Late Talking and the Risk for Psychosocial Problems During Childhood and Adolescence

WHAT'S KNOWN ON THIS SUBJECT: School-age language impairment is associated with behavioral and emotional problems. However, it remains unknown whether toddlers who are late to start talking ("late talkers"), many of whom resolve their language difficulties, are at greater risk for psychosocial problems.

WHAT THIS STUDY ADDS: Using a large longitudinal cohort, we found that late talkers have mild levels of behavioral and emotional problems at the age of 2 years but are at no greater risk for these difficulties during childhood or adolescence.

abstract

FREE

OBJECTIVE: Although many toddlers with expressive vocabulary delay ("late talkers") present with age-appropriate language skills by the time they are of school age, little is known about their broader behavioral and emotional profile. The aim of this study was to determine whether late talkers are at increased risk for behavioral and emotional problems during childhood and adolescence.

PATIENTS AND METHODS: Participants were from the Western Australian Pregnancy Cohort Study. Early expressive vocabulary was measured by parent report at age 2 years using the Language Development Survey. Late talkers were defined as toddlers who scored at or below the 15th percentile on the Language Development Survey for their gender but were screened not to have any other developmental delays. The Child Behavior Checklist was used to measure problem child behavior with continuous *z* scores and clinical thresholds at ages 2, 5, 8, 10, 14, and 17 years. Potential confounders included maternal and family sociodemographic characteristics as well as prenatal smoking and alcohol exposure.

RESULTS: At age 2 years, late talkers ($n = 142$) had higher Child Behavior Checklist scores (representing poorer behavior) than control toddlers ($n = 1245$) in total, internalizing, and externalizing scales and higher risk for clinically significant internalizing and externalizing problems. Regression models, incorporating the confounding variables, revealed no association between late-talking status at age 2 years and behavioral and emotional problems at the 5-, 8-, 10-, 14-, and 17-year follow-ups.

CONCLUSIONS: Expressive vocabulary delay at the age of 2 years is not in itself a risk factor for later behavioral and emotional disturbances. *Pediatrics* 2011;128:e324–e332

AUTHORS: Andrew J. O. Whitehouse, PhD,[a,b] Monique Robinson, PhD,[a] and Stephen R. Zubrick, PhD[a]

[a]Centre for Child Health Research and [b]Neurocognitive Development Unit, School of Psychology, University of Western Australia, Perth, Australia

KEY WORDS
late talkers, expressive language delay, behavioral problems, emotional problems, Raine Study

ABBREVIATIONS
LDS—Language Development Survey
CBCL—Child Behavior Checklist

Associate Professor Whitehouse developed the hypotheses, wrote the main drafts of the manuscript, and is responsible for correspondence and requests for reprints; Dr Robinson conducted the statistical analyses, and both Dr Robinson and Professor Zubrick contributed to the interpretation and discussion of the results and other sections of the manuscript.

www.pediatrics.org/cgi/doi/10.1542/peds.2010-2782

doi:10.1542/peds.2010-2782

Accepted for publication Mar 28, 2011

Address correspondence to Andrew J. O. Whitehouse, PhD, Telethon Institute for Child Health Research, Centre for Child Health Research, University of Western Australia, 100 Roberts Rd, Subiaco, Western Australia, 6872. E-mail: awhitehouse@ichr.uwa.edu.au

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

FINANCIAL DISCLOSURE: *The authors have indicated they have no personal financial relationships relevant to this article to disclose.*

There is considerable variation in early language development, with some children beginning to talk much later than others. Previous studies[1] have benchmarked 24 months as the age at which children with an expressive vocabulary delay, or "late talkers," can be ascertained reliably. The prevalence of late talkers, defined as children who demonstrate limited expressive vocabulary in the face of otherwise typical development, ranges from 7% to 18% dependent on the vocabulary threshold used.[2] Although these difficulties may persist to the school-aged years, often resulting in a diagnosis of specific language impairment, ~70% to 80% of late talkers are able to compensate for this initial delay[3–5] and present with age-appropriate language skills by the time they enter school. Given the variability in the emergence of language and its poor predictive utility for onward management,[6] a "wait-and-see" strategy often is adopted with respect to initiating speech and language intervention.

Cross-sectional and prospective studies have provided support for a relationship between school-aged language impairment and the risk for a number of behavioral and emotional disturbances, including attention deficit hyperactivity disorder and internalizing problems.[7–11] Although investigations of children with less severe language problems, such as late-talking toddlers, have revealed less consistent findings,[12–14] there is evidence that expressive vocabulary delay at age 2 years is associated with broader temperamental difficulties, such as increased levels of shyness, fearfulness, and disruptive behaviors.[15–18] It remains unknown as to whether this (in most cases) transient language delay increases the risk for emotional and behavioral disturbances in later childhood or adolescence.

Obtaining an understanding of the longer-term neurodevelopmental profile of late talkers has both theoretical and practical implications. If late talkers are susceptible to behavioral and emotional disturbances in later life, irrespective of any improvement in language ability, it may suggest that expressive vocabulary delay and behavioral and emotional problems share a common (genetic or neurobiological) causal factor,[19] a theory for which there is currently little support. Furthermore, although the emerging empirical evidence suggests that later-talker status at age 2 years has poor predictive efficiency for later language impairment,[6] later-talker status may provide an important opportunity for intervention efforts to prevent the onset of later psychiatric difficulties. On the other hand, if late talkers are not at increased risk for behavioral and emotional disturbances at later time points, this would suggest that any difficult behaviors observed at age 2 years may be psychosocial consequences of the social adversity associated with limited communicative skills and that these resolve as their language skills achieve age-appropriate levels. Such a finding may provide support for a wait-and-see approach in public health systems with finite resources.

The current study provides the first prospective investigation of the behavioral and emotional development of late talkers up to the age of 17 years, using a well-defined population-based cohort of children in Perth, Western Australia.

PATIENTS AND METHODS

Cohort

Participants were part of the Western Australian Pregnancy Cohort (Raine) Study, which is a longitudinal study of pregnant women consecutively recruited from the public antenatal clinic at King Edward Memorial Hospital or surrounding private clinics in Perth (Australia) between May 1989 and November 1991 ($n = 2900$). The inclusion criteria were a gestational age between 16 and 20 weeks, English-language skills sufficient to understand the study demands, an expectation to deliver at King Edward Memorial Hospital, and an intention to remain in Western Australia to enable future follow-up of their child. Full details of the enrollment methods are included in Newnham et al.[20] From 2900 pregnancies recruited into the Raine Study, 2868 children were available for follow-up at birth. Participant recruitment and all follow-ups of the study families were approved by the human ethics committee at King Edward Memorial Hospital and/or Princess Margaret Hospital for Children in Perth. Parents provided written informed consent to participate at each follow-up. Children were reconsented at the 17-year follow-up for the use of these stored data.

Toddler Language

At the 2-year follow-up (mean age: 26 months) caregivers of 1623 children completed the Language Development Survey (LDS), a parent-reported measure of expressive vocabulary of children between the ages of 18 and 33 months.[2] The LDS listed 310 words arranged into 14 semantic categories (eg, food, animals, people, and vehicles). Parents were asked to circle each word the child uses spontaneously, allowing for minor errors in pronunciation. The LDS had high test-retest reliability (0.97–0.99),[2,13,21] high Cronbach's α internal consistency (0.99),[2] and strongly correlates with measures of direct child language assessment, including the Reynell Receptive and Expressive Language Scales,

the Mullen Scale of Early Language, and naturalistic language samples.[13,22]

Childhood Behavioral and Emotional Problems

The Child Behavior Checklist (CBCL), an empirically validated measure of child behavior by parent report, was used to measure child and adolescent behavior. The CBCL for ages 2 to 3 years (CBCL/2–3)[22] was used at the 2-year follow-up and the CBCL for ages 4 to 18 years (CBCL/4–18)[23] was administered at the 5-, 8-, 10-, 14-, and 17-year follow-ups. These measures contain a list of behavioral and emotional problem items (CBCL/2–3: $n = 99$; CBCL/4–18: $n = 118$) that parents rated as not true (0), somewhat or sometimes true (1), or very or often true (2) of their children. Both measures are widely used in the research literature and show good internal reliability and validity in a number of population settings.[24] A clinical calibration with Australian children demonstrated moderately high sensitivity (83% overall) and specificity (67% overall) to a clinical diagnosis and good test-retest reliability.[25] The 3-year predictive validity of the CBCL/2–3 for CBCL/4–18 outcomes across both genders is $r = 0.49$, indicating moderate predictive power (Achenbach et al[23]).

Both the CBCL/2–3 and CBCL/4–18 produced a raw score that was transformed into 3 summary *z* scores for (1) total behavior, (2) internalizing behavior, and (3) externalizing behavior. The *z* scores for total, internalizing, and externalizing behavior were used as continuous scores in this study, with higher scores reflecting more disturbed emotions and behaviors. The raw scores produced by the CBCL also were converted into *T* scores (standardized by age and gender) for total, internalizing, and externalizing behavior. The recommended clinical cutoff score ($T \geq 60$) was applied to the CBCL *T* scores to obtain 3 binary variables indicative of clinically significant total, internalizing, and externalizing problems.[24] By the term "clinically significant," we are referring to maladaptive behavior that falls within a defined clinical range for behavioral problems.[24]

Predictor Variable

Late-talking status was defined on the basis of LDS scores. Using the criterion recommended by Rescorla and Achenbach,[14] children with an LDS score at or below the 15th percentile for their age and gender were identified as having an expressive vocabulary delay (late talkers). To ensure that the language delay was not caused by a general developmental delay, we excluded from the investigation children who were reported by their parents and caregivers to not have achieved any of the 4 developmental milestones shown in the Appendix at age 2 years (assessed using the Infant Monitoring Questionnaire[26]). Children with hearing problems, who spoke a language other than English at home or who had received a diagnosis of a developmental or intellectual disability up to the 17-year follow-up, also were excluded from the investigation. On the basis of these criteria, there were 143 children in the late-talking group and 1280 children in the typical language group.

Covariates

A range of covariates known to have an effect on language development[1] as well as behavioral and emotional outcomes[27] also were considered. These variables included maternal sociodemographic information measured at 18 weeks' gestation, such as maternal age, maternal education, family income, and the presence of the biological father in the family home. The maternal experience of stressful events in pregnancy was measured at 18 and 34 weeks' gestation and were added together to produce a continuous variable representing the total number of events experienced.[27] Maternal smoking and alcohol intake at 18 weeks' gestation also were included in the analyses.

Sample Attrition

Previous analysis of the Raine Study cohort found that young mothers, single mothers, and those who experienced high levels of stress were less likely to remain in the study as follow-ups progressed.[28]

Statistical Analyses

The current study aimed to compare the behavioral and emotional development of late-talking and typically developing children. First, we investigated CBCL *z* scores at the 2-year follow-up, which was when late-talking status was determined. Two analyses were conducted investigating between-group differences in continuous CBCL *z* scores and the proportion of children reaching the clinical cutoff score. We then investigated the longer-term behavioral and emotional development of these children, measured at the 5-, 8-, 10-, 14-, and 17-year follow-ups. A linear regression model with a random intercept (random-effects model) was used to examine the ability of our predictor variable (late-talking status) to effect changes on the continuous CBCL *z* scores, and generalized estimating equations (a random-effect logistic regression model) were used to assess whether such changes in score reflected clinically meaningful differences in child behavioral problems. We used an unstructured working correlation matrix specification, which provided the best goodness of fit. For both models, the predictor variable was added first, followed by the inclusion of all the control variables (maternal age and education, maternal experience of

TABLE 1 Frequency Characteristics for Control Variables

Categorical Variable	*n*	Typical Language Group, ($N = 1280$)		Late-Talker Group, ($N = 143$)		*P*
		n	Mean (SD) or %	*n*	Mean (SD) or %	
Maternal age at conception, y	1391	1250	28.02	141	28.24 (6.12)	.67
Maternal life events during pregnancy, *n* events	1277	1145	2.15 (1.96)	132	2.28 (2.15)	.46
Proportion of optimal birth weight	1410	1268	97.76 (12.75)	142	97.18 (13.1)	.61
Apgar scores 5 min after birth	1391	1249	9 (0.72)	142	9.07 (0.67)	.28
Maternal education at pregnancy	1394					.37
Completed secondary school		543	43.4	56	39.4	
Did not complete secondary school		709	56.6	86	60.6	
Family income during pregnancy	1326					<.01
≥$24 000		872	73.2	75	55.6	
<$24 000		319	26.8	60	44.4	
Biological father living with family during pregnancy	1396					.74
Yes		1124	89.6	126	88.7	
No		130	10.4	16	11.3	
Smoking in pregnancy, cigarettes per d	1397					
0		956	76.2	108	76.1	.94
1–5		111	8.8	10	7	
6–10		76	6.1	9	6.3	
11–15		58	4.6	7	4.9	
16–20		36	2.9	6	4.2	
≥21		18	1.4	2	1.4	
Alcohol consumption during pregnancy, per wk	1397					
0		663	52.8	78	54.9	.05
≤1		320	25.5	37	26.1	
2–6		218	17.4	17	12	
7–10		38	3	4	2.8	
≥11		16	1.3	6	4.2	
Parity	1397					
0		637	50.8	45	31.7	<.01
≥1		618	59.2	97	68.3	

stress events, total family income, alcohol and smoking intake during pregnancy, presence of the biological father in the family home, proportion of optimal birth weight,[29] Apgar scores 5 minutes after birth, and parity). Two-way interaction effects were tested between the predictor variable and control variables, but there were no significant results; therefore, interactions were not included in either model.

RESULTS

Frequency characteristics for the predictor, outcome, and control variables are presented in Table 1. The proportion of late talkers in the current sample was 9.9% ($n = 143$). These children, who formed the late-talking group, were more likely to come from families with a household income below the level of qualification for government benefits (which was AUD$24 000 at the time of the participants' recruitment) and have 1 or more siblings at the time of birth compared with the remainder of the sample (typical language group).

Figure 1 presents the mean *z* scores for the 3 CBCL scales across the different time points, and Table 2 presents the proportion of children who scored above the clinical cutoff for CBCL morbidity. At the 2-year follow-up, independent-samples *t* tests found that late-talking children ($n = 142$) scored higher than control children ($n = 1245$) on the total difficulties (mean: 0.2; SD: 1.02 [late talkers] and mean: 0.01; SD: 0.95 [control children]; $P = .03$), the internalizing difficulties (mean: 0.29; SD: 1.16 [late talkers] and mean: −0.02; SD: 0.94 [control children]; $P < .01$), and the externalizing difficulties (mean: 0.19; SD: 1.00 [late talkers] and mean: 0.01; SD: 0.95 [control children]; $P = .04$) subscales. At this same age, χ^2 analyses found that proportionately more late-talking children scored above the morbidity cutoff on the internalizing subscale ($P = .04$), whereas there was a trend in the same direction for the externalizing subscale ($P = .05$).

We then investigated CBCL scores measured at the 5-, 8-, 10-, 14-, and 17-year follow-ups. CBCL *z* scores of late-talking children were compared with children with typical language in a linear regression model with a random intercept (Table 3). After adjusting for confounding variables, there was no significant effect of late talking on

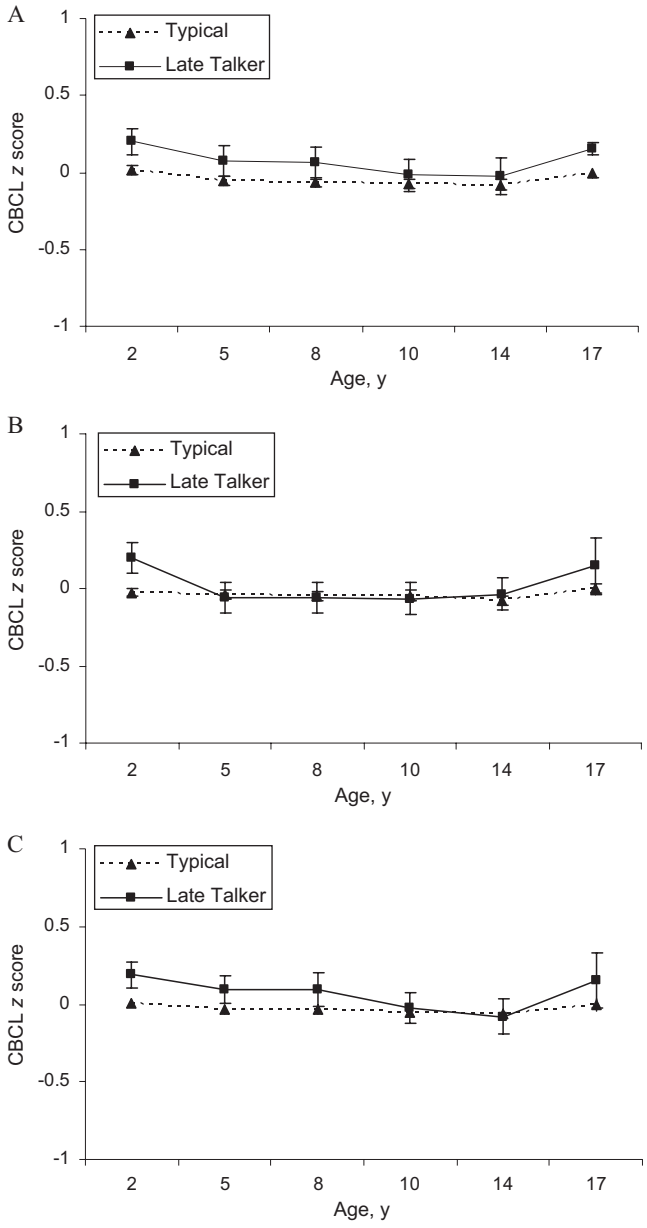

FIGURE 1

Line graphs showing CBCL *z* scores on the total (A) scale and the internalizing (B) and externalizing (C) subscales across childhood and adolescence for late-talking and typically developing children. Scores on each scale are based on a mean of 0 and an SD of 1; higher scores indicate greater levels of difficulty. Error bars represent 1 SE of the mean.

CBCL *z* scores for the total behavior ($P = .34$), internalizing behavior ($P = .98$), and externalizing behavior ($P = .65$) scales. Likewise, a generalized estimating equation model that adjusted for confounding variables (Table 4) revealed no between-groups difference in the proportion of children exceeding the clinical cutoff on the total behavior ($P = .5$), internalizing behavior ($P = .74$), and externalizing behavior ($P = .78$) scales.

DISCUSSION

The current study reports the first investigation of the long-term impact of isolated expressive vocabulary delay at the age of 2 years on behavioral and emotional functioning during childhood and adolescence in a community-based sample of children. At age 2 years, late-talking children were more likely to have clinically significant internalizing and externalizing difficulties. However, at 5 subsequent follow-up assessments to the age of 17 years, there was no difference between the late-talking and control groups on CBCL scores when examined as a continuous variable or when incorporating a cutoff for clinical levels of difficulty. Expressive vocabulary delay at age 2 years is not in itself a risk factor for later behavioral and emotional disturbances in childhood and adolescence.

Previous investigations of the behavioral and emotional profile of late-talking 2-year-old children have revealed mixed findings. In general, studies of samples recruited from health clinics have reported increased levels of shyness, fearfulness, and disruptive behaviors among late talkers,[15–18] whereas investigations of samples recruited from the general population have identified no difference in the behavioral or emotional development of late talkers relative to typically developing toddlers.[12–14] This pattern of findings may reflect an ascertainment bias of clinically recruited samples, in which late talkers with comorbid behavioral problems are more likely to receive a clinical referral as a result of the conspicuous nature of these disturbances.[30] It is intriguing that the findings from the current study of increased levels of externalizing and internalizing difficulties among 2-year-old children with expressive vocabulary delay contradict the null findings from studies of other community-based samples. One potential explanation for the discrepancy in findings may be the larger sample size provided by the Raine Study cohort (late talkers: $n = 143$; control toddlers: $n = 1280$) relative to the studies of Horwitz

TABLE 2 Behavioral Morbidity (CBCL *T* Score ≥ 60) at Each Follow-up According to Total Sample and Language Group

	n	Within Total Study Sample, *n* (%)	Within Typical Language Group, *n* (%)	Within Late-Talker Group, *n* (%)	*P*
CBCL year 2 morbidity	1387				
Total		161 (11.61)	139 (11.16)	22 (15.49)	.13
Internalizing		113 (8.15)	95 (7.63)	18 (12.68)	.04
Externalizing		190 (13.7)	163 (13.09)	27 (19.01)	.05
CBCL year 5 morbidity	1232				
Total		241 (19.56)	211 (19.01)	30 (24.59)	.14
Internalizing		212 (17.21)	192 (17.3)	20 (16.39)	.8
Externalizing		243 (19.72)	218 (19.64)	25 (20.49)	.82
CBCL year 8 morbidity	1178				
Total		210 (17.83)	186 (17.51)	24 (20.69)	.4
Internalizing		218 (18.51)	197 (18.55)	21 (18.1)	.91
Externalizing		206 (17.49)	184 (17.33)	22 (18.97)	.66
CBCL year 10 morbidity	1159				
Total		155 (13.37)	139 (13.3)	16 (14.04)	.84
Internalizing		180 (15.53)	164 (15.69)	16 (14.04)	.64
Externalizing		124 (10.7)	110 (10.53)	14 (12.28)	.57
CBCL year 14 morbidity	1019				
Total		121 (11.87)	111 (12.04)	10 (10.31)	.62
Internalizing		115 (11.29)	103 (11.17)	12 (12.37)	.72
Externalizing		137 (13.44)	125 (13.56)	12 (12.37)	.75
CBCL year 17 morbidity	826				
Total		65 (7.87)	56 (7.52)	9 (11.11)	.25
Internalizing		78 (9.44)	68 (9.13)	10 (12.35)	.35
Externalizing		74 (8.96)	67 (8.99)	7 (8.64)	.92

TABLE 3 Random-Effects Model Showing Relationship Between Late-Talking and CBCL *z* Scores Between the Ages of 5 and 17 Years

	Unadjusted Analysis			Adjusted Analysis		
	Estimate of Effects	95% Confidence Interval	*P*	Estimate of Effects	95% Confidence Interval	*P*
Total behavior	0.11	−0.05 to 0.27	.19	0.09	−0.1 to 0.29	.34
Internalizing behavior	0.04	−0.11 to 0.19	.62	<0.01	−0.19 to 0.19	.98
Externalizing behavior	0.08	−0.08 to 0.24	.33	0.05	−0.15 to 0.24	.65

TABLE 4 Generalized Estimating Equation Model Showing the Relationship Between Late-Talking Status at Age 2 Years and CBCL Morbidity (*T* Score ≥ 60) Between the Ages of 5 and 17 Years

	Unadjusted Analysis			Adjusted Analysis		
	Odds Ratio	95% Confidence Interval	*P*	Odds Ratio	95% Confidence Interval	*P*
Total behavior	1.15	0.74–1.78	.54	1.18	0.72–1.94	.5
Internalizing behavior	0.99	0.64–1.53	.95	1.08	0.67–1.75	.74
Externalizing behavior	1.08	0.69–1.7	.74	0.93	0.56–1.55	.78

et al[12] (late talkers: $n = 47$ at age 24–29 months; control toddlers: $n = 269$), Rescorla and Alley[13] ($n = 41$; control toddlers: $n = 381$), and Rescorla and Achenbach[14] (late talkers: $n = 25$; control toddlers: $n = 147$). For example, 6 of 25 late talkers in the study by Rescorla and Achenbach[14] exceeded the criterion for clinical levels of behavioral difficulties on the CBCL, compared with 27 of 120 typically developing toddlers. The effect size for this difference, 0.05 (Cramer's ϕ), is comparable with those for the between-group differences in children exceeding the clinical cutoff on the internalizing (0.06) and externalizing (0.05) scales in the current study (Table 2). The increased statistical power generated by the substantially larger sample size increased the chances of the current study, identifying a statistically significant effect.

The findings from our longitudinal study also may provide insights into the etiology of the widely observed relationship between language impairment and psychiatric difficulties.[7–11] Two prevailing hypotheses for this association are that behavioral and emotional disturbances arise as a consequence of social difficulties experi-

enced by those with language delay or that these problems share a common (genetic or neurobiological) causal factor. In the current study, it is pertinent that the only age at which the late-talking group was reported to show increased levels of internalizing and externalizing difficulties (age 2 years) also was the age at which the language status of the cohort was determined. There is now a large quantity of empirical evidence that the majority (between 70% and 80%) of 2-year-old children with isolated expressive vocabulary delay present with age-appropriate skills at age 4 to 5 years.[31] Although this developmental pattern cannot be definitively confirmed in the current study, the initial recruitment procedure for the Raine Study (consecutively enrolling pregnant women presenting to community-based antenatal) is known to have established an original cohort that is highly representative of the general population,[20] and therefore we may expect similar levels of language "recovery" to have occurred in the current sample. In support of this view, it is notable that the Raine Study cohort has been found to be representative of the broader Australian population in terms of motor competence,[32] behavioral development,[27] and educational outcomes.[33] The findings from the current study seem to support a causal pathway in which the behavioral and emotional problems identified at age 2 years are attributed to the psychosocial difficulties (eg, frustration) of not being able to communicate effectively[34] and that these problematic behaviors are ameliorated as language skills improve with age. Additional evidence for this position comes from the laboratory observations of Caulfield et al,[15] who found no behavioral differences between late talkers and typically developing control children when they participated in a simple pointing task (which both groups were able to complete) but significantly more tantrums from the late-talking children when they participated in a naming task (which was difficult for them but not for the typical language group). Other population-based cohorts with data on both language and behavioral and emotional development throughout childhood and adolescence[6] will provide a comprehensive test of this hypothesis.

The prospective study design and large community sample were clear strengths of the current study, generating adequate statistical power to investigate the relationship between early language development and later behavioral and emotional functioning. Additional strengths of the study design were the ability to control for potentially confounding variables on this association, as well as the use of the same assessment of behavioral and emotional functioning at 6 different time points to the age of 17 years, both of which limited measurement error. However, the Raine Study did not include a comprehensive measure of receptive language ability at age 2 years, and therefore we were unable to determine whether the delay in the late-talking group was limited to expressive language development. Furthermore, it is possible that sample attrition may have affected the current results. Behavioral and emotional disturbances are known to be particularly prevalent among socially disadvantaged groups,[35] and sample attrition among the Raine Study cohort has been more common among these families.[28] However, a recent article from a similar cohort[36] found that although attrition in longitudinal cohort studies is likely to be nonrandom, this attrition did not invalidate regression models used to predict behavioral disorders. Although we would expect the selective attrition of children with behavioral and emotional problems to affect both groups, it is possible this had greater influence on the late-talking group, given that these children were more likely to be from socially disadvantaged families.

The current study identified late talkers using the gold-standard technique of parent-report of expressive vocabulary at age 2 years. However, this methodology did not allow us to identify children with more specific language phenotypes, such as those with social communication difficulties, who may be more prone to persisting behavioral and emotional difficulties.[37] Future studies that include a more fine-grained analysis of language abilities at age 2 years will build on the research reported in the current study.

CONCLUSIONS

Using a large, population-based cohort, the current study found that children with expressive language delay at age 2 years are at no more risk for behavioral and emotional problems during childhood and adolescence than typically developing children. Although these findings support a wait-and-see approach to behavioral and speech and language intervention among late talkers with otherwise normal development, it is important to highlight the considerable evidence linking persisting language impairment and psychiatric difficulties.[38] Clinicians need to be cognizant of the broader implications of poor language development to promote better outcomes for these children.

ACKNOWLEDGMENTS

We acknowledge the National Health and Medical Research Council (NHMRC) for their long-term contribution to funding the study over the last 20 years. Core management of the Raine Study has been funded by the University of Western Australia (UWA); the UWA Faculty of Medicine, Dentistry, and Health Sciences; the

Raine Medical Research Foundation; the Telethon Institute for Child Health Research; and the Women's and Infants Research Foundation. The 2-year follow-up was funded by the NHMRC and the Raine Medical Research Foundation. Associate Professor Whitehouse is funded by a Career Development Fellowship from the NHMRC (1004065).

We are extremely grateful to the study participants and their families as well as the Raine Study team for cohort coordination and data collection.

REFERENCES

1. Zubrick SR, Taylor CL, Rice ML, Slegers DW. Late language emergence at 24 months: an epidemiological study of prevalence, predictors, and covariates. *J Speech Lang Hear R*. 2007;50(6):1562–1592
2. Rescorla L. The Language-Development Survey: a screening tool for delayed language in toddlers. *J Speech Hear Disord*. 1989;54(4):587–599
3. Dale PS, Price TS, Bishop DVM, Plomin R. Outcomes of early language delay: I. predicting persistent and transient language difficulties at 3 and 4 years. *J Speech Lang Hear Res*. 2003;46(3):544–560
4. Paul R, Hernandez R, Taylor L, Johnson K. Narrative development in late talkers: early school age. *J Speech Hear Res*. 1996;39(6):1295–1303
5. Rescorla L, Roberts J, Dahlsgaard K. Late talkers at 2: outcome at age 3. *J Speech Lang Hear Res*. 1997;40(3):556–566
6. Rice ML, Taylor CL, Zubrick SR. Language outcomes of 7-year-old children with or without a history of late language emergence at 24 months. *J Speech Lang Hear Res*. 2008;51(2):394–407
7. Beitchman JH, Brownlie EB, Inglis A, et al. Seven-year follow-up of speech/language impaired and control children: psychiatric outcome. *J Child Psychol Psychiatry*. 1996;37(8):961–970
8. Clegg J, Hollis C, Mawhood L, Rutter M. Developmental language disorders a follow-up in later adult life: cognitive, language and psychosocial outcomes. *J Child Psychol Psychiatry*. 2005;46(2):128–149
9. Benasich AA, Curtiss S, Tallal P. Language, learning, and behavioral disturbances in childhood: a longitudinal perspective. *J Am Acad Child Psychiatry*. 1993;32(3):585–594
10. Snowling MJ, Bishop D, Stothard SE, Chipchase B, Kaplan C. Psychosocial outcomes at 15 years of children with a preschool history of speech-language impairment. *J Child Psychol Psychiatry*. 2006;47(8):759–765
11. Whitehouse AJO, Watt HJ, Line EA, Bishop DVM. Adult psychosocial outcomes of children with specific language impairment, pragmatic language impairment and autism. *Int J Lang Commun Disord*. 2009;44(4):511–528
12. Horwitz SM, Irwin JR, Briggs-Gowan MJ, Bosson Heenan JM, Mendoza J, Carter AS. Language delay in a community cohort of young children. *J Am Acad Child Psychiatry*. 2003;42(8):932–940
13. Rescorla L, Alley A. Validation of the language development survey (LDS): a parent report tool for identifying language delay in toddlers. *J Speech Lang Hear Res*. 2001;44(2):434–445
14. Rescorla L, Achenbach TM. Use of the Language Development Survey (LDS) in a national probability sample of children 18 to 35 months old. *J Speech Lang Hear Res*. 2002;45(4):733–743
15. Caulfield MB, Fischel JE, Debaryshe BD, Whitehurst GJ. Behavioural correlates of developmental expressive language disorder. *J Abnorm Child Psychol*. 1989;17(2):187–201
16. Irwin JR, Carter AS, Briggs-Gowan MJ. The social-emotional development of "late-talking" toddlers. *J Am Acad Child Psychiatry*. 2002;41(11):1324–1332
17. Paul R, James DF. Language delay and parental perceptions. *J Am Acad Child Psychiatry*. 1990;29(4):669–670
18. Ross G, Weinberg S. Is there a relationship between language delays and behaviour and socialization problems in toddlers? *J Early Child Infant Psychol*. 2006;2(1):101–116
19. Beitchman JH, Inglis A. The continuum of linguistic dysfunction from pervasive developmental disorder to dyslexia. *Psychiatry Clin N Am*. 1991;14(1):95–111
20. Newnham JP, Evans SF, Michael CA, Stanley FJ, Landau LI. Effects of frequent ultrasound during pregnancy: a randomised controlled trial. *Lancet*. 1993;342(8876):887–891
21. Patterson JL. Expressive vocabulary development and word combinations of Spanish-English bilingual toddlers. *Am J Speech Lang Pathol*. 1998;7(4):46–56
22. Klee T, Carson DK, Gavin WJ, Hall L, Kent A, Reece S. Concurrent and predictive validity of an early language screening program. *J Speech Lang Hear Res*. 1998;41(3):627–641
23. Achenbach TM, Edelbrock C, Howell CT. Empirically based assessment of thebehavioural/emotional problems of 2- and 3-year-old children. *J Abnorm Child Psychol*. 1987;15(4):629–650
24. Achenbach TM. *Manual for the Child Behavior Checklist/4–18 and 1991 Profile*. Burlington, VT: University of Vermont, Department of Psychiatry; 1991
25. Zubrick S, Silburn S, Gurrin L, et al. *Western Australian Child Health Survey: Education, Health and Competence*. Perth, Western Australia: Australian Bureau of Statistics and the Telethon Institute for Child Health Research; 1997
26. Bricker D, Squires J. The effectiveness of parental screening of at-risk infants: the Infant Monitoring Questionnaires. *Top Early Child Spec Educ*. 1989;9(3):67–85
27. Robinson M, Oddy WH, Li J, et al. Pre- and postnatal influences on preschool mental health: A large-scale cohort study. *J Child Psychol Psychiatry*. 2008;49(10):1118–1128
28. Whitehouse AJO, Zubrick SR, Ang QW, Stanley FJ, Pennell CE. Maternal life events during pregnancy and offspring language ability in middle childhood: the Western Australian Pregnancy Cohort Study. *Early Hum Dev*. 2010;86(8):487–492
29. Blair E, Liu Y, de Klerk N, Lawrence D. Optimal fetal growth for the Caucasian singleton and assessment of appropriateness of fetal growth: an analysis of a total population perinatal database. *BMC Pediatr*. 2005;5(1):13
30. Whitehouse AJO. Is there a sex ratio difference in the familial aggregation of specific language impairment? A meta-analysis. *J Speech Lang Hear Res*. 2010;53(4):1015–1025
31. Ellis EM, Thal DJ. Early language delay and risk for language impairment. *Perspect Lang Learn Ed*. 2008;15(3):93–100
32. Hands B, Larkin D, Parker H, Straker L, Perry M. The relationship among physical activity, motor competence and health-related fitness in 14-year-old adolescents. *Scand J Med Sci Sports*. 2009;19(5):655–663
33. Oddy WH, Li J, Whitehouse AJO, Zubrick SR, Malacova E. Breastfeeding duration and academic achievement in a cohort of children at ten years of age. *Pediatrics*. 2011;127(1). Available at: www.pediatrics.org/cgi/content/full/127/1/e137

34. Paul R, Kellogg L. Temperament in late talkers. *J Child Psychol Psychiatry*. 1997;38(7):803–811
35. Robins LN. Sturdy childhood predictors of adult antisocial behaviour: replications from longitudinal studies. *Psychol Med*. 1978;8(4):611–622
36. Wolke D, Waylen A, Samara M, et al. Selective drop-out in longitudinal studies and non-biased prediction of behaviour disorders. *Br J Psychiatry*. 2009;195(3):249–256
37. Mackie L, Law J. Pragmatic language and the child with emotional/behavioural difficulties (EBD): a pilot study exploring the interaction between behaviour and communication disability. *Int J Lang Commun Disord*. 2009;45(4):397–410
38. Sundheim S, Voeller KKS. Psychiatric implications of language disorders and learning disabilities: risks and management. *J Child Neurol*. 2004;19(10):814–826

APPENDIX Exclusion Criteria

Gross motor	Does your child run well, being able to stop himself without running into things or falling?
Fine motor	Does your child use a turning motion with his hand while trying either to turn doorknobs, wind-up toys, twist tops, open or unscrew lids of small jars?
Adaptive	When you line up four blocks, does your child try to copy you by lining up at least two blocks side-by-side?
Personal/social	Does your child copy the things you do around the house, such as sweeping, dusting, hammering nails etc?

Any child whose parent(s) responded "no" to any of these questions was excluded from investigation. Questions were from the Infant Monitoring Questionnaire.[26]

Late Talking and the Risk for Psychosocial Problems During Childhood and Adolescence

Andrew J. O. Whitehouse, Monique Robinson and Stephen R. Zubrick

Pediatrics 2011;128;e324
DOI: 10.1542/peds.2010-2782 originally published online July 4, 2011;

PEDIATRICS®
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Late Talking and the Risk for Psychosocial Problems During Childhood and Adolescence

Andrew J. O. Whitehouse, Monique Robinson and Stephen R. Zubrick

Pediatrics 2011;128;e324
DOI: 10.1542/peds.2010-2782 originally published online July 4, 2011;