CHILDREN AT RISK FOR LANGUAGE DELAY: FINDINGS FROM THE ITALIAN MACARTHUR-BATES COMMUNICATIVE DEVELOPMENT INVENTORIES

ALESSANDRA SANSAVINI[1], ARIANNA BELLO[2], ANNALISA GUARINI[1], MARIA CRISTINA CASELLI[3]

[1]Department of Psychology "Renzo Canestrari", University of Bologna, Bologna, Italy

[2]Department of Education, Roma Tre University, Roma, Italy

[3]Institute of Cognitive Sciences and Technologies, CNR, Roma, Italy

Corresponding authors: Alessandra Sansavini, e-mail: alessandra.sansavini@unibo.it and Arianna Bello, e-mail: arianna.bello@uniroma3.it

Received: 11.10.2025
Accepted: 04.01.2026

REVIEW ARTICLE
UDK: 81'23:811.131.1
DOI: https://doi.org/10.31299/hrri.62.si.12

Abstract: *In the present study, we review research published by our group on Italian-speaking late talkers (LTs) and preterm (PT) children, who were assessed using the Italian MacArthur-Bates Communicative Development Inventories (CDIs). Overall, our research confirms that the CDIs are an effective tool for identifying children with language delay and tracing different profiles in various areas of neurodevelopment in both populations. Using the CDIs, the predictive value of early receptive and expressive vocabulary size for subsequent lexical development and word combination has been documented in LTs, after accounting for neonatal conditions. Furthermore, data from the Italian CDIs were used to develop a direct tool (the 'Picture Naming Game' – PiNG) to assess vocabulary and serve as a lexical reference for a parent-coaching, dialogic book reading intervention aimed at promoting early childhood vocabulary and grammar.*

Keywords: *Italian CDIs, Short Form, Complete Form, Late talkers, Preterm children*

INTRODUCTION

The Italian MacArthur-Bates Communicative Development Inventories (CDIs) - Gestures and Words (G&W) and Words and Sentences (W&S) in Complete (CF) and Short (SF) Form (Caselli et al., 2015; Rinaldi et al., 2019; Rinaldi et al., 2026) - are widely used to investigate language and communication in typically and atypically developing children. Here, we review research published by our group on Italian-speaking late talkers (LTs, see Table 1) and preterm children (PT, see Table 2) using the Italian CDIs. Both these populations are at risk for persistent language delay and later language disorders, as well as difficulties in other neurodevelopmental areas.

Late Talkers

The term Late Talkers (LTs) refers to 18- to 36-month-old children who are slow to develop expressive language in the absence of cognitive, neurological, socio-emotional, or sensory deficits (Rescorla & Dale, 2013). The incidence of LTs varies depending on tools, risk thresholds, and age of the samples (around 10-20% at 2 to 3 years of age). In Italy, a screening programme involving 2685 children (average age = 30 months) estimated the incidence of LTs at 9% (n = 237), when the CDI:W&S SF was used and a 5th percentile risk threshold was considered. Of this sample, 140 children were evaluated with a clinical assessment using direct and indirect instruments (i.e., the CDI:W&S CF), and language delay was confirmed in 82% of the sample (Bello et al., 2014).

Using the CDI:W&S SF to assess 35 LTs aged 29 months (vocabulary size < 10th percentile), Bello et al. (2018) reported that 54% of participants did not combine words into sentences. In addition, a significant percentage did not produce declarative pointing or verbal imitation, nor did

they show comprehension for questions about events temporally situated in the past or future (decontextualised comprehension), and the words they produced were phonologically inaccurate. The low expressive vocabulary size, measured with the CDI:W&S SF at 29 months, was confirmed five months later, when direct and indirect tools were used for an in-depth clinical assessment. In fact, when assessed with the CDI:W&S CF at 34 months, 89% of the LTs continued to show a vocabulary size that was below the 10th percentile, demonstrating the predictive value of vocabulary size at 29 months on subsequent lexical development. Lexical delay was also confirmed using a structured vocabulary assessment tool (i.e., the 'Picture Naming Game' – PiNG; Bello et al., 2012), with lexical comprehension being better preserved than lexical production. Difficulties in socio-conversational and non-verbal cognitive abilities also emerged. Consistent with other studies (e.g., Desmarais et al., 2010), the present study documented that, in addition to poor expressive vocabulary skills, some LTs may have difficulties in several linguistic and non-linguistic domains.

A longitudinal study with a sample of around 500 children explored the predictive value of biological and linguistic factors such as vocabulary size (assessed using the CDI:W&S SF) on later Developmental Language Disorders (DLDs) (Rinaldi et al., 2023b) or Specific Learning Disorders (SLDs) (Rinaldi et al., 2023a). In this sample, 11.7% received a diagnosis of DLD between the ages of 4 and 5 years, of whom 52% had been previously identified as LT at 27-32 months. In the same sample, 7% received a diagnosis of SLD at the mean age of 8.5 years, of whom 29.7% had been previously diagnosed with DLD. The probability of receiving a DLD diagnosis was higher for LTs who did not imitate words, those who had a vocabulary that was below the 10th percentile, those who did not combine words or use symbolic play, as well as those who had lower decontextualised comprehension and a familial risk of DLD/SLDs. The probability of receiving a SLD diagnosis was higher in LTs who did not imitate words, those who had a vocabulary below the 10th percentile, those who did not combine words, those who were male, and those who had received a diagnosis of DLD.

Preterm children

Around 15 million babies are born preterm (PT), i.e., before 37 weeks of gestational age (GA), across the world each year, accounting for 5-18% of all births. PT newborns are exposed to atypical biological, environmental, and socio-relational constraints, which can lead to atypical trajectories (Sansavini, Guarini, & Caselli, 2011). Although developmental delays are more frequent among extremely preterm (EPT; GA ≤ 28 weeks) and very preterm (VPT; GA ≤ 32 weeks) children, they can also occur among low-risk preterm (LRPT) children, i.e., those who are less immature when born, hospitalised for a shorter time, and do not have severe perinatal complications (Sansavini et al., 2021). Several studies have investigated language and communication trajectories, as well as profiles in PTs using the CDIs, adjusting the assessment age based on weeks of prematurity in order to account for neurobiological maturation.

Using the CDI:G&W and CDI:W&S SFs, a slower acquisition in gesture/action production, word comprehension, and word production was found in VPTs than in full-terms (FTs), with an increasing divergence from 12 months to 18 and 24 months (Sansavini et al., 2011).

Regarding early predictive skills, in both EPTs and FTs, oral object exploration at 6 months was related to word comprehension at 12 months, assessed with the CDI:G&W CF, whereas manual object exploration at 6 months was related to gesture and vocal production during mother-infant play interaction at 12 months (Zuccarini et al., 2018). In both VPTs and FTs, word comprehension and word production at 12 and 18 months, as well as gestures/actions at 18 months, assessed with the CDI:G&W SF, were predictive of word production at 24 months, assessed with the CDI:W&S SF (Sansavini et al., 2011). Low rates of pointing observed during mother-infant play interaction in EPTs at 18 months acted as a marker of expressive lexical delay, i.e., a vocabulary

size that was ≤ 10th percentile on the CDI:W&S CF recorded at a minimum of two time points between 18 and 36 months (Sansavini et al., 2019). Using the same procedure, a similar result was found among siblings at risk for autism spectrum disorder (ASD; Sansavini et al., 2019).

Expressive lexical delay was found in one-fifth of VPTs (Sansavini et al., 2011) and one-fourth of EPTs (Sansavini et al., 2015), assessed with the CDI:W&S SF at 24 months. Biological (i.e., male gender and bronchopulmonary dysplasia) and social (i.e., low maternal educational level) factors increased the risk of delay (Sansavini et al., 2011).

Lexical and grammatical skills, assessed with the CDI:W&S CF at 30 months, fell within the normal range in most children in a PT sample (GA ≤ 33 weeks), compared to a FT sample, with strict relationships between these competencies (Sansavini et al., 2006). However, 17.8% of PTs showed an expressive lexical delay. Specifically, PTs characterised by higher immaturity and male sex were at risk: those who were male and had a birthweight ≤ 1000g had a significantly smaller lexical size; those who were male and had a GA < 31 weeks had a significantly shorter mean length of utterance, but continued to retain the strict relationship between lexical and grammatical skills.

Using the CDI:G&W and CDI:W&S SFs at 30 months, four language profiles were found in LRPTs and FTs: low levels of receptive and expressive vocabulary, as well as absent or limited word combination and phonological accuracy characterised the poor profile (21%); average levels of receptive, but limited expressive vocabulary, incomplete sentences, and absent or limited phonological accuracy characterised the weak profile (22.5%); average levels of receptive and expressive vocabulary, incomplete and complete sentences, and partial phonological accuracy characterised the average profile (25%); high levels of expressive vocabulary, complete sentence production, and complete phonological accuracy characterised the advanced profile (31.5%) (Sansavini et al., 2021). Expressive lexical delay was found in 92.8% of the poor profile, 17.8% of the weak profile, 2% of the average profile, and 0% of the advanced profile. The poor profile was associated with lower cognitive and motor scores, and social risk factors (i.e., having an unemployed mother and a father with a low level of education), whereas the weak profile was associated with lower cognitive and perception-action scores, and biological risk factors (i.e., low birth weight relative to gestational age).

Furthermore, when focusing on LTs, who were born either LRPT or FT, three language profiles - severe (25%), moderate (35%), and mild (40%) - were found (Zuccarini et al., 2023). Severe LTs, compared to mild LTs, showed less frequent use of pointing, limited verbal imitation, receptive vocabulary size, lexical and sentence production; in addition, they were characterised by lower responsiveness and assertiveness, assessed with the child socio-conversational skills questionnaire (ASCB, Bonifacio et al., 2013), and lower cognitive scores, assessed with the Italian version of the Bayley Scales of Infant and Toddler Development (BSID-III, Ferri et al., 2015). Moderate LTs, compared to mild LTs, showed less frequent verbal imitation, limited lexical and sentence production, and lower cognitive scores. Male sex was significantly more represented in severe LTs, whereas other biological and environmental factors did not differ across the three profiles (Zuccarini et al., 2023).

CONCLUSIONS

In Italy, screening programmes to identify LTs have been conducted over the last 25 years using the CDIs (Caselli & Capirci, 2002; Rinaldi et al., 2023a; Rinaldi et al., 2023b). The CDI:W&S SF has proved to be an effective screening tool for identifying LTs around 30 months of age, with language delays being confirmed by further direct assessment and the CDI:W&S CF (Bello et al., 2014; Bello et al., 2018). Nevertheless, caution for diagnostic accuracy should be considered when using CDIs alone (Eriksson, 2023).

Taken together, the research revealed weaknesses in several linguistic and non-linguistic skills among LTs, with wide inter-individual variability. This variability has been documented by different profiles identified using the CDI:W&S

SF in LT samples (Bello et al., 2018), as well as in relation to neonatal conditions (PT vs FT; Sansavini et al., 2021; Zuccarini et al., 2023). Using the CDIs, the predictive value of early receptive and expressive vocabulary size for subsequent lexical development and word combination has been documented in LTs (Bello et al., 2018; Rinaldi et al., 2023a; Rinaldi et al., 2023b), while considering different neonatal conditions (PT vs FT, Sansavini et al., 2011; Sansavini et al., 2019).

Normative data from the Italian CDIs have been used to develop a direct tool to assess expressive and receptive lexical skills, e.g., the PiNG (Bello, et al., 2012). Furthermore, in a parent-coaching, dialogic book reading intervention aimed at promoting early childhood vocabulary (Girolametto et al., 2017), several target words were selected among the words of the CDI:W&G CF – words that the children understood, but did not yet produce. The application of this intervention in Italian healthcare contexts confirmed its feasibility in promoting lexical development (out of 11 LTs, 7 achieved a vocabulary size > 10th percentile). Furthermore, a positive significant association between the caregiver's reading time and the number of target words learned by the child was evident (Bello et al., 2019).

The effectiveness of this intervention on LTs, born either LRPT or FT, was assessed using the CDI:W&S CF. Zuccarini et al. (2020) highlighted that, in the intervention group, more LTs showed partial or full recovery of their expressive lexical delay and acquired the ability to produce complete sentences between 31 and 37 months, compared to the control group. Increased complete sentence production was observed in both LRPT and FT LTs, whereas a higher daily growth rate of words was observed only in FT LTs.

REFERENCES

Bello, A., Giannantoni, P., Pettenati, P., Stefanini, S., & Caselli, M. C. (2012). Assessing lexicon: Validation and developmental data of the Picture Naming Game (PiNG), a new picture naming task for toddlers. *International Journal of Language and Communication Disorders*, 47, 589-602. https://doi.org/10.1111/j.1460-6984.2012.00168.x

Bello, A., Onofrio, D., & Caselli, M.C. (2018). Prediction and persistence of late talking: A study of Italian toddlers at 29 and 34 months. *Research in Developmental Disabilities*, 75, 40–48. https://doi.org/10.1016/j.ridd.2018.02.006

Bello, A., Onofrio, D., Remi, L., Caselli, M. C., & Girolametto, L. (2019). La lettura dialogica per genitori di bambini con ritardo di linguaggio di 2-3 anni. *Psicologia Clinica dello Sviluppo*, 23, 159-168.

Bello, A., Remi, L., Olioso, G., Anghinoni, E., Galavotti, M., & Caselli, M. C. (2014). Un'esperienza di screening per l'identificazione di bambini con ritardo di linguaggio nella provincia di Mantova: primi risultati e prospettive future. *Psicologia Clinica dello Sviluppo*, 18, 329–342.

Bonifacio, S., Girolametto, L., & Montico, M. (2013). *Le abilità socio-conversazionali del bambino. Questionario e dati normativi dai 12 ai 36 mesi d'età*. Milano: Franco Angeli.

Caselli, M.C., Bello, A., Rinaldi, P., Stefanini, S., & Pasqualetti, P. (2015). *Il Primo Vocabolario del Bambino: Gesti, Parole e Frasi. Forme Lunghe e Forme Brevi del Questionario e Valori di Riferimento per la Fascia 8–36 Mesi*. Milano: Franco Angeli.

Caselli, M. C., & Capirci, O. (2002). *Indici di rischio nel primo sviluppo del linguaggio. Ricerca, Clinica e Educazione*. Milano: Franco Angeli.

Desmarais, C., Sylvestre, A., Meyer, F., Bairati, I., & Rouleau, N. (2010). Three profiles of language abilities in toddlers with an expressive vocabulary delay: Variations on a theme. *Speech, Language and Hearing Research*, 53(3), 699–709. https://doi.org/0.1044/1092-4388(2009/07-0245

Eriksson, M. (2023). Insufficient evidence for the validity of the Language Development Survey and the MacArthur–Bates Communicative Development Inventories as screening tools: A critical review. *International Journal of Language and Communication Disorders*, 58, 555–575. https://doi.org/10.1111/1460-6984.12800

Ferri, R., Orsini, A., Rea, M., Stoppa, E., & Mascellani, F. (2015). *Bayley Scales of Infant and Toddler Development*. *Manuale dell'adattamento italiano* (3rd ed.). Giunti, O.S.: Italian adaptation.

Girolametto, L., Bello, A., Onofrio, D., Remi, L., & Caselli, M.C. (2017). *Parent-coaching per l'intervento precoce sul linguaggio. Percorsi di lettura dialogica nel programma "Oltre il libro".* Trento: Centro Studi Erikson.

Rescorla, L., & Dale, P. (2013). *Late talkers: Language development, interventions, and outcomes*. Baltimore, MD: Brookes Pulishing.

Rinaldi, P., Bello, A., Simonelli, I., & Caselli, M.C. (2023). Is Specific Learning Disorder Predicted by Developmental Language Disorder? Evidence from a Follow-Up Study on Italian Children. *Brain Sciences*, 13 (4), 701. https://doi.org/10.3390/brainsci13040701

Rinaldi, E., Bello, A., Stefanini, S., Caselli, M.C., & Pasqualetti, P. (2026). The Italian MB-CDI 'Words and Gestures' complete and short forms: Normative data and validity. *Infant Behavior and Development*, 82, 102173. https://doi.org/10.1016/j.infbeh.2025.102173

Rinaldi, P., Pasqualetti, P., Stefanini, S., Bello, A., & Caselli, M. C. (2019). The Italian words and sentences MB-CDI: Normative data and concordance between complete and short forms. *Journal of Child Language*, 46(3), 546–566. https://doi.org/10.1017/s0305000919000011

Rinaldi, P., Simonelli, I., Caselli, M.C., Lasorsa, F., & Bello. A. (2023). Prevalenza e predittori del DPL in età prescolare: uno studio, di popolazione italiano. *Logopedia e Comunicazione*, 19, 281-302. https://doi.org/doi:10.14605/LOG1932301

Sansavini, A., Bello, A., Guarini, A., Savini, S., Alessandroni, R., Faldella, G., & Caselli, M. C. (2015). Noun and predicate comprehension/production and gestures in extremely preterm children at two years of age: Are they delayed? *Journal of Communication Disorders*, 58, 126-142. https://doi.org/10.1016/j.jcomdis.2015.06.010

Sansavini, A., Guarini, A., Alessandroni, R., Faldella, G., Giovanelli, G., & Salvioli, G. P. (2006). Early relations between lexical and grammatical development in very immature Italian preterms. *Journal of Child Language*, 33, 199-216. https://doi.org/10.1017/s0305000905007208

Sansavini, A., Guarini, A., & Caselli, M.C. (2011). Preterm birth: Neuropsychological profiles and atypical developmental pathways. *Developmental Disabilities Research Reviews*, 17, 102-113. https://doi.org/10.1002/ddrr.1105

Sansavini, A., Guarini, A., Savini, S., Broccoli, S., Justice, L. M., Alessandroni, R., & Faldella, G. (2011). Longitudinal trajectories of gestural and linguistic abilities in very preterm infants in the second year of life. *Neuropsychologia*, 49, 3677-3688. https://doi.org/10.1016/j.neuropsychologia.2011.09.023

Sansavini, A., Guarini A., Zuccarini M., Lee J. Z., Faldella G., & Iverson, J. M. (2019). Low Rates of Pointing in 18-Month-Olds at Risk for Autism Spectrum Disorder and Extremely Preterm Infants: A Common Index of Language Delay? *Frontiers in Psychology, Section Developmental Psychology*, 10, 2131, 1-12. https://doi.org/10.3389/fpsyg.2019.02131

Sansavini, A., Zuccarini, M., Gibertoni, D., Bello, A., Caselli, M.C., Corvaglia, L., & Guarini, A. (2021). Language profiles and their relation to cognitive and motor skills at 30 months of age: An online investigation of low-risk preterm and full-term children. *Journal of Speech, Language, and Hearing Research,* 64, 2715-2733. https://doi.org/10.1044/2021_jslhr-20-00636

Zuccarini, M., Guarini, A., Gibertoni, D., Suttora, C., Aceti, A., Corvaglia, L., Bello, A., Caselli, M.C., & Sansavini, A., (2023). Describing communication profiles of low-risk preterm and full-term late talkers. *Journal of Communication Disorders*, 104, 106336, 1-18. https://doi.org/10.1016/j.jcomdis.2023.106336

Zuccarini, M., Guarini, A., Iverson, J.M., Benassi, E., Savini, S., Alessandroni, R., Faldella, G., & Sansavini, A. (2018). Does early object exploration support gesture and language development in extremely preterm infants and full-term infants? *Journal of Communication Disorders,* 76, 91-100. https://doi.org/10.1016/j.jcomdis.2018.09.004

Zuccarini, M., Suttora, C., Bello, A., Aceti, A., Corvaglia, L., Caselli, M.C., Guarini, A., & Sansavini, A. (2020). A parent-implemented intervention for late talkers: An exploratory study on low-risk preterm and full-term children. *International Journal of Environmental Research and Public Health*, 17, 9123, 1-20. https://doi.org/10.3390/ijerph17239123

Table 1 *Summary of Studies on Early Language and Communication Development in Late Talkers Assessed using the Italian MacArthur–Bates Communicative Development Inventories (CDI): Gestures and Words (G&W) and Words and Sentences (W&S) in Complete (CF) and Short Form (SF).*

Study Authors (Year)	Study design	Participants (N)	Age	Assessment tool	Main outcomes	Predictors / Risk factors
Bello et al. (2014)	Screening programme; Observational	2,685	Mean age = 30 months	Screening tool: CDI:W&S SF (5th percentile cut-off). Clinical assessment: CDI:W&S CF and direct measures for 'positive' cases	Incidence of LTs = 9% (n = 237). Language delay confirmed in 82% of the LTs.	CDI:W&S SF is an effective tool for identifying language delay.
Bello et al. (2018)	Observational; Longitudinal	35 LTs	T1 = 29 months T2 = 34 months	T1: CDI:W&S SF. T2: CDI:W&S CF and clinical assessment (cognitive, communicative, linguistic).	At 29 months, 54% of LTs did not combine words in sentences, and did not show declarative pointing, decontextualised comprehension, symbolic play or verbal imitation; words were phonologically altered. At 34 months, 89% of them had a confirmed language delay (vocabulary size < 10th percentile).	Expressive vocabulary size at 29 months is a predictor of later lexical development.
Bello et al. (2019)	Feasibility: 2-month structured parent-coaching intervention for LTs based on dialogic book reading; Longitudinal	11 LTs	T1: Age range = 27-30 months T2: after 2 months	Screening tool: CDI:W&S SF (5th percentile cut-off). Clinical assessment: CDI:W&S CF and direct measures for 'positive' cases.	Caregiver's reading time per week: ranges from 8 to 31 minutes per child. Number of target words learned (only 2 sessions): ranges from 2 to 7 per child. Significant increase of vocabulary size (mean number of words, W&S SF: pre-intervention: 28.5; post-intervention: 48.0) Of the 11 LTs, 7 achieved a vocabulary size > 10th percentile post-intervention.	Significant association between the caregiver's reading time and the number of target words learned by the child.
Rinaldi et al. (2023b)	Observational; Longitudinal	523	T1: Age range = 27-32 months T2: Age range = 4-5 years	Screening tool: CDI:W&S SF. Follow-up measure: Parental interview.	Prevalence of DLD was 11.7%, and of this group, 52% had been previously identified as LT. The probability of DLD was higher for LTs who did not imitate words, had a vocabulary below the 10th percentile, did not combine words, did not use symbolic play, had lower decontextualised comprehension, and a familial risk of DLD/SLD.	Familial risk of DLD/SLD, poor expressive vocabulary skills, and difficulties in linguistic and non-linguistic domains represent a risk factor for DLD.
Rinaldi et al. (2023a)	Observational; Longitudinal	528	T1: Age range = 27-32 months T2: Mean age = 8.5 years	Screening tool: CDI:W&S SF. Follow-up measure: Parental interview.	Prevalence of SLD was 7%, and of this group, 29.7% had been previously diagnosed with DLD. The probability of SLD was higher in LTs who did not imitate words, had a vocabulary below the 10th percentile, did not combine words, were male, and had received a diagnosis of DLD.	Diagnosis of DLD, male sex, poor expressive vocabulary skills, and difficulties in linguistic and non-linguistic domains represent a risk factor for SLD.

Note: DLD, developmental language disorder; LT, late talker; SLD, specific learning disorder.

Table 2 *Summary of Studies on Early Language and Communication Development in Preterm Children Assessed using the Italian MacArthur–Bates Communicative Development Inventories (CDI): Gestures and Words (G&W) and Words and Sentences (W&S) in Complete (CF) and Short Form (SF).*

Study Authors (Year)	Study design	Participants	Mean age of assessment (corrected for PT)	Assessment tool	Main outcomes	Predictors / Risk factors
Sansavini et al. (2006)	Observational; Cross-sectional	N = 95 73 PT (GA ≤ 33 w) 22 FT	30 months	CDI:W&S CF; TFR test.	Lexical and grammatical skills fell within the normal range in most of the PT sample compared to FTs, with strict relationships between domains. Expressive lexical delay was observed in 17.8% PTs vs 13.6% FTs.	Smaller lexical size observed in PTs with birthweight ≤ 1000g and those who were male; shorter MLU in PTs with GA ≤ 31 weeks and those who were male.
Sansavini, Guarini, Savini, et al. (2011)	Observational; Longitudinal	N = 124 104 VPT 20 FT	T1 = 12 months T2 = 18 months T3 = 24 months	T1: CDI:G&W SF. T2: CDI:G&W SF. T3: CDI:W&S SF.	VPTs showed slower acquisition of gestures/ actions, word comprehension, and word production, with increasing divergence from FTs between the ages of 12 to 24 months. At 24 months, expressive lexical delay was observed in about 20% of VPTs vs 5% of FTs.	Early word comprehension and production (12 and 18 months) and gestures/actions (18 months) predicted expressive vocabulary at 24 months. Male gender, bronchopulmonary dysplasia, and low maternal educational level increased the risk of expressive lexical delay at 24 months.
Sansavini et al. (2015)	Observational; Cross-sectional	N = 80 40 EPT 40 FT	24 months	CDI:W&S SF; PiNG test.	Noun comprehension and production were delayed in EPTs compared to FTs. Expressive lexical delay was observed in 27% EPTs vs 5% FTs.	EPT birth increased the risk of expressive lexical delay at 24 months.
Zuccarini et al. (2018)	Observational; Longitudinal	N = 40 20 EPT 20 FT	T1 = 6 months T2 = 12 months	T1: Object exploration coded during mother-infant play interaction. T2: CDI:G&W CF; Gesture and vocal production coded during mother-infant play interaction.	In both the EPT and FT groups, oral object exploration at 6 months predicted word comprehension at 12 months; manual object exploration at 6 months predicted gesture and vocal production at 12 months.	Oral object exploration at 6 months predicted word comprehension at 12 months; manual object exploration at 6 months predicted gesture and vocal production at 12 months.
Sansavini et al. (2019)	Observational; Longitudinal	N = 110 29 American siblings TD 41 American siblings at risk for ASD: 28 no-LD 13 LD 20 Italian FT 20 Italian EPT: 11 no-LD 9 LD	T1 = 18 months T2 = 24 months T3 = 30 months T4 = 36 months	T1: CDI:W&S CF; Gesture production coded during mother-infant play interaction. T2: CDI:W&S CF. T3: CDI:W&S CF. T4: CDI:W&S CF.	Siblings at risk for ASD with LD and siblings at risk for ASD with no LD produced fewer pointing gestures at 18 months than siblings with TD. EPTs with LD produced fewer pointing gestures at 18 months than EPTs with no LD and FTs.	Low rate of pointing at 18 months is a marker of expressive lexical delay between 18 and 36 months in siblings at risk for ASD and EPTs.

Study Authors (Year)	Study design	Participants	Mean age of assessment (corrected for PT)	Assessment tool	Main outcomes	Predictors / Risk factors
Zuccarini et al. (2020)	Experimental: 2-month structured parent-coaching intervention for LTs based on dialogic book reading; Longitudinal	N = 50 27 Intervention 17 LRPT 10 FT 23 Control 6 LRPT 17 FT	T1 = 31 months T2 = 37 months	T1: CDI:W&S CF; BSID-III cognitive scale. T2: CDI:W&S CF.	In the intervention group, compared to the control group, more LTs showed partial or full recovery of their expressive lexical delay and acquired the ability to produce complete sentences between 31 and 37 months; increased complete sentence production was observed in both LRPT and FT LTs, whereas a higher daily growth rate of words was observed only in FT LTs.	PT birth should be considered in evaluating the effect of this parent-coaching intervention.
Sansavini et al. (2021)	Observational; Cross-sectional	N = 200 100 LRPT 100 FT	30 months	CDI:G&W SF; CDI:W&S SF; PARCA_R; EMQ.	Four language profiles identified - Poor (21%): lowest receptive and expressive vocabulary, absent or limited word combination and phonological accuracy; 92.8% had expressive lexical delay. Weak (22.5%): average receptive, but limited expressive vocabulary, incomplete sentences, average or limited phonological accuracy; 17.8% had expressive lexical delay. Average (25%): average receptive and expressive vocabulary, incomplete and complete sentences, partial phonological accuracy; 2% had expressive lexical delay. Advanced (31.5%): highest expressive vocabulary, complete sentences, complete phonological accuracy; 0% had expressive lexical delay.	The poor profile was associated with lower cognitive and motor scores and social risk factors (i.e., having an unemployed mother and a father with a low education level), whereas the weak profile was associated with lower cognitive and perception-action scores and biological risk factors (i.e., low birthweight relative to gestational age).
Zuccarini et al. (2023)	Observational; Cross-sectional	N = 68 LT 33 LRPT 35 FT	30 months	CDI:G&W SF; CDI:W&S SF; ASCB; PiNG test; BSID-III language, cognitive and motor scales.	Three language profiles identified - Severe LTs (25%): less frequent use of pointing, limited verbal imitation, receptive vocabulary size, lexical and sentence production, lower responsiveness, assertiveness, and cognitive scores than mild LTs. Moderate LTs (35%): less frequent verbal imitation, limited lexical and sentence production, lower cognitive scores than mild LTs. Mild LTs (40%): better abilities than severe and moderate LTs.	The proportion of males was significantly higher in the severe LT group.

Note: ASCB, Child Socio Conversational Skills Questionnaire; ASD, autism spectrum disorder; BSID-III: Bayley Scales of Infant and Toddler Development (3rd edition); EMQ, Early Motor Questionnaire; EPT, extremely preterm (GA ≤ 28 weeks); FT, full-term; GA, gestational age; LD, language delay; no-LD, no language delay; LRPT, low risk preterm; LT, late talker; MLU, mean length of utterance; PARCA_R, Parent Report of Children's Abilities -Revised; PiNG, Picture Naming Game test; PT, preterm; TD, typically developing; TFR, Test of Sentence Repetition; VPT, very preterm (GA ≤ 32 weeks).
Expressive lexical delay is associated with a vocabulary size ≤ 10th percentile at the W&S SF or CF.