

A Review of Empirical Research on Enhancing Communication Skills in Special Needs Children through the Integration of Picture Exchange Communication System and Video Modeling

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Abstract

Picture Exchange Communication System (PECS) and video modeling are classic strategies for improving communication skills in special needs children, but the effect of their combination still requires further exploration. Reviewing nine empirical studies integrating the PECS and video modeling, this paper summarizes findings across six dimensions: participants, design, goals, settings, strategies, and outcomes. Based on this analysis, four recommendations are proposed: First, Attending to individual differences and focusing on female participants and adolescents; Second, Basing interventions on needs and focusing on authentic natural social contexts; Third, Deepening combined strategies to leverage comprehensive advantages; Fourth, Focusing on long-term maintenance and generalization. This analysis provides insights for empirical research on communication skills intervention for special needs children in China.

Keywords

Picture Exchange Communication System; Video Modeling; Special Needs Children; Communication Skills.

1. Introduction

Communication is an indispensable skill in human society and an important pathway for individuals to integrate into society and develop themselves. However, due to developmental disorders or organic lesions, special needs children are often unable to express their own wishes smoothly, which in turn creates many inconveniences in their communication with others and affects their quality of life. For this reason, developing the communication skills of special needs children has become an important issue in the field of special education.

The Picture Exchange Communication System (PECS) is an augmentative and alternative communication system that helps users communicate with others through tools such as picture cards and communication boards [1]. As a communication skills intervention strategy, PECS has been proven to have positive intervention effects on special needs children, including those with autism, intellectual disabilities, and multiple disabilities [2-5]. At the same time, however, PECS also has some shortcomings in teaching. Some studies have pointed out that students tend to progress slowly when learning to use PECS and are overly dependent on teacher guidance [6], to the extent that completing all phases requires a significant amount of time and effort. To address this challenge, researchers have turned to seeking strategies that can enhance the effectiveness of PECS teaching while reducing its drawbacks [7], with the goal of maximizing the improvement of communication abilities in special needs children.

Some studies have indicated that, compared with using the Picture Exchange Communication System alone, combining it with other intervention methods can yield better intervention outcomes [8], and that integrating PECS with video modeling can jointly enhance the non-verbal communication skills of special needs children [9]. Video Modeling is a method that uses

video technology to record and demonstrate target behaviors or skills for the intervention and teaching of special needs children [10], which also has positive effects on improving social communication skills in special needs children [11-13]. Its intervention effects not only show good durability but also promote the generalization of target behaviors to different contexts, thereby compensating for the generalization difficulties that may arise when using the Picture Exchange Communication System alone. In addition, video modeling is also effective for children who have had previous failures with PECS. The New Zealand scholar Smith used self-video modeling to help children with a history of PECS failure successfully acquire picture-exchange behaviors [7], further demonstrating the potential of video modeling to enhance the effectiveness of PECS teaching.

This study aims to systematically review and analyze empirical reports on the combination of the Picture Exchange Communication System and video modeling, to clarify the optimal ways of combining the two methods and their applicability to children with different types of disabilities, and to provide experience and reference for future related practices.

2. Research Methods

In this study, searches were conducted in databases including China National Knowledge Infrastructure, Wanfang Data Knowledge Service Platform, Web of Science and SpringerLink. By using the keywords "Picture Exchange Communication System + video modeling/video demonstration". To ensure the timeliness of the literature, the search period was set from January 2010 to December 2025. Articles that met the following criteria were selected: (1) peer-reviewed journal articles, excluding review and commentary articles, and retaining only intervention-based empirical studies; (2) at least one child with special needs as the intervention participant; if non-special-needs children were also included, only the special-needs children were included and analyzed; (3) the independent variables of the intervention were PECS and its combination with video modeling. After rigorous screening, 9 empirical studies that met the criteria were finally obtained.

The basic information is presented in Table 1.

3. Research Results

3.1. Participants

In terms of the number of participants, the nine existing empirical studies involved a total of 19 special needs children, covering a wide range of disability types, including autism spectrum disorder, Down syndrome, intellectual disability, and developmental delay. Regarding gender, there were 5 female participants and 14 male participants. Among them, male children with ASD accounted for 57.9%, which is consistent with the well-known higher prevalence of ASD in males [22]. In terms of age range, the participants covered preschool children (3–6 years) and school-age children (6–12 years).

3.2. Research Designs

All these empirical studies in this field adopted single-subject experimental design paradigms. Among them, two studies used a single-subject AB design, which verified the effectiveness of the intervention for children with different types of disabilities by comparing participants' skill levels before and after the intervention preliminarily. Another four studies employed multiple baseline designs and their variants, of which two were multiple baseline across participants and across settings, and two were multiple probe across participants and across settings. In addition, three studies involved alternating treatment designs, which facilitated the comparison of effects between using PECS alone and using PECS combined with video modeling. Overall, these experimental designs collectively ensured that the intervention effects were

rigorously evaluated under repeated measurements and controlled conditions, balancing internal validity and practical applicability.

Table 1. Summary of basic information of the included literature

Author	Participants	Research Design	Intervention Target	Intervention Setting	Intervention Strategy	Intervention Outcomes
Cihak et al. [14]	3-year-old ASD and DD (N=4; 3M, 1F)	Alternating treatment design	Independent communication initiation	Special education classroom, inclusive classroom	VM, PECS	IE:Significant RE:good SV:good
Rodrigues et al. [15]	10-year-old ID (N=1; 1M)	Single-subject AB design	PECS communication skills	Special education classroom	VM, PECS	IE:Significant ME:good SV:good
Rodrigues et al. [6]	9-year-old DS (N=1; 1F)	Single-subject AB design	PECS communication skills	Special education classroom, playground, individual training room	VM, PECS	IE:Significant ME:good GE:good SV:good
Odluyurt et al. [16]	4–5-year-old ASD (N=3; 3M)	Alternating treatment design	Spontaneous communication initiation	Individual training room, cafeteria, playroom	VM, PECS	IE:No significant difference ME:good GE:good
Rodrigues et al. [17]	4–6-year-old ASD (N=3; 2M, 1F)	Multiple probe design combined with alternating treatment design	PECS communication skills	Classroom, service room, playground, and home	POVM, PECS	IE:Significant ME:good SV:good
Chen et al. [18]	10–12-year-old ASD (N=3; 3M)	Multiple probe across participants design	Active communication behaviors	Individual training room	VM, PECS	IE:Significant ME:good
Ma [19]	5-year-old moderate ASD (N=1; 1M)	Multiple probe across settings design	Request expression behaviors	Individual training room, sensory integration room, dining hall	AVM, PECS	IE:Significant ME:good GE:good SV:good
Li [20]	4–9-year-old ASD (N=2; 1M, 1F)	Multiple baseline across participants design	Verbal expression ability	Intervention classroom	AVM, iPad-based PECS	IE:Significant ME:good GE:good SV:good
Yang [21]	12-year-old mild ASD (N=1; 1F)	Multiple baseline across settings design	Requesting skills	Classroom and after-school activity areas	VM and POVM, PECS	IE:Significant ME:good SV:good

Notes: M=Male; F=Female; ASD=Autism Spectrum Disorder; DD=Developmental Delay; DS=Down Syndrome; ID=Intellectual Disability; VM=Video Modeling; AVM=Adult Video Modeling; POVM=Point-of-View Video Modeling; PECS=Picture Exchange Communication System; IE=Immediate Effect; ME=Maintenance Effect; SV=Social Validity; RE=Replication Effect; GE=Generalization Effect.

3.3. Intervention Targets

With respect to intervention targets, a review of the nine empirical studies revealed that existing research primarily focused on the communication skills of special needs children, specifically covering three dimensions: communication initiation, communication expression, and communication response.

Three studies reported the intervention effects of this strategy on children's communication initiation abilities. These three studies targeted independent initiation of communication behaviors and verified the effectiveness of PECS combined with video modeling in improving participants' communication initiation. In addition, two studies focused on specific expressive behaviors, such as request-expression behaviors and verbal expression abilities, with an emphasis on children's active initiation of requests and clear transmission of their own needs. A total of four reports addressed communication response abilities. In Phase V of PECS, the child's behavior of using a picture card to respond to the question "What do you want?" is considered a foundation for answering complex social communication questions. Yang's definition of "responding to requests" placed greater emphasis on the changes in children's understanding of and responses to others' requests in the school setting[15].

3.4. Intervention Settings

Regarding intervention settings, three studies reported interventions conducted in fixed structured classrooms, while the remaining studies involved two or more types of settings. Specifically, the intervention settings mainly fell into two categories: structured teaching environments and daily activity environments. Structured teaching environments, such as individual training rooms, classrooms, and special education service rooms, with fewer distractions, were mostly used in the early stages to establish basic picture-exchange skills. Interventions implemented in daily activity environments such as cafeterias, playgrounds, and homes helped learners integrate communication skills into their daily routines.

3.5. Intervention Strategies

The combination of PECS and video modeling has developed into a diverse set of strategies. The first is other-video modeling, which involves recording videos of typically developing children or adults correctly performing PECS and engaging in communication, and presenting the complete communication behavior sequence to the target children. This approach may also be delivered via digital tools such as tablets, aligning with the trend of digital transformation in special education. The second is POVM, which simulates a first-person perspective of the PECS operation process, focusing the learner's attention on key manual actions such as handing over the card. This isolates the behavior from external interference and facilitates learning. The third is mixed video modeling, which combines a third-person perspective that fully displays the entire picture-exchange process with a first-person perspective that finely demonstrates key manual details. This strategy emphasizes both the integrity of the target behavior and the cognition of critical actions. These three strategies build upon each other, collectively enriching the implementation framework of PECS instruction and thereby strengthening the communication foundation of special needs children.

3.6. Intervention Outcomes

All empirical studies confirmed that the intervention strategy of PECS combined with video modeling produced good immediate effects; all participants acquired basic communication behaviors such as picture exchange to varying degrees. In terms of maintenance effects, eight studies reported the durability of participants' communication skills after intervention, all indicating that the strategy could consolidate active communication behaviors in the short and medium term. Four studies clearly reported generalization effects, which focused on two aspects: settings and communication partners. That is, most participants generalized their

acquired communication skills to different people (researchers, teachers, mothers) and different settings (classrooms, cafeterias, playrooms). Additionally, seven studies reported social validity. Most reports indicated that the combined strategy received consistent approval from educational practitioners and parents, laying a solid foundation for its subsequent dissemination and practical application.

4. Conclusion and Future Directions

Reviewing the existing literature, the combination of the Picture Exchange Communication System and video modeling has made considerable progress in intervening in the communication skills of special needs children. The range of participant populations has gradually expanded, with study samples extending from preschool children to school-age children, and the types of disabilities broadening from autism spectrum disorder to include developmental delay and Down syndrome. The intervention targets have varied, with researchers exploring different dimensions of communication ability and fully verifying the superiority of the combination in practice. The intervention settings have also shifted from structured classrooms to unstructured environments such as homes and cafeterias, enhancing ecological validity through diverse application scenarios. In terms of intervention strategies, existing studies have been devoted to integrating PECS with multiple forms of video modeling, keeping pace with the current trend toward the digitalization of education in practice.

However, current research still faces several limitations. First, existing reports lack studies focusing on female participants and adolescents with special needs. Second, all reported studies have been conducted in relatively enclosed unstructured settings such as homes or schools, while research involving open social environments like supermarkets, shopping malls, and communities is scarce. Moreover, the combined strategy is mostly used only in the behavior-modeling phase, with demonstration videos serving merely to illustrate the operation of the communication tool, thus failing to fully exploit the advantages of the integration. Finally, there is a lack of long-term follow-up data on the strategy's effects and its generalization to novel stimulus items. Based on the progress and limitations of existing empirical studies, this paper offers some suggestions for future research, with the aim of providing insights for relevant research and practice in China.

4.1. Attending to individual differences and focusing on female participants and adolescents

The positive effects reported in existing studies are predominantly based on male participants, which making it difficult to generalize the findings to all special needs children. At the same time, the rapidly changing social environment has made communication demands increasingly complex. Therefore, future research should increase the proportion of female participants and adolescents in samples intentionally. When conducting studies with adolescents, intervention objectives should be adjusted according to their developmental stage, with a focus on advanced communication skills such as turn-taking, topic maintenance, affective commenting, and opinion expression, rather than just change of communication symbols.

4.2. Basing interventions on needs and focusing on authentic natural social contexts

Through diverse communication partners and unpredictable social stimuli in daily life can develop the various aspects of communication skills in special needs children. Therefore, future research must extend intervention settings from structured, enclosed environments to open natural social environments intentionally. Specifically, intervention experiments should, gradually expand to unstructured settings with varying social difficulty, such as parks and public transportation while ensuring the personal safety of students. At the same time, clear

and quantifiable communication behavior indicators should be established for comprehensive and systematic communication evaluation. Such an approach can reveal the communication needs of special needs children in different contexts and provide empirical evidence for optimizing subsequent intervention strategies.

4.3. Deepening combined strategies to leverage comprehensive advantages

Although existing studies have combined the two strategies, their application remains at the level of simple deconstructed behavioral operations and has not fully realized the synergistic effects of both. Therefore, future efforts should focus on innovation in the following directions. First, the content of video modeling should be expanded. The video content should shift from demonstrating operations to demonstrating “strategies.” Video modeling should not be limited to physical operations but should extend to how to actively initiate communication or cope with communication failures in natural contexts, thereby helping children understand the function of communication. Second, the effects of combining diverse forms of video modeling with different versions of PECS should be explored. Existing studies have mostly used other-person or peer modeling; future research could further investigate non-human video modeling approaches such as animated modeling, in combination with children's preferred tool versions. Third, additional functions of the combined strategy should be developed. Parents and relevant practitioners could be trained for indirectly intervening in the communication skills of special needs children by this approach, and maximizing the benefits of this combined approach.

4.4. Focusing on long-term maintenance and generalization

Future research should design generalization testing procedures rigorously. For example, specific snacks, toys, everyday objects or outdoor activities can be used as reinforcers that unused in the training phase to observe whether children can independently use the communication tool to initiate requests or respond during the testing phase. At the same time, children's communication with different categories of stimuli should be recorded to scientifically evaluate whether the intervention strategy truly enables them to transfer learning to new contexts. In addition, the follow-up periods in existing studies are mostly concentrated within 1-2 months, lacking investigation of long-term maintenance. Therefore, regular assessments should be conducted on a quarterly basis after the intervention. Data on children's communication behaviors should be collected in natural settings such as homes and communities through behavioral observation records, scale evaluations and structured interviews, to understand children's communication performance in real-life contexts and provide a basis for developing individualized maintenance support plans.

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