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An Early Intervention in Gestural Communication in Chilean Children from Psychosocially At-Risk Backgrounds and Its Impact on Language Skills at 18 Months Old

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Abstract: The emergence of symbolic gestures is a solid milestone in early childhood development. Interventions that intentionally promote them have contributed to children's language, cognitive, and socioemotional development. However, these studies have mainly been conducted in the USA with middle-SES families, and such research has considerably decreased in recent years. This study aimed to assess the effects of an intentional intervention for promoting symbolic gestures in the expressive and comprehensive language of Chilean children who were aged 18 months. Sixty-nine highly psychosocially at-risk children were assessed at 5–9 months and then at 18 months. Teachers from half of the nurseries involved in the study received the intervention. The assessment included a report on the children's gestural vocabulary, the CDI, and the language scale of BSID-III. The results showed that the children in the intervention group had a significantly greater gestural vocabulary at 18 months and they performed better in their expressive language than the children in the control group did. Additionally, this study aimed to analyze if this intervention affected children differentially in consideration of their language development (adequate and at-risk). The results showed that children with adequate development improved their language when they received the intervention, but those from the at-risk group did not. The implications of these results for the design of interventions at an early age are discussed while considering children from different sociocultural backgrounds and with different language development.

Keywords: gestures; communication; early infancy; language; development

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1. Introduction

The spontaneous appearance of gestures with communicative intention is a clear and solid milestone in children's development (Goldin-Meadow 1999; Tomasello 2008). These gestures have been investigated from different perspectives, and their appearance has been placed before the first year of age (Bates et al. 1979; Premack and Woodruff 1978). The study of the different benefits that this gestural communication presents for children's development led to the emergence of different initiatives to intentionally promote it in the 1990s (e.g., Acredolo and Goodwyn 1990; Farkas 2007a), which are still valid to this day.

Among the multiple benefits that these programs have demonstrated are the contributions to children's language, cognitive, and socioemotional development in follow-up studies up to 7 years of age (i.e., Acredolo and Goodwyn 1990). However, these studies were mainly conducted in the USA and with families of middle socioeconomic status (SES) (Farkas 2007a). In addition, the interest in researching this topic has decreased considerably in recent years, affecting the availability of updated literature. For this reason, it is relevant to continue studying this tool more, as it has proven to be very useful for children's development. Additionally, it is necessary to incorporate specific studies of its effects on children from other cultures, such as Latin America, and in populations with greater psychosocial risk. Considering that gaps in language development appear from a very early age, such

studies will contribute to the knowledge of the implications of this intervention for children from other socioeconomic and cultural backgrounds.

1.1. Spontaneous Development of Gestures in Early Infancy

Language is the ability to communicate ideas, emotions, and desires through symbols produced intentionally or deliberately (Bermeosolo 2000). Gestures are kinesthetic or bodily movements that are considered to be non-verbal communication or language. These gestures or symbols are intended to communicate ideas, emotions, and requests (e.g., putting the index finger in front of the mouth or asking for silence) (Tomasello 2008).

This study focused on intentional gestures—those that intend to communicate something to another (Acredolo and Goodwyn 1988; Farkas 2007a; Tomasello 2008). These gestures are actions that express something deliberately, as they are under the voluntary control of the person who produces them and are carried out with the main purpose of communicating or expressing something (Kendon 2004).

During early infancy, gestures develop toward increasingly complex forms in progressive and non-exclusive stages and are linked to children's cognitive development (Camaioni et al. 2003; Capirci et al. 1996; Rodrigo et al. 2006). First, deictic gestures appear between 9 and 12 months of age (e.g., points, shows, gives, and reaches) (Bates et al. 1979). Their representational capacity is still quite primitive since the meaning of the referent is clear only if the observer follows the trajectory of the gesture toward its objective. However, they constitute an essential step in symbolic development (Goodwyn et al. 2000). For example, studies on the impact of deictic gestures on children's language have found that at 10 months of age, "show + give" gestures are a better predictor of 18-month-old language skills, while at 14 months, pointing gestures are a better predictor (Choi et al. 2021). Another study with toddlers at risk of language delays showed gains in the use of deictic gestures after a month-long intervention as a way of supporting their future language development (Romano and Windsor 2020). A systematic review analyzed gesture-oriented early interventions centered on parents while considering deictic and symbolic gestures. They concluded that these interventions may benefit deprived populations, such as atypically developing children and children from low-income families (Colombani et al. 2023).

Next, symbolic or representational gestures emerge between 12 and 15 months of age. These gestures constitute simple physical actions that can represent objects and events and express desires, needs, thoughts, and emotions. Their function is nominative and communicative, they are generalizable to different contexts, they represent a specific referent (e.g., "book", "dog"), and they carry their meaning in their form. Furthermore, they arise before speech (Acredolo and Goodwyn 1990; Goodwyn et al. 2000; Iverson et al. 1994; Moore et al. 2001); for example, flapping arms to represent a bird's flight or blowing to create bubbles. Once the child has acquired verbal language, symbolic gestures evolve into iconic gestures (Nicoladis et al. 1999), which also are representational gestures. They appear at approximately 3 years of age, are more complex and abstract than symbolic gestures, and accompany speech, always reaffirming or complementing it. They are also more complex, since the receiver of the message needs to understand the speech and simultaneously interpret the gesture to understand the complete representation that the person is trying to communicate (Holler et al. 2009). For example, an iconic gesture is doing rapid hand movements up and down that accompanies the instruction and indicates the action of chopping ginger when somebody is cooking.

This study aimed to analyze an intervention based on symbolic gestures among children at 18 months old. These gestures are relevant because it has been proposed that they are the precursors of verbal language (Tomasello 2008; Volterra et al. 2005). Within the development of the representational ability that is necessary to communicate, gestures require a shorter symbol–referent distance and a lower cognitive demand than words. For this reason, they appear earlier in evolutionary development than speech (Goodwyn et al. 2000). Symbolic gestures are conceived as relevant indicators of a prelinguistic stage as behaviors that precede and prepare for the emergence of verbal language (Volterra et al.

2005). Prelinguistic and linguistic development is located on a continuum, where symbolic gestures and vocal productions are connected and evolve together with other general cognitive skills (Farkas 2007a, 2009; Volterra et al. 2005).

The spontaneous development of these gestures allows children to communicate while they cannot yet speak (Goodwyn et al. 2000; Iverson et al. 1994). Moreover, learning gestures enables adults to establish a communication bridge with the child until the appearance of verbal communication (Goldin-Meadow 2002). Even when communication appears, not all words have the same difficulty level, so gestures can serve until the word can be said or understood (Kelly 2001). Thus, symbolic gestures are a natural part of early vocabulary acquisition that emerges spontaneously and regardless of children's hearing status (Colombani et al. 2023).

Even when words appear, gestures continue to accompany speech, reaffirming or complementing it (Nicoladis et al. 1999). In this regard, an interplay between gestures and spoken words long after speech has emerged has been described. Thus, gestures are considered as shaping spoken communication, which is considered from a multimodal point of view (Sparaci and Volterra 2017; Volterra et al. 2018). This is related to a multimodal conception of thinking. For example, in relation to mathematical thinking, when children are confronted with a mathematical problem, thinking does not occur solely in the head but also in and through a sophisticated semiotic coordination of speech, body, gestures, symbols, and tools (Radford 2009). Therefore, gestures are a fundamental tool for analyzing and describing children's cognitive processes and learning when they are involved in mathematical activities (Robutti et al. 2022), as well as other activities.

Studies have shown that children's early gestures predict language development when considering expressive and comprehensive aspects (Cadime et al. 2017; Rowe et al. 2008, 2022). Studies conducted with preschoolers have also shown that gestures continue playing an essential role in language comprehension as children develop more complex linguistic skills (Kelly 2001). Gestures can map many meanings more directly than language can and can harmoniously represent many concepts. Designing and using gestures congruent with specific meanings can increase children's comprehension and learning (Kang and Tversky 2016). Therefore, interventions based on intentionally promoting this tool could significantly impact children's development from earlier ages.

1.2. Intentional Development of Symbolic Gestural Communication

Due to the benefits of the spontaneous development of symbolic gestures for children, a series of interventions arose to develop intentional gestural communication between typically developing children and their parents. Among these interventions, which were developed in the USA in the 1990s, we found the Baby Signs® Program, which was developed by Linda Acredolo and Susan Goodwyn and widely distributed in the USA, as well as in other countries, such as Canada, Chile, Korea, Hong Kong, and India. Another intervention is the SIGN with your BABY® Program, which was developed by Joseph Garcia and is well known in the USA, Canada, and the United Kingdom (Farkas 2007a).

Studies have shown that these programs effectively increase children's gestural vocabulary (Acredolo and Goodwyn 1988; Farkas 2007b). Moreover, the intentional use of symbolic gestures in children is related to the size of their verbal vocabulary (Acredolo and Goodwyn 1988, 1990), as well as better development of expressive and comprehensive language and better performance on tasks of phonetic discrimination and syntax development (Goodwyn et al. 2000). In addition, in follow-up studies, children at 7–8 years of age were shown to perform better in cognitive skills that were evaluated through the WISC-III, especially on the verbal and total scales (Acredolo and Goodwyn 2000).

Concerning their benefits for socioemotional development, children who participate in these programs become less frustrated and angry, cry less, and do not preferentially use shouting to attract attention (Acredolo and Goodwyn 2001). These effects can be understood because the possibility of communicating through gestures allows children to convey their needs quickly and easily, thus reducing their frustration, reinforcing them,

and helping adults understand what they intend to communicate (Farkas 2007a). In terms of the parents, when they participate in a program to reinforce the use of gestures in their communication with their children, they show better bonds with them, less stress related to their parental roles, and better affective parent–baby tuning (Vallotton 2005). Additionally, studies have shown higher frequencies of synchronic mother–infant interactions, especially in visual and tactile interactions (Góngora and Farkas 2009).

In addition, not only have programs that promote the intentional use of these gestures shown their benefits in different aspects of children's development, but their conscientious use in different educative contexts has also been studied. Various studies have shown the benefits of complementing speech and gestures in mathematical instruction (Congdon et al. 2017; Robutti et al. 2022) and learning a foreign language (Mavilidi et al. 2015).

When children were instructed to gesture while learning a new concept (e.g., palindromes), they were more likely to learn it than children who used a strategy with speech alone (Wakefield and James 2015). Instructions accompanied by iconic gestures that illustrated a target action to teach toddlers how to operate a novel toy showed better learning than instructions without a demonstration (Novack et al. 2015).

1.3. The Present Study

Considering this background, the first aim of this study was to assess the effects of an earlier intervention on promoting intentional symbolic gestures on the expressive and comprehensive language of psychosocially at-risk Chilean children at 18 months of age. The first hypothesis was that an earlier intervention to encourage the use of intentional symbolic gestures in a group of psychosocially at-risk Chilean children would promote better expressive and comprehensive language at 18 months of age.

In this regard, studies have shown that developing countries, such as those in Latin America, have lower rates of school achievement and worse standards in international language tests than those of developed countries (Schady et al. 2006). Although Chile's results in international cognitive and language assessment tests (PISA) are above the average of other Latin American countries (OECD–UNESCO 2007), they are significantly below the standard of developed countries (LLECE 2008).

For example, 10% of children under 5 years old in the USA have language delays (King et al. 2005), a rate that increases to 28.3% in Chilean children (Behrman et al. 2010; Farkas et al. 2020). Indeed, based on the OECD Gini coefficients, Chile also manifests significant levels of inequality across the population (OECD 2018), with a larger gap between children of different SESs. Thus, children under 5 years old from low-SES backgrounds present significantly elevated rates of language delays compared to children from high-SES backgrounds (Schady et al. 2015), with rates between 41.5% and 52% (Schonhaut et al. 2005), which are much larger than the 28.3% described above. Therefore, it is relevant to study whether an early intervention promoting symbolic gestures during the first year could support Chilean children's language development.

The second aim was to analyze if this intervention affected children differentially in consideration of their language development (adequate and at-risk). For this aim, it was hypothesized that this intervention would have a differential effect considering both groups but would probably have a more significant impact in the group with adequate development.

Although there is international evidence of the positive effects of this intervention on children's language, both with typical development and with difficulties (e.g., Anderson 2016; Mueller et al. 2014), and of its effectiveness on children from low-income families (e.g., Vallotton 2012), no study has compared children with different levels of linguistic development and, specifically, those from low-income families. Thus, the second aim was focused on studying the differential effects of an intervention during the first year of life when considering a group at high psychosocial risk but with adequate language development and a group at high psychosocial risk with at-risk language development. Chilean children's language is significantly below the standard of developed countries (LLECE

2008). In addition, those from low-SES backgrounds present significantly elevated rates of language delays (41.5% and 52%; Schady et al. 2015; Schonhaut et al. 2005). Therefore, studies that analyze this intervention's potential differential effects in different groups are relevant for the design of public policies.

To check the above hypotheses and reach the set aims, the following tasks were identified and are presented in the section containing the results: (1) conducting descriptive and comparative analyses before the intervention; (2) conducting comparative analyses between the intervention and control groups after the intervention; (3) analyzing the effect of the intervention on the adequate and at-risk groups.

The benefits of an intervention that promotes the use of symbolic gestures before one year of age are supported by international research. Additionally, such an intervention would be of low cost and could be a valuable tool for supporting children's early language development. However, the research is inconclusive regarding its benefits in all cases and populations (Fitzpatrick et al. 2014). Therefore, it is relevant to conduct studies replicating the results in different populations.

2. Materials and Methods

2.1. Design

The present study employed a quantitative methodology with a longitudinal, descriptive, and comparative design.

2.2. Participants

A sample of 69 children belonging to families with a low SES and at high psychosocial risk was assessed. The average age of the children at the beginning of the study was 7.1 months (S.D. = 1.03; range = 5–9 months), with 56.5% being male. All children lived in the Metropolitan region of Chile and attended 20 different public nurseries. They all also lived with their mothers, and 58.0% lived with their fathers. The families' SESs and their conditions of high psychosocial risk were determined in the children's socioeconomic files at the nurseries, where 21.0% of the families were of low SES but were not in poverty, 46.8% were poor but not indigent, and 32.2% were indigent. The average age of the mothers was 26.9 years (S.D. = 6.73), and that of the fathers was 30.8 years (S.D. = 8.17). Meanwhile, 29.2% of the mothers and 5.0% of the fathers were unemployed. For more information, see Table 1.

The criteria for inclusion in this study were that the children were registered at a nursery, were between 5 and 9 months old, and had no severe developmental or sensory disorders. These criteria were revised during the first contact with the families. Thirty-nine children were randomly assigned to the intervention group, and thirty were randomly assigned to the control group. Both groups were homogeneous regarding the families' and children's characteristics, except for the children's gender distribution.

Table 1. Demographic characteristics of the participants.

		Frequency	Percentage
Children's gender	Male	39	56.5
	Female	30	43.5
Mothers' occupational level (n = 65)	Unemployed	19	29.2
	Studying	10	15.4
	Tasks without a technical certification	18	27.7
	Jobs with technical certification	14	21.5
	Jobs with a university degree	4	6.2
Fathers' occupational level (n = 60)	Unemployed	3	5.0
	Studying	2	3.3
	Tasks without a technical certification	36	60.0
	Jobs with technical certification	19	31.7
	Jobs with a university degree	0	0
Father living with the child	No	29	42.0

Table 1. *Cont.*

		Frequency	Percentage
Family SES (n = 62)	Low, not in poverty	13	21.0
	In poverty, not indigent	29	46.8
	Indigent	20	32.2
Children's risk factors			
Problems during pregnancy	Yes	16	23.2
Type of delivery	Cesarean	16	23.2
Weight at birth	2.500 or less	1	1.4
Gestational age	36 weeks or less	9	17.6
Health issues during the first year	Respiratory problems	18	26.1
		Min–Max	M (S.D.)
Children's age (months)		5–9	7.1 (1.03)
Mothers' age (years)		14–39	26.9 (6.73)
Fathers' age (years)		15–54	30.8 (8.17)
Number of persons living at home		1–12	4.4 (1.09)

N = 69. The families' SESs were established in the socioeconomic files at nurseries when children were registered.

2.3. Instruments

Sociodemographic questionnaire: This questionnaire contained questions related to the children's development, parents' characteristics, and contextual and sociodemographic information.

Bayley Scales of Infant and Toddler Development (BSID-III, Bayley 2006): This instrument is an extensive formal developmental assessment tool that comprises physical, cognitive, socioemotional, linguistic, and behavioral milestones. Individually applied, it lasts approximately 1 h and 45 min. The BSID-III assesses development from 1 to 42 months in five domains: cognition, motor skills, language, the socioemotional domain, and adaptive behavior; a score is provided for each scale and subscale. For this study, only the language scale was applied, and both subscales, receptive (49 items) and expressive (48 items), were considered. The scores considered for the analyses were the standardized scores for both the subscales and the total scale (calculated considering the child's age) and the percentile for the total scale. The receptive subscale assessed preverbal behaviors and vocabulary development, vocabulary related to morphological development, and understanding morphological markers, such as plurals. The expressive subscale assessed preverbal communication (e.g., gesturing and turn taking), vocabulary development (e.g., naming objects), and morphosyntactic development. The instrument was standardized in a sample of 1700 North American children between 1 and 42 months of age. It had good reliability indices and construct, predictive, and discriminative validity. It also had high-to-moderate correlations with the Weschler Scale, Peabody Scale, and Vineland Adaptive Scale, among others (Albers and Grieve 2007).

MacArthur-Bates Communicative Development Inventories (CDI; Jackson-Maldonado et al. 2003): The CDI provides information on the development of communication skills. The first inventory, "First words and gestures", was answered by parents or significant caregivers of children between 8 and 18 months of age, assessed the child's understanding of vocabulary items that were separated into semantic categories, and considered whether a word was understood and produced. It also asked about communicative and symbolic gestures produced by children. Its application lasted approximately 45 min, and the results were organized into six subscales: comprehension of first sentences, expressive vocabulary, comprehensive vocabulary, early gestures, late gestures, and total gestures. Numerous studies have documented the CDI's reliability and validity, and a Chilean validation showed good reliability indices (0.84–0.98) and psychometric properties (Farkas 2011). The children's teachers answered this inventory, and only the first three subscales were applied for this study. However, the previous literature showed negative biases in the perception of teachers of students who belonged to a more disadvantaged SES in terms of lower expectations about their performance (Doyle et al. 2023; Filp 1995; Sneyers and Mahieu 2020). Therefore, the CDI was applied in two moments: at the beginning and when the children were 18 months of age, and the growth delta was calculated for each child to control this bias (growth delta = 18-month score − initial score).

Gestural vocabulary report: This report asked the children's parents to identify gestures that their children could perform from a list. The report considered a list of the gestures that were part of the intervention (N = 115; see report in the online Supplemental Material). As a control measure, they were also asked to describe how the child performed the gesture (to differentiate gestures from sounds or symbolic games). It is worth mentioning that less than 10% of the gestures considered in this report differed from gestures included in the Baby Signs Program (for reference, see Acredolo and Goodwyn 2001). This slight difference was because the gestures used by the Baby Signs Program are very intuitive. The changed gestures were those with different cultural expressions in Chile (mostly related to emotional expressions) and those that are not commonly used in Chile because of cultural characteristics (e.g., in the U.S., a fan is a very common object in houses, but not in Chile).

2.4. Procedures

Different public nurseries in the Metropolitan region of Chile were initially contacted to explain the study and ask for their collaboration in disseminating the invitation to families whose children attended the centers and who met the inclusion criteria. The families and teachers were invited after the directors signed the authorization for the study. The parents and teachers who agreed to participate signed a consent form. The nurseries were randomly divided into two groups: the intervention group (IG; n = 10), which received the intervention; and the control group (CG; n = 10).

At the beginning of the study, the families answered a sociodemographic questionnaire, and the children's language was assessed with the BSID-III to analyze if the IG and CG were equivalent in their initial language level and to place them in adequate (above P25) or at-risk development (equal to or below P25) groups. The children's teachers also answered the CDI. Following this, the intervention was implemented with teachers from the GI. When the children were 18 months old, the families answered the report on the children's gestural vocabulary, the teachers answered the CDI, and the children were evaluated with the language subscale of the BSID-III.

2.5. Intervention

The intervention was based on the Baby Signs© Program, which was developed in the USA by Acredolo and Goodwyn (2001). It consisted of three phases: teachers' training, monitoring of the teachers' training, and families' training.

Phase 1: The teachers' training considered two psychoeducational sessions; the first was more theoretical, and it provided information about the history of the program, studies' results, relevant concepts, the characteristics of the intervention, and its fundaments and relevance for children's development. The second session was more practical; the teachers learned about and practiced symbolic gestures and were given written and graphic support material. Part of the material was a gesture dictionary (Farkas 2009) that considered more than 100 gestures corresponding to five categories: (1) objects (e.g., "book" and "brush"); (2) animals (e.g., "dog" and "fish"); (3) everyday requests or actions (e.g., "eat" and "sleep"); (4) adjectives (e.g., "big" and "small"); and (5) emotions (e.g., "happy" and "angry"). The teachers also received two sheets—each with 10 of the most frequent gestures—to put on their classrooms' walls. The material also included familiar songs that allowed for the inclusion of some gestures and examples of how to incorporate the gestures into daily routines (e.g., greetings and goodbyes, napping, and feeding time). This training lasted 4 h (2 h per session) and was carried out weekly in each nursery belonging to the IG. In addition to the teachers participating in the intervention, all of the teachers of the IG centers were invited to assist in the training, regardless of whether they were part of the study.

Phase 2: The monitoring phase was conducted for 6 months (fortnightly sessions for the first 3 months and monthly sessions for the last 3 months) by the same person who previously led the training. During the monitoring, previously established interactions (e.g., greetings and goodbyes, changing clothes, feeding, and napping) and the use of previously learned gestures in these interactions were observed over half a day. After each observation,

feedback was given to each teacher individually on their use of gestural communication, missed opportunities were identified, and activities and instructions for a better way to implement the gestures were discussed.

Phase 3: The teachers implemented the families' training phase with the help and guidance of the research team. To accomplish this training, the teachers were provided with standard written material that included almost the same activities, songs, and routines that they received first, but they were adapted to home context. They also received graphic support materials (e.g., sheets with 10 frequent gestures to implement each week and "the gesture of the week" picture to put on the fridge). The teachers received verbal and written instructions to implement this phase during phase 2 after they had begun to implement the program well in their rooms.

2.6. Data Analyses

Statistical analyses were conducted with SPSS® 27.0 for Microsoft Windows®. Previously, the normality of the variables and the sample distribution were tested, allowing parametric tests to be used. For the assessment of the effects of the intervention to promote the use of symbolic gestures on the expressive and comprehensive language of children, descriptive statistics were calculated for the variables (children's receptive and expressive language (BSID-III), growth delta for the CDI, and the gestural vocabulary report). Then, comparative analyses between the IG and CG were conducted for these variables through ANOVA when the children were 18 months old. Next, to determine whether this intervention affected children differently considering their language level, the children were divided into two groups: adequate and at-risk. The criterion for this distribution was their percentile on the total language scale of the BSID-III (>P25 or $\leq$P25). Then, independent comparative analyses between the IG and CG were conducted for each group (adequate and at-risk) using an ANOVA while considering the children's performance on the BSID-III.

3. Results

3.1. Descriptive and Comparative Analyses before the Intervention

At the beginning of the study, all of the children reached average scores of 9.2 on the receptive language subscale from the BSID-III, 8.7 on the expressive language subscale, and 17.9 on the total language scale. The comparative analyses showed that both groups—the IG and CG—were equivalent before the intervention (see Table 2). Additionally, as stated before, both groups were equivalent in the children's and sociodemographic variables, except for the gender distribution, with more male children in the CG (46.2% male and 53.8% in the IG; 70.0% male and 30.0% in the CG).

Table 2. Descriptive and comparative analyses of the children's variables.

	Total Sample M (S.D.)	**IG M (S.D.)**	**CG M (S.D.)**	***F* (*p*)**	η^2
BSID-III: initial assessment					
Receptive language subscale	9.20 (2.97)	9.54 (3.15)	8.75 (2.72)	1.13 (0.292)	0.018
Expressive language subscale	8.66 (3.10)	8.97 (3.12)	8.25 (3.07)	0.87 (0.356)	0.014
Total language scale	17.86 (5.27)	18.51 (5.75)	17.00 (4.51)	1.32 (0.255)	0.021
BSID-III: 18 months					
Receptive language subscale	9.29 (2.10)	9.30 (2.16)	9.28 (2.07)	0.02 (0.967)	0.000
Expressive language subscale	8.55 (2.39)	9.21 (2.37)	7.68 (2.17)	6.38 (0.014)	0.102
Total language scale	17.85 (3.86)	18.52 (4.12)	16.96 (3.36)	2.37 (0.129)	0.041
Growth delta: teachers					
Comprehension of first sentences	5.22 (8.50)	7.66 (5.45)	2.23 (10.55)	6.39 (0.014)	0.102
Expressive vocabulary	35.85 (52.02)	48.03 (40.80)	20.85 (60.68)	4.13 (0.047)	0.069
Comprehensive vocabulary	5.00 (6.36)	5.88 (5.88)	3.92 (6.86)	1.36 (0.249)	0.024
				***t* (*p*)**	***d***
Gestural vocabulary report	24.6 (16.2)	29.37 (17.25)	17.05 (11.08)	3.043 (0.004)	0.760

Note: At the beginning of the study, 69 children were assessed (N_{IG} = 39; N_{CG} = 30). At the 18-month assessment, only 65 children completed the BSID-III assessment (N_{IG} = 37; N_{CG} = 28), and 62 teachers completed the CDI (N_{IG} = 35; N_{CG} = 27).

On average, the total sample was located at percentile 30 in their language development, with a slight but non-significant difference between the groups (P34 for the IG and P23 for the CG).

3.2. Comparative Analyses between the IG and GC after the Intervention

When the children were 18 months old, they reached average scores of 9.3 on the receptive language subscale from the BSID-III, 8.6 on the expressive language subscale, and 17.9 on the total language scale (see Table 2). The comparative analyses showed significant differences between the groups; the IG reached higher scores on the expressive language subscale ($F(1, 64) = 6.38$, $p = 0.014$, $\eta^2 = 0.102$) compared to the CG, with a medium effect size (see Figure 1).

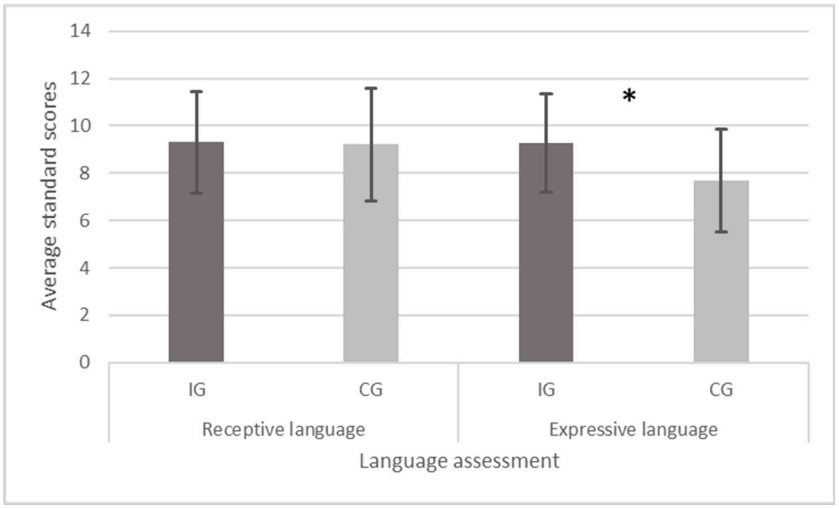

Figure 1. Comparison between groups on the language subscales (BSID-III) when the children were 18 months old. * = $p < 0.05$.

Considering the teachers' perception of the children's language as reported in the CDI, the growth delta for the comprehension of first sentences was M = 5.2, while it was M = 35.9 for expressive vocabulary and M = 5.0 for comprehensive vocabulary (see Table 2). The comparative analyses showed significant differences between the groups, where the IG reached higher scores for the comprehension of first sentences ($F(1, 61) = 6.39$; $p = 0.014$; $\eta^2 = 0.102$) and expressive vocabulary ($F(1, 61) = 4.13$; $p = 0.047$; $\eta^2 = 0.069$) compared to the CG, with medium effect sizes (see Figure 2).

Regarding gestural vocabulary, parents reported 0 and 62 different gestures that were performed by their children, with an average of 24.6 gestures for the total sample. A great variability was observed within each group. However, from the six categories that were considered, both groups produced the most frequent gestures for animals (i.e., "dog", "bird"), objects (i.e., "airplane", "car"), and requests (i.e., "give me", "stop"). From these categories, some gestures only appeared in the IG, such as "elephant", "bug", or "butterfly" for animals, "book", "candle", or "flower" for objects, and "more", "please", and "thank you" for requests. In addition, gestures related to actions (i.e., "drink", "eat", "sleep") and emotions (i.e., "happy", "sad", "angry") only appeared in the IG. When comparing the IG and the CG, the analyses showed that the children in the IG had a significantly greater gestural vocabulary than that of the CG children ($t(65) = 3.04$; $p = 0.004$; $d = 0.760$), with a medium effect size (see Table 2 and Figure 3).

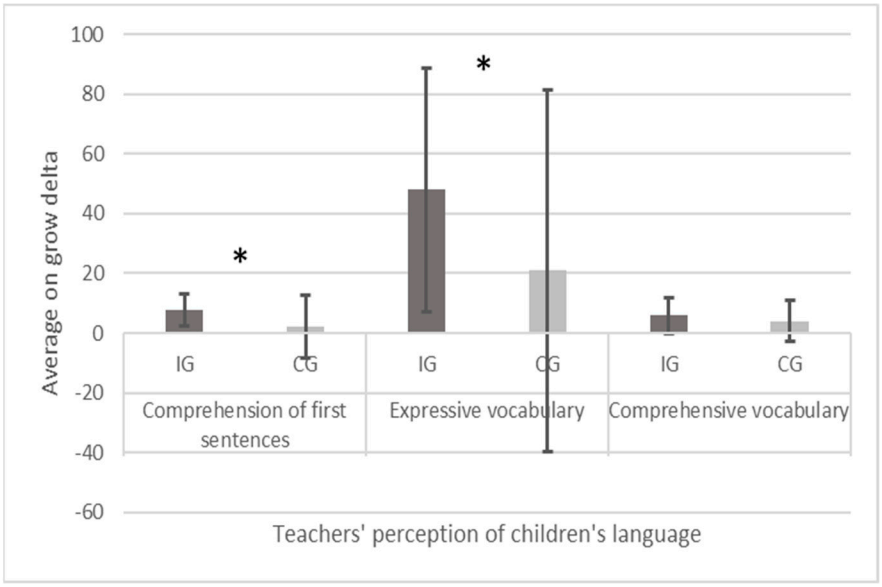

Figure 2. Comparison of the growth delta of the teachers' perception of the children's language subscales (CDI) between groups when the children were 18 months old. * = $p < 0.05$.

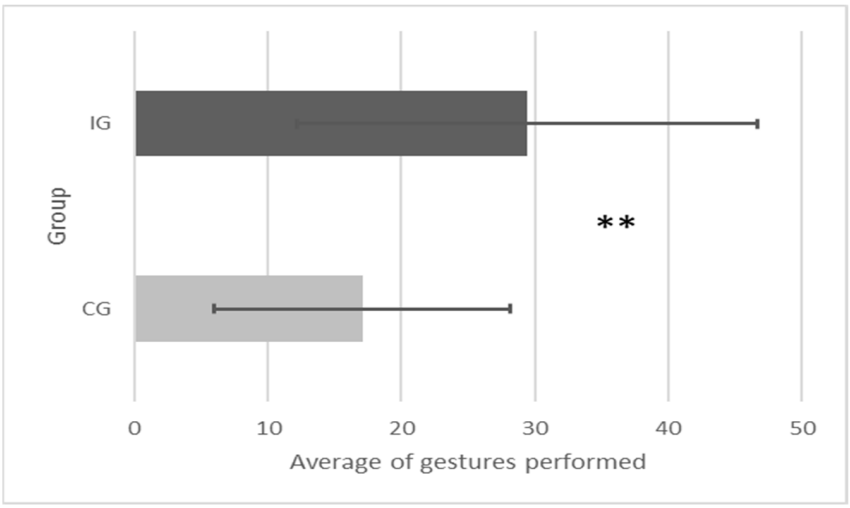

Figure 3. Comparison of children's gestural vocabulary between the groups when the children were 18 months old. ** = $p < 0.01$.

3.3. Analysis of the Intervention's Effect for the Adequate and At-Risk Groups

At the beginning of the study, 64% of the children were assigned to the adequate group, while 36% were in the at-risk group. In the adequate group, that is, the children who had sufficient language development, the comparative analyses showed statistically significant differences between the IG and CG at 18 months; the IG obtained higher scores on the expressive language subscale ($F(1, 37) = 21.50$; $p = 0.000$; $\eta^2 = 0.410$) and the total language scale ($F(1, 37) = 8.08$; $p = 0.008$; $\eta^2 = 0.207$) than the CG did, with medium effect sizes. However, in the at-risk group, that is, the children with insufficient language development, the comparative analyses did not show statistically significant differences between the IG and CG (see Table 3).

Table 3. Descriptive and comparative analyses of the children's language in the adequate and at-risk groups when the children were 18 months old.

	IG M (S.D.)	CG M (S.D.)	*F* (*p*)	η^2
BSID-III: 18 months, adequate group (n = 38)				
Receptive language subscale	9.95 (1.90)	9.93 (1.86)	0.01 (0.978)	0.000
Expressive language subscale	10.26 (2.13)	7.21 (1.42)	21.50 (0.000)	0.410
Total language scale	20.21 (3.51)	17.14 (2.32)	8.08 (0.008)	0.207
BSID-III: 18 months, at-risk group (n = 27)				
Receptive language subscale	8.43 (2.24)	8.46 (2.12)	0.01 (0.977)	0.000
Expressive language subscale	7.79 (1.93)	8.27 (2.83)	0.26 (0.614)	0.011
Total language scale	16.21 (3.85)	16.73 (4.47)	0.10 (0.761)	0.004

4. Discussion

This research aimed to assess the effect of an intentional gestural communication program on the expressive and comprehensive aspects of the speech of 18-month-old infants in a sample of Chilean children at high psychosocial risk. Early experiences and the social context in which a child develops are highly relevant for language to develop appropriately (OECD 2018; Schady et al. 2015). Considering the disadvantaged cultural conditions under which these children find themselves, which are known to negatively affect subsequent language development (Behrman et al. 2010; LLECE 2008; Schady et al. 2006), it is becoming relevant to seek intervention strategies at early ages.

To this end, an intervention was implemented with teachers who attended Chilean children from psychosocially at-risk contexts who were 6–9 months old. The intervention consisted of training the teachers in a program that intentionally promoted the learning and use of symbolic gestures in children as a communicative strategy prior to the emergence of speech. This study had two aims. The first was the assessment of the effects of the intervention on the expressive and comprehensive language of the children at 18 months of age. The second was the analysis of whether this intervention affected the children differentially considering their language development (adequate and at-risk). It was expected that the children in the group that had received the intervention would have better development of verbal language from both comprehensive and expressive perspectives. Furthermore, it was expected that children with adequate prior language development would benefit more than children who were already at risk of difficulties in their development.

The first result of the intervention was that significant differences regarding greater gestural vocabulary were observed between the children who had received the intervention and those who had not. That is, the children whose teachers participated in the intervention at 18 months of age made more symbolic gestures in their communication according to the parents' report. These results corresponded to what was observed in previous studies (Acredolo and Goodwyn 1988; Farkas 2007b). They demonstrated that interventions of this type are effective in encouraging children to use more gestures when communicating with others, expanding their communication repertoire. This aspect is relevant because it has been suggested that gestures, as behaviors that precede and prepare for the emergence of verbal language, are important indicators of a prelinguistic stage (Farkas 2007a, 2009; Goodwyn et al. 2000; Volterra et al. 2005). Indeed, after speech emerges, gestures continue to have a role in language, as well as thinking and learning processes (Kang and Tversky 2016; Robutti et al. 2022; Sparaci and Volterra 2017; Volterra et al. 2018).

Regarding the children's language at 18 months of age, the results showed that the children who had participated in the intervention reached greater expressive language than those who had not. This result could be seen in both the measurements carried out with the BSID-III language scales and the changes in the teachers' reports between the beginning of the intervention and when the children reached 18 months of age as measured with the CDI. On the level of comprehension, an increase was observed only in the comprehension of first sentences (CDI). These results support the positive effect of this intervention, which is in line with research carried out internationally (Goodwyn and Acredolo 1998; Goodwyn

et al. 2000). Moreover, studies have shown that children's early gestures predict language development when considering expressive and comprehensive aspects (Cadime et al. 2017; Rowe et al. 2008, 2022). Thus, interventions that intentionally support the development of these early gestures will promote the later development of speech, especially in its expressive aspects. Indeed, an increase in children's gestural vocabulary could support other processes, as some studies have demonstrated, such as the learning of new concepts (Novack et al. 2015; Wakefield and James 2015), mathematical thinking (Congdon et al. 2017; Robutti et al. 2022), and the learning of a foreign language (Mavilidi et al. 2015).

Finally, the effect of the intervention was analyzed by differentiating between children whose language development at the beginning of the study was adequate versus those who were at-risk. The results showed that at 18 months of age, the children who belonged to the appropriate group and had received the intervention had significantly better expressive language than that of the children without the intervention. However, no differences were observed in the group of at-risk children.

Let us consider that the children in this sample were all "at risk" due to their psychosocial characteristics. Then, there would two risk groups: (a) those with only "psychosocial" risk but with adequate language development; and (b) those with psychosocial risk and risk in their language development. It is possible to believe that for the children who presented a "biological risk", that is, a delay in their language, this intervention was not enough to generate an effect, especially considering that they were in a more disadvantageous context. Hence, this group probably needed a more specialized intervention. On the contrary, for the children with normal biological development during the first year of their life but who were at "psychosocial risk", this early intervention could make a difference. This difference would be in terms of ensuring that these children undergo normal development of their language, which would be equivalent to the development that children from higher socioeconomic strata have, as well as the development documented in other countries. Thus, this intervention would help reduce the gap observed in children's language development due to socioeconomic factors (Schady et al. 2006, 2015).

This research has some limitations: The sample that was studied was small, the results may be linked to the instruments chosen for application, and follow-up was only carried out up to 18 months of age, so the results must be taken with caution. Future studies to support these findings should consider larger samples that are representative of the entire country. Furthermore, they should incorporate different instruments and follow up to later ages. In addition, it would be interesting to analyze the impact of this intervention on other Chilean children—for example, while considering new learning and thinking processes. However, the results of this research are consistent with studies carried out in other cultures. They present a valuable tool for supporting children's language at an early age, especially in populations with a low SES and a high psychosocial risk, where the delay in language is greater.

In this respect, 28.3% of children under five in Chile have language delays (Behrman et al. 2010; Farkas et al. 2020). Indeed, this rate increases significantly when children belong to low-SES backgrounds (Fink et al. 2020; Schady et al. 2015). All experts agree that basic language learning is more effective the earlier it occurs (Bakken et al. 2017; Nippold 2016). Furthermore, most factors that explain inequality occur early in life, combining genetic and environmental aspects and the family conditions in which a child grows up (Fisher 2017; McKean et al. 2017). Interventions that have been implemented to support the language of 7–8-year-old children do not appear to be effective (Carneiro and Heckman 2003; Cunha and Heckman 2007). In addition, follow-up studies have shown that children's language development remains unchanged between 3 and 18 years of age (Brooks-Gunn et al. 2006). Therefore, the earlier one intervenes, the greater the chances of overcoming inequality.

The last application of the National Learning Result Evaluation System (SIMCE for its acronym in Spanish) to children in the fourth grade, which was carried out in Chile in 2022, showed that 32% of children were at an insufficient level of written language learning, while 28% were at an elementary level and only 40% were at an adequate level

(Agencia de Calidad de la Educación 2023). In addition, the differences according to SES were significant, with poorer performance by children of a low SES. These results highlight the relevance of earlier interventions in Chilean children.

From this perspective, language should be considered a fundamental tool not only for communication but for the entire learning process. Poor language development will interfere with a child's educational experience, since oral language development supports—and is necessary for—the subsequent development of reading and writing, among other skills (Bakken et al. 2017; Nippold 2016).

However, despite all of the evidence, the study of educational strategies for promoting language development in young children has been focused almost exclusively on its verbal aspects. Interventions aimed at intentionally developing gestural communication are viewed with reluctance, since it is feared that by enhancing gestural communication in children, the development of speech will be delayed (Farkas 2009). This is despite the international studies that support the positive effect of such interventions on children's speech development (Daniels 1996; Goodwyn et al. 2000; Moore et al. 2001; Namy and Waxman 1998) and those for other processes related to thinking and learning (Novack et al. 2015; Robutti et al. 2022; Wakefield and James 2015).

Such evidence has led to the incorporation of intentional gestural communication development in early childhood in countries such as the USA, both in workshops for parents and in educational programs (e.g., Early Head Start) and family service agencies. This tool has also spread to countries such as Canada, Korea, Hong Kong, and India, but it has had little resonance in Latin American countries despite the rich gestural expression of such countries. In this context, initiatives such as this intervention are of great relevance, in addition to being simple to implement and of low cost. Additionally, they can make a difference in terms of supporting children's development and helping to overcome the conditions of inequality in the educational process of countries such as Chile.

Chilean culture is characterized by close and warm communication, and the use of gestures in communication is present on a daily basis in a fluid and frequent manner (Farkas 2009). In this way, this tool does not require complex training but, rather, sensibilization of the key agents involved with young children to its benefits to explicitly raise awareness of its use. In turn, countries such as Chile that lack an unlimited national budget to invest in education need proven effective interventions that are easy to apply and of low cost.

Supplementary Materials: The following supporting information can be downloaded at https://www.mdpi.com/article/10.3390/languages9040146/s1: Gestural Vocabulary Report.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available upon request from the corresponding author. The data are not publicly available due to restrictions related to the consent given by the children's parents.

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