

Research Paper

## Advocating an Android App for Toilet Training in Children with Autism Spectrum Disorder

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### ABSTRACT

Learning occurs through diverse methods, and one such method involves utilizing an Android application to teach vital daily living skills to children with special needs, aiding them in achieving independence in their routines. This study concentrates on instructing toileting skills to children with autism using a mobile application that delivers audio and visual guidance in a step-by-step manner. Employing a pre and posttest control group design, the study found a significant difference in toileting skill attainment between the experimental and control groups. This indicates that the Android application is more effective in teaching toileting skills compared to the traditional method of using picture flashcards.

**Keywords:** Toilet Training, Autism Spectrum Disorder, Android App

Acquiring daily living skills is essential for children with autism and other neurodevelopmental disorders to foster independence through specialized education services. Special education tailors instructions to meet the unique requirements of exceptional children, employing specific materials, teaching methods, and facilities. Its primary goal is to instill confidence and competence in children with special needs, utilizing various teaching strategies to enhance skill development. Among these skills, mastering toileting is paramount, requiring support from parents or caregivers who understand the importance of this aspect in a child's overall growth. Children with autism often encounter challenges in toileting and may require assistance ranging from basic cues to complete support. Teaching this skill involves natural setting and timing, adapting teaching strategies to individual learning styles, especially considering that many autistic children are visual and auditory learners. Leveraging technology, such as mobile apps and tablets, can be a feasible teaching approach due to its effectiveness in teaching both academic and functional skills. Various apps cater to different disabilities, offering platforms for learning daily living activities, including toileting, suitable for children with physical and mental disabilities like autism. Examples include LetMeTalk: Free AAC Talker, Speech Assistant, and Autism Therapy with MITA.

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Received: April 15, 2024; Revision Received: June 01, 2024; Accepted: June 05, 2024

## REVIEW OF LITERATURES

The realm of technology has become instrumental in enhancing skills across various demographics, regardless of gender or qualification. Both educators and parents of children with special needs are increasingly drawn to mobile technology for its convenience and accessibility. In this study, the app KAVI-pts was employed, offering customized mobile learning tailored to the specific needs of children with special requirements. This app allows for the seamless integration of visuals and auditory cues, which are particularly beneficial for children with autism, known for their preference for visual and auditory learning methods. Mothers of children with special needs find comfort in utilizing mobile apps as visual aids in their training efforts. Previous research, such as David's (2010) investigation into computer-based video instruction for life skills, and Toni's (2010) comparison of picture and video prompts for teaching daily living skills to individuals with autism, underscores the efficacy of multimedia tools in skill acquisition. David and Morgan (2008) also demonstrated the positive impact of multimedia instruction in teaching grocery store purchasing skills to high school students with intellectual disabilities. Tailoring instruction to suit individual learning styles is essential, as highlighted by Cronin's (2006) study on computer-based video instruction for augmentative and alternative communication devices. While digital media has been extensively used in teaching various skills, including domestic, arithmetic, and literacy skills, there remains a gap in utilizing digital applications for teaching personal hygiene skills such as toileting. This study aims to address this gap by leveraging digital media, particularly Android applications, to teach toileting skills to students on the autism spectrum, with the ultimate goal of promoting independence in this crucial aspect of daily living.

### *Need & Significance of The Study*

The aim of this study is to assess the impact of the Kavi-PTS Android application on improving toileting abilities among students diagnosed with Autism Spectrum Disorder (ASD). Previous research has demonstrated the efficacy of digital media in teaching various skills and fostering positive behaviors in individuals with ASD and other disabilities. Education ultimately strives to foster personal adequacy, social competence, and economic independence. Therefore, providing training in toileting skills is crucial for integrating children with autism into mainstream society. Additionally, such training can alleviate the burden on caregivers and empower the child to become more independent in performing essential daily tasks, allowing them to focus on developing functional and literacy skills.

### *Statement of the Problem*

The primary objective of this study is to investigate the impact of the Kavi-Pts (Picture to Speech) Android application on toilet training skills among students diagnosed with Autism Spectrum Disorder (ASD).

### *Objectives of the Study*

1. Assessing the impact of the Kavi-Pts (Picture to Speech) Android application on the attainment of toileting skills within the experimental group.
2. Evaluating the effectiveness of the traditional method, utilizing picture flashcards, in facilitating toileting skill development among the control group.
3. Comparing the achievement levels of toileting skills between the experimental and control groups.

### Hypotheses

1. A notable disparity exists in the mean scores of toileting skill achievement between the pre-test and post-test assessments within the experimental group.
2. Similarly, a significant variance is observed in the mean scores of toileting skill before and after intervention within the control group.
3. Furthermore, a significant discrepancy is evident between the post-test scores of the experimental group and the control group in terms of toileting skill proficiency.

## RESEARCH METHODOLOGY

The study titled "Utilizing Android Applications as an Intervention Method for Toilet Training in Children with Autism" was carried out to investigate the effectiveness of a digital app, specifically KAVI-PTS, in improving toileting skills among students diagnosed with Autism Spectrum Disorder (ASD) aged 7 to 10 years attending primary-I classes. The research employed an experimental design featuring pre-test and post-test measures with a control group. The sample comprised 10 students with moderate autism within the specified age range, attending a special school in Pondicherry. An initial assessment of toileting skills was conducted using a checklist devised by the researcher, with 10 students selected based on their performance, scoring between 80% and 90%. These students were then evenly divided into matched experimental and control groups, ensuring homogeneity in skill levels. The allocation process considered the specific score ranges achieved by each student on the pre-assessment checklist. The checklists used in the study were developed by the researcher and validated by 15 special educators and senior professionals in special education.

### Data Analysis & Interpretation

Data collected during intervention have been tabulated and the mean, SD, Wilcoxon Signed Rank Test and Kolmogorov-Smirnov Tests were used for analysis. The details of analysis and interpretation of results are discussed below.

**Table: 1 Comparison of Pre-Test Mean Scores of Experimental and Control group:**

Group	N	Mean	SD	Mean Diff	Kolmogorov-Smirnov test "Z"-value	Level of significance
E-Pre	5	31.80	10.159	1.80	0.550	NS
C-Pre	5	30.80	6.760		0.700	

The above table presents the results from Kolmogorov-Smirnov test of normal that the p values of Experimental pre test  $p = 0.923$ , Control pre test  $p = 0.711$ , Experimental post test  $p = .997$  and Control post test  $p = .809$ , the p values of Kolmogorov-Smirnov test is greater than 0.05 which states that the data follow a normal distribution. Hence, we can use the parametric test for further analysis. It is evident from the table 1, Pre –test mean score of Experimental Group is 31.80 (SD=10.159) and Pre –test mean score of Control Group is 30.80 (SD= 6.760) which shows that there is no difference between pretest mean scores of Experimental and Control Group who received training in the Toileting skills. "Kolmogorov Smironov test was used to find out whether this difference in the mean scores is statistically significant or not. The obtained 'Z' value is 0.550 and 0.700 which indicates that there is no significant difference between Pre-Test mean scores of Experimental and Control group. Hence there exists homogeneity between the groups.

**Achievement of Experimental Group on Toileting skills**

**Table 2: Comparison of Pre and Post Test Mean Scores of Experimental Group (Kavi-PTS)**

Group	N	Mean	SD	MEAN DIFF	“t” Value	df	Sig. (2-tailed)
E Pre-Test	5	31.80	10.159	-4.40	-3.641	4	0.022
E Post-Test	5	36.20	10.159		P<0.05		

Table 2 demonstrates a notable increase in the disparity between pre and post-test mean scores among the Experimental group, who underwent training in Toileting skills using an Android app called Kavi-PTS. The initial mean score before training was 31.80 (SD=10.159), and post-training, it rose to 36.20 (SD=10.159), resulting in a mean score difference of -4.40. A paired t-test was conducted to determine if there was a significant difference between these scores. The calculated t value was -3.641, with 4 degrees of freedom, yielding a two-tailed p-value of 0.022. Since the p-value is less than 0.05, it indicates statistical significance, suggesting that the intervention via the Kavi-PTS app positively influenced the acquisition of Toileting skills among students with ASD. Consequently, the hypothesis stating that there would be a significant improvement in Toileting skill achievement between pre and post-test scores within the experimental group is supported.

According to Table 2, there's a noticeable increase in the difference between the pre and post-test mean scores of the Experimental group, who underwent Toileting skill training via the Kavi-PTS Android app. Initially, the mean score was 31.80 (SD=10.159), and after the training, it rose to 36.20 (SD=10.159), resulting in a mean score difference of -4.40. A paired t-test was conducted to determine if there's a significant difference between these scores. The calculated t-value (t) was -3.641, with 4 degrees of freedom, and the two-tailed p-value of the paired t-test was found to be 0.022. Since the p-value is less than 0.05 (i.e.,  $p < .05$ ), it's concluded that there's a statistically significant difference between the two variable scores. This significance at  $p < 0.05$  level indicates that the intervention through the Kavi-PTS app positively impacted the achievement of Toileting skills among students with ASD. Consequently, the hypothesis stating that there would be a significant improvement between pre and post-test scores on Toileting skill achievement within the experimental group is accepted.

**Achievement of Control group on Toileting Skills:**

**Table 3: Comparison of Pre and Post-Test Mean Scores of Control Group:**

Group	N	Mean	SD	MEAN DIFF	“t” Value	df	Sig. (2-tailed)
C Pre-Test	5	30.80	6.460	-2.40	-4.000	4	0.016
C Post-Test	5	33.20	6.611		P<0.05		

Based on the data presented in Table 3, it is observed that the Control group exhibited a difference in pre and post-test mean scores. Prior to the intervention, the mean score was 30.80 (SD=6.760), which increased to 33.20 (SD=6.611) post-intervention, resulting in a mean difference of 2.40. This suggests that there was a discernible change in the performance of the Control group, who received intervention in Toileting skills through the traditional method of picture flash cards. A paired t-test was conducted to ascertain the significance of this difference. The calculated t-value (t) was -4.000, with 4 degrees of

freedom, and the two-tailed p-value of the paired t-test was found to be 0.016. Since the p-value is less than 0.05 (i.e.,  $p < .05$ ), it indicates a positive effect of the traditional method utilizing picture flash cards on the performance of toileting skills among the subjects of the control group. Consequently, the hypothesis stating that there would be a significant improvement in pre and post-test mean scores on Toileting skills among the control group is accepted.

**Comparison on the achievement of Toileting skills among experimental and control group:**

*Table 4: Comparison of Post-Test Mean Scores of Experimental and Control group:*

Group	N	Mean	SD	Mean Diff	Kolmogorov-Smirnov test "Z"-value	Level of significance
E-Post	5	36.20	10.159	3.00	0.400	0.05
C-Post	5	33.20	6.611		0.639	

The provided Table 4 displays the post-test mean scores of toileting skill among students with moderate ASD in both the experimental and control groups. The post-test mean scores for the experimental and control groups are (10.159) and (6.611) respectively, with a difference in mean scores of 3.00. To determine the statistical significance of this difference, the Kolmogorov-Smirnov test was utilized. The p-values for the experimental group's post-test ( $p = 0.997$ ) and the control group's post-test ( $p = 0.809$ ) indicate that the data follow a normal distribution, as they are both greater than 0.05. Additionally, the obtained Z values of 0.400 and 0.639 for the experimental and control groups respectively are significant at  $p < 0.05$  levels. This suggests that the subjects in the experimental group, trained through Kavi-PTS, exhibited higher achievement in toileting skills compared to the control group, which underwent traditional picture flash card training. Consequently, the hypothesis stating that there would be a significant difference between the post-test mean scores of the experimental and control groups in terms of achievement of toileting skills is accepted. It is noted that individuals with Autism Spectrum Disorder have the capability to learn activities through the Kavi-PTS Android app technique. This method provides a slight positive impact on performing the activity, possibly due to the motivation provided by colorful digital pictures, resulting in higher scores in toileting skill attainment among students with ASD compared to those who learned through traditional picture flash cards.

*Table 5: Comparison of session-wise means scores of Experimental group and Control Group.*

Group	Pre-Test	5th	10th	15th	Post-Test
Exp	31.80	33.00	33.40	36.00	36.20
Ctr	30.80	32.00	32.80	33.20	33.20

Table 5 presents the mean scores of both the Experimental group and the Control group at various intervals. A gradual progression is noticeable in both groups, with the Pre-test mean scores for the subjects in both groups being 31.80 and 3.80 respectively. Throughout each session, it becomes apparent that the performance of the experimental group slightly surpasses that of the control group. One plausible explanation for this discrepancy could be attributed to the use of digital pictures accompanied by the recorded voice of the mother. This familiar voice may serve as a significant motivational factor for the child, contributing to enhanced engagement and consequently, better performance in the experimental group compared to the control group.

### ***Limitations of the Study***

- The data collection period was short, which may have limited the depth of understanding of the intervention's long-term effects. Given that students with ASD often require more time to adapt to new interventions, conducting the study over an extended period could yield more comprehensive and reliable results.
- Mothers faced challenges operating the Android phone or tablet in the toilet, risking potential damage if dropped into the commode or water bucket during use. This operational difficulty may have affected the consistency and effectiveness of the intervention.
- Battery power depletion of the Android device posed a limitation during skill training sessions, potentially disrupting the continuity of the intervention.
- Limited water supply in some households posed a practical constraint in executing the study, potentially impacting the frequency or quality of training sessions.
- The natural inclination of students with ASD towards playing games may have led to distractions during toileting skill learning sessions, potentially affecting the focus and engagement levels during training.

### ***Direction for Future Research***

Based on the findings of the present study, several research questions and suggestions for future research emerge:

1. **Exploration of Teaching Skills Using Android Apps:** There is a paucity of research in teaching skills across various domains such as personal, social, academics, and occupational areas using Android app techniques among students with Autism Spectrum Disorder (ASD) and other disabilities. Therefore, there is a pressing need for more studies in these areas utilizing available Android apps to explore their effectiveness in skill acquisition.
2. **Customized Applications for Functional Skills Training:** The current study demonstrated the effectiveness of the KAVI-PTS Android app in teaching toileting skills. This suggests the potential utility of similar customized applications for training other functional skills among children with special needs. Future research could focus on developing and testing such applications for a broader range of functional skills.
3. **Diversification of Study Participants:** The present study focused on students with moderate ASD, aged 7 to 10 years old, attending primary school. Future studies should consider diversifying the participant pool to include individuals of different age groups and varying severity levels of ASD. This broader scope would help determine whether similar effects are observed across different demographic profiles, thus enhancing the generalizability of the findings.
4. **Implications for Teachers and Parents:** The findings of future studies exploring teaching strategies for personal skills among individuals with special needs will have direct implications for educators and parents. By identifying effective instructional methods and tools, such as Android apps, teachers and parents can make informed decisions when selecting strategies for teaching personal skills to children with ASD and other disabilities.

In summary, future research endeavors should focus on expanding the use of Android apps for teaching various skills among individuals with ASD and other disabilities, diversifying study participants to enhance generalizability, and providing practical guidance for educators and parents in selecting effective teaching strategies.

## CONCLUSION

The present study highlights the effectiveness of the KAVI-PTS Android app as an instructional strategy for training toileting skills among students with Autism Spectrum Disorder (ASD). Mothers reported that during the intervention, the majority of subjects in both groups showed enthusiasm for performing the skill, particularly those in the experimental group who received training through multi-sensory methods via the digital app. This sustained motivation throughout the learning sessions resulted in better achievement among subjects in the experimental group.

Mothers observed that children were focused and engaged when using the app, especially when listening to audio instructions while scrolling through pictures. Children demonstrated initiation and imitation of tasks such as removing and wearing clothing, pouring water into the toilet, and indicating gestures for washing. The study underscores the potential for students with ASD to learn skills more effectively through digital Android applications. Teaching toileting skills using the KAVI-PTS app proved to be an effective strategy, facilitating better expression and performance of various tasks associated with the skill. The engaging nature of digital apps serves as a motivational factor, making them effective tools for teaching a variety of personal skills. These findings suggest innovative ways to teach personal skills using digital methods. Customized apps can include a variety of pictures tailored to each child's level and preferences, along with voice recordings suited to their needs. Moreover, this approach can be extended to other categories of disabilities, such as intellectual disability and learning disability, to promote a wide range of functional skills including cooking, washing, and functional academics like time and money concepts, as well as various social skills. By leveraging these customized apps, educators and caregivers can enhance skill development in individuals with diverse learning needs.

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## Acknowledgment

The author(s) appreciates all those who participated in the study and helped to facilitate the research process.

***Conflict of Interest***

The author(s) declared no conflict of interest.

***How to cite this article:*** Kulshreshtha, P. & Mangral, S.M. (2024). Advocating an Android App for Toilet Training in Children with Autism Spectrum Disorder. *International Journal of Indian Psychology*, 12(2), 3028-3035. DIP:18.01.265.20241202, DOI:10.25215/1202.265