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The Research on the Predicting the Phenomenon of Intervention in Communication Skills for Children with Autism Using New Media - An Example of Yuudee IPad Application

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Abstract: Due to functional communication difficulties, children with autism are unable to freely communicate their needs and respond to social interactions. It has been demonstrated that the learning of communication skills alleviates the challenges caused by communication impairments. With the use of Augmentative Alternative Communication technologies, it is yet unknown how to develop the communication abilities of children with autism more successfully. During the preparatory phase of this research, a literature search was undertaken to build a instructional teaching plan by integrating the characteristics of the iPad application and the Picture Exchange Communication System teaching process. In the experimental phase, a cross-behavioral multi-baseline design was utilized to empirically demonstrate the communication behaviors pertaining primarily to expressing needs and addressing problems in a single subject. There was an increase in the number of subject's autonomous declarations of needs and responses to questions after the intervention. The maintenance impact of the intervention was greater for the former than for the latter. The number of independent replies to questions was more than the number of needs expressed. Based on the study's findings and the subject's performance in the intervention training, the iPad application Yuudee is beneficial for enhancing the communication behaviors of children with autism, and the instructional use should be tailored to the subject's individual circumstances to develop specific instructional programs. The creation of appropriate application software should adhere to the cognitive rules of children with autism, from simple to complex, with treatments at each developmental stage.

Keywords: autistic children, education, ipad application, communication intervention

1. Introduction

Autism is a developmental disease that occurs in infancy or early childhood and is caused by a neurological disorder that is often characterized by deficiencies in social interaction and communication, as well as stereotyped, repetitive, and restricting movements and behaviors [1]. Verbal communication issues in children with autism include challenges with spontaneous communication, responding to the communication of others, and engaging in conversation. Communication difficulties are one of the basic deficiencies of children with autism and have a significant impact on their ability to meet their own needs and communicate with others.

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Individuals with autism acquire communication skills to reduce maladaptive behaviors such as aggression and self-injury, boost resilience, and enhance their overall quality of life. The Augmentative Alternative Communication (AAC) system is one of the most frequently utilized strategies to address the communication impairments of children with autism, not only as an alternative communication strategy, but also as an extended communication strategy. The Picture Exchange Communication System (PECS), which uses paper pictures, employs effective reinforcers to interact in both directions with children with autism throughout the course of six stages, from guiding the case to build communication behaviors to instructing the case to make remarks [2].

However, PECS has the limitations of low-tech augmentative communication technologies, such as a restricted vocabulary and tedious processes. With the advancement of technology, iPad applications that can show images can compensate for the limitations of traditional PECS and are frequently utilized as high-tech AAC systems for autistic children in the fields of education and research. Numerous empirical studies have been conducted in other countries employing iPad applications to assist with autistic children, mostly focusing on treatments for the communicative and intellectual skills of autistic persons [3]. For this new high-tech assistive system to be effective with autistic children, it is necessary to investigate how to use the iPad's numerous benefits in visual communication using the relatively mature ideas and practices of PECS. This research used the literature search method in preparatory phase to draw on the mature teaching procedures and methods of PECS to develop an iPad-based PECS teaching procedure, on which the teaching program was designed for different target behaviors, and in experimental stage, the intervention was empirically demonstrated by employing a cross-behavioral multi-detection design in a single subject for the communication behaviors of the case, and relevant implementation strategies were also discussed.

2. Basic Concept of Augmentative Alternative Communication Methods

2.1. Picture Exchange Communication System and High-tech Augmentative Alternative Communication System

In the preparatory phase of the research, the literature research method was used to summarize and analyze the teaching objectives, communication behaviors, and teaching procedures of the six stages of PECS, as well as to combine the benefits of the iPad augmentative communication system to form the iPad-based six-stage PECS teaching procedure.

The use of AAC systems in autism was first investigated in the 1980s and 1990s, and the most widely used method in AAC interventions for autism was the PECS developed by Bondy and Frost in 1994, which is a low-tech system that allows individuals with communication disorders to express needs or convey information by pointing to pictures and exchanging picture cards. Six instructional levels based on behavioral and reinforcement theories that educate youngsters to utilize functional communication in social interaction circumstances [2]. Children with autism can acquire a variety of communication skills via the PECS's simple and hands-on work instructions, which vary from demonstrating how children with autism can communicate with a single picture to utilizing phrases with many pictures.

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Table 1: PECS teaching procedures.

Stage	Teaching objectives	Communication behaviors
Stage 1	Establish communication concepts	Pick up, display, put down
Stage 2	Expand spontaneous communication skills	Pick up, walk to others, display
Stage 3	Image identification	Identify, pick up, put down
Stage 4	Organize sentences	Identify, organize
Stage 5	Answer questions	Listen, organize, exchange
Stage 6	Comment	Listen, understand, organize, display

2.2. Combination: Six Stages PECS Teaching Procedures Based on High-tech Ipad Application

As shown in Table 1, PECS is a commonly utilized low-tech AAC system. However, in recent years, technological advancements have switched traditional communication intervention strategies to mobile devices with higher levels of technology. Because the iPad is more technical than conventional PECS in terms of communication symbols, picture creation programs, and communication aids, it may be utilized to fulfill customized needs, customize educational programs, and enhance the efficacy of treatments [3]. Following Table 2 is the combination of six stages PECS teaching procedures and advantages of high-tech iPad application.

Table 2: Six stages PECS teaching procedures based on high-tech iPad application.

Stage	Teaching objectives	Communication behaviors
Stage1	Establish communication concepts	Click on the image of the reinforcers, release fingers to generate speech from iPad
Stage2	Expand spontaneous communication skills	Walk to the iPad, click on the image of the reinforcers, release fingers to generate speech
Stage3	Image identification	Identify the reinforcers' image, click on the image, release fingers to generate speech
Stage4	Organize sentences	Identify the reinforcers' image, organize sentences using images, click on the sentences to generate speech
Stage5	Answer questions	Listen, identify, organize, click
Stage6	Comment	Listen, understand, comment motivation, identify, organize, click

3. Explorary Research on Communication Intervention

3.1. Basic Information about Research Subject

The research needed and chose individuals who satisfied the following inclusion criteria from a sample of children with autism attending a special education school in Pingdu, Qingdao. 1)

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Hospitalized and diagnosed with autism. 2) Nil or little vocal expressiveness as measured by the communication Behavior Rating Scale for autism [4]. 3) Lacked prior experience with iPad communication software but have considerable cognitive abilities. 4) Parents consented to engage in the intervention training program and filled out a consent form.

Ultimately, a third-grade student named Coco was chosen based on the inclusion requirements of the research. This 9-year-old girl with limited oral expressiveness who was diagnosed with autism at the age of 1 year and 2 months and is presently receiving cognitive, language, and fine motor instruction at a special education facility with her mother as her primary caregiver. According to the DSM-V diagnostic criteria for autism, the subject rarely initiated conversations in social communication and social interaction, lacked sharing interaction, liked to circle around people but rarely had one-on-one interaction, did not respond to the interaction of others on a basic level, had trouble playing imaginative games and making friends, and had a fixed consistency in the arrangement of objects, particularly block toys.

3.1.1. Reinforcers

Watermelon, strawberries, cookies, rainbow candy, seaweed, marshmallows, blocks, Rubik's cube.

3.1.2. Description of Autistic Characteristics

According to the DSM-V diagnostic criteria for autism [1], the subject rarely initiated conversations in social communication and social interaction, lacked sharing interaction, liked to circle around people but rarely had one-on-one interaction, did not respond to the interaction of others on a basic level, had trouble playing imaginative games and making friends, and had a fixed consistency in the arrangement of objects, particularly block toys.

3.1.3. Self-care and Cognitive Ability

The subject was not good at fine motor skills and have poor hand coordination. She could use a spoon to eat, undress, urinate and defecate on her own, understand simple commands, recognize numbers, simple shapes, basic colors, and some animals, but her attention was easily distracted.

3.1.4. Communication Ability

According to the communication Behavior Rating Scale for autism completed by the Coco's parents, the subject expressed requests by pointing to objects or staring at them, typically by ignoring them to indicate refusal, by walking around in front of people or screaming to attract attention, and by head movements in response to "yes" and "no" questions. "Do you want it?" and further inquiries posed with head gestures. Excited individuals may engage in self-stimulating actions such as running in circles and shaking the body when interacting with others.

In general, the subject's expressions were dominated by movements and simple sounds, whereas her speech was dominated by reduplicated words and less dynamic facial gestures. In terms of language comprehension, she could comprehend typical instructions encountered in daily life but less frequently responded to familiar commands with some extreme emotional changes.

3.2. Research Tool

3.2.1. Tools of Intervention

An iPad with the Yuudee application.

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3.2.2. Target Behavior Observation Record

Developed a Target Behavior Observation Record Form and kept it record.

3.2.3. Reinforcers Evaluation Form

Subject's preferred items were assessed according to Deleon's preference assessment procedure and assessment requirements [5].

3.3. Variables

3.3.1. Argument

PECS teaching program for iPad application Yuudee.

3.3.2. Dependent Variables

Subject’s express needs and respond to problem behaviors.

3.3.3. Control Variables

Intervention time, intervention site, intervention experimenter.

3.4. Research Design

Yuudee was used to train the communicative behaviors of one autistic subject in a one-on-one setting from August 20, 2022, to October 30, 2022, for a projected length of 10 weeks. Target Communication behaviors comprised of two primary goal actions: communicating requirements and responding to questions. In the quantitative data analysis part of this study, the target behavior observation record form was utilized to record the number of times subjects autonomously expressed needs and responded to the researcher's inquiries using the iPad. Using visualization analysis and C-statistics, the number of independent communications and communication proficiency of the subjects were assessed. The obtained data were examined by presenting the change curve of the data information visually, assessing the change of the data information between stages, and providing the findings of descriptive analysis of the data information as within-stage and between-stage visual analysis summary tables.

By employing a cross-behavioral multi-baseline design in a single subject, the experimental research was used to examine whether children with autism spectrum disorders could improve the communication ability with the intervention of application Yuudee on the communication behaviors.

Cross-behavioral multiple baseline experimental designs typically intervene on the same subjects for two or more behaviors in the same context to investigate the effects of interventions with different target behaviors, and require a stepwise intervention approach, with the intervention period beginning when the data from the first baseline period for the first target behavior have stabilized [6]. This study's data collecting for the first target behavior baseline period began on August 20, 2022, and was completed on October 30, 2022. The second target behavior maintenance period was anticipated to run a total of 10 weeks.

The communication behaviors chosen for this study pertain to the subject’s capacity to convey two categories of behavior using Yuudee: expressing needs and responding to questions. During the baseline, intervention, and maintenance phases, both behaviors were recorded. During the baseline period of need-expressing behaviors, the preferred reinforcers of the subject were put within their

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line of sight, and an iPad with Yuudee was utilized to present the created classroom interface and placed next to the subjects without intervention.

3.4.1. Baseline Period

During the baseline period of responding to problem behaviors, the researcher took out the subject's favorite blocks and Rubik's cube and asked the subject about the color and shape of the toys. The researcher then presented the created lesson interface using Yuudee on the iPad and placed it next to the subject, without intervening during the period, and recorded the subject's behavior when answering the researcher's questions using the iPad. Data collection for the baseline period commenced on August 20, 2022, and was anticipated to continue for two weeks, with at least three data points per subject recorded, and entry into the intervention predicted when three consecutive data points demonstrated a stable trend. The gathering of baseline period data for response problem behaviors will occur when the indicated need behavior becomes an intervention expectation.

3.4.2. Intervention Period

The first target behavior can be incorporated into the intervention when data from the baseline period indicate stability and the intervention was projected to last six weeks. The first target behavior was divided into four phases, and the next phase data was based on stability of last phase. The second desired behavior was predicted to last for four weeks based on consistent baseline data. The intervention was a didactic intervention in which subjects were taught to communicate using iPads at a defined time and location in accordance with a training protocol, and only the target behavior was interfered for 15 minutes per intervention, five times per week.

3.4.3. Maintenance Period

The intervention period ended and was followed by the maintenance period, during which observations of the target behaviors were regularly recorded. During this phase, the behaviors of subject utilizing the iPad to communicate its wants and reply to questions were documented. The researcher did not perform any formal training on the maintenance period and did not provide any urging or assistance to the subject. The subject would be encouraged and rewarded when she demonstrated the desirable target behaviors [7].

3.5. Concrete Teaching Plans for Implementation

To examine the effects of the interventions on the two target behaviors of expressing needs and responding to questions, the following two study questions were posed. 1) What was the impact of the intervention on the frequency with which autistic children expressed their needs after utilizing the iPad application Yuudee, relative to the baseline period? 2) What was the impact of the intervention on the frequency with which autistic children responded to questions after using the iPad application Yuudee, relative to the baseline period?

3.5.1. Teaching Plans for Goals of Expressing Needs

This instructional target behavior was intended to teach the participants to tap on the correct images to independently request the requested items from the researcher. According to the PECS iPad application teaching technique, the intervention was separated into four stages that primarily train the subject’s basic communication capacity and expanded communication ability. When the subject exhibited the target behavior, she would be rewarded verbally and with reinforcers, but, if she made

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a mistake, research should quickly remedy it. The reinforcers should be changed periodically throughout the training process to prevent subject from losing interest in the reinforcer.

Stage 1: The researcher demonstrated to the subject how to receive the reinforcer by clicking the image on the screen by displaying the reinforcer in front of them.

Stage 2: Once the subject understood the concept of communication, the researcher instructed her to walk towards the iPad when she saw the desired item, picked up the iPad and walked towards the researcher, then clicked on the picture of the reinforcer in front of the researcher to obtain the desired item.

Stage 3: The reinforcer images in the Yuudee were assigned voice output, while the non-reinforcer images were assigned no voice output. Through practice, subject was able to click on the appropriate image.

Stage 4: After the individuals were able to identify the reinforcer, the researcher instructed them to click on the "I want to eat" image and then the reinforcer image to demonstrate their wants.

3.5.2. Teaching Plans for Goals of Responding to Questions

Once the subject was able to communicate her demands via the iPad application, she waw trained to answer easy questions in an effort to increase involvement in class. The researcher asked the subject "What is this?" and then instructed her to answer to the images on the iPad application by imitating and demonstrating "What color is it?" with increasing difficulty. "What is the illustration on this?" etc.

4. Research Results Analysis

Ten weeks of data were gathered from August 20, 2022, to October 30, 2022, using iPads to train the communication behavior of one student with autism. In the quantitative analysis component of this work, the Targeted Behavior Observation Document Form was utilized to record the quantity and competency of subjects using the iPad to independently communicate their requirements and answer the researcher's questions. Using visualization analysis and C-statistics, the number of independent communications and communication skills of the subjects were assessed [8]. Simplified time series analysis was used to interpret the results and make up for the shortcomings of visual data analysis [9].

$$C = 1 - \frac{\sum_{i=1}^{N-1}(X_i - X_{i-1})^2}{2\sum_{i=1}^{N}(X_i - \bar{X})^2} \qquad S_C = \sqrt{\frac{N-2}{(N-1)(N+1)}} \qquad Z = \frac{C}{S_C}$$

This chapter is broken into two sections: the first section analyzes the effect of subject using iPad to communicate needs, while the second section analyzes the effect of subject using iPad to react to questions. The analysis focuses on the following: the graphs depicting the frequency with which iPads were used to express demands and answer to queries, the summary table of the visualization analysis, and the trend and level of the graphs.

As Figure 1 shown, a total of 51 data points were collected for the two behaviors of independently expressing needs and responding to questions at the baseline, intervention period, and maintenance period.

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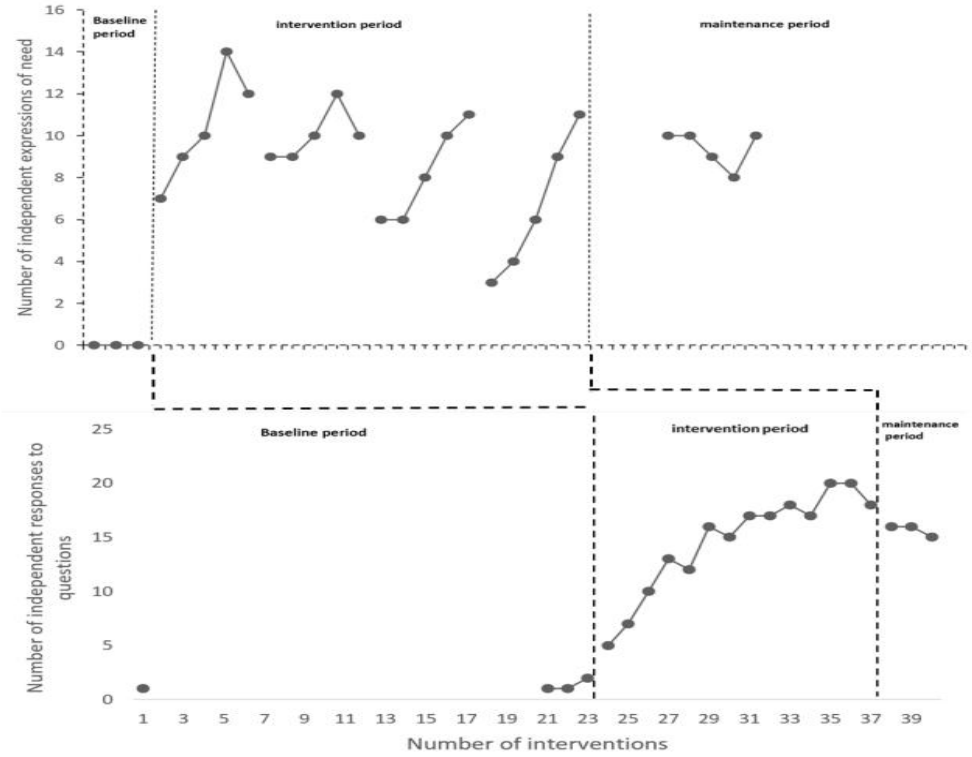

Figure 1: Plot of the number of subject's independent expressions of needs and responses to questions.

4.1. Analysis on the Intervention Effect of the Number of Subject's Expression of Needs

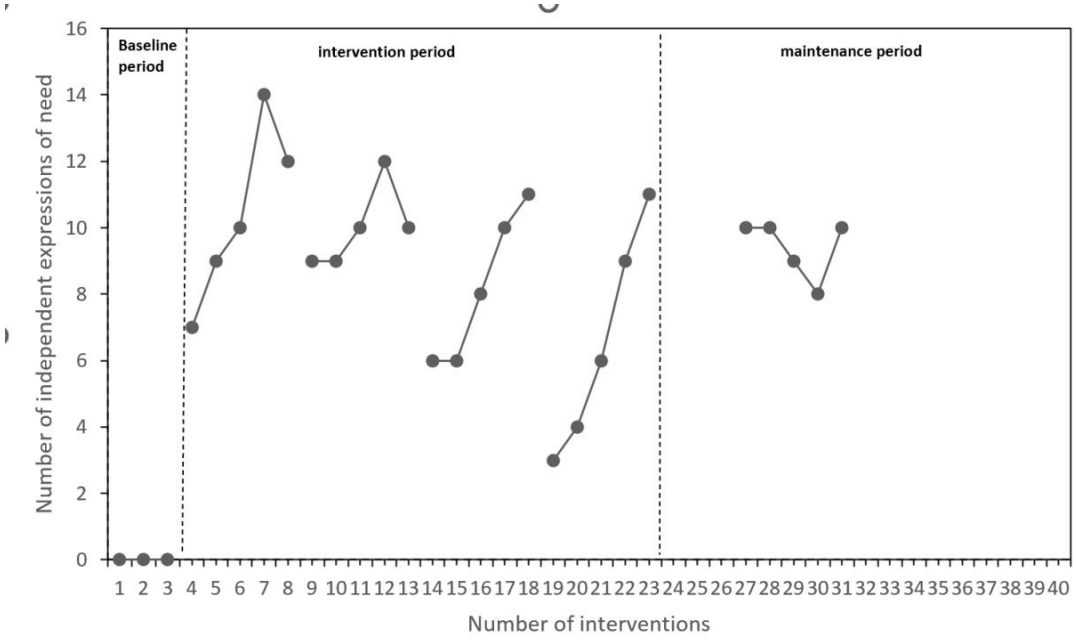

Figure 2: Plot of the number of subject's independent expression of needs.

During the baseline period, subject participated in three data collection sessions, and the number of iPad used to indicate needs remained steady at zero across all three observation records. The

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intervention period consisted of four phases with a total of twenty data collection sessions. From the Figure 2, it's clear to see that all four stages exhibited a rapid upward trend; however, due to the gradual increase of difficulty in the four stages, the data for the four stages as a whole exhibited a slow downward trend, with the number of occurrences for each stage being 7, 9, 10, 14, 12, 9, 9, 10, 12, 10, 6, 6, 8, 10, 11, 3, 4, 6, 9, 11. When the respondent's proficiency in independent presentation of requirements reached 80% during the fourth stage. The intervention concluded when subject attained more than eighty percent autonomous expression of needs in the fourth stage and entered the maintenance phase. During the maintenance period, data collection was undertaken five times, and the collected data showed a decreasing tendency but remained largely steady. Since the highest point of the available data was 14 (less than 25), the standard percentage of data stability was determined to be 20%, and the standard range of data stability was calculated as 14 x 20% = 2.8.

4.1.1. Intra-stage Data Analysis

Table 3: Summary table of visual analysis in stages of the number of independent needs expressed by subject.

Stage order	Baseline period	Intervention period	Maintenance period
length	3	20	5
Trend	-(=)	\(-)	-(=)
Trend stability	100%（Stable）	25%（Unstable）	100%（Stable）
average	0	8.8	9.2
Horizontal stability	100%（Stable）	40%（Unstable）	100%（Stable）
Horizontal range	0-0	3-14	8-10
Level change	0-0(+0)	7-11（+4）	8-10(+2)
C Statistics	\	0.4872	\
Z-Value	\	0.1092	\

To evaluate in more detail the particular changes in the subject's capacity to utilize the iPad independently to convey her wants at each stage, the frequency with which she used the iPad independently during the baseline, intervention expectation, and maintenance periods was studied within stages. As shown in the Table 3, the number of times subject independently expressed needs across all three data collections during the baseline period was zero, and trend and level stability were both one hundred percent, indicating that this stage was at a stable level and could enter the intervention expectation. During the intervention period, the number of independent expressions of need utilizing the iPad increased over the course of 20 data collection sessions, with a mean value of 8.8. The data level varied between 7 and 11, with a level change of +4 and a level stability of 40%, indicating an improvement. The overall trend was a downward trend, but the trend's stability was unstable, indicating that the target behavior was highly variable and exhibited a gradual ascending trend. C-statistics z = 0.1092, which did not reach a significant level due to the amount of the data change. During the maintenance time, a total of five data collections were completed, each with a number of 10, 10, 9, 8, and 9, with a mean value of 9.2. The data level range was between 8 and 10, with a +2 data level change. The data level and trend stability were both 100 percent, and the direction of the trend was smooth.

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4.1.2. Interphase Data Analysis

Table 4: Summary table of interstage visual analysis of the number of independent needs expressed by subject.

Phase comparison	Baseline/intervention period	Intervention/ maintenance period
Trend paths and changes in effects	-(=) to \(-)	\(-) to -(=)
Change in trend stability	Stable to unstable	Unstable to stable
Absolute change in horizontal	0-7(+7)	11-10(-1)
Overlap percentage	0	100%
C Statistics	0.4813	0.2208
Z-Value	2.2653**	0.8023

With Table 4 shown, from the baseline period to the anticipated intervention, the data trend shifts from no change to a phase rise with a declining overall trend. It is probable that the overall downward trend is a result of the growing difficulty of the fourth stage of the intervention expectation and the low level of the initial two data points. The absolute shift from the baseline period to the intervention expectancy level +7 achieved a significant level with a C statistic of z = 2.2653 (P .01) indicating an immediate effect of the intervention. From the intervention expectation to the maintenance period, the data trend from an overall decline to a plateau, the change in trend stability from unstable to stable, the absolute change in level -1, and the overlap percentage of 100% all indicate that the intervention effect of the intervention expectation can be maintained in the maintenance period. z = 0.8023 (p .01), which did not meet the level of significance, suggests that the data trend during the maintenance period is not significantly different from the intervention expectation and has some maintenance effect.

4.2. Analysis on the Intervention Effect of the Number of Subject's Responses to Questions

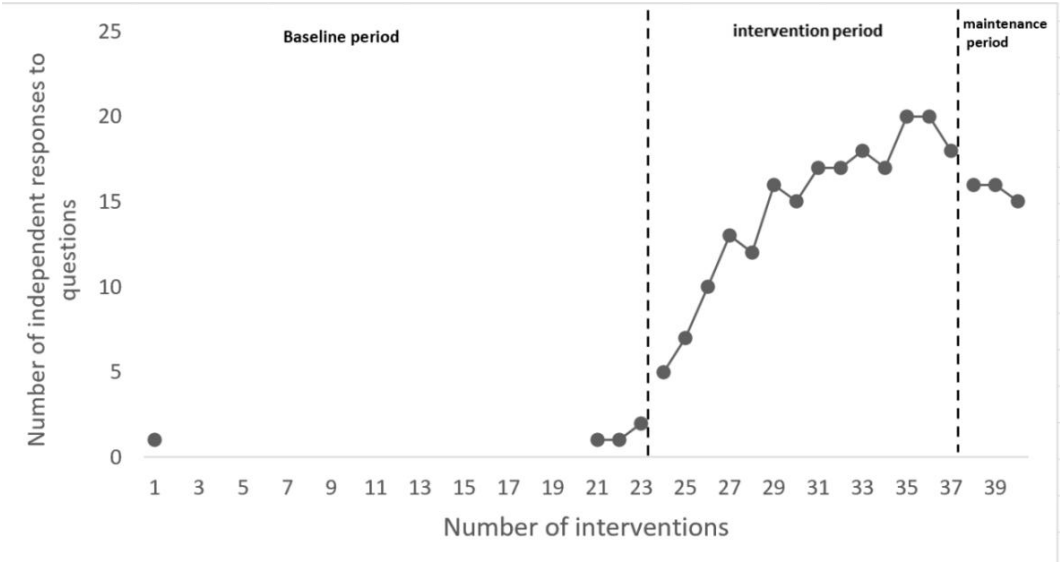

Figure 3: Plot of the number of subject's independent responses to questions.

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During the baseline period, subject participated in four data collecting sessions, and the number of responses to iPad-based questions remained steady throughout the four observation sessions. During the intervention phase, data collection occurred 14 times. The Figure 3 demonstrated a general increasing trend in intervention anticipation, and the intervention was terminated when the individuals attained more than 80% competency in independently answering questions and entered the maintenance period. During the maintenance time, three data collections were undertaken, and the data exhibited a decreasing tendency but remained steady in most respects. Since the highest data point was 20 (less than 25), the standard percentage of data stability was set at 20%, and the standard range of data stability was calculated as 20x20% = 4.

4.2.1. Intra-stage Data Analysis

Table 5: Summary table of visual analysis in stages of the number of independent questions responded by subject.

Stage order	Baseline period	Intervention period	Maintenance period
length	4	14	3
Trend	-(=)	/(+)	-(=)
Trend stability	100%(stable)	78.5%（stable）	100%(stable)
Average	1.25	14.6	15.6
Horizontal stability	100%（Stable）	28.57%（Unstable）	100%（Stable）
Horizontal range	1-2	5-20	15-16
Level change	1-2(+1)	5-18(+13)	15-16(-1)
C Statistics	\	0.891	\
Z-Value	\	0.064	\

To examine in greater detail the specific changes in the ability of subject to independently respond to questions using the iPad at each stage, the number of independent responses to questions using the iPad during the baseline, intervention expectancy, and maintenance periods was analyzed within stages. As shown in the Table 5, the number of times subject independently responded to questions during the four baseline data collections, with a mean value of 1.25 and a trend and level stability of 100%, suggested that this stage was stable and could be incorporated into the intervention expectation. In the 14 data collections completed during the intervention period, the number of times s individually responded to questions using the iPad showed a quick increase, with the number of times each time being 5, 7, 10, 13, 12, 16, 15, 17, 17, 18, 17, 20, 20, 18, and the mean value being 14.6. The level range of the data was between 5 and 18, with a level change of +13 and a level standard deviation of 1. The data's stability was 28.57 percent, which was an improvement. The overall trend was upward; however, the trend stability was stable at 78.5%, indicating that the goal behavior demonstrated a consistent upward trend with little side-to-side fluctuation. Due to the amount of the data change, z = 0.064 is not statistically significant. During the maintenance period, a total of three data collections were conducted, with 16, 16, and 15 times for each, with a mean value of 15.6. The data level range was between 15 and 16, the data level change was -1, the data level stability and trend stability were both 100%, and the trend direction was smooth.

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4.2.2. Interphase Data Analysis

Table 6: Summary table of interstage visual analysis of the number of independent questions responded by subject.

Phase comparison	Baseline/Intervention period	Intervention/ Maintenance period
Trend paths and changes in effects	-(=) to /(+)	/(+) to -(=)
Change in trend stability	Stable to stable	Stable to stable
Absolute change in horizontal	1-5(+4)	18-16(-2)
Overlap percentage	0	100%
C Statistics	0.8166	0.7806
Z-Value	2.6852**	2.9068

With Table 6 shown, from the baseline period to the intervention expectation, the trend of the data shifted from no change to a rapid increase, with an absolute change of level +4 and a 0% overlap percentage, and the C statistic reached a significant level of z = 2.6852 (P .01), indicating an immediate effect of the intervention. From the intervention period to the maintenance period, the trend of the data shifted from a rapid increase to a plateau, the change in trend stability went from stable to stable, the absolute change in level was -2, and the overlap percentage was 100%, indicating that the intervention effect could be maintained in the maintenance period. The C statistic yielded z = 2.9068 (p.01), which reached a significant level, showing that there was some maintenance effect during the maintenance period, but it was weak.

5. Discussion

The goal of this study was to examine the effects of the iPad program based on PECS on the communication skills of autistic children. Previous research including interventions for communication skills often included instruction in receptive and expressive language, such as recognizing paired words and symbols, following instructional pairs, and imitating speech. The majority of intervention components for the iPad application for autism communication skills tended to focus on expressive demand behaviors, manifested primarily as requests for toys, activities, food, etc. This study established a phased instructional intervention program based on the PECS instructional procedures using Yuudee application, from simple to complex, suggesting that the development of related iPad software should also consider the cognitive developmental patterns of autism, taking into account its propensity to consider parts and ignore the whole. Prior to designing the software, it is vital to analyze the testing results and characteristics of children with autism, and to consult teacher and parent reports to identify the target abilities that now require intervention as a matter of priority.

The intervention effect remained largely stable during the maintenance period, although the number decreased, indicating an improvement in the subjects' ability to independently express needs using the iPad application. Based on the study's findings, it is suggested that those with limited or no language should train their communication skills using visuals and images. Individuals are taught to select a symbol (i.e., a picture of a snack) to request a preferred object or activity as the initial step in developing their communication skills (i.e., to obtain a favorite snack).

The iPad-based PECS-based teaching tool improves autistic children's ability to answer independently to inquiries. Individuals with autism have been reported to reply to queries better

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than actively articulate their needs [10], which is consistent with the findings of this study. In this study, subjects were taught to respond to the researcher's questions by clicking on the corresponding pictures on the screen to assemble their own sentences. The results of the study revealed that because the intervention time for responding to questions was shorter than that for expressing needs, the intervention maintenance effect for subjects independently expressing needs was greater than the maintenance effect for independently responding to questions, however, the number of independent response times increased, and the number of independent response times was more than the number of demand expression times. The individuals' ability to reply to queries improved. According to the findings of the study, the instructor should create a situation, set the stage, and then help autistic pupils to comprehend the questions and develop motivation to comment. Assessment needs to be multidisciplinary and developmental, and early detection is essential for early intervention [11].

6. Conclusions

In this research, after the subject was trained through iPad application Yuudee, the subject's independently expressed demands increased in phases as time passed, and the independent response needs climbed swiftly as a whole. The intervention effect of subject independently expressing wants is superior to that of independently responding to questions. The quantity of independent responses to queries exceeds the stated requirement. The number of times she used iPad to independently express her needs and respond to questions increased rapidly.The absolute level change from the baseline period to the intervention expectation indicated that the number of times she independently expressed her needs increased from 0 to 7 and the number of times she independently responded to questions increased from 1 to 5, indicating significant improvement. And after the intervention was withdrawn, the data trend of the number of times subject used iPad to independently express needs in the maintenance period did not differ significantly from the intervention expectation, and there was some maintenance effect; the maintenance period of the number of times subjects used iPad to independently respond to questions had some maintenance effect, but the maintenance effect was poor. The PECS-based iPad application instructional program demonstrated generally positive intervention effects on the two communication target behaviors of independent expression of needs and responding to questions, providing autism educators and parents with a reference for specific operational procedures for autism communication skills intervention. On the basis of the study's findings and the subject's performance in the intervention training, the iPad application Yuudee is beneficial for enhancing the communication behaviors of children with autism. The instructional use should be tailored to the subject's specific circumstances in order to develop individualized instructional programs. The development of suitable application software should adhere to the cognitive rules of autistic children, from simple to sophisticated, including therapies for each developmental stage. The assessment process must be multidisciplinary and developmental, and early discovery is crucial for early intervention.

However, this research contains two limitations: 1) The sample size is too small. Children with autism have varying cognitive capacities, so the results cannot be immediately applied to other children with autism. 2) The intervention is brief, the communicative behavior training is insufficiently in-depth, and there are fewer scenarios engaged.Future study will concentrate on increasing the number of participants, designing comparison experiments between control and experimental groups, extending the training duration, and extending to expressing needs and addressing problem behaviors in a variety of life scenarios.

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