Risk and Protective Factors for Late Talking: An Epidemiologic Investigation

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Objective To identify risk and protective factors for late talking in toddlers between 24 and 30 months of age in a large community-based cohort.

Study design A prospective, longitudinal pregnancy cohort of 1023 mother-infant pairs in metropolitan Calgary, Canada, were followed across 5 time points: before 25 weeks gestation, between 34-36 weeks gestation, and at 4, 12, and 24 months postpartum. Toddlers who scored ≤10th percentile on The MacArthur-Bates Communicative Development Inventories: Words and Sentences between 24 and 30 months of age were identified as late talkers. Thirty-four candidate characteristics theoretically and/or empirically linked to language development and/or language impairment were collected using survey methodology.

Results The prevalence of late talking was 12.6%. Risk factors for late talking in the multivariable model included: male sex ($P = .017$) and a family history of late talking and/or diagnosed speech or language delay ($P = .002$). Toddlers were significantly less likely to be late talkers if they engaged in informal play opportunities ($P = .013$), were read to or shown picture books daily ($P < .001$), or cared for primarily in child care centers ($P = .001$).

Conclusions Both biological and environmental factors were associated with the development of late talking. Biological factors placed toddlers at risk for late talking, and facets of the environment played a protective role. Enveloping infants and toddlers in language-rich milieus that promote opportunities for playing, reading, and sharing books daily may decrease risk for delayed early vocabulary. *(J Pediatr 2016;172:168-74)*.

Impaired language learning is linked with poor outcomes in academic achievement,[1] reading, and comprehending text,[2] social and behavioral development,[3-6] self-esteem,[7,8] and being bullied or victimized.[9] Accordingly, the American Academy of Pediatrics counsels parents to seek guidance if their toddlers show a delay in saying or understanding words so that early management can be contemplated if deemed necessary.[10] The term late talker is often used to describe toddlers between 18 and 35 months of age who, in the absence of clear underlying neurologic, sensory, or cognitive deficits, fall at the bottom of the population distribution for number of words in their early vocabularies.[11,12] Often considered an expressive language phenomenon, late talking may occur with or without a concomitant delay in receptive language.[11,12]

The few prospective studies that have tracked the evolution of delayed word production after the toddler period have reported wide variation in later language abilities across a number of dimensions (eg, vocabulary, grammar, inflectional morphology), spanning typical to impaired.[13-16] Factors contributing to these differences in reported trajectories include the inherent heterogeneity of language development and lack of consistent inclusion criteria, measures, and thresholds for identifying late talking. Prospective, longitudinal, population-based studies, applying consistent instruments and selection criteria, are required to characterize more fully typical and atypical variation across pivotal language dimensions as a function of age.[12]

Current theories of language impairment posit a multifactorial causal mechanism, inclusive of an array of inherited and acquired factors.[17,18] A limiting factor to a better understanding of how these factors might work together to shape language delay, however, is the small sample sizes of the majority of late talker cohorts, which restricts the number of factors considered simultaneously. Five large, population-based studies, to date, have investigated the relations between a number of genetic/biological and environmental associations with late talking status.[19-23] Two involve longitudinal cohorts in Australia,[19,20] 1 involves a longitudinal cohort in Denmark,[21] 1 reports a longitudinal cohort of twins in England and Wales,[22] and the fifth is a cross-sectional investigation of young children with language delay in the US.[23] Together, these studies have yielded robust evidence for 2 biological associations for late talking: male sex and a family history of late talking or speech and language difficulties. Environmental factors that are hypothesized to be associated with late talking,

CDI	McArthur-Bates Communicative Development Inventories
PP	Predicted probability

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however, have either not yet been tested or consistently contributed significantly to multivariable models. Those that have shown an associative relationship with late talking in at least 1 large cohort include a bilingual language learning environment, low maternal education, low family expressiveness, and presence of siblings.[19-23] These 4 variables represent a small fraction of possible environmental factors hypothesized to be associated with the development of early vocabulary delay, leaving the majority largely unspecified.[22] Yet, the identification of factors that are conducive to modification holds promise in the mitigation of a suboptimal language learning trajectory.

This study used a prospective, North American community-based cohort of 1023 mothers and toddlers to examine the potential association of 34 theoretically and/or empirically identified factors to late talking at 24-30 months of age. We tested the hypothesis that, in addition to biological risk for late talking, previously untested environmental factors can be associated with decreased risk for the development of early vocabulary delay.

Methods

The present study is based on data from the All Our Babies community-based prospective longitudinal pregnancy cohort in Calgary, Alberta, Canada, (metropolitan population; 1.3 million). Canada has a publically funded universal health care system, and 99% of women receive some prenatal care. Women were recruited from physician offices, laboratory services, provincial healthcare websites, and community posters between May 2008 and December 2010 (details reported elsewhere).[24] Women were eligible to participate if they met the following criteria: less than 24 weeks, 6 days gestation at the time of recruitment, 18 years or older, receiving prenatal care in Calgary, and able to complete the surveys in English. The participation rate for the All Our Babies study at the 24-month follow-up was 75.5%. Comparisons between the All Our Babies cohort and national, provincial, and local statistics showed that the women in the All Our Babies cohort are representative of the sociodemographic profile of the pregnant and parenting population in urban Canada, including, for instance, average age at delivery, foreign-born proportion, visible minority status, and household income.[25] This study was approved by the Conjoint Health Research Ethics Board at the University of Calgary, and all participants provided written informed consent.

Participants completed questionnaires at the following time points: before 25 weeks gestation, between 34-36 weeks gestation, and at 4, 12, and 24 months postpartum. The questionnaires were composed of both standardized scales and investigator-derived questions on a variety of topics, including maternal mental health, sociodemographics, work-life balance, parenting, and child development. When their children were 12 months of age, mothers completed child development assessments that included the McArthur-Bates Communicative Development Inventories (CDI): Words and Gestures as well as the Ages and Stages Questionnaire-3.[26,27] When their children were 24-30 months old, mothers completed the CDI: Words and Sentences as well as the Ages and Stages Questionnaire-3.

Thirty-four candidate factors associated with late talking in toddlers were identified from studies that theoretically and/or empirically linked these factors to language development and/or language impairment (**Table I**). Candidate factors included child sex, family history (late talking/diagnosed speech or language delay), other children in the home, number of adults in the home, number of children younger than 5 years, maternal age at birth of child, maternal education, nominal exposure to another language (operationalized as ≤12 hours per week), ethnicity, time in Canada, preterm birth status, family income, maternal paid employment, neighborhood safety, maternal depression, stress and anxiety (state and trait), maternal smoking, alcohol use, drug use, physical health, emotional health, social support (partner, friends, family), mother and partner concordance in their views of their child, child frequency of ear infections, use of formal community resources, engagement in informal play opportunities, television viewing, computer habits, reading and sharing picture books, and child care type. Toddlers with an identified medical condition or syndrome associated with language or cognitive impairment and those whose families reported a bilingual language learning environment were excluded from the sample. We excluded simultaneous bilinguals because an accurate measure of their productive language involves combining vocabulary in both languages. Our participants completed the CDI: Words and Sentences in English only. To capture bilingual language learning environments, we applied the threshold of "exposure to a language other than English more than 12 hours per week" to our sample to align with the norming sample of the outcome measure, the CDI: Words and Sentences (**Figure**; available at www.jpeds.com).

We compared the final sample of eligible participants with the full sample on the 27 variables that were collected either at baseline or at 12 months of age. There were 27 P values generated, so caution must be taken in the interpretation of the P values because the probability of spuriously significant P values is high. There were 6 variables on which the 2 groups differed at $P < .01$ and an additional 3 variables that had P values less than .05 but greater than .01. Women who had missing data at 24 months (including the CDI: Words and Sentences) were more likely to be those who had lived in Canada less than 5 years or were not Caucasian. They were also less likely to live in a home with 2, and only 2 adults, and were less likely to have a college education. They were more likely to report their physical heath as fair or poor and high trait anxiety scores (all P values <.01). Women who had missing data at 24 months (including the CDI: Words and Sentences) may be more likely to have low income, feel less safe in their neighborhoods, and use street drugs ($.05 < P < .01$).

Table I. Descriptive statistics for the potential child, familial, and environmental predictors

Candidate risk factors	Late talker, N (%)	Typically developing, N (%)	*P* value
Child's sex			
Male	80 (62.0)	451 (50.5)	.018
Female	49 (38.0)	442 (49.5)	
Family history of late talking and/or diagnosed speech or language delay			
0 family members	90 (69.8)	747 (83.6)	.000
1 family members	23 (17.8)	106 (11.9)	
2 or more family members	16 (12.4)	41 (4.6)	
Preterm birth status			
<37 wk	9 (7.0)	43 (4.8)	.283
37 wk +	119 (93.0)	848 (95.2)	
Other language spoken in the home ≤12 h			
Other language	15 (11.6)	111 (12.4)	.887
English only	114 (88.4)	783 (87.6)	
Time in Canada			
Born/lived in Canada >5 y	125 (97.7)	873 (98.0)	.731
Lived in Canada <5 y	3 (2.3)	17 (1.9)	
Maternal age at birth of child			
<23 y	6 (4.7)	41 (4.7)	.601
24-29 y	44 (34.7)	279 (31.9)	
30-34 y	47 (37.0)	376 (43.0)	
≥35 y	30 (23.6)	178 (20.4)	
Maternal ethnicity			
Other	11 (8.5)	60 (6.7)	.458
White/Caucasian	118 (91.5)	831 (93.3)	
Maternal education			
Some or completed high school	11 (8.5)	68 (7.6)	.724
Some or completed college	118 (91.5)	824 (92.4)	
Number of adults in the home			
1	2 (1.6)	14 (1.6)	.624
2	120 (93.0)	809 (90.5)	
3	7 (5.4)	71 (7.9)	
One child vs many children in the household			
>1 child	67 (51.9)	476 (53.3)	.778
1 child	62 (48.1)	417 (46.7)	
Number children <5 y			
1	76 (58.9)	480 (53.9)	.388
2	53 (41.1)	400 (44.9)	
3	0 (0.0)	10 (1.1)	
Family income			
<$40 000	5 (4.0)	42 (4.7)	.306
$40 000-$79 000	36 (28.6)	199 (22.4)	
≥$80 000	85 (67.5)	647 (72.9)	
Maternal paid employment			
None	64 (49.6)	409 (45.9)	.425
1-2 d	22 (17.1)	121 (13.6)	
3-4 d	16 (12.4)	142 (15.9)	
5-7 d	27 (20.9)	219 (24.6)	
Neighborhood safety			
Very safe	76 (58.9)	526 (58.8)	.995
Safe	45 (34.9)	302 (33.8)	
Average	8 (6.2)	60 (6.7)	
Relatively unsafe	0 (0.0)	6 (0.7)	
Very unsafe	0 (0.0)	0 (0.0)	
Maternal social support (satisfaction with social/emotional support received from partner)			
Very satisfied	68 (53.1)	512 (58.1)	.285
Satisfied	49 (38.3)	325 (36.9)	
Unsatisfied	9 (7.0)	38 (4.3)	
Very unsatisfied	2 (1.6)	7 (0.8)	
Maternal social support (satisfaction with social/emotional support received from friends)			
Very satisfied	53 (41.1)	367 (41.1)	.315
Satisfied	70 (54.3)	456 (51.1)	
Unsatisfied	4 (3.1)	61 (6.8)	
Very unsatisfied	2 (1.6)	9 (1.0)	
Maternal social support (satisfaction with social/emotional support received from family)			
Very satisfied	61 (47.3)	430 (48.2)	.752
Satisfied	60 (46.5)	383 (42.9)	
Unsatisfied	6 (4.7)	63 (7.1)	
Very unsatisfied	2 (1.6)	17 (1.9)	
Maternal depression EDPS			
Not depressed	116 (89.9)	784 (88.3)	.393
Depressed	13 (10.1)	104 (11.7)	
Maternal emotional health – self-reported			
Excellent/very good/good	119 (92.3)	830 (93.0)	.717
Fair/poor	10 (7.8)	63 (7.1)	
Maternal physical health – self-reported			
Excellent/very good/good	118 (91.5)	845 (94.7)	.152
Fair/poor	11 (8.5)	47 (5.3)	
Maternal stress			
Not stressed	101 (79.5)	673 (77.1)	.572
Stressed	26 (20.5)	200 (22.9)	
Maternal anxiety (state anxiety)			
No anxiety	108 (88.5)	731 (83.4)	.187
Anxiety	14 (11.5)	146 (16.7)	
Maternal anxiety (trait anxiety)			
No anxiety	100 (77.5)	687 (76.9)	.911
Anxiety	29 (22.5)	207 (23.2)	
Maternal smoking			
Yes	12 (9.3)	66 (7.4)	.477
No	117 (90.7)	826 (92.6)	
Maternal alcohol use			
Yes	106 (82.2)	723 (81.0)	.810
No	23 (17.8)	170 (19.0)	
Maternal street drug use			
Yes	2 (1.6)	20 (2.2)	1.000
No	127 (98.5)	873 (97.8)	
Mother and partner sees their child in the same way			
Strongly agree	45 (34.9)	342 (38.3)	.779
Agree	60 (46.5)	421 (47.1)	
Not sure	14 (10.9)	70 (7.8)	
Disagree	7 (5.4)	43 (4.8)	
Strongly disagree	2 (1.6)	12 (1.3)	
N/A	1 (0.8)	6 (0.7)	
Child ear infections (identified at 12 or 24 mo or both or having ventilating tubes)			
Yes	53 (41.1)	300 (33.6)	.113
No	76 (58.9)	594 (66.4)	
Type of child care			
Mother	67 (51.9)	420 (47.0)	.011
Relative	18 (14.0)	78 (8.7)	
Nanny	4 (3.1)	50 (5.6)	
Day home	32 (24.8)	207 (23.1)	
Child care center	8 (6.2)	139 (15.5)	
Child television viewing			
None	16 (12.4)	154 (17.2)	.046
<1 h	53 (41.1)	424 (47.4)	
>1 h	60 (46.5)	316 (35.4)	

Table I. Continued

Candidate risk factors	Late talker, N (%)	Typically developing, N (%)	*P* value
Child computer habits			
None	58 (45.0)	340 (38.0)	.045
<1 h	25 (19.4)	265 (29.6)	
>1 h	46 (35.7)	289 (32.3)	
Reading and sharing books with infant/toddler daily			
No	14 (10.9)	31 (3.5)	.001
Starting between 12 and 24 mo	28 (21.7)	168 (18.8)	
Starting before 12 mo	87 (67.4)	695 (77.7)	
Child informal play opportunities			
No	59 (45.7)	300 (33.6)	.008
Yes	70 (54.3)	594 (66.4)	
Formal community resources utilization (library, recreational facility)			
No	11 (8.5)	37 (4.1)	.041
Yes	118 (91.5)	857 (95.9)	

EDPS, Edinburgh Postnatal Depression Scale; *N/A*, not applicable.

The outcome variable of late talking status between 24 and 30 months of age was based on a score of at or below the 10th percentile on the CDI: Words and Sentences. The raw scores (number of words the child says out of 680 possible words) were converted to percentiles across 1-month intervals. The 10th percentile cut point has been a widely adopted threshold in studies involving late talkers.[11,12]

Statistical Analyses

Potential predictor variables of late talking at 24-30 months of age were described using the median and IQR for continuous variables and percentages for categorical variables. Differences in the continuous variables were examined using the *t* test for (approximately) normally distributed variables and the Wilcoxon test for variables that were not normally distributed. Differences between the categorical variables were examined using Fisher exact test. Variables that were significant at $P < .2$ were considered eligible for inclusion in the multivariable logistic regression. Ordinal level variables that were significant predictors, but in which the relationship with late talking was nonmonotonic were not considered eligible. A "full" model was developed by including all variables that were considered eligible and reduced by omitting one nonsignificant variable at a time (using the likelihood ratio statistic $P < .05$) ensuring that there was no evidence of confounding by examining the stability of the estimated coefficients and also ensuring reduction in the Akaike information criterion and the Bayesian information criterion. Goodness of fit of the "final" reduced model was examined using the Hosmer-Lemeshow test.

In addition to the ORs, we present the results of the logistic regression model using predicted margins with 95% CIs. The predictive margin is an estimate of adjusted risk for individuals in that category. Given each participant's values for the covariates included in the logistic regression model, the estimated odds and, hence, probability of that child being a late talker was calculated from the covariate values and the estimated regression coefficient in the model. The predicted margin or probability for a given value of a covariate was obtained by setting the covariate to that value for each participant, leaving all the values of all the other variables the same and calculating the average value of the estimated probability. This provides more information than either the OR or relative risk because this method describes the prevalence of late talking for all levels of the risk factor estimated from the multivariable model. Finally, we calculated the sensitivity, specificity, and positive and negative predictive values.

Results

A total of 12.6% (129 of 1023; [95% CI 10.6, 14.8]) of toddlers were identified as late talkers. Descriptive statistics for the potential predictor variables are presented in Table I.

Variables considered eligible for entry into the multivariable model were mother's physical health ($P = .152$), child's sex ($P = .018$), ear infections ($P = .113$), family history of late talking and/or diagnosed speech or language delay ($P < .000$), childcare arrangements ($P = .011$), reading or sharing books with baby daily ($P = .001$), television habits ($P = .046$), use of formal community resources ($P = .041$), participation in informal play opportunities ($P = .008$), and preterm birth ($P = .283$). Preterm birth, although above the threshold, was retained given a reported link between birth status and late talking in one other community cohort.[20]

The final multivariable model is presented in Table II. In Table III, we present the estimates and *P* values for variables considered eligible but not included in the model. There was no evidence of lack of fit of the model ($P = .343$). Female children were significantly less likely to be late talkers than male children ($P = .017$, predicted probability [PP] of 15.0% for males [95% CI 12.0, 17.9] and 10.1% for females [95% CI 7.5%, 12.7%]). Children with 1 family member with a history of late talking had a 1.7-fold increase in the odds of being a late talker (PP of 17.3% [95% CI 11.0, 23.6]) compared with children without a family member (PP 10.9% [95% CI 8.8, 13.0]), and those with 2 or more family members with a history had a 3-fold increase in odds (PP 25.7%, [95% CI 14.8, 36.6]). Reading daily to the child had a significant impact on the odds of late talking ($P < .001$). Children who were not read to daily had a PP of 25.9% (95% CI 14.0, 37.8), whereas children who were read to daily starting between 12 and 24 months of age had a PP of 13.4% (95% CI 8.9, 18.0) and those who were read to daily from a very early age (less than 1 year) had a PP of 11.5% (95% CI 9.3, 13.7). Participating in informal play opportunities arranged by the mother also reduced the likelihood of late talking (PP for children of mothers who participated in informal play opportunities was 10.7% [95% CI 8.4, 13.0] compared with 16.2% [95% CI 12.4, 19.9] in children whose mothers did not participate in these same opportunities). Children who were primarily cared for in child care centers were

Table II. The final multivariable model

Variables	Category	OR				Predicted margin	
						Estimate	95% CI
		Estimate	95% CI	LRS (df)	*P* value	%	%
Care type	Mother	1		13.4 (4)	.001	13.7	10.7, 16.7
	Relative	1.42	0.79, 2.57			18.2	10.7, 25.6
	Nanny	0.58	0.20, 1.71			8.6	0.70, 16.6
	Day home	1	0.62, 1.59			13.6	9.3, 18.0
	Child care center	0.34	0.16, 0.74			5.3	1.8, 8.8
Sex	Male	1		5.75 (1)	.017	15.0	12.0, 17.9
	Female	0.62	0.42, 0.92			10.1	7.5, 12.7
Family members with a history of late talking	None	1		12.6 (2)	.002	10.9	8.8, 13.0
	1	1.74	1.04, 2.92			17.3	11.0, 23.6
	2 or more	2.97	1.56, 5.64			25.7	14.8, 36.6
Reading or sharing books daily	No	1		22.0 (2)	<.001	25.9	14.0, 37.8
	Starting between 12 and 24 mo	0.42	0.20, 0.92			13.4	8.9, 18.0
	Starting before 12 mo	0.35	0.18, 0.71			11.5	9.3, 13.7
Informal play opportunities	No	1		6.17 (1)	.013	16.2	12.4, 19.9
	Yes	0.61	0.41, 0.90			10.7	8.4, 13.0

LRS, likelihood ratio statistics.
Predicted margin estimate describes the prevalence of late talking for all levels of each variable.

significantly less likely to be late talkers ($P = .001$, PP 5.3% [95% CI 1.8, 8.8]) than children with all other forms of care (ie, primarily cared for by mother, relative, nanny, or in day homes) in which the PP of late talking did not differ significantly and ranged between 8.6% and 18.2%. The sensitivity of the model was 62% (95% CI 53%, 70%) and the specificity 68% (95% CI 64%, 91%), with 67% of the participants correctly identified. The positive predictive value was quite low (22%, 95% CI 18%, 26%), but the negative predictive value was extremely high (93%, 95% CI 90%, 94%), which is beneficial because, should this model be used as a screening tool (which we do not recommend), fewer children are likely to "slip through the net."

Discussion

This large, prospective study identified risk and protective factors for late talking in a North American community cohort of 1023 toddlers between 24 and 30 months of age, quantifying the contribution of both environmental and biological associations with early vocabulary delay. The late talker prevalence in this community cohort was 12.6%; a proportion that parallels existing prevalence reports of between 13.4% and 19.7% in population-based samples in a similar age group.[19-23]

Consistent with previous studies, this study identified male sex and a positive family history of late talking and/or diagnosed speech or language delay as significant risk factors for late talking.[13,16,20,22,28,29] The dose-response effect of increased risk as a function of increased numbers of family members with a positive history is consistent with a biological predisposition perspective of language impairment.

Three protective factors associated with late talking were identified: reading and sharing books with infants daily, providing informal play opportunities, and being cared for primarily in child care centers compared with all other forms of care (ie, primarily cared for by mother, relative, nanny, or in day homes in which the risk of late talking was not significantly different).

Importantly, these protective factors describe aspects of the environment that are conducive to modification. This is particularly evident in reading and sharing books with infants. Our results showed the earlier families introduced

Table III. Variables eligible but not included in the model

Variables	Category	OR	95% CI	LRS (df)	*P* value
Physical health	Excellent/good/average				
	Fair/poor	1.49	0.73, 3.06	1.14 (1)	.285
Preterm birth	≥37 wk				
	<37 wk	1.19	0.54, 2.61	0.17 (1)	.679
Use of formal community resources	No				
	Yes	0.52	0.24, 1.11	2.66 (1)	.103
TV viewing habits	None				
	<1 h	1.14	0.62, 2.10	1.56 (2)	.458
	≥1 h	1.40	0.76, 2.59		
Ear infections	None				
	≥1	1.36	0.92, 2.03	2.33 (1)	.127

children's literature to their infants, the greater the protection against low expressive vocabulary. Book reading, play opportunities, and formal child care experiences are all examples of opportunities for language-based social interaction with a variety of communication partners. Language acquisition research demonstrates that infants are highly sensitive to variability in the speech input,[30,31] and this variability may play a critical role in supporting word learning by providing exposure to a constellation of speech features from which memory representations of words can be made.[32]

Although these relations between late talking and environmental factors are correlational, a growing body of research shows facilitative effects of book reading, play opportunities, and formal child care experiences on vocabulary development under specific conditions. For instance, play has been shown to enhance vocabulary development when the play environment promotes "guided play," which comprises an attentive adult partner who engages the child interactively.[33] Similarly, shared book reading interactions are most effective when the adult-child interactions include joint attention, elaborating questions and answers.[34] Moreover, demographics such as maternal education and socioeconomic status as well as the toddlers' skill levels also influence the strength of facilitative effects.[34] Unlike the studies reported above, we have quantified the effects of a facilitative language learning environment on decreasing risk for late talking at the population level. Taken together, these findings advance the proposition that in the face of genetic predisposition for late talking, the environment has a role to play in nudging a suboptimal trajectory closer toward the broad range of normal.

We hypothesize that the protective factor afforded by formal child care in our study is due, in part, to robust regulations including staff training and certification required of child care specialists in Alberta, which of itself is based on the philosophy of early quality experiences maximizing children's social, physical, intellectual, creative, and emotional growth.[35] The protective influence shown in this study is consistent with prevailing research which shows quality child care can confer positive effects on cognitive and school readiness outcomes in specific populations.[36,37]

Primary care providers, who are often among the first to recognize signs of suboptimal language learning, are well positioned to engage a combination of risk and protective factors when making decisions about care. Of course, measures of vocabulary alone are insufficient for predicting continued language learning difficulties and should be considered in conjunction with other early communication behaviors such as eye gaze, understanding of language, and use of gestures and sounds.[11] Supplementing milestone checklists and clinical screening tools with epidemiologically ascertained risk information helps to clarify which late talkers are most in need of further assessment to determine the need for intervention. Evidence-based protective information related to child language development and well-being can be imparted to families seeking to understand how to facilitate language learning in their homes. Finally, variability in early language development after 24-30 months of age for late talkers reinforces the need for primary care providers to monitor closely these children into later stages of development.

We advocate for a public health perspective in applying risk and protective factors for late talking in toddlers. Epidemiologic methods lend themselves to determinants of health across the lifespan, including infants and toddlers. This study identified 2 population-based protective factors for late talking that can be promoted universally: very early exposure to children's literature and play. The link between overall child well-being and early language development at the population level is a relatively new alliance.[38] Its relevance is the advancement of universal health promotion strategies appropriate for all infants and toddlers. ■

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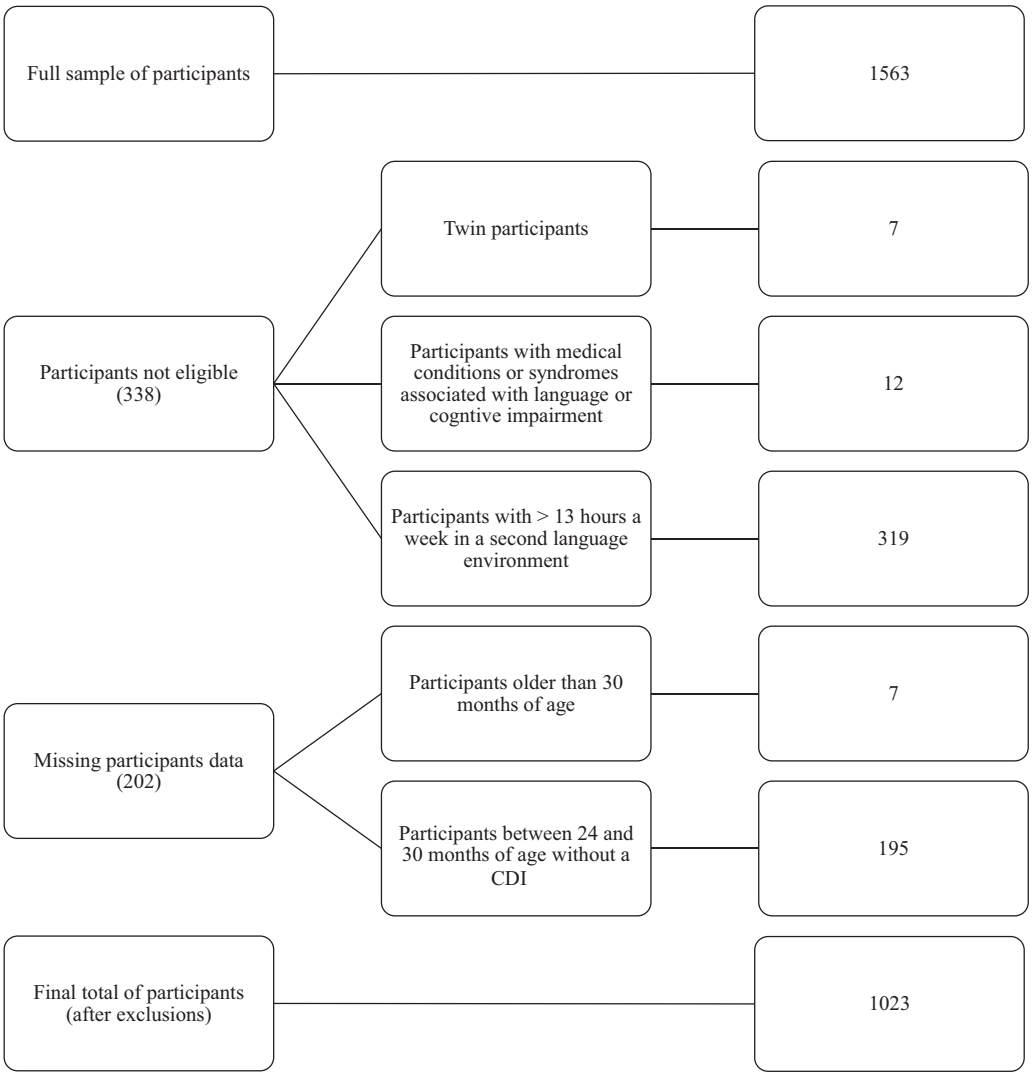

Figure. The study sample.