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Comparing the Applicability of Three Different Speech Therapy Service Delivery Models for Preschoolers with Intellectual Disability: A Single-Blind Randomized Controlled Trial

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ABSTRACT

Background: Many Speech and language pathologists (SLPs) are employed by Iran's Ministry of Education, with services traditionally delivered through a pull-out model. However, alternative service delivery models (SDMs), such as classroom-based and consultant approaches, are also available for SLPs working in schools. While the advantages of these approaches have been established in other countries, their effectiveness in the Iranian context remains unexplored. This study sought to determine which SDM is more effective in enhancing language skills among Persian-speaking children with intellectual disability (ID) in Iran.
Methods: This study employed a single-blind, randomized, controlled trial design. Twenty-one preschoolers, with a mental age of approximately 4:6, were randomly assigned to one of three groups (pull-out, classroom-based, and consultant) to receive speech therapy services. Language skills of all students were assessed by an experienced speech therapist using the Persian version of Test of Language Development-Persian:3 (TOLD-P:3), which has demonstrated favorable content validity and acceptable reliability. The language age of students on core subtests and their compositions were compared using the Kruskal-Wallis test.
Results: Analyzing language areas and compositions revealed that speech therapy was effective across all delivery service models. However, notable changes were observed in students under the consultant model, particularly in their "Grammatical completion" score (P=0.011). Additionally, significant improvements were noted in four other composition scores: 'spoken language' (P=0.05), 'organizing' (P=0.009), 'speaking' (P=0.017), and 'syntax' (P=0.055).
Conclusion: The findings of this study demonstrate that speech therapy, irrespective of the service delivery models (SDMs), effectively improves language skills in children with ID. However, the consultant model emerged as the most effective among the three models (pull-out, classroom-based, and consultant) for children with ID.

Introduction

The American Speech-Language-Hearing Association (ASHA) defines service delivery as a dynamic process encompassing four dimensions of providing speech and language pathologist (SLP) services: 1) Setting: This refers to the location where the intervention is delivered, such as home, clinic, school, pull-out, push-in, or within the classroom. 2) Dosage: This dimension includes the duration (length of intervention), frequency (number of intervention sessions during a specific period), and

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intensity (amount of time SLPs spend in each therapeutic session) of the intervention. 3) Format: Format pertains to how SLPs provide the intervention, whether one-on-one, in a group setting, or through consultation with school staff and.or family members. 4) Provider: This dimension involves identifying who administers the intervention, including SLPs, school staff, volunteers, parents, or trained personnel [1, 2].

ASHA has categorized speech and language therapy services into two main types: direct and consultative, marking a shift from the caseload to the workload model [1, 3]. Direct services involve interventions where SLPs have direct contact with their clients on a one-to-one basis or in a group setting. Consultative services, also known as indirect services, involve SLPs coaching and collaborating with teachers, guardians, caregivers, parents, or other individuals responsible for promoting the communication skills of the client [1].

ASHA identifies seven distinct ways to deliver speech and language services within school settings: Collaborative consultation, Monitoring, Language-based classroom, Combination, Pullout, Community-based, and Self-contained classroom [4]. Paul extensively discusses three models in her book: Pull-out, Consultant and Collaboration, and Language-Based Classroom. She provides detailed explanations of how these models dictate where, when, how, and with whom the intervention occurs, shedding light on the roles assumed by SLPs in school settings. These roles outline the objectives and goals that SLPs should pursue in their service delivery [5].

The roles undertaken by SLPs in schools encompass a range of responsibilities, including screening, assessment, intervention, consultation, resource allocation, activity design, monitoring, and termination of language, communication, and literacy intervention plans for students [6-10]. Currently, SLP services are an integral component of the rehabilitation process provided by special schools to children in Iran. The exceptional education sector in the country comprises 719 rehabilitation workers, with 386 SLPs catering to the needs of approximately 57,000 students with special needs. Among these students, those with physical disabilities, intellectual disabilities, multiple disabilities, and autism spectrum disorders receive the highest proportion of SLP services [11, 12].

Beyond children with disabilities, various studies conducted in Iran have highlighted the significant demand for SLP services among students in mainstream schools. For instance, a study conducted in Zanjan city revealed that 10.2% of 1,170 students exhibited various speech and language disorders [13]. Similarly, in Semnan City, 7.8% of 3,013 students were reported to have pronunciation disorders [14]. In Tehran, another study found that 16.1% of 1,010 elementary school students had speech and language disorders, while between 24% and 27% of children were diagnosed with learning disorders [15]. Additionally, in Arak, 11.9% of primary school students were identified as having speech disorders [16], and approximately 11% of 600 students in Kermanshah were reported to have speech disorders [17]. Despite the substantial need for SLP services in mainstream schools, it is surprising to note that these schools in Iran do not have any officially employed SLPs to address the needs of these children.

In 1986, in the United Kingdom, Enderby and Davies reported that approximately 26 qualified SLPs would be needed per 100,000 population [18]. The most recent report released by ASHA avoided reporting any specific figure as a 'good' SLP.population ratio. They mentioned that "population density, client demographics, service needs, and the presence of support staff" must be considered to calculate the SLP.population ratio [19]. From any perspective (the number of children with disabilities present at special needs schools or the percentages of children with communication disorders), currently, there are not enough employed SLPs to provide services in Iran's exceptional and mainstream schools.

The responsibilities of SLPs have evolved with the emergence of newer models, positioning them within schools and communities [6]. However, without increasing the number of employed SLPs or implementing policies to place SLPs in mainstream schools, the amount of time each client receives SLP services may decrease, or the number of clients receiving specialized SLP services may be limited. The size of SLPs' caseloads significantly influences the selection of service delivery models, and larger caseloads can impact collaboration levels with school staff and the provision of support to each student [20-22]. To address the shortage of employed SLPs, SLP services can be delivered through various pathways. Systematic reviews have not shown the superiority of one service delivery model over others; rather, they have confirmed the effectiveness of various speech therapy service delivery models in schools [8, 9, 23-25].

In summary, given the significant gaps in the evidence and the implications for clinical practice in schools [23], there is a pressing need for local and focused research to establish a substantial evidence base for Iranian SLPs, aiding them in selecting the most effective service delivery approach. Therefore, the present study aimed to investigate the linguistic outcomes in children with intellectual disability (ID) who received speech therapy services under specific SD models to provide SLPs with a broader array of options to deliver their services to a wider range of clients.

Methods

This paper constitutes the second part of a larger study to evaluate the effectiveness of various SLP service delivery models in Iran, encompassing diverse populations with and without language disorders.

Participants

The study population comprised all preschoolers with ID enrolled in exceptional schools in Semnan, Iran, during the 2022-2023 academic year. Students meeting the inclusion criteria were selected from three exceptional schools through purposive sampling. Inclusion criteria stipulated that children must have a mental age of at least 4, be deemed educable, be enrolled in preschool grade 2, exhibit no signs or symptoms of known syndromes, and

be of any gender. The sole exclusion criterion was lack of parental consent; any family declining participation would have their child excluded from the study while remaining in routine rehabilitation programs. Although all preschoolers registered for the 2021-2022 educational year were invited to participate, 12 were ultimately excluded, leaving 21 participants whose parents provided consent and who met all inclusion criteria.

This study was conducted by ethical guidelines and received approval from the Semnan University of Medical Sciences (ethics code=IR-SEMUMS-REC. 1401. 163) and was registered with the Iranian Registry of Clinical Trials (IRCT20180612040069N2). Informed consent was obtained from all participants, and families were assured that their children would not be harmed, their identities and information would remain confidential and anonymous throughout the study, and they could withdraw from the study at any time without consequences. The data collection process commenced only when families and children were ready to participate, and no costs were imposed on participants for evaluations or interventions. The initial 10 minutes of each evaluation session were dedicated to rapport building, and no students were compelled to participate in assessment sessions if they chose not to; in such cases, assessments were rescheduled for another day.

Service Delivery

Pullout services involve the SLP working with children individually or in small groups outside the classroom [4].

Classroom-based service delivery occurs when the SLP engages in whole-class instruction, small group sessions, or guided learning within the classroom setting. In this model, collaboration with the classroom teacher is key, with the SLP either teaching alongside the teacher or alternating teaching responsibilities [26].

Collaborative Consultation refers to a scenario where the SLP does not directly interact with the student but instead collaborates with teachers and families to support the student's communication needs [4].

Outcome Measurements

A comprehensive array of assessment tools was administered to evaluate various aspects of children's language abilities. However, only the outcomes of the adapted version of the Language Development Test (Newcomer and Hamill: TOLD-P: 3) and demographic information will be presented for brevity and to leverage the benefits of our standardized language test.

A comprehensive array of assessment tools was administered to evaluate various aspects of children's language abilities. However, only the outcomes of the adapted version of the Language Development Test (Newcomer and Hamill: TOLD-P: 3) and demographic information will be presented for brevity and to leverage the benefits of our standardized language test. The Test of Language Development-Persian:3 (TOLD-P:3), standardized for Persian-speaking children aged 4-11 [27], comprises six core subtests: *Picture vocabulary, Relational vocabulary, Oral vocabulary, Grammatical understanding, Sentence Imitation, and Grammatical Completion*. Additionally, the scores of the core subtests are aggregated in various formats to generate six composite scores representing the major dimensions of language [27]:

- Spoken Language: Picture Vocabulary, Relational Vocabulary, Oral Vocabulary, Grammatical Understanding, Sentence Imitation, and Grammatical Completion
- Listening: Picture Vocabulary and Grammatical Understanding
- Organizing: Relational Vocabulary and Sentence Imitation
- Speaking: Oral Vocabulary and Grammatical Completion
- Semantics: Picture Vocabulary, Relational Vocabulary, Oral Vocabulary
- Syntax: Grammatical Understanding, Sentence Imitation, and Grammatical Completion

The three supplemental subtests assess the prerequisites of literacy skills. Raw scores can be converted into age scores, standard scores, and percentile scores to compare each child with the appropriate age range.

Procedure

The present study utilized a single-blind controlled trial design. An expert panel comprising the head of speech and language therapists working at schools, the deputy manager of research at the Semnan Branch of the Ministry of Education, a biostatistician, and an academic team of SLPs from Semnan University of Medical Sciences, convened to discuss the applicability of various SLPs-SD. They reached a consensus on the suitability of the pull-out, collaborative consultation, and classroom-based models for implementation in this study.

Following the acquisition of necessary consents, the first author, an experienced speech therapist, extended invitations to all mothers to attend the schools. She elucidated the study's objectives and provided an information sheet and consent form. All participating parents were mothers aged between 28 to 41 years. Subsequently, children whose mothers signed the consent form were enrolled in the study, while others continued with their routine rehabilitation services without alteration.

The psychologist, employed at the Ministry of Education in the Semnan Branch, assessed the children's intellectual quotient using the Lighter IQ test, which determined their eligibility as educable. Subsequently, the twenty-one preschoolers were divided into three groups through systematic randomization. Each group underwent an eight-week intervention comprising three sessions per week, with each session lasting 45 minutes. The comprehensive program designed for ten weeks is detailed in Table 1.

Long-term and Short-term Plans

The research team developed a long-term plan based on the results of all tests and language sample analysis. Emphasizing socio-conversational analysis, the children's pragmatic skills were identified as the primary focus of therapeutic sessions. It was assumed that addressing

Table 1: Details of session plans in different Speech and Language Pathologists-Service Delivery (SLPs-SD)

Week number	Pullout	Consultant	Classroom-based
1	Pretest Evaluation– Group Allocation		
2	- Conversational skills - Asking for, giving, and responding to information - Turn-taking - Eye contact	- Turn-taking - Asking for, giving, and responding to information	- Turn-taking - Eye contact
3	- Introducing and maintaining topics - Making relevant contributions to a topic - Asking questions	-Conversational skills	- Turn-taking
4	- Avoiding repetition or irrelevant information - Asking for clarification - Adjusting language based on the situation or person	- Asking for clarification - Adjusting language based on the situation or person	-Avoiding repetition or irrelevant information
5	- Using humor - Using appropriate strategies for gaining attention and interrupting - Asking for help or offering help appropriately	- Asking for help or offering help appropriately	- Asking for help or offering help appropriately
6	- Offering.responding to expressions of affection appropriately - Facial expression	Offering.responding to expressions of affection appropriately	Offering.responding to expressions of affection appropriately
7	- Body language - Intonation of voice - Body distance and personal space	- Body language - Using appropriate strategies for gaining	- Using appropriate strategies for gaining
8	Repeat the previous exercises	Repeat the previous exercises	Repeat the previous exercises
9	Repeat the previous exercises	Repeat the previous exercises	Repeat the previous exercises
10	Posttest Evaluation- Report Preparation		

pragmatic skills would also impact other language areas. Consequently, implementing this intervention was anticipated to result in an approximate one-year increase in the children's language age.

Intervention Procedures

The most prominent methods for delivering SLP services to enhance language development include clinician-directed, child-centered, and hybrid approaches, considered in both pull-out and classroom-based interventions [5]. However, for the consultation model, the therapist focused on implementing Indirect Language Stimulation (ILS) to assist mothers [Please refer to pages 260-362 in Paul and Norbury for further details [5].

Alterations During the Program

The research team maintained flexibility during the meetings. Although we initially allocated 45 minutes for each therapeutic session in any service delivery model, we were patient and adaptable if any session required more time for various reasons. We actively listened to the mothers, children, and educational collaborators during each session, allowing us to adjust our agenda, long-term plans, short-term objectives, and session plans accordingly. As a result, it was common for us to extend the duration of therapeutic sessions as needed.

Based on the initial evaluation, the research team defined the goals to target for each student. They consistently referred back to the student's curriculum, focusing on goals that would significantly impact the student's ability to learn, speak, or participate. In cases where a goal did not seem to affect the student's progress, the research team monitored it closely and discussed it with the mothers, teachers, and educational collaborators. Given the importance of balancing the time each student spent in their classroom with the time they spent with the SLP to ensure success in the school setting, the research team prioritized addressing challenges that arose for each child accordingly.

One of our main concerns was ensuring the generalization of goals beyond the speech therapy room. Research has shown that pull-out service delivery models can yield significant intervention outcomes, particularly in controlled, structured, and individualized settings. However, achieving generalization beyond the intervention environment may require additional intentional programming. On the other hand, interventions conducted in natural, inclusive communicative contexts, like classrooms, may result in smaller gains but better student use and generalization [28, 29].

To promote generalization, our research team focused on strategies students could apply outside the speech room. For instance, we implemented contextualized therapy approaches, such as narrative intervention, which has led to greater generalization than decontextualized therapy [30].

We knew from the literature that family involvement and student participation were crucial for achieving optimal outcomes in these service delivery models. Therefore, our research team placed significant emphasis on considering the feelings of both the families and the students regarding the SLP services and the type of service delivery.

In cases where a student or mother expressed dissatisfaction, the research team was prepared to make immediate and appropriate adjustments, such as changing the service delivery model or adjusting the days.hours of service delivery. To maintain the cooperation of both the child and the mother, we implemented a token boost system. We also tried to adapt the sessions to support the children's emotional, sensory, or attention regulation needs by incorporating flexibility, providing visual or food reinforcements, offering breaks, and engaging in activities beyond the scope of speech and language goals.

Statistics

All data were entered into SPSS software version

21 for analysis. The normal distribution of data was assessed using the Shapiro-Wilk test. Non-parametric tests, specifically the Kruskal-Wallis test, were utilized to compare the three groups.

Results

The study comprised 21 children with intellectual disabilities randomly assigned to three groups, each receiving different speech therapy service delivery models. Analysis of the means of chronological and non-verbal mental ages revealed no significant differences among the groups (P>0.05) (Table 2).

Tables 3 and 4 present the means and standard deviations of language age and the standard scores of children before and after receiving SLP services. The results indicate no significant differences in the standard mean, percentage, and language age test scores, except for grammar completion scores after the provision of services (P>0.05).

In addition to the scores obtained from the core subtests of TOLD-P:3, composition scores were calculated based on these subtests. Table 5 displays the pre-and post-test scores for each area of language abilities. The analysis revealed that the only significant difference among groups was observed for organizing before intervention; however, this difference diminished after the delivery of services.

The research team was interested in evaluating and comparing the extent of changes observed in each group after receiving speech therapy services under specific SDs. Changes in language age and composition scores were calculated, and the groups were compared based on the magnitude of these changes. Tables 6 and 7 compare the groups regarding the amount of changes observed.

Table 2: Demographic characteristics of the participants

Service Delivery Model	Gender		Total	Chronological age		Non-verbal intellectual age	
	Boy	Girl		Mean	SD*	Mean	SD
Pull-out	4	3	7	8.16	2.12	4.21	0.36
Classroom Based	6	1	7	7.32	1.70	4.48	0.80
Consultant	6	1	7	8.46	1.90	4.90	0.53

*Standard Deviation

Table 3: Comparison of Language age according to the Core Subtests of the Test of Language Development-Persian:3 (TOLD-P:3)

Service Delivery Model	Subtests of TOLD-P: 3											
	Picture vocabulary		Relational vocabulary		Oral vocabulary		Grammatical understanding		Sentence Imitation		Grammatical completion	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Pull-out	(0.22) 3.11	(0.37) 3.20	(0.00) 3.00	(0.01) 3.00	(0.39) 3.16	(0.38) 3.16	(0.00) 3.00	(0.41) 3.16	(0.00) 3.00	(0.00) 3.00	(0.00) 3.00	(0.00) 2.73
Classroom Based	(0.03) 3.05	(0.36) 3.19	(0.01) 3.00	(0.01) 3.00	(0.04) 3.03	(0.02) 3.02	(0.00) 3.00	(1.14) 3.44	(0.00) 3.00	(0.04) 3.02	(0.01) 3.00	(0.01) 3.00
Consultant	(0.39) 3.21	(0.46) 3.34	(0.00) 3.00	(0.40) 3.16	(0.02) 3.01	(0.03) 3.04	(0.00) 3.00	(0.39) 3.15	(0.00) 3.00	(0.00) 3.00	(0.00) 3.00	(0.00) 3.33
P value	0.499	0.466	0.368	0.683	0.554	0.447	1.00	0.747	1.00	0.122	0.368	0.012

Table 4: Comparison of Standard Scores according to the Core Subtests of the Test of Language Development-Persian:3 (TOLD-P:3)

Service Delivery Model	Subtests of the Test of Language Development-Persian:3 (TOLD-P:3)											
	Picture vocabulary		Relational vocabulary		Oral vocabulary		Grammatical understanding		Sentence Imitation		Grammatical completion	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Pull-out	(0.90) 4.14	(1.65) 5.57	(0.95) 5.71	(1.07) 6.14	(2.15) 6.57	(1.83) 6.00	(0.49) 2.71	(2.76) 5.43	(0.79) 2.43	(0.95) 2.71	(0.38) 2.14	(2.41) 5.86
Classroom Based	1.11) 3.71	(1.07) 5.14	(0.90) 4.86	(0.90) 6.14	(1.35) 5.14	(1.07) 5.86	(0.38) 2.14	(4.11) 4.39	(1.073) 2.86	(3.05) 4.43	(1.11) 2.71	(1.50) 3.29
Consultant	(2.94) 5.43	(1.62) 6.43	(0.95) 4.71	(1.51) 6.57	(1.35) 4.86	(1.27) 6.43	(0.38) 2.14	(2.81) 4.71	(0.98) 2.57	(1.38) 3.71	(0.38) 2.14	(1.25) 7.71
P value	0.263	0.194	0.135	0.748	0.217	0.744	0.038	0.429	0.732	0.352	0.322	0.002

Table 5: Comparison of composite scores before and after providing services by group

		Compositions											
		Spoken language		Listening		Organizing		Speaking		Semantics		Syntax	
		Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Service Delivery Model	Pull-out	(7.85) 55.00	(8.99) 68.28	(4.30) 59.86	(12.99) 74.00	(4.65) 59.57	(5..88) 61.29	(7.45) 67.71	(10.03) 76.29	(4.92) 73.71	(5.12) 76.29	(14.84) 29.86	(12.97) 67.00
	Classroom-Based	(6.75) 49.42	(14.66) 61.43	(3.26) 56.57	(15.73) 67.57	(6.53) 54.57	(13.66) 68.26	(7.44) 65.57	(5.93) 69.14	(6.95) 66.00	(3.73) 75.29	(18.28) 30.43	(18.65) 60.14
	Consultant	(6.11) 50.57	(8.21) 74.14	(9.99) 63.71	(10.68) 75.14	(3.63) 51.14	(10.84) 67.57	(5.54) 62.00	(6.37) 82.57	(8.15) 69.86	(8.28) 79.29	(12.37) 25.00	(8.15) 72.86
	P value	0.183	0.145	0.248	0.398	0.021	0.386	0.278	0.015	0.186	0.292	0.489	0.135

Table 6: Changes in language ages based on the core subtests of the Test of Language Development-Persian:3 (TOLD-P:3)

Service Delivery Model	Subtests of the Test of Language Development-Persian:3 (TOLD-P:3)											
	Picture vocabulary		Relational vocabulary		Oral vocabulary		Grammatical understanding		Sentence Imitation		Grammatical completion	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Pull-out	0.09	0.47	0.004	0.01	-0.009	0.02	0.16	0.41	0.00	0.00	-0.27	1.27
Classroom Based	0.15	0.34	0.00	0.00	-0.004	0.03	0.44	1.14	0.02	0.04	-0.004	0.01
Consultant	0.13	0.34	0.16	0.40	0.03	0.04	0.15	0.39	0.00	0.00	0.33	0.49
P value	0.884		0.313		0.135		0.747		0.122		0.011	

Table 7: Changes in language skills abilities based on the compositions of the Test of Language Development-Persian:3 (TOLD-P:3)

Service Delivery Model	Compositions of the Test of Language Development-Persian:3 (TOLD-P:3)											
	Spoken language		Listening		Organizing		Speaking		Semantics		Syntax	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Pull-out	13.29	11.28	14.14	13.99	1.71	4.57	8.57	7.65	2.57	5.47	37.14	10.51
Classroom Based	12.00	13.50	11.00	16.29	13.71	10.70	3.57	9.48	9.29	7.59	29.71	14.23
Consultant	23.57	7.29	11.43	10.89	16.43	12.12	20.57	9.32	9.43	4.11	47.86	17.82
P value	0.050		0.687		0.009		0.017		0.084		0.055	

Discussion

The present study demonstrated the effectiveness of different SLP-SDs in a cohort of 21 children with ID who were randomly allocated into three groups. All three groups exhibited positive changes after receiving the SLP services. Stone reported similar findings which were consistent with this study results [31], who investigated the impact of three SDs (Pull-out, SLP co-teaching, and teacher-SLP independent group) on teaching instructional verbs to three different groups (typical children, children from low socio-economic backgrounds, and children with disabilities). It was observed that all children learned the targeted vocabulary regardless of the specific delivery model utilized.

Initially, we hypothesized that children in the pull-out SD would exhibit significant changes in all measurements. However, the results were unexpected. While the pretest comparisons between groups did not reveal any significant differences in core subtests and compositions, after receiving different SDs, a significant difference was observed among groups in the grammatical completion core subtest. This significance stemmed from a notable increase in the grammatical completion score among children who received consultant services. Additionally, the posttest comparison of compositions showed a significant increase in the 'speaking' score (derived from oral vocabulary and grammatical completion) among children in the consultant SD. In contrast, the other two groups did not exhibit such changes.

Regarding the changes observed in the core subtests and compositions within each group, children in the consultant SD displayed significant and positive increases across all measures. These findings contradict our initial hypothesis and are not consistent with similar studies conducted by Throneburg et al. (2000), Farber and Klein (1999), and Ellis et al. (1995) [32-34]. These studies found that collaborative SD, where an SLP and teacher work together, resulted in better student outcomes than the traditional pull-out approach and.or consultative model. However, no significant differences were observed among groups based on the SLP-SDs utilized in Stone's study.

There are several reasons why our results diverged from previous findings. Firstly, we focused on a specific group of children with unspecified intellectual disabilities. In contrast, previous studies applied different SDs to children in kindergarten or primary schools with or without a need for SLP services. Moreover, our participants' mothers were well-informed about their children's rehabilitation and educational processes. This is significant as our study was conducted shortly after the COVID-19 pandemic, during which many routine services were provided through telehealth or virtual platforms, requiring mothers to take an active role in working with their children.

Additionally, the literature suggests that several important factors may influence the outcomes of SDs. These include characteristics of the student, such as the nature and severity of language problems; environmental factors, including cultural and linguistic considerations; family and community support; and availability of resources [35-38]. The organizational factors include the educational frameworks, policies, and values of the province or territory, school district, and individual schools. These also encompass each teacher's instructional style, expectations, and understanding of the scope of practice and role of S-LTs in schools [8, 39]. Finally, SLP factors include staffing levels, the availability of resources (such as classroom and curriculum-based materials), administrative support and space, access to other SLP service providers in the community, caseload, and workload demands, responsibilities assigned by school administrators, time required for travel between schools, the number of students in need of SLP services, and the complexity of their needs. This study did not examine the long list of potential influential factors provided here. However, future studies might consider the effectiveness of SDs in addressing these factors.

Even though the research team endeavored to provide a rich and comprehensive intervention, the observed changes in language age were not deemed sufficient to warrant discontinuation of SLP services for these children. This finding aligns with previous research, highlighting the challenge of identifying a universally optimal SLP

service delivery model. The variability across schools, classrooms, staff members, and students, coupled with the diverse range of available service delivery options, underscores the complexity of addressing speech, language, communication, and literacy issues [8].

While some evidence suggests the efficacy of collaborative, functional, curriculum-based, and inclusive intervention approaches [8, 40, 41], further exploration of these delivery models in diverse populations is warranted. Our collaborative efforts with parents and teachers proved invaluable in adapting, implementing, and assessing the effectiveness of SLP-SDs. However, several limitations may have impacted the outcomes: reliance on an older version of a single standardized language test, limited access to children with ID who had speaking skills, and the inability to generalize our results to children with other disorders or those lacking oral language skills.

Conclusion

The findings of this study indicate that SLP services, irrespective of their service delivery models (SDs), positively impact the language skills of children with ID. However, the consultant SD emerged as the most effective among the three compared (pull-out, classroom-based, and consultant) for preschoolers with ID.

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Conflict of interest: the authors of this manuscript have no conflict of interest to declare

Authors' Contribution

Conceptualization, [M.A and M.S]; Methodology, [all authors]; Investigation [M.A]; Writing – Original Draft [all authors]; Writing – Review and Editing [all authors]; Funding Acquisition and Resources and Supervision [M.S and M.K]

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