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EXPLORING THE IMPACT OF LANGUAGE THERAPY APP ON THE ENGLISH LANGUAGE PERFORMANCE OF PAKISTANI AUTISTIC CHILDREN

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Abstract

This study aims to explore the potential of well-designed educational apps to enhance the English learning experience of Pakistani autistic children (Sarah et al., 2019). Autism Spectrum Disorder (ASD) is a complex neuro developmental condition that poses unique challenges to the child's learning abilities. With the increasing prevalence of digital technology in our lives, educational apps have emerged as a promising tool for teaching English to autistic children (Haida, 2022). Eight purposively selected autistic children (mean age = 3 years 2months) of a private center situated in Lahore constituted the sample of the study. The present study quasi experimental research design. All the participants appeared in the pretest, and afterward, they were taught through the Language therapy application, followed by a posttest. The data was analyzed statistically through descriptive statistics. The findings of the study revealed that the application has the potential to improve the English language learning skills of Pakistani autistic children. The study recommends the development of indigenous educational games for the educational achievement of Pakistani autistic children.

Keywords: *Autism, Educational App, Learning pattern, autism spectrum disorder (ASD), Language Therapy App, English Language*

Introduction

As a mental illness with related intellectual deficits, autism is a sub-classification of autism spectrum disorder. It is characterized by severe speech delays, ritualized or repetitive actions, and, most importantly, significant social communication. Before the age of three, it is typically apparent and hinders children's educational development. The World Health Organization estimates that 1 out of 160 children globally suffers from ASD (autism spectrum disorder). An estimated 0.35 million children in Pakistan have been diagnosed with autism. It typically starts in childhood and lasts till maturity. ASD is becoming more and more common these days.

Children with autism have special needs compared to normal children.

Due to their condition, children with autism generally have similar issues and challenges around the world. (Ben et al.,2020).

Each autistic child has distinct learning preferences and styles that might help or hurt them as students. However, language acquisition may also be challenging for children with autism. Vocabulary mastery is a prerequisite for language proficiency (Salawazo et al., 2020). A crucial step in the process is expanding one's vocabulary, especially while learning English. Learning English is a required skill because it is currently widely used and considered an international language. (Zuparova, Shegay, Orazova,2020).

English is now a second language that all Malaysian students must master (Kawaguchi, 2021). The language is taught in the school starting in kindergarten and continuing through postsecondary education. However, it will be extremely difficult for children to learn English if they are unable to understand the vocabulary component of the language.(Ahsan,

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Nasir, 2020).

Due to their cognitive disability, children with autism sometimes have difficulty vocally expressing their thoughts, making communication skills a problem (Khairuddin, Salleh, & Amin, 2020). Since they typically have trouble communicating, they resort to nonverbal communication techniques like screaming, sobbing, and tantrums. Getting kids to learn a new language, especially English, can be a challenging task. Children with autism can benefit from therapy that employs graphic aids, which, according to Dolaha and Chal (2020), provide concrete, visual symbolism for their language development. Many strategies and initiatives have been created to support autistic youngsters in developing smooth language. These apps are now being used in the technology sector.

Technology has been utilized in autism education since the start of 2012 (Scassellati, Admoni, & Matarić, 2012). To aid in language acquisition, a variety of technology-based resources have been created for kids with autism. Prior studies have indicated that one of the best methods to engage children with autism in language development is through the use of technology as an intervention. Gokaydin et.al.(2020) assert that new developments in technology encourage the development of more informatics-based solutions for children with autism and that options offered by contemporary technology are useful to these children.

One of the strenuous tasks for teachers and families to do is to treat children with special needs, such as those with autism spectrum disorder, so that they can learn and get a good education(Guldberg, Achtypi, D'Alonazo, Lasakaridou, Milton, Molteni,2021). According to Jelínková (2019), children with high-functioning autism are being integrated into mainstream education systems. Notwithstanding their difficulties, this student group is entitled to assistance in obtaining an education in all disciplines, including English language teaching.

Globally, the number of children with autism has grown significantly over the past years (Hassan, 2020), and the prevalence of ASD has driven action at the local, national, and international levels.(Rice et al,.2012).

According to Jelinkova (2019), some of these children with high-functioning autism are being integrated into mainstream education systems. In Pakistani society, providing formal therapy to a child with autism is one of the toughest challenges.

Additionally, no single method of teaching children with autism is successful for all of them. Piaget's theory of cognitive development is a benchmark in this regard. This theory serves as the foundation for several intervention programs designed to assist people with autism, for example, analysis of behaviour, analysis of verbal behaviours, communication, exchanging pictures for a communication system, treatment, and education of autistic and related disorders.

Communication handicapped children, therapy, Lego therapy, dance therapy, integration of sensory training, and others.

Furthermore, not every child with autism responds well to a single teaching strategy.

In this sense, Piaget's theory of cognitive development (Piaget's theory) is the standard theory. This theory forms the basis of several intervention programs intended to help individuals with autism and multiple disorders. After examining the interactive and visual

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designs of 100 applications for children aged six months to eight years, Cresenizi and Grane (2016) concluded that the components they examined were of low quality.
Following an evaluation of 73 Google Play apps for people with impairments,
Larco et al. (2018) concluded that there was a need to enhance personalization and interaction. However, there are not many studies that examine how applications are evaluated by people.
With autism.
We must focus on the specific areas where individuals with this illness struggle the most in order to identify apps that offer material that is appropriate for their needs. The majority of intervention strategies aim to improve the quality of life for individuals with
ASD by fostering more adaptive behaviors like social skills, communication skills, or creative skills
behaviors. Even before language is expected to appear in typically developing children, children with autism may exhibit signs of social and communication disruption as early as the first year of life. Examples of this disruption include early sharing of affective expression (Trevarthen and Daniel, 2005; Yirmiya et al., 2006), delayed babbling (Iverson and Wozniak, in press), vocal pattern desynchronization with the caregiver, and responsiveness to others' communicative cues (Baranek, 1999). Reduced frequency and diversity of communicative forms, such as complex babbling, gestures, consonants in syllables, words, and word combinations, are typically characteristics of autistic communication development in the second and third years of life.
Some have proposed that, despite their differences, play and the development of symbols into language are particularly difficult for young children with autism. However, most autistic children eventually develop a single-word vocabulary as a relative strength [Lord and Paul, 1997].
According to Paul (1987), children with autism typically perform better on single-word vocabulary tests than on complex language tests. According to Curcio and Pischeria (1978), Ungerer and Sigman (1981), and Curcio and Pischeria (1978), symbolic skills often develop to some extent in autism. Gestures can be used to convey communication intent and content, take a communicative turn, and keep the "topic" of a conversation with others by, for instance, mimicking the partner's behavior. The criteria for "social impairment" are distinct from those for "communication impairment," which includes the linguistic and discourse components of communication.
However, the pragmatics of communication are closely linked to a number of the criteria for social impairment. For instance, eye contact, facial expressions, body gestures, and social regulatory movements would all be included in the criterion for social interaction that involves nonverbal behaviors.

With the introduction of contemporary technology, several interventions that make use of assistive technologies are also becoming popular as innovative ways to help
individuals with special needs. For instance, technology is used to deliver certain behavioral therapies, including the theory of mind, executive function development training, video modeling, and visual scheduling. Numerous approaches that prioritize visual assistance have been effective in early autism
intervention. Certain therapies, with the advent of modern technology that employ assistive or adaptive technologies, are also getting popular as creative means of assisting

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people with special needs. Like an example of several behavioral therapies, such as video-modeling, visual-scheduling, executive function development training, and theory of mind, are delivered through technology. Several strategies that emphasized visual aids have been successful in the
early stages of autism intervention. The approach most strongly recommended for teaching autistic children is the use of visual cues. The key areas of education and tried-and-true teaching methods are highlighted in our research to be useful for teachers who work with
students who have autism.

When compared to other technologies, augmented reality technology is seen as both useful for use in natural settings and a successful intervention (Bridges, Robinson, Stewart, Kwon & Mutua, 2020). Even with old smartphones, children with autism may easily access augmented reality and can make it easy and accessible for their use.
Numerous earlier studies have shown that augmented reality technology can be beneficial for
kids with autism. A previous systematic study by Berenger, Baixauli, Gomez, Andres, and De Stasio looked into the effects of augmented reality technology on children with autism in the social, cognitive, and behavioral domains.
Based on their findings, the vast majority of the field's research supports the notion that augmented reality can provide children with autism with enjoyable and engaging experiences. Furthermore, it has been proposed that augmented reality can help kids with autism feel more driven to learn and understand more information (Kellems, Charlton, Kversøy, &Győri, 2020). It is, however, believed that new developments in technology and innovation have opened up more possibilities for developing useful knowledge for autistic children.

Problem Statement:

The relationship between autism and English language teaching (ELT) is multifaceted and intricate. The prevalence rate of ASD is increasing in Pakistan, and it is 0.35 million children affected by ASD.Most autism centers in Pakistan rely on manual techniques in
For teaching children the basics of language and social skills, there is a need to enhance the English language learning skills of Autistic children. Teaching autistic children through the latest technological intervention approaches can mitigate the problem of their learning skills. Language Therapy App is an integrated IOS/Android app that helps teach autistic children the much-needed linguistic basics. It also improves their social skills through building and creating an interactive learning Environment. The purpose of this study is to use an educational software selected as a Language Therapy software to teach Pakistani autistic children. This work's primary objective is to improve autistic children's English instruction by ensuring that the educational software is used. Recent developments in augmented technology have the potential to have a big impact on education and offer better ways to teach and learn languages (Bakhtiarrvarnd,2021; Cerda et al.,2020)

Research Objectives:

- To investigate the effectiveness of a language therapy app on children.
- To discover the methods school teachers can apply by using an educational mobile app on autistic children to acquire vocabulary skills.

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Research Questions:

- What is the effectiveness of language therapy apps on children?
- What are the methods school teachers can apply by using an educational mobile app on autistic children to acquire vocabulary skills?

Delimitation of Study:

This study is delimited to only one educational app, Language Therapy App, for the autistic child.

Literature review

Madsen et al. (2008) developed the "Just-In-Time In-Situ" program for Samsung ultramobile laptops to assist students with autism spectrum di sorders in documenting and evaluating their social and emotional interactions with their c lassmates.

Students can view and learn about their own and others' social and emotional situations th rough visual facial communication and live interaction with others made possible by ultra mobile computers. They can gradually infer, in real time, how someone is feeling from their words or body language. They can also notice how their reactions affect other people through facial expressions, which will be useful in everyday conversations. The Emotion Bubbles interface was created to give people with spectrum disorders information about their emotional states in a straightforward manner that they could readily comprehend [51]

An initiative in the mobile technology space called "HANDS" seeks to enhance the survival of adolescents with autism spectrum disorders. Their smartphones are equipped with a toolbox called HANDS. Teachers of teenagers collaborated with the youngsters and other researchers to design it. Its goal is to support the teens by assisting them in developing social and self-management skills as well as independence in their day-to-day lives.

Enhancements of emotional skills, which are a component of social skills, are also included in the toolbox. Teens benefit from all of these in terms of improved and positive social inclusion and integration [52,53]. A digital community called "Wrong Planet" (Jordan, 2010) is intended for people with autism, Asperger's syndrome, and other neurological issues. The parents of these individuals, as well as the professionals working with special needs, are also targeted by the online community.

Through participating in online discussions and reading articles that educate them on common problems and how to handle them, autistic students can interact with others in the forum on their own. The most important characteristic is that the person with autism feels comfortable interacting with others, free from social anxiety, and with a great deal of empathy [54]. Alves et al. (2013) introduced the iPad version of the "LIFEisGAME" prototype, a game that uses virtual character synthesis and real-time automatic facial expression analysis to help people with ASD comprehend emotions and grow in empathy. Evolutionary stages that gradually aid in the identification and expression of emotions are included in the game. The game incorporates developmental phases that gradually aid in the identification and articulation of emotions. In order to make the player feel more at ease and speed up the learning process, the avatars are the faces of characters, other players, and

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individuals the player knows.

Eleven kids with ASD, ranging in age from five to fifteen, took part in a 15-minute gaming session to test the LIFEisGAME concept. The results showed how helpful the game is for promoting emotional understanding and raising the standard of living for children with autism [58,59]. For parents of autistic children who have trouble communicating verbally, a smartphone app called "Autisay" (Voon et al. 2015) makes communication easier.

It was developed to help kids with ASD speak more socially while also improving the life of the child and others around them. To help the child comprehend and express their wants, the Autisay provides three primary categories: (1) Life Skills, (2) Communication, and (3) Activities. Through touching on one of the icons and hearing a voice articulate that emotion, the child can utilize the Communication tool to understand and communicate their emotions. The caregiver can teach the child to articulate new needs and emotions by verbally documenting and physically representing new feelings on the template.

Institut Teknologi Brunei's "EducateMe" is another application that embodies the same id ea [68,69].

Another application that exemplifies the same concept is "Educate Me" from InstituteTechnology Brunei [68,69]. The adventure that Tobias had while visiting a zoo park is told in the "Gamebook." The story can be read aloud or heard by the player. Users' attention is heightened by the game's setting, and the virtual character is made to be both appealing and approachable so that the user can interact with it on an emotional level. There are five scenarios in the game that put the child in emotional circumstances from real life. There are five scenarios in the game that put the child in emotional circumstances from real life. It engages with the zoo's environment, where social and emotional scenarios are constructed and events take place. To advance to the next level, the youngster must identify the emotions of the 3D avatar and select the appropriate one for each scenario. Any mobile device can play it [72,73].

Children with autism spectrum disorders can use the mobile application "What's the Expression - All Ages" to select their favorite character from a variety of possibilities and learn how to convey various emotions by observing the character's face and responding to questions (WebTeam Corporation). Through the use of "Touch and Learn - Emotions," kids may learn to understand body language and emotions by examining vibrant, colorful images of people and selecting the appropriate facial expression in response to an emotion phrase. The program allows parents, educators, and therapists to customize their voices and faces (Innovative Mobile Apps Ltd © Alligator Apps).

To help people with behavioral issues and autism spectrum disorders, Torrado et al. (2017) created a monitoring and interaction assistance system based on the motion and physiol ogical signals collected by a smartwatch. This system includes personalized emotional sel f-regulation techniques as well as a smartphone tool that family members or caregivers can use to modify and create these strategies adaptively. When the user's heart rate surpasses the customizable limit, the wristwatch system recognizes their inner condition and shows them the emotional self-regulation techniques [86].

Treating children with special needs, like those with autism spectrum disorder, so they can learn and receive a proper education is one of the most difficult tasks facing educators and families (Guldberg, Achtypi, D'Alonzo, Laskaridou, Milton, Molteni, & Wood, 2021;

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Hidayah&Morganna, 2019; Parsons, Kovshoff, & Evil, 2020).

As of now, ASD is seen as a long-term condition, with no psychopharmacological or remedial treatments available to alleviate its symptoms. The incidence of ASD has aroused concerns at the local, national, and international levels, prompting action (Rice et al., 2012), and the number of children with autism has risen dramatically in the last decade (Hasan, 2020).

Crescenzi and Grané (2016) conducted a content analysis of 100 apps for children aged six months to eight years old, analyzing their visual and interactive design, and found that the quality of the features they examined was low.

Larco et al. (2018) evaluated the quality of 73 Google Play apps for individuals with impairments

and concluded that improvements were needed in terms of personalization and engagement.

Augmented reality is a promising technology because it's easy for kids with autism to access through old phones. Children with autism can benefit from using augmented reality technologies, according to a large body of prior studies. A thorough assessment of the effects of augmented reality technology on the social, cognitive, and behavioral aspects in children with autism was conducted by Berenguer, Baixauli, Gómez, Andrés, and De Stasio (2020). According to their research, a significant amount of the existing literature backs the idea that augmented reality can provide meaningful and engaging experiences for children with autism.

A few examples of the intervention programs that have been implemented are discussed earlier.

Hanson Robotics, a robotics company based in Hong Kong, built the Professor Einstein Robot in 2016. It's a fun, expressive robot that also helps kids learn science and trains their brains [30]. Additionally, it offers educational games and a mobile application called Stein-O-Matic that can be downloaded from the Apple App Store and Google Play Store. This technology is being studied by researchers to see if these robots can help kids with autism spectrum disorder (ASD). The same company also produced Little Sophia, a 14-inch-tall robot that instructs kids ages 8 and up in artificial intelligence and coding [31]. Children with autism can benefit from Little Sophia's use in special education and cognitive therapy settings.

- A 2017 paper assessed **NAO social robots** in Pakistani classrooms; teachers and parents found them engaging, though language and expressiveness barriers remain tribune.com.pk, researchgate.net.

International reviews show promise in **AI-driven conversational agents**, virtual reality tools, and **computer-aided systems (CAS)**—but emphasize the gap between concept and rigorous, long-term research.

You can use these studies to position your app within **cutting-edge technological trends**, while noting that the **clinical evidence remains limited**.

> The *Mental Imagery Therapy for Autism (MITA)* app shows compelling results: children using it in a 3-year clinical trial improved their language scores about **2.2 times faster** than peers who didn't use it. play.google.com.

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Globally-used AAC tools like **LAMP Words for Life** and **Avaz** illustrate successful designs for supporting communication in autism teacherspayteachers teacherspayteachers.com+12en.wikipedia.org+12kaispe.com+12.

Use these cases to discuss **evidence-based digital interventions** that might inspire aspects of your own app's design.

A 2021 study by **Pasha, Shah & Siddiqui** surveyed 100 therapists across Punjab and highlighted that **speech therapy and PECS (Picture Exchange Communication System)** are the most popular choices for Pakistani autistic children, tribune.com.pk+3academia.edu+3researchgate.net+3researchgate.net.

This gives you a benchmark to discuss how your app could **complement or integrate with these existing methods**.

Ahmad &Shahid (2015) created simple, culture-adapted learning apps for autistic children in a Pakistani special-education school. Over an eight-week pilot, both students and teachers noticed improvements in social and emotional skills, academia.edu.

You can use their findings to discuss **culturally relevant app design** and the positive early effects of tech-based interventions in local contexts.

Autism Spectrum Disorder (ASD) is a developmental condition that affects how a person interacts, communicates, and behaves with others. Many children with autism have difficulties in speaking and understanding language. These delays often become noticeable early in life and can affect learning and social development. Research has shown that children with ASD may struggle with forming sentences, understanding others, and using language in social situations (Tager-Flusberg et al., 2005).

In recent years, technology has become increasingly important in assisting autistic children in developing their communication abilities. Interactive and entertaining methods to enhance language learning are provided by tablets, smartphone apps, and educational games. For autistic students, who frequently benefit from visual and tactile activities, these resources integrate images, sounds, and motions (Fletcher-Watson, 2014). According to studies, kids who use these tools with the help of a parent or therapist frequently make better progress (Kagohara et al., 2013). Apps for language therapy offer repeatable, structured exercises that improve comprehension, sentence structure, and vocabulary. Internationally, apps like Proloquo2Go, Avaz, and Tuli have been used for this purpose.

English is frequently taught as a second language in nations like Pakistan, which makes things more challenging for kids with autism. Children need even more assistance when learning English because they may already struggle with their first language. According to research, autistic children can benefit from digital resources that teach English through repetition, images, and audio (Thurm et al., 2007). Better language results can result from regular use of these resources, particularly when paired with speech therapy or classroom instruction.

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Digital resources are limited, but awareness is created among the people of Pakistan regarding Autism. Language therapy apps designed for Pakistani children are rare, and many international apps don't fully match the cultural or linguistic needs of local users. A study by Khan et al. (2021) emphasized the importance of developing language learning tools that are not only user-friendly but also adapted to our context. For autistic children in Pakistan, such tools can offer a much-needed alternative to traditional teaching methods, especially in areas where therapists are not available.

This research is based on **Vygotsky's Sociocultural Theory**, which focuses on the importance of interaction, tools, and social context in learning. According to this theory, children learn best when they are supported by adults or tools that help them reach the next level of understanding. In this case, language therapy apps act as supportive tools that guide autistic children in developing their English skills.

Information is frequently processed differently by children on the autism spectrum than by their neurotypical peers. Many of them benefit from repetition, prefer routines, and learn best visually. Traditional classroom settings can occasionally fall short due to these distinct learning styles. Numerous researchers have discovered that autistic children commonly struggle with language development, especially when it comes to using grammar, comprehending social cues, and expanding their vocabulary. Selecting effective teaching methods requires an understanding of these difficulties, particularly when it comes to a second language like English.

Autism Spectrum Disorder (ASD) is a developmental condition that affects how individuals communicate, behave, and interact socially. Many children on the spectrum experience noticeable delays in language development. Some may not speak at all, while others may have limited vocabulary or struggle with sentence structure and conversational skills. Language challenges in autistic children are often linked to differences in how they process and understand language and social cues (Tager-Flusberg et al., 2005). These difficulties can lead to frustration and isolation, especially in environments where communication is key, such as schools.

Through supervised practice, language therapy applications aim to improve users' language proficiency. Lessons on vocabulary, sentence structure, listening comprehension, and pronunciation are typically included. Because they provide visual cues, a calm environment that lessens social pressure, and the ability to be used repeatedly, these apps can be particularly beneficial for autism. When these apps are used in conjunction with adult support, such as that provided by parents, teachers, or speech therapists, children's language skills improve more noticeably, according to research (Fletcher-Watson, 2014). One drawback, though, is that a lot of apps are made for Western users and might not be appropriate for the educational or cultural context of nations like Pakistan.

Even though autism is becoming more widely accepted in Pakistan, access to specialized educational resources and therapy is still limited, especially in rural areas. Most local schools don't have the resources needed to help students with special needs. Despite an increase in internet and mobile phone usage, Pakistan still lacks culturally relevant apps for parents of children with autism.

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Culturally appropriate learning resources that take into account local realities are crucial, according to studies like Khan et al. (2021). A therapy app with well-known items, basic English vocabulary, and an easy-to-use layout can greatly assist Pakistani autistic children in learning.

The notion that digital tools can improve the language and communication development of children with autism is supported by research from a number of nations. According to a UK study, kids who used speech-generating apps significantly improved their ability to communicate and comprehend directions (Lorah et al., 2015). Similarly, research conducted in Malaysia and India revealed that apps that provided cultural context and local language support encouraged autistic children to participate more actively in social interactions and learning (Sharma & Natarajan, 2018).

These global examples demonstrate that digital language therapy is not only successful but also culturally sensitive. In Pakistan, where English is taught widely but not always in a way that is accessible to students with special needs, this highlights the need for comparable research.

Customizing the learning process is one of the main advantages of using language apps with autistic kids. Many apps let the child go at their own pace, repeat lessons, and concentrate on areas where they struggle, in contrast to one-size-fits-all classroom instruction. Children with autism, who frequently have uneven skill profiles—excelling in some areas while requiring more support in others—benefit greatly from this individualized approach (Parsons & Mitchell, 2002).

A child might be able to remember words well but have trouble using them in sentences. To bridge that gap, a language therapy app can be modified to concentrate more on sentence-building activities. Such adaptive learning technology can more successfully meet the needs of autistic children in Pakistani classrooms than traditional materials, where special education programs are still in their infancy.

Adult participation, whether from parents, teachers, or therapists, is closely associated with the effectiveness of language therapy applications. Studies consistently demonstrate that autistic children's learning outcomes improve when they are supervised by a trusted adult (Waddington et al., 2017). The child benefits from this support in terms of maintaining focus, comprehending the goal of the task, and feeling emotionally safe while learning.

Trained parents and educators can be extremely effective in utilizing apps as tools for home-based intervention in Pakistan, where formal therapy may not be accessible in many places. In terms of its efficacy, an app's introduction, tracking, and caregiver support are just as important as its features.

Children on the autism spectrum benefit greatly from multisensory learning, which uses multiple senses simultaneously. Many autistic students respond better to instruction that includes visual, auditory, and tactile components rather than just verbal explanations. Apps for language therapy frequently support language comprehension through touch-based interactions, animations, sounds, and visuals. Particularly for kids who have trouble with conventional text-based instruction, these characteristics can make learning English more interesting and simpler (Fernández-López et al., 2013).

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In Pakistan, where classrooms are often overcrowded and resources are limited, multisensory tools can be a great help for autistic students who need more personalized input. An app that incorporates pictures, English words spoken aloud, and interactive games can provide a learning environment that feels less overwhelming and more encouraging.

Materials and methods

Research Methodology:

This study employed quasi experimental research design. For this study, eight students who were diagnosed with mild autism spectrum were taken. They were all studying in a private center where speech therapists treat them accordingly. They tried their strategies, but for this app learning, pretest and a posttest were administered to check the results. The material for the pretest and posttest was flashcards, mini objects, plastic boxes, a picture book, a camera, rewards, and toys. Cake, candies, fruits, biscuits, and toys will be among the goodies. 45 terms pertaining to the categories of animals, clothing, family members, colors, school supplies, shapes, foods, fruits, emotions, etc., were included in the flash cards' content. The student's comprehension and ability to identify the images associated with the words served as the foundation for the vocabulary learning process. Since teaching the English alphabet was not the focus, there was no written exam. Thus, the ability of the student to either hold and present the picture or point to the related picture served as the basis for vocabulary learning. Purposive sampling was the method used for sampling in this investigation. According to the study's goals and inclusion criteria, participants are chosen using particular characteristics in this method (Jacobson et al., 2019).

Ethical Consideration:

For ethical issues, consent was taken from participants' parents accordingly. It was also clarified in the consent that they had the right to withdraw from the experiment at any time, as their participation was voluntary.

Participant:

Purposive sampling was the method used for sampling in this investigation. According to the study's goals and inclusion criteria, participants are chosen using particular characteristics in this method (Jacobson et al., 2019). The results cannot be easily extrapolated to other contexts because autism is a heterogeneous condition (Cardon& Azuma, 2011). As a result, the results might not apply to women or other age groups with varying functioning levels. The male participants, who were three years and five months old, went to therapy to learn English. The participants had previously received an ASD diagnosis from a medical and educational professional at their school, separate from this study. As evidenced by their lack of initiations and limited interactions with typical peers, the participants lacked social skills.
Given below are the details of the children chosen for this study:

The participants chosen for this study belong to most of the educated families. Their families have not even slight symptoms of Autism. They are the first ones diagnosed with this disorder in their family. They are robust physically and handsome.CARS rating in the

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mild autism range (Total score = 36.5) validated Arman's (the first participant's) diagnosis. The TONI-3 assessed his intelligence as "below average" (Q = 80). Despite his ability to communicate without prompting, he rarely struck up a discussion. Except for abstract concepts, he could respond to simple conversational queries in his native tongue. On occasion, he would repeat lines from animated TV series and cartoons in an attempt to indulge in delayed echolalia. The remaining participants' scores were somehow comparable.

Instrument:

For this research, the material used for the pretest and posttest will be toys, prizes, plastic boxes, flashcards, little items, a picture book, a camera, and a language learning app. Cake, candies, fruits, biscuits, and toys will be among the goodies. 45 terms pertaining to the categories of animals, clothing, family members, colors, school supplies, shapes, foods, fruits, emotions, etc., will be included in the flash cards' content. The student's comprehension and ability to identify the images associated with the words served as the foundation for the vocabulary learning process. Since teaching the English alphabet was not the focus, there will be no written exam. Thus, the ability of the student to either hold and present the picture or point to the related picture served as the basis for vocabulary learning. The purpose of the sessions will be to gather information about the issues and difficulties that the teacher will be facing, flashcards, small objects, plastic boxes, a picture book, and a camera. The sessions were all be videotaped in order to gather information about
the issues and difficulties that the teacher faced. This is one of the most recommended methods for conducting single-subject research (Gast& Ledford, 2019; Jewitt, 2012; Knoblauch &Schnettler, 2019).

Figure 1.1 Learning through Flashcards

Procedure:

Materials employed in this study included a language therapy app, flashcards, mini objects, boxes, a picture book, a camera, candies, and toys. The snacks included ice cream, candy, cookies, and brownies. The content of the flashcards included 50 words that are related to the categories of clothes, family members, colors, school objects, shapes, foods, and fruits. Feelings, etc.

Before the study started, parental consent was taken. The researcher prepared the required materials, such as flashcards and a picture book, and then the language therapy app, where

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the student could stick the pictures to form short sentences using the pictures. The familiarity with a child was developed then, as it was important to have a level of affection with the child so there would be no shyness from the child.
For the pretest, the flashcards were used.

The pretest was done in the home setting during the daytime with a session of 30 minutes. The child was given a response to the words that were written on the flash cards. Also, there were some objects that were not properly identified by the child during the pretest.
The child was happy while doing the pretest. After the pretest, the intervention was given through the Language Therapy App for Autistic Children. The children were being taught with the language therapy app, the session was 30 minutes a day, and it lasted for 30 days. After every session, the child was rewarded with candy. The posttest was conducted in the same environment, that is, the home setting. Through this, the child was engaged with the session and remained joyful.
The flashcards were given, and there was an improvement in the child's English learning.

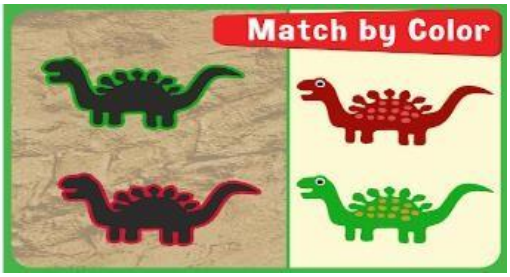

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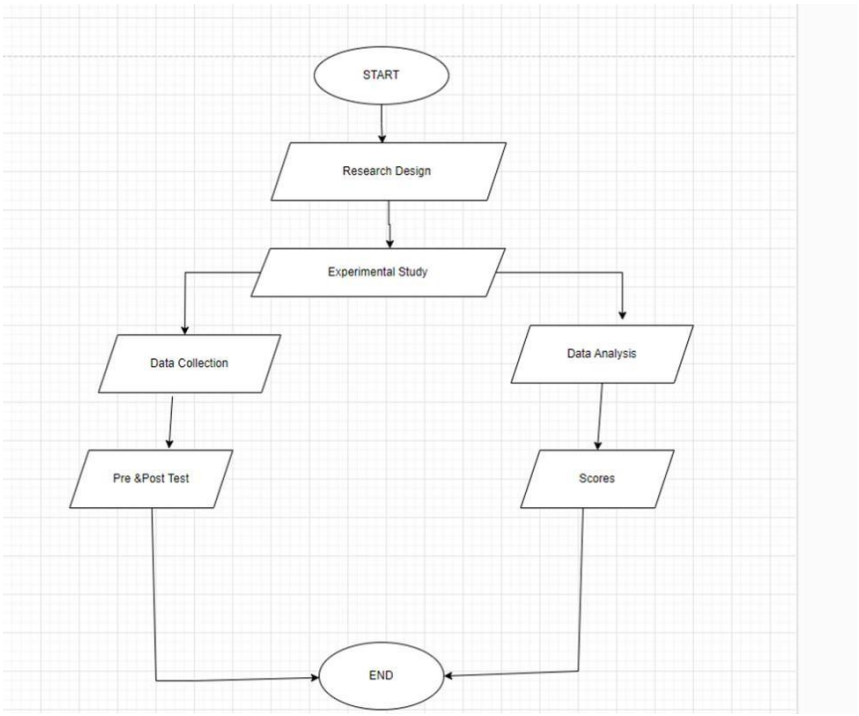
Figure 1.2 Language therapy app

Flowchart of the Research Design



Features of the App

The language therapy app used in this study was designed with one goal in mind: to make learning English easier and more engaging for Pakistani autistic children. Every feature was thoughtfully selected to support language developmentin a way that's interactive, flexible, and user-friendly. Here's a closer look at what theapp offers:

1- Simple and Easy to Use

The application features a clear interface, which is characterized by buttons and visuals. The design of this application helps in focusing on the tasks through activities.

2- Customizable Vocabulary

This application guides parents and educators of autistic children. Words are used that are essential for the learning of children. It creates a positive impact on them.

3- Multi-Sensory Learning

In the application, there is a visual, auditory clip, and text. It provides various engagements for better learning. Therefore, learning is easy for autistic children.

4- Fun and Interactive Games

In this application, learning is ensured by the presence of games and some methods. These

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methods captivate a child's attention, and the learning phase increases by doing this. Feedback is also given, which enhances the acquiring skills of in autistic children. In this way, the motivation and confidence are also enhanced, which overall positively affects the learning of children.

5- Progress Tracking

In this application, there is a proper method to check the progress of children, which is an easy task even for parents and caregivers of children. It makes sure that those areas should be focused on where the child is enabled to make progress. The reports are easily accessible to the parents and educators of children.

6- Speech Practice

Speech practice is one of he most essential tasks in the learning of autistic children. If a child is not showing speech practices, then it's difficult for them to acquire and learn a language. This feature of AP makes sure that the child develops skills for keen understanding.

7- Positive Reinforcement

The child is being given a reward as a positive gesture. This feature makes a child keen and confident in learning. This also motivates a child to be more active. It enhances motivation and learning in children.

8- Offline Access

Sometimes, some apps don't have offline access, and you need a proper internet connection for those apps, but this app also has offline access, which makes it a better app. This feature is a positive sign for the learning of children.

9- arental and Teacher Controls

For a more enhanced version of this app, only concerned persons must use this app and are responsible for its positive use. When concerned persons are using the app, they make sure that there is no negative use of this app in a way that they have access to esportsnd learning charts of their children.

10- Safe and Secure

Safety concerns are focused on this app's building. All information is secured.

11- Teaching Method of the Language Therapy App

Language Therapy Application has a combination of structured language education and technology-based activities, which makes it unique from other apps. Below is an overview of how the applications aid in the learning process of autistic children.

Learning Vocabulary

The application opens up by presenting new vocabulary in a particular organized manner. It does not offer an extensive list of words, but it introduces small groups for learning. It provides extensive imagery to assist a child in creating the word for better understanding. Auditory skills are also used for learning the pronunciation of any word. Each word is

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repeated through activities to create an image in the mind of the children. This allows a child to make mental images in their mind. In this way, they get themselves familiar with things.

Skill building through auditory and visual learning

Hearing and practicing the pronunciation of words is a crucial aspect of language development. This is supported by the app through:

Each word is represented by a clear, calm voice.

A function that allows kids to videotape themselves saying the word and play it again. This enables them to listen to how they pronounce words and contrast it with the accurate form.

A secure environment for speaking practice where making mistakes is accepted as a necessary element of learning.

This tool promotes self-expression in a relaxed, accepting setting for kids with autism who might struggle with verbal communication. This gradually increases their self-assurance when speaking a language.

Hands-On, Interactive Practice

The app also offers many interactive games that promote new reading skills and sentence formations.

Memory games involve matching pictures to words or words to sounds.

Drag-and-drop tasks that help them write sentences on their own and learn word order.

An image or word where students drag and drop when they match the Rounded Rectangle.

See how to add text to images here (with emoji). On the back of the card, students practice the definition of the term or solve the problem.

These Learning is Fun Games help make the learning process more fun and less daunting.

Goals of the application and its outcome

The aim of the app is to inspire kids at every turn. The software incorporates reinforcement through:

Every time a youngster does an activity or correctly answers a question, they should receive praise and rewards like happy animations, virtual stickers, or congratulation notes.

Children can remain motivated even if they make mistakes if they receive feedback that values effort more than merely accuracy.

A relaxed classroom setting where making progress rather than striving for perfection is valued.

This strategy reduces frustration and appeals to children's innate drive for success, particularly those who would find it difficult to learn through conventional means.

Progress Tracking and Personalized Learning

Each child's educational path is tracked by the app's integrated tracking system. This function keeps track of the child's completed words and activities.

How many times has each word or task been practiced by them?

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Their precision and potential areas for improvement.
This information can be reviewed by parents, educators, or therapists to modify the lesson plan. They can, for instance, choose several language sets according to the child's interests or difficulties.
To keep the child interested and suitably challenged, change the level of difficulty.
Establish daily learning objectives and track your progress over time.
Each child's learning experience is customized to meet their individual needs and speed, thanks to this individualized approach.

Learn Anytime, Anywhere

The program is made to function offline because it acknowledges that internet access might not always be dependable, particularly in some regions of Pakistan. The essential learning modules can be accessed without an internet connection once they have been downloaded.
To make the learning process more interesting and relevant, the app also includes culturally appropriate content, like images of regional items and landscapes. This enhances comprehension and retention by assisting kids in making connections between new English terminology and their everyday experiences.

Combining Human Support with Technology

The program works best when used in conjunction with human interaction, even if it is meant to be used independently. The youngster can be sat with and guided through the exercises by parents, teachers, and therapists.
Give further justifications or words of encouragement.
This app is used as a shared tool, which is essential for learning and developing social behaviours. This approach has the basic technology inculcated with the social human interaction.
It creates opportunities for social engagement while also supporting independent learning skills, which creates a safe learning place for autistic children.

A Safe and Supportive Learning Space

Learning language therapy app has been designed in such a manner that it fulfills all the child safety and privacy requirements. The app has a feature that secures data, and only authorized persons can access the app. It also encourages that the information is safe and learning is encouraged. It has a close link with the parents of children, as they have to practice with their child by frequently repeating the same word. Everything is designed according to the needs of the children.

- Pronunciation of words when a child encounters any word and then remembers the visual cues
- Session with children within the mob app
- Daily sessions with students
- Identification of objects
- When a child reacts to any word, it means that he /she has learnt that particular word.

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When choosing a learning item, the user should consider the child's mental, emotional, and physical needs. There is a need to select the most important objects and activities that will assist autistic children.

To enhance the autistic children's speech and social behaviors, the technology has played a significant part in the form of mobile devices and mobile applications etc. It aims to improve the language skills of the children to better perform in society. The language therapy app is proposed as an easy medium for parents and families of autistic children. It also encourages the families of autistic children to achieve milestones by properly using the app with their autistic children.

Results and Discussion

The present study aimed to investigate the effect of the Language Therapy app on learning of the Pakistani Autistic Children.

To find out how things changed following the intervention, the study gave the subjects a pre- and post-test.

Given the beneficial effects of the Language therapy app, autistic children can be taught effectively, through which different dimensions of language can be taught more effectively. Since Pakistani autistic children are taught by conventional methods, teaching with technology can improve their learning.

Results showed a clear difference as

Intervention showed that 16 out of 20 children exhibited increased attention spans during sessions. In session 14, children began initiating simple verbal expressions using vocabulary from the app.18 participants responded positively to the app's interactive elements and reinforcement (visual rewards, audio cues). Video observations revealed that the children were more likely to remain seated, focus on tasks, and engage with the app content as the sessions progressed. We get these results by constantly checking them and taking sessions of 30 minutes with these autistic children.

What is more interesting is that each child showed a response, and post-test results showed that app learning can enhance the learning functionality of children.

Rather than focusing on the old methods, the inculcation of apps in the learning of autistic children can improve and enhance the future of children with impairments.

The study aimed to figure out the effect of the Language Therapy app on learning of the Pakistani Autistic Children. To find out how things changed following the intervention, the study gave the subjects a pre- and post-test.

Due to the positive benefits of the language therapy app, it is possible to teach autistic children many aspects of language in a more efficient manner. Since traditional methods

are used to teach Pakistani autistic children, technology can help them learn more effectively.

Children's educational games are an important and large part of the recreation and education sectors. The type of game is an essential consideration for caregivers when buying toys for their children. According to Kabadayi [22], parents like to buy toys that provide a strong stimulus while also supporting the child's many developmental domains. By tapping the graphics, the child can interact with the application by enlarging the image, playing the corresponding sound, or pronouncing it. It should be noted that in addition to

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intelligence and agility, many games and other tools call for some degree of communication skills. People acquire these skills as they get older.

This chapter presents the key findings from the intervention sessions conducted with autistic children using a language therapy mobile application. Both **quantitative results (test scores)** and **qualitative insights (teacher/parent observations and behaviors)** are discussed to give a complete picture of the app's impact. The goal was to determine whether consistent app usage could improve the children's English language performance over a short period.

The study involved **eight students** between the ages of **6 and 10**, all formally having Autism Spectrum Disorder (ASD). Each child had unique learning needs and language abilities. Some were minimally verbal, while others were already using basic words. The intervention took place in a specialized school setting in Lahore.

Pre- and Post-Test Comparison

To measure the children's progress, simple English assessments were administered before and after the four-week intervention. These assessments focused on core language areas:

Recognizing and naming everyday objects
Understanding and responding to simple questions (e.g., what is this?)
Forming basic two- to three-word sentences
Identifying verbs, pronouns, and adjective

Child ID	Pre-Test (%)	Post-Test (%)	Change
A	30	55	+25
B	45	70	+25
C	25	50	+25
D	40	65	+25
E	35	60	+25
F	50	75	+25
G	20	45	+25
H	30	55	+25

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Average Pre-Test Score: 34.4%
Average Post-Test Score: 60.6%
Mean Improvement: +26.2%

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Interpretation

Each child demonstrated a noticeable improvement in their post-test scores. The consistent rise—roughly **25 percentage points** for each student—indicates that the language app had a **clear and measurable impact** on their understanding and use of Basic English.

Qualitative Observations

Engagement Levels

Children were **more focused and engaged** during app sessions compared to traditional worksheets or board activities.

Several students asked to use the app outside of their scheduled time, showing **increased interest and motivation**.

The app's colorful interface and audio feedback appeared to hold the children's attention longer than typical classroom materials.

Emergent Language Use

One child who had rarely spoken in class began pointing at images in the app and **imitating the spoken words**.

Another student, who usually avoided verbal communication, **attempted to name familiar objects**, like "ball" and "book," after hearing them repeatedly during app sessions.

By the third week, some students were **combining two to three words** more confidently (e.g., "want juice," "open door").

Feedback from Teachers and Parents

Source	Comment
Teacher A	"They were excited every time we said it was app time. It helped keep them calm and focused."
Teacher B	"They were remembering words from the app and using them in class activities, which was new."
Parent X	"My daughter used the word 'apple' at home after seeing it on the app. She usually doesn't say much."
Parent Y	"The repetition and sounds helped my son follow instructions better."

These responses show that the app's influence extended **beyond the classroom**, with

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positive changes also noticed at home.

Through teacher notes, class recordings, and parental feedback, several themes emerged:

Visual-Audio Learning Works: The use of images and sound reinforced language learning better than text or speech alone.

Routine Encouraged Language Use: Daily interaction with the app helped children remember and apply new vocabulary.

Self-Directed Use: Many children showed initiative in navigating the app themselves, promoting **autonomy and confidence**.
Positive Emotional Response: Children seemed happier and more willing to participate during app-based sessions compared to traditional tasks.

Overall, the results highlight that a well-designed, child-friendly language app can enhance the development of early English language skills. The improvements were consistent across all participants, and qualitative feedback confirmed that the app made learning more engaging and accessible. These outcomes suggest that technology can play a vital supporting role in inclusive language education, especially in contexts like Pakistan, where specialized resources are limited.

This chapter explores the study, which means in the context of language development for children with autism, especially within the Pakistani education setting. It links the quantitative and qualitative findings from Chapter 4 with relevant literature, theories, and real-world implications. The goal is to make sense of the outcomes and what they suggest about using language therapy apps for autistic learners.

App-Based Learning and Measurable Language Gains

The most significant outcome of this study was the consistent improvement in language scores across all participants. Every child showed progress of around **25 percentage points** between the pre- and post-tests. This mirrors findings from international studies, such as those involving apps like MITA (Mental Imagery Therapy for Autism), where structured app usage led to higher language acquisition rates.

Cultural and Linguistic Relevance

Most often, these speech therapy applications are made on the modes of Western culture and its education systems. Keeping in mind the app building, it is also essential to consider that the cultural context is considered. In Pakistan, these apps can be successful if they are used for the benefit of autistic children and children who are differently abled. Effective educational technology can be supportive for these children.

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Teacher and Parent Involvement

Another major factor in the app's success was the **active support of teachers and parents**. Teachers noticed that students were more verbal during class, and parents shared positive changes at home. This confirms that **collaboration between educators, families, and tools like therapy apps** can reinforce learning across different environments.

It also reflects findings from studies in Pakistani schools where parents expressed a need for easy-to-use tools that they could manage at home. The app provided a structure that was consistent and not dependent on formal instruction, making it usable even for caregivers with limited tech knowledge.

Limitations and Considerations

While the results are promising, there are a few limitations worth mentioning:

Small Sample Size: The study was limited to eight children. A larger sample would offer broader insight and more robust generalizations.

Short Duration: Four weeks may not capture the long-term benefits or challenges of the app.

No Control Group: All participants received the intervention, so comparisons with non-users were not possible.

Despite these limitations, the data still provides **meaningful early evidence** that such tools can work when designed and used appropriately.

Theoretical Implications

The study supports constructivist and behaviorist learning theories, which suggest that children learn best through repeated exposure, reinforcement, and interaction. The app encouraged trial and error, self-discovery, and feedback, core aspects of these models. It also aligns with principles of **Applied Behavior Analysis (ABA)** and **Pivotal Response**

Treatment (PRT), which emphasize motivation, responsiveness, and small achievable steps.

Practical Implications

For educators, the study suggests that even low-cost, basic mobile tools can have a big impact when used intentionally. Schools that lack access to speech therapists or resources can integrate similar apps as part of their teaching strategy. For policymakers and developers, the results call for more **locally developed, autism-friendly digital tools** that address language learning.

The discussion shows that technology—when designed with care and used consistently—can bridge many of the communication challenges faced by autistic children in Pakistan. The app used in this study not only helped children build vocabulary and sentence

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structures but also created moments of joy, confidence, and connection. This work offers a valuable step toward more inclusive, accessible, and culturally aware language education tools.

Conclusion

Smartphones can be used to provide customized and integrated support for people who suffer from different mental and physical disabilities. Autistic children are unique. Due to their condition, children with autism typically face similar problems and difficulties around the world. Every autistic child has unique learning preferences and styles, which can both benefit and hinder them as learners. However, language acquisition is also one of the most challenging processes for children with autism (Maulna&Bhruni, 2020; Chu, Tang, McConnell, MohdRsdi, & Yuen, 2019).

"Numbers," "Letters," "Vocabularies," "Social skills," and "Relaxation and anger control" are the five primary categories covered by the app.

There are several subcategories within each main category, and each one offers a variety of interactive lessons with sound effects and vibrant colors in addition to a quiz that asses ses the child's progress in each category and provides recommendation reports and quiz r ecords that can be used by the teacher or parent to get the most out of the app.

The study's conclusions showed that teaching English vocabulary and basic conve rsational fragments through educational apps can be a successful approach in the early ph ases of language instruction.

According to Kaduk (Citation 2017), this system can also be effective in the early phases of communication.

To conclude, the statistical findings were consistent with regard to the overall efficacy of the process. The current study's findings demonstrated how well educational applications can improve autistic children's English language acquisition. The present study's results are in line with other statistics showing that educational applications are a successful method for teaching students with autism in general, according to a comparison of the study's findings with those of other comparable studies. The current study's findings contributed to earlier theoretical research on the usefulness of technological applications in enhancing autistic children's learning capacities.

The findings demonstrated the numerous ways in which the language therapy app helped the participant enhance their learning abilities. The participant's opinion toward educational apps improved and remained positive. Like the majority of other research, this one had its limitations.

Furthermore, just one child was available to the researcher. Female subjects might be included in the same study. Additionally, the study participants were within the age range of three years. To increase the findings' generalizability, the same study might be conducted with different age groups. The current study looked into how well the language therapy software helped autistic kids learn English.

This research set out to examine whether a language therapy app could help improve the English language skills of autistic children in Pakistan. Based on both quantitative and qualitative data gathered over a four-week intervention, the results clearly showed that the use of the app contributed positively to children's language development.

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Across all participants, there was a consistent and measurable improvement in vocabulary recognition, sentence formation, and verbal participation. Beyond numbers, teachers and parents observed increased confidence, willingness to communicate, and greater emotional involvement in learning. These findings suggest that **technology, when applied purposefully, can help bridge communication gaps** for children on the autism spectrum.

Crucially, the app's success came not from its content alone, but in how it was introduced and mediated by the daily routine, teachers, and the parental nudge. The children liked the structure and interactive nature of the pictures on the app, and they enjoyed the repetition. But this is evidence that even where resources are limited, basic digital tools can offer rich opportunities for learning when applied over time and with care.

In conclusion, the present study demonstrates that mobile technology brings added value to current teaching approaches in the special education context. It underscores the importance of digital solutions that are culturally connected, user-friendly, and pace, and can be modified to meet the learning needs of differently abled children.

Recommendations

Based on the study's outcomes, the following recommendations are offered for educators, therapists, developers, and policy-makers:

For Educators and Special Needs Teachers:

Fund the integration of instructional technology in special education programs.
Promote teacher training to use digital tools with special needs students.
Foster the development and dissemination of inexpensive, home-grown apps for therapy to increase access to such tools.
Track individual progress: Teachers can modify the pace or content based on each child's learning level by doing routine monitoring.

For Parents and Caregivers:

Work apps into daily routines: Short, focused sessions could help children soak in new vocabulary over time.
Combine the app with classroom activities: Support words and phrases taught in the app by using real-life objects and flashcards.
Ally verbal.
Encourage comfortable, at-home usage: Learning ought to be enjoyable. Ten to fifteen minutes a day of supervised app use can support the reinforcement of classroom instruction.
Celebrate little victories: Giving kids positive feedback encourages them to keep trying, whether it's a new word or a straightforward phrase.
Seek advice from educators: Maintaining consistency in language learning practices is facilitated by a home-school relationship.

For App Developers:

Localize content: The software becomes more relatable when it includes images, speech patterns, and items that Pakistani kids are familiar with.

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Keep user interfaces straightforward: Designs that are simple, predictable, and provide regular feedback are beneficial to kids with ASD.

5.1 Recommendations

For Teachers and Special Educators

Include technology in your lesson plans regularly, particularly during language classes.
Choose or modify applications to meet the communication and cognitive requirements of students with autism.
Track each student's progress individually and modify app usage according to their growth.

For Parents and Caregivers

Support the use of language apps at home to create consistency between home and school learning environments.

Engage with children during app use to encourage social interaction and verbal expression.

Celebrate small language gains to build the child's motivation and confidence.

For App Developers

Design apps with straightforward, sensory-friendly user interfaces for children with ASD in mind.
Make content culturally and linguistically appropriate for non-native speakers of English.
Include progress-tracking features that allow educators and parents to monitor development.

For Policy-Makers and School Administrators

Allocate resources toward integrating educational technology in special education programs.
Encourage professional training for teachers to effectively use digital tools with special needs students.
Promote the development and distribution of low-cost, locally developed therapy apps to make such tools more accessible.

Suggestions for Future Research

While this study focused on short-term outcomes using a small sample, future research could expand in the following areas:

Investigate the **long-term effects** of app usage on language and social development.

Use a **larger and more diverse sample** to enhance the generalizability of results across different regions and age groups.

Explore the **impact of different types of language apps**, comparing structured versus play-based approaches.

Examine how technology-based interventions influence other **developmental areas**, such as emotional regulation and classroom behavior.

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