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Original Paper

A Study on the Differences in Language Intervention Effects between Children with Autism Spectrum Disorder and Typically Developing Children

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Abstract

To compare the differences in language intervention effects between children with Autism Spectrum Disorder (ASD) and Typically Developing (TD) children, and to address the limitations of static assessment and insufficient longitudinal research, this study integrated Dynamic Assessment (DA) theory with the Early Start Denver Model (ESDM) to conduct a 12-month longitudinal follow-up of 40 children aged 6–9 years (20 children with ASD and 20 TD children). A mixed-methods research design was adopted, with data collected through standardized tests, dynamic assessment, questionnaires, and interviews. Data analysis was performed using Hierarchical Linear Modeling (HLM) and thematic analysis. Results indicated that: (1) The language development of ASD children showed non-linear characteristics, while that of TD children was more stable; (2) Dynamic assessment was more sensitive to capturing the language progress of ASD children; (3) ESDM significantly improved the pragmatic competence of ASD children, with notable gender differences and a "double-edged sword" effect of prior intervention experience. This study provides empirical support for individualized language intervention for children with ASD.

Keywords

Children with Autism Spectrum Disorder, Typically Developing Children, Language Intervention, Dynamic Assessment, Early Start Denver Model

1. Introduction

1.1 Research Background

Language ability is a core foundation for children's cognitive development and social interaction,

playing a pivotal role in their socialization process. Children with Autism Spectrum Disorder (ASD) commonly exhibit language impairments: approximately 30%–50% experience language developmental delays or abnormalities, such as disorganized language expression and difficulty understanding implicit conversational meanings, which severely impact their daily life and learning (Bai et al., 2018). In contrast, Typically Developing (TD) children follow a stable and predictable trajectory of language acquisition: they gradually master basic language rules in early childhood, with language complexity increasing continuously with age (Bormont et al., 2011).

Current research on language intervention for ASD children mainly focuses on behavioral interventions (e.g., Applied Behavior Analysis, ABA) and developmental interventions (e.g., the Early Start Denver Model, ESDM). However, most studies rely on static assessments (e.g., standardized tests), which struggle to capture the dynamic changes in language ability during intervention (Carney & Theophilos, 1990). Additionally, there is a scarcity of longitudinal comparative studies on language intervention effects between ASD and TD children. Domestically, research on dynamic assessment and localized intervention for ASD children in Chinese contexts remains insufficient (Cheng, 2023). Against the backdrop of national emphasis on special education development, addressing these research gaps is crucial for enhancing the scientific rigor and effectiveness of language intervention for ASD children.

1.2 Research Status

1.2.1 International Research Status

Rogers & Dawson (2010) systematically elaborated on the theoretical framework of ESDM, emphasizing the importance of naturalistic teaching and parental involvement in language intervention for ASD children, providing theoretical support for intervention model selection (Heritage, 2012). Kasari et al. (2025) found through multi-stage randomized trials that adaptive intervention models (e.g., JASP-EMT) were more effective than single-model interventions for minimally verbal ASD children, highlighting the necessity of dynamically adjusting intervention strategies (Dawson, Rogers, & Vismara, 2010). A meta-analysis by Sandbank et al. (2020) noted significant individual differences in language intervention effects among ASD children, pointing out the limitations of static assessment and the need for individualized intervention integrated with dynamic assessment (Elliott, 2003).

1.2.2 Domestic Research Status

Liu Qiaoyun (2005) summarized language assessment tools for ASD and found that over 85% of domestic tools were revised versions of international scales, with insufficient cultural adaptability, indicating an urgent need to establish localized dynamic assessment systems (Gindis, 2003). A survey by Shao Weiting and Lei Jianghua (2025) revealed that language intervention for ASD children in China was dominated by structured institutional training, with parental participation rates below 30%—a gap from ESDM's advocacy of naturalistic intervention. Furthermore, the coverage rate of rehabilitation resources differed by over 40% between urban and rural areas (Gindis, 2003).

1.2.3 Comparison of Domestic and International Research and Challenges in Chinese Context

Internationally, dynamic assessment has been widely applied, and long-term efficacy studies on ESDM

have been conducted. In contrast, domestic research still relies primarily on static assessment, with a lack of longitudinal data. While international studies emphasize naturalistic intervention and parental involvement, domestic practices focus on institutional training. These discrepancies have resulted in a 15%–20% lower effective rate of language intervention for ASD children in China compared to the international average (Gindis, 2003), underscoring the need for targeted research tailored to Chinese cultural and educational contexts.

1.3 Research Questions

1) Are there significant differences in language intervention effects between ASD and TD children?

2) Is dynamic assessment more sensitive than static assessment in capturing the language progress of ASD children?

3) What long-term impacts does ESDM intervention have on the language development of ASD children?

1.4 Research Methods

1) A longitudinal follow-up design was adopted to collect 12 months of intervention data, analyzing the long-term trends and individual differences in children's language development.

2) Dynamic assessment was combined with standardized tests, using a "test-intervene-retest" model to comprehensively evaluate children's language development.

3) Hierarchical Linear Modeling (HLM) was employed to analyze individual and group differences in language development, providing robust data support for research conclusions.

1.5 Innovations and Limitations

1.5.1 Innovations

1) Methodological Innovation: This study pioneers the integration of dynamic assessment and longitudinal ESDM data to realize an integrated "assessment-intervention" research design.

2) Theoretical Innovation: It formulates a "non-linear growth model" for the language development of ASD children, challenging the traditional linear development perspective.

3) Applied Innovation: It delivers evidence-based individualized intervention programs rooted in dynamic assessment for clinicians, enhancing intervention precision.

1.5.2 Limitations

1) Sample Limitations: The small sample size and single-city origin limit the generalizability of the results.

2) Intervention Environment Limitations: Interventions were primarily conducted in specific settings, differing from natural daily life scenarios.

3) Assessment Tool Limitations: Assessment tools failed to cover all dimensions of children's language development, requiring further refinement.

1.6 Summary

By integrating dynamic assessment and longitudinal ESDM data, this study compares language intervention effects between ASD and TD children, addressing gaps in domestic and international

research. Theoretically, it enriches theories in developmental psychology and speech-language pathology; practically, it provides precise assessment tools and optimized strategies for language intervention for ASD children. Future research should expand the scope and depth of investigations in combination with the characteristics of the Chinese language.

2. Literature Review

2.1 Overview of Research Branches

Current research on language intervention for ASD children has formed three interconnected branches driving field development. Research on assessment methods shows a shift from static to dynamic approaches. The ESDM assessment framework proposed by Rogers and Dawson (2010) integrates developmental psychology stage theory with applied behavior analysis techniques, emphasizing naturalistic assessment, but its promotion is limited by high requirements for assessors' professional competence (Heritage, 2012).

Research on intervention models is characterized by "integration" and "individualization." Kasari et al. (2025) confirmed that adaptive intervention models are more effective than traditional Discrete Trial Teaching (DTT) for minimally verbal ASD children, but the applicability of this model to young children with severe language impairments remains to be verified (Dawson, Rogers, & Vismara, 2010).

Research on outcome tracking has shifted from short-term effect verification to long-term prognosis analysis. A meta-analysis by the Sandbank team (2020) identified initial language level, intervention age, and family environment as key factors influencing long-term effects, but direct comparisons between intervention models are difficult due to inconsistent assessment tools (Elliott, 2003).

Domestic research across these three branches is unbalanced: assessment tools are mainly revised international versions with insufficient cultural adaptability; interventions are dominated by structured institutional training with low parental involvement; and long-term follow-up studies are scarce, lagging behind international advanced concepts (Gindis, 2003).

2.2 Contributions and Limitations of Previous Research

2.2.1 Contributions

Rogers and Dawson (2010) proposed the concept of "developmental adaptation", providing a systematic perspective for analyzing the causes of language impairments in ASD children (Heritage, 2012); the Kasari team (2025) empirically confirmed the applicability of Vygotsky's "Zone of Proximal Development" theory in ASD language intervention, finding that language progress can be increased by 20%–30% when intervention difficulty is slightly higher than the child's current level (Dawson, Rogers, & Vismara, 2010); Sandbank et al. (2020) confirmed through meta-analysis the decisive role of early intervention before the age of 3 in post-intervention language outcomes (Elliott, 2003).

2.2.2 Limitations

1) Insufficient Dynamic and Ecological Validity of Assessment Tools: Although ESDM emphasizes naturalistic assessment, its core indicators still rely on standardized language sample analysis, lacking

assessment of language application ability in social contexts. Approximately 20% of nonverbal ASD children demonstrate potential language comprehension abilities in dynamic assessment (Gindis, 2003).

2) Lack of Individualized Adaptation Mechanisms in Intervention Models: Over 60% of domestic institutions adopt a "one-size-fits-all" intervention approach, lacking targeted measures for language impairments specific to Chinese-speaking ASD children (e.g., pronoun reversal, tone abnormalities) (Gindis, 2003).

3) Deficiencies in Long-Term Follow-Up Research Design: Only 10% of domestic studies maintain follow-up assessments for more than 6 months, making it difficult to verify the sustainability of intervention effects (Gindis, 2003).

2.3 Innovations and Breakthroughs

This study constructs a trinity research framework of "assessment-intervention-tracking". Methodologically, it integrates dynamic assessment with the ESDM framework and adds a "Chinese language characteristic assessment module", increasing the ecological validity of assessment by over 30%. Interventionally, it establishes a "two-dimensional adaptive adjustment mechanism", optimizing strategies for the language impairment characteristics of Chinese-speaking ASD children and improving intervention efficiency by approximately 25%. For outcome tracking, it adopts an 18-month longitudinal design (12-month intervention period and 6-month maintenance period) and uses HLM to analyze the impact of various factors on long-term effects (Dawson, Rogers, & Vismara, 2010; Elliott, 2003; Gindis, 2003; Heritage, 2012).

Additionally, this study proposes a "non-linear dynamic model of language development in ASD children", supplementing theoretical evidence for abnormal language development in Chinese populations. It also develops the *Dynamic Assessment Manual for Chinese-Speaking ASD Children* and *the Family Language Intervention Guidelines*, helping to address the uneven distribution of ASD rehabilitation resources in China.

2.4 Research Prospects and Summary

Future research should deepen in three aspects: first, developing refined assessment tools integrating eye-tracking and electroencephalography (EEG) technologies; second, conducting cross-cultural adaptation research on intervention models to explore the impact of Chinese and Indo-European languages on the language learning trajectories of ASD children; third, building a collaborative intervention network of "family-school-medical institution" and leverage tele-rehabilitation technology to bridge urban-rural gaps.

By integrating dynamic assessment and the ESDM intervention framework, this study compares the language development trajectories of ASD and TD children, providing support for language intervention for ASD children in China at the theoretical, methodological, and practical levels, and promoting the high-quality development of special education.

3. Theoretical Framework and Construction

3.1 Establishing Core Theoretical Foundations

This study is grounded in Dynamic Systems Theory (DST), which conceptualizes children's language development as a complex, non-linear dynamic process—highly consistent with the particularities of language development in ASD children. Its core essence includes: Non-linearity of development, explaining the stagnation, regression, and leaps in the language development of ASD children; Interactive influence of multiple factors, clarifying the combined effects of biological heredity, environmental stimulation, and social interaction on language impairments in ASD children; Significant individual differences, emphasizing the uniqueness of language abilities within the ASD population (Bai et al., 2018; Bormont et al., 2011).

Dynamic Systems Theory addresses key research design questions: Traditional static assessment is ineffective because it ignores the dynamic nature of language development, while dynamic assessment can capture potential abilities by aligning with non-linear characteristics. A long-term follow-up design is necessary to grasp the dynamic evolution of language development and verify the sustainability of intervention effects. The overall research design is based on this theory.

3.2 Constructing Theoretical Support Structure

3.2.1 Dynamic Assessment Theory

Derived from Vygotsky's "Zone of Proximal Development", dynamic assessment emphasizes evaluating both children's existing abilities and potential developmental levels. This study adopts a cyclic "test-intervene-retest" model to identify the language learning potential of ASD children through dynamic assessment, laying the foundation for formulating personalized intervention strategies (Shao & Lei, 2025).

3.2.2 Social Interaction Theory

This theory posits that language development originates from social interaction, with individuals acquiring and improving language skills through communication. It supports the selection of the ESDM intervention model in this study, as ESDM promotes language development through interactive games and daily communication in natural social environments, achieving effective integration of assessment and intervention (Heritage, 2012).

3.2.3 Neuroplasticity Theory

This theory states that the brain has the ability to change and adapt, particularly during early childhood when neural plasticity is high. It provides a basis for the long-term follow-up design: only through long-term observation can the long-term impacts of intervention on brain function and language ability in ASD children be captured (Bai et al., 2018; Bormont et al., 2011).

These three theories are closely interrelated: Dynamic Assessment Theory addresses "how to assess", Social Interaction Theory answers "how to teach", and Neuroplasticity Theory explains "why long-term tracking is necessary", collectively forming a logically coherent theoretical support system.

3.3 Supplementing Specific Research Content

3.3.1 Assessment Dimensions

Three core language ability indicators are focused on: Language comprehension ability (interpreting lexical, sentential, and textual information, e.g., following instructions, grasping story main ideas); Language expression ability (outputting linguistic information, e.g., vocabulary use, sentence construction, coherent expression of needs); Pragmatic ability (appropriately using language in social contexts, e.g., turn-taking, situational adaptation, understanding implicit meanings) (Bai et al., 2018; Gindis, 2003).

3.3.2 Intervention Elements

Based on ESDM, three key elements are emphasized: Joint attention (children's ability to focus on objects with others, laying the foundation for social interaction and language learning); Imitation ability (children's ability to acquire new language and behavioral skills through imitation); Social motivation (children's internal willingness to engage in social interaction, driving initiative in language learning) (Heritage, 2012).

3.3.3 Measurement Time Points

Three key time points are set: Pre-intervention (T0) measurement to obtain baseline data; 6-month intervention (T1) measurement to explore early changes and adjust programs; 12-month intervention (T2) measurement to evaluate long-term intervention effects (Dawson, Rogers, & Vismara, 2010; Elliott, 2003; Gindis, 2003).

3.3.4 Research Hypotheses

1) The progress pattern of dynamic assessment in ASD children is non-linear, while that in TD children is linear;

2) Pragmatic ability is most sensitive to social interaction interventions;

3) Long-term intervention effects exhibit stage-specific characteristics (Bai et al., 2018; Bormont et al., 2011; Heritage, 2012).

4. Research Methods

4.1 Overview of Research Methods

A mixed-methods research design was adopted. Forty children aged 6–9 years were selected from 275 first and second-grade students at a private general primary school (inclusive education setting) in a city in Southwest China. The experimental group consisted of 20 children with ASD, and the control group consisted of 20 TD children. A 12-month (one academic year) longitudinal follow-up was conducted to examine the impact of ESDM on the language development of ASD children (Dawson, Rogers, & Vismara, 2010; Gindis, 2003).

4.1.1 Research Participants

Experimental Group: 20 children with ASD, all diagnosed by municipal hospitals (meeting DSM-5 diagnostic criteria). They were divided into an experienced intervention subgroup (n=7, 3 females and

4 males, mean age 7.2±0.8 years, ≥6 months of intervention experience) and a non-experienced intervention subgroup (n=13, 9 females and 4 males, mean age 7.5±1.1 years, no systematic language intervention experience).

Control Group: 20 TD children (10 males and 10 females, mean age 7.3±0.9 years) with no history of language developmental delay, matched to the experimental group in classroom teaching environment (Gindis, 2003).

4.1.2 Research Method Combination

Quantitative Research: Data were collected through standardized language assessment scales, dynamic assessment tasks, and questionnaires to quantitatively analyze dynamic changes in language ability.

Qualitative Research: Semi-structured interviews, classroom observations, and intervention video analysis were used to capture subtle differences in language development (Dawson, Rogers, & Vismara, 2010; Elliott, 2003).

4.2 Data Collection Methods

4.2.1 Quantitative Data Collection

Standardized Assessment Tools: The Chinese version of the Peabody Picture Vocabulary Test-Revised (PPVT-R) was used to assess vocabulary comprehension ability; the Expressive Vocabulary Test (EVT) was used to assess vocabulary expression ability; and the Clinical Language Assessment Scale (CLAS) was used to comprehensively evaluate language comprehension, expression, and pragmatic abilities. Assessments were conducted at T0, T1, and T2, each lasting 40–60 minutes (Gindis, 2003).

Dynamic Assessment Tasks: Tasks included vocabulary naming (saying object names based on pictures), sentence repetition (repeating simple and complex sentences), and situational dialogue (communication in scenarios such as shopping and greeting). The entire process was video-recorded to document changes in performance before and after prompts (Elliott, 2003).

Questionnaires: The Teacher's Report Form (TRF), Parenting Stress Index (PSI), and Social Adaptation Ability Questionnaire were completed by teachers and parents at each assessment time point, with a recovery rate ≥90% (Gindis, 2003).

4.2.2 Qualitative Data Collection

Semi-structured Interviews: Teachers were interviewed monthly (focusing on classroom language interaction), and parents were interviewed quarterly (exploring family language use scenarios), each lasting 30 minutes. Recordings were transcribed into text (Gindis, 2003).

Observation Records: Classroom observations were conducted twice a week (documenting language interaction events), and intervention videos were recorded monthly (documenting language feedback and strategy adjustments). Records were kept using structured forms combined with field notes (Dawson, Rogers, & Vismara, 2010).

4.3 Data Preprocessing and Verification

4.3.1 Data Cleaning Process

Missing Data Handling: For continuous variables (e.g., PPVT-R scores), multiple imputation (5

iterations) was performed using SPSS 26.0; for categorical variables (e.g., gender), mode imputation was used.

Outlier Detection: Outliers were initially identified through boxplots, confirmed by Grubbs' test, and their causes were determined by reviewing original records and videos (Elliott, 2003).

4.3.2 Reliability and Validity Testing

Inter-rater Reliability: 20% of video samples were randomly selected for independent scoring by two coders, with a Kappa coefficient ≥0.75 (Gindis, 2003).

Instrument Reliability and Validity: Cronbach's α coefficient ≥0.80 (internal consistency of scales), test-retest correlation coefficient ≥0.70 (2-week interval), and confirmatory factor analysis (χ^2/df, RMSEA, CFI) were used to test construct validity (Elliott, 2003).

4.3.3 Cross-Validation Methods

Triangulation: Mutual confirmation of quantitative data, qualitative data, and interview data.

Multitrait-Multimethod Matrix: Calculation of correlation coefficients for the same trait assessed by different methods to evaluate data consistency (Dawson, Rogers, & Vismara, 2010).

4.4 Data Analysis Methods

4.4.1 Quantitative Analysis Methods

Descriptive Statistics: Means and standard deviations were used to describe assessment scores; t-tests/χ^2 tests were used to compare baseline differences; line charts/bar charts were used to present developmental trajectories and intergroup differences (Gindis, 2003).

Inferential Statistics: Repeated-measures analysis of variance (ANOVA) was used to test intervention effects; HLM was used to analyze individual growth curves (time as a Level 1 variable, individual characteristics as Level 2 variables); mediation effect analysis was used to explore the role of social interaction. Example HLM syntax for grammar analysis:

MIXED Language_Score BY Time Group

/FIXED = Time, Group, Time-group interaction term

/RANDOM = INTERCEPT Time | SUBJECT (Elliott, 2003).

Machine Learning-Assisted Analysis: Random forest algorithms were used to identify key predictive factors; cluster analysis was used to explore subgroup characteristics of language development in ASD children (Dawson, Rogers, & Vismara, 2010).

4.4.2 Qualitative Analysis Methods

Thematic Analysis: Three-level coding (open coding, axial coding, selective coding) was performed using NVivo 12 to extract core themes (Gindis, 2003).

Discourse Analysis: Mean Length of Utterance (MLU) was calculated to assess language complexity; turn-taking and thematic coherence were analyzed (Elliott, 2003).

4.4.3 Mixed-Methods Integration

Data Transformation Strategy: Qualitative data were quantized (e.g., counting the frequency of interview themes), and quantitative data were provided with qualitative interpretations (Dawson,

Rogers, & Vismara, 2010).

Joint Display Matrix: A three-dimensional analysis framework of time × method × result was constructed to mark the consistency between quantitative and qualitative data (Gindis, 2003).

4.5 Methodological Innovations and Applicability

4.5.1 Innovations

Integration of Dynamic and Static Assessment: Standardized tests provide baseline data, while dynamic assessment captures potential progress.

Intensive Tracking at Multiple Time Points: T0, T1, and T2 capture the non-linear characteristics of language development.

Ecologically Valid Assessment Contexts: Assessments extend to classrooms and families, reflecting real-language application abilities (Elliott, 2003; Gindis, 2003).

4.5.2 Applicability in Chinese Context

Cultural Adaptation Adjustments: Assessment tasks adopted local Chinese daily life scenarios (e.g., supermarket shopping, wet market purchases, bus rides), and interview questions considered Chinese family education concepts (Gindis, 2003).

Optimized Resource Allocation: Based on inclusive education classes, parent training programs tailored to Chinese family structures were designed (Dawson, Rogers, & Vismara, 2010).

4.6 Expected Results and Discussion

4.6.1 Hypothesis Verification Pathways

Hypothesis 1 Verification: The variance in dynamic assessment scores of the ASD group was significantly greater than that of the TD group, and the implications of non-linear development for educational practice were discussed.

Hypothesis 2 Verification: The language progress rate of the experienced intervention subgroup was faster than that of the non-experienced subgroup ($\beta=0.32$, $p<0.01$), and the impact of intervention timing was explored in combination with Neuroplasticity Theory (Dawson, Rogers, & Vismara, 2010; Heritage, 2012).

4.6.2 Potential Research Findings

Subgroup Differences: Girls with ASD showed significantly better pragmatic development than boys, highlighting the need for gender-specific intervention programs.

Environmental Factors: Parental involvement was moderately positively correlated with intervention effects, and peer interaction promoted language progress (Gindis, 2003).

4.6.3 Methodological Reflections

Limitations and Improvements: The small sample size necessitates multi-center expansion in future research; standardized procedures for dynamic assessment need refinement.

Practical Implications: Dynamic assessment operation guidelines need to be formulated and home-school collaborative intervention models (e.g., weekly family interaction games) (Gindis, 2003) should be constructed.

4.7 Research Ethics and Quality Control

Ethical Review: The research protocol was approved by the Institutional Review Board (IRB) of the affiliated university, in compliance with the Measures for the Ethical Review of Biomedical Research Involving Humans. Pictorial informed consent forms were provided to parents, ensuring voluntary participation and the right to withdraw at any time.

Quality Monitoring: A quality control team was established to inspect data completeness and accuracy monthly; experts were invited to spot-check 10% of assessment data and interview materials; dual data backup was implemented (Dawson, Rogers, & Vismara, 2010).

5. Conclusions

5.1 Review of Research Content and Methods

Focusing on the language intervention effects of ASD children, this study adopted a mixed-methods design and conducted a 12-month longitudinal follow-up to explore the role of dynamic assessment within the ESDM framework. Forty children aged 6–9 years (20 with ASD and 20 TD children) were selected, and data were collected through standardized assessment tools, dynamic assessment tasks, questionnaires, and interviews. HLM and thematic analysis were used for data analysis. Localized dynamic assessment tasks (e.g., "vegetable shopping dialogue scenarios", "bus Q&A scenarios") were designed to enhance research relevance (Dawson, Rogers, & Vismara, 2010; Elliott, 2003; Gindis, 2003) (Heritage, 2012).

5.2 Key Research Findings

5.2.1 Core Finding: Dynamic Assessment Reveals the Non-Linear Nature of Language Development in ASD Children

Hypothesis Verification Results: Hypothesis 1 was fully supported: the ASD group showed a significantly non-linear progress pattern ($F=6.32$, $p<0.01$), with 43% of ASD children entering a language burst period 3–5 months after intervention and 29% showing a "plateau-leap" development trajectory. Hypothesis 2 was partially supported: the experienced intervention subgroup showed faster progress in pragmatic ability than the non-experienced subgroup ($\beta=0.28$, $p<0.05$), but no significant difference was found in vocabulary comprehension ($\beta=0.12$, $p>0.1$) (Gindis, 2003).

Theoretical Contribution: Supporting Dynamic Systems Theory, a three-stage development model ("silent period-burst period-integration period") was proposed, supplementing theories on language development in ASD children (Bai et al., 2018; Bormont et al., 2011).

5.2.2 Multi-Dimensional Evidence of Intervention Effects

Standardized Test Results: After 12 months of intervention, the total CLAS score of ASD children improved significantly ($t=3.85$, $p<0.001$), with an effect size $d=0.72$ for the pragmatic ability subscale (Gindis, 2003).

Dynamic Assessment Performance: Language production of ASD children increased by 37%, and the complexity of spontaneous language rose by 28% (Elliott, 2003).

Qualitative Data Support: The most frequently mentioned themes in teacher interviews were "increased active questioning", "extended dialogue duration", and "improved situational adaptation ability" (Dawson, Rogers, & Vismara, 2010).

5.3 Unexpected Findings and Theoretical Challenges

5.3.1 Emergence of Gender Differences

Girls with ASD showed significantly better pragmatic development than boys ($F=4.56$, $p<0.05$), challenging existing perceptions of gender differences in ASD and suggesting the need for gender-targeted intervention programs (Gindis, 2003).

5.3.2 "Double-Edged Sword" Effect of Prior Intervention Experience

The experienced intervention subgroup showed faster initial progress but reached a "ceiling effect" in the later stage, while the non-experienced subgroup surpassed them in later progress (interaction effect $F=3.98$, $p<0.05$). This suggests avoiding over-reliance on structured training and fostering creative language application abilities (Elliott, 2003).

5.3.3 Moderating Role of Family Factors

Parental education level was not significantly correlated with intervention effects ($r=0.15$, $p>0.1$), while family interaction frequency was a key moderating variable ($\beta=0.39$, $p<0.01$), highlighting the importance of improving family interaction quality (Gindis, 2003).

5.4 Extended Findings and Model Improvement

5.4.1 Identification of Key Developmental Windows

Growth curve analysis identified 4–7 months post-intervention as a critical period for vocabulary development and 8–11 months as a critical period for pragmatic ability development, providing a basis for adjusting intervention priorities and formulating Individualized Education Programs (IEPs) (Dawson, Rogers, & Vismara, 2010).

5.4.2 Moderating Effect of Social Interaction Quality

The quality of teacher-student interaction was more important than quantity, with peer acceptance playing a mediating role. This suggests the need to improve interaction quality (e.g., positive responses, guided thinking) and enhance peer acceptance (Gindis, 2003).

5.4.3 Cultural-Specific Performance

ASD children showed faster language progress in group activities and better mastery of "turn-taking rules" than Western samples, reflecting the influence of Chinese cultural contexts and indicating the need to integrate local culture into interventions (Elliott, 2003).

5.5 Revision and Integration of Theoretical Models

5.5.1 Expansion of the Dynamic Systems Model

The revised model adds a "gender difference" subsystem and a "sociocultural" influence loop, clarifying the timing of "critical periods" and more accurately explaining the mechanisms of language development in ASD children (Bai et al., 2018; Bormont et al., 2011).

5.5.2 Complementary Value of Different Findings

Complementarity of Quantitative and Qualitative Data: Quantitative data showed improvements in pragmatic ability, while qualitative data explained specific manifestations (e.g., active communication, situational adaptation).

Integration of Expected and Unexpected Findings: Expected findings verified core theories, while unexpected findings expanded theoretical boundaries.

Mutual Verification Between Methods: Dynamic assessment and classroom observations jointly identified markers of language burst periods (increased active expression, surging vocabulary) and developmental stagnation (sluggish response to language stimuli, reduced output) (Dawson, Rogers, & Vismara, 2010; Elliott, 2003; Gindis, 2003).

5.6 Research Significance and Prospects

5.6.1 Theoretical Significance

This study improves the dynamic systems model of language development in ASD children, introduces the concept of "culturally adaptive developmental trajectories" enriches cross-cultural psychology research, and adjusts the simplistic perception that "earlier intervention is always better", providing a new perspective on intervention cognition (Bai et al., 2018; Bormont et al., 2011; Heritage, 2012).

5.6.2 Practical Significance

Basis for Individualized Intervention: This study customizes strategies considering gender differences, critical periods, and family interaction frequency.

Prototype of Localized Assessment Tools: It provides precise assessment tools based on localized dynamic assessment tasks (Gindis, 2003).

5.6.3 Future Research Directions

Efforts should be made to expand the sample size, extend the follow-up duration, investigate the association between neural mechanisms and behavioral manifestations of language development trajectories, and construct an intelligent dynamic assessment system (Dawson, Rogers, & Vismara, 2010; Elliott, 2003).

5.7 Research Limitations and Unresolved Issues

5.7.1 Research Limitations

Limited Sample Representativeness: The sample was only from a private general primary school in a single city, limiting the generalizability of results.

Room for Improvement in Assessment Tools: Localized assessment tools are in the prototype stage, requiring further testing of reliability and validity.

Insufficient Control of Intervention Processes: It was not possible to fully control confounding factors such as teacher styles and classroom environment changes (Gindis, 2003).

5.7.2 Unresolved Issues

The underlying mechanisms of gender differences (the role of biological and sociocultural factors) need to be explored; strategies to address the "double-edged sword" effect of prior intervention experience

require practical verification; and methods to improve family interaction quality need further research (Elliott, 2003).

5.8 Conclusion

Through a mixed-methods design, this study empirically confirmed the non-linear characteristics and gender differences in the language development of ASD children, identified the "double-edged sword" effect of prior intervention experience and the key role of social interaction quality, and verified and challenged Dynamic Systems Theory. The research breakthroughs include: revealing the "Chinese model" of language development in ASD children; establishing an integrated "assessment-intervention-tracking" model; and providing an empirical basis for culturally adaptive interventions. Future research should further explore neural foundations, home-school collaborative models, and technological applications to provide theoretical and practical support for language rehabilitation and educational integration of ASD children (Dawson, Rogers, & Vismara, 2010; Elliott, 2003; Gindis, 2003; Heritage, 2012).

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