivate families when they need psychological support. Maintaining order and discipline at home is crucial to ensuring family cooperation. Support points for all students, such as device and internet support, are also suggested. Codes of coordinated action are also used to provide emotional motivation for students and parents with disabilities and to communicate with rehabilitation centers. If necessary, students with disabilities should be brought to school settings, as they are more likely to listen to an administrator's suggestions. Additionally, educational games and activities can be used to make learning more enjoyable for students with disabilities. Support could be provided to those in need, particularly those with insufficient financial situations.

According to the survey and interview, it might be difficult for children with ASD to grasp the idea of virtual learning. These were spoken about and outlined above;

4.4. Benefits of Technology-Assisted Training Programs

For families with ASD, technology-assisted training programs can be beneficial and offer benefits, including cost, accessibility, and intervention customization.

- **Accessibility and Convenience:** Programs for technology-assisted instruction can also be prepared more readily to make them more accessible to families living in remote or underserved areas. Because of the online nature of these programs, parents may more easily obtain training materials without having to travel. Because of its accessibility, more families needing evidence-based solutions may be able to utilize it, depending on how much time they have or where they live.

- **Cost-Effectiveness:** Regarding training, technology-assisted programs are significantly less expensive than traditional in-person ones. These programs are relatively less costly for the families and do not need travel, lodging, or in-person sessions. However, since temporal or spatial constraints do not constrain technology, it may successfully teach big cohorts of these families, possibly at a reduced cost.

- **Personalized Learning:** One of these programs' advantages is that the material may be customized to meet the needs of every household. This might entail adjusting the pace of instruction, focusing on specific problems, and directing students towards resources that could assist in managing their ASD. This method suggests that the parents receive individualized practical instruction, which makes the overall training effective.

- **Enhanced Engagement and Retention:** Because of the improved interactivity and ease of use of the course material, technology-supported training

programs have the benefit of increasing engagement and attendance rates. Feedback on the state of the learning is similar to employing games in the learning modules. It also has a virtual support group to help parents stay interested in and motivated to finish the course. Increased completion rates indicate that more students are using their newly acquired skills and may even be helping families and kids.

4.5. Obstacles and Constraints of Technology-Assisted Training Programs

The success of technology-assisted parent education programs must be assessed in light of a few obstacles and constraints. These include technological difficulties, information gaps, and ethically dubious areas that impact their effectiveness.

- **Technological Barriers:** Certain families, particularly those in rural areas or with poor incomes, may face difficulties due to seasonal variations and other circumstances that impact the cost or accessibility of technology. Disadvantages are not having internet access, gadgets that work with it, or the money to buy the equipment needed to participate in these programs. Additionally, technical challenges such as CD ROM malfunctions, software bugs, navigational difficulties, and ongoing technical support needs might reduce the effectiveness of developing technology-assisted training programs and the subsequent deployment stage.

- **Research Gaps:** Subsequent investigations must concentrate on producing more superior, extensive studies to thoroughly evaluate the long-term efficacy of technology-supported parent education programs. Students who use current research as a reference sometimes run into issues with respondents' sample heterogeneity, limited sample size, and short data collection periods.

These elements obstruct drawing broader conclusions and creating a thorough understanding of these initiatives' advantages and disadvantages. In addition, inconsistent study designs and insufficient use of control to provide a counterbalance may result in biased or insufficient data, necessitating the commissioning of better, more thorough investigations.

- **Ethical Considerations:** Privacy and consent are another area where undertaking technology-assisted training may give rise to ethical dilemmas. The use of digital platforms for training brings to light data privacy concerns, particularly about children with ASD. In addition, the employment of technology raises some moral conundrums in this instance with these samples—children and their families. Transparency, safe procedures, and moral behaviour in creating and implementing programs are necessary to allay these worries.

4.6. Future Directions and Innovations for Technology-Assisted Training Programs

There are several prospects for the progression and enhancement of technology-supported parent education initiatives in the field of autism treatment in the future. In this part, the author discusses the future of the subject, emerging technology, improving accessibility, and the value of a cross-disciplinary approach.

- **Emerging Technologies:** Parent training programs may greatly benefit from the application of AI and machine learning technologies. These technologies can offer personalized learning experiences and prompt feedback tailored to the requirements of the parent figure. While the use of virtual reality might imitate social scenarios for practice, artificial intelligence could observe behaviour and recommend suitable actions depending on it. Future developments that might be used in technology-based autism management training include wearable technology, augmented reality, and trash. These elements will enhance the program's interaction and increase its effectiveness.

- **Expanding Access and Inclusivity:** To improve the extension of technology-supported training interventions to all communities, the following must be implemented: multilingual data, applications designed to work with a variety of devices, and financial support to alleviate concerns about viability. The programs raise issues related to learning styles, cultural orientation, and technical competency, all of which need to be taken into account to maximize the number of families who may use these resources. By expanding the options for accredited alternative training programs, autistic treatment disparities will be reduced, and other families will receive helpful training.

- **Cooperation and Multidisciplinary Methods:** Implementing the technologically assisted training programs depends on ongoing communication between the families, healthcare professionals, and technologists. Thus, research and development components that increase the problem's usability and a more exhaustive knowledge by the many stakeholders may be used to address it.

For example, improved training interventions that address families' technological and therapy requirements have resulted from cooperation between software developers, behavioural therapists, and educators. Multidisciplinary initiatives emphasize the importance of parent engagement in the development process to create effective programs from a usability perspective.

5. Conclusion

Technology can reduce costs and increase the reach of evidence-based, successful initiatives. Behavioural. Sadly, there are significant differences in the availability and use of evidence-based parenting programs, which have been shown to lessen problematic conduct in children. It is challenging for parents to follow prescribed treatment protocols on their own since Autism Spectrum disease (ASD) is a disease characterized by communication and repetitive behavioural problems. While in-person training methods have advantages, not all families in the community can benefit from them owing to financial, time, and transportation constraints, among other challenges. By enabling the delivery of excellent, evidence-based training to a larger audience, distance-based training and other technology-assisted training options offer a solution to these issues.

Potential initiatives that use digital technologies to give parents basic training information so they may set up their homes to promote their children's future growth include the PLAY Project and ADEPT. To determine their impact and maybe make changes, it is crucial to evaluate the success of these activities. The effectiveness of technology-supported training may be ascertained using scientific approaches such as longitudinal research and randomized controlled trials. At the same time, quantifiable outcomes like behavioural changes or parent-child interaction can demonstrate its efficacy. Data about best practices and areas in which further innovation is needed are gathered from this research.

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