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Research Article

Children With Persistent Versus Transient Early Language Delay: Language, Academic, and Psychosocial Outcomes in Elementary School

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Purpose: The objective of this study was to compare children with persistent versus transient preschool language delay on language, academic, and psychosocial outcomes in elementary school.
Method: Children with persistent language delay (n = 30), transient language delay (n = 29), and no language delay (controls; n = 163) were identified from a population-based sample of twins. They were compared on language skills, academic achievement, and psychosocial adjustment in kindergarten and Grades 1, 3, 4, and 6.
Results: Children with persistent language delay continued to show language difficulties throughout elementary school. Furthermore, they had academic difficulties, in numeracy, and psychosocial difficulties (attention-deficit/hyperactivity disorder behaviors, externalizing behaviors, peer difficulties) from Grade 1 to Grade 6. Children with transient language delay did not differ from controls on language and academic performance. However, they showed more externalizing behaviors in kindergarten and peer difficulties in Grade 1 than controls.
Conclusion: Difficulties at school age are widespread and enduring in those with persistent early language delay but appear specific to psychosocial adjustment in those with transient language delay.

Language skills are central to children's development in promoting school readiness and learning vital to school achievement (Bleses et al., 2016; Dionne et al., 2013; Hoff, 2014; Krajewski & Schneider, 2009; Lefevre et al., 2010), as well as self-regulation of emotions (Kopp, 1989), behaviors (Dionne, 2005, Dionne et al., 2003; Girard et al., 2014), and social interactions (Rice, 1993). Therefore, children with language problems may be at risk of difficulties not only in language development but also in academic achievement and psychosocial adjustment at school age. Previous studies on children with language problems included children with language delay (when children acquire language more slowly than other children their age) and/or developmental language disorder (DLD; a profile of language problems that causes functional impairment in everyday life and that is associated with poor prognosis, with no known biomedical etiology; Bishop et al., 2017). In this article, the term *language problems* is thus used when samples included children with language delay and/or DLD. The current study does not focus on children with DLD (nor on children whose language delay was first identified by the end of the preschool years or the beginning of the school years, i.e., late-emerging language delay) but rather on children with early language delay in toddlerhood.

Toddlers with early language delay may follow two distinct language trajectories (Dale et al., 2003; Henrichs et al.,

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2011; Law et al., 2000; Rescorla & Dale, 2013; Zambrana et al., 2014). Studies show that roughly half of these children catch up to children with typical language development by the end of their preschool years (transient language delay) whereas the other half have persistent language delay—some of which may qualify as having DLD (Caglar-Ryeng et al., 2020; Law et al., 2000; Rescorla & Dale, 2013). Though many studies have shown that children with early language delay may have difficulties at school age, it remains controversial as to whether they differ for persistent versus transient language delay. The objective of this study was to compare language, academic, and psychosocial outcomes of children with early language delay at 18 months as a function of early language delay persistence at 5 years of age. Persistence of early language delay is typically identified before children enter school (a period of transition in child and language development), by the end of the preschool years (i.e., 4–5 years of age; Rescorla & Dale, 2013), when children have accomplished the basics of language development (Hoff, 2014). Identification of early language delay at 18 months is earlier than in most previous studies (Paul et al., 1996; Rescorla & Dale, 2013); nonetheless, it was shown that parents express worries about their child's language development even before the age of 2 years (Rescorla & Dale, 2013; Shevell, Majnemer, Webster et al., 2005). In addition, early identification offers the opportunity to provide early interventions that improve prognosis (Dale & Patterson, 2010; Paul & Roth, 2011).

Language Development in Children With Early Language Delay

Rescorla (2009) proposed a "language endowment spectrum," ranging from children with typical language development to children with transient early language delay, to those with persistent language delay, and to children with DLD. According to this dimensional account of early language delay, differences between children are quantitative rather than qualitative. This account was supported by numerous studies (Ellis Weismer, 2007; Rescorla & Dale, 2013). Indeed, children with persistent language delay typically display a broad range of language difficulties at school age, whereas children with transient language delay have few or no residual language difficulties (Bishop & Adams, 1990; Dale et al., 2014; Paul et al., 1996, 1997; Stothard et al., 1998). For instance, Bishop and Adams (1990) and Stothard et al. (1998) found that children with persistent expressive or receptive language problems between 4 and 5.5 years of age had a range of language difficulties in vocabulary and morphosyntax at ages 8 and 15 years, respectively. Similarly, Paul et al. (1996, 1997) identified various language difficulties in children with expressive language delay at 2 years of age and persistent language problems at ages 6, 7, and/or 8 years. In contrast, Dale et al. (2014) observed that children with transient expressive language delay between 2 and 4 years of age had similar language scores than controls at 7 and 12 years of age. Others did find residual language difficulties in children with transient LD. Indeed, difficulties were found in morphosyntax at 8 years of age in children referred for expressive or receptive language problems at 4 years of age (Bishop & Adams, 1990), and in narrative skills at ages 6 and 7 years in children with expressive language delay at 2 years of age (Paul et al., 1996). Consequently, it still remains unclear if the recovery of children with transient language delay is only illusory (Dale et al., 2014).

Academic Outcomes in Children With Early Language Delay

Studies have documented academic difficulties in literacy domains (reading, writing, and spelling) in children with early language delay (Hawa & Spanoudis, 2014; Larney, 2002; Paul & Roth, 2011; Preston et al., 2010; Rescorla, 2002), as well as early language problems in children who end up having dyslexia (Bishop & Snowling, 2004; Nash et al., 2013). The role of language in mathematics may seem less obvious than in literacy domains, though language and mathematic skills share neurobiological and cognitive bases, such as working memory and executive functions (Cragg & Gilmore, 2014). Furthermore, recent studies have shown that early language skills predict later mathematics achievement (Bleses et al., 2016; Krajewski & Schneider, 2009; Lefevre et al., 2010; von Stumm et al., 2020).

Although children with early language delay show poorer overall reading, writing, spelling, and mathematic skills than controls in elementary school (Beitchman, Wilson, et al., 1996; Hawa & Spanoudis, 2014; Justice et al., 2009; Larney, 2002; Paul & Roth, 2011; Preston et al., 2010; Rescorla, 2002), it is unclear whether children with persistent delay have more difficulties than those with transient delay. A few studies point to differing trajectories in academic achievement as a function of language delay persistence. Indeed, the literacy and numeracy skills of children with transient language delay do not appear to be affected during their elementary school years (Bishop & Adams, 1990; Dale et al., 2014; Paul et al., 1997). Dale et al. (2014) even found that children with transient expressive language delay between the ages of 2 and 4 years had slightly better reading skills at ages 7 and 12 years than children without early language delay; however, differences were not significant. Results are less clear for children with persistent language delay. Bishop and Adams (1990) found that children with persistent expressive or receptive language problems between the ages of 4 and 5.5 years had weaker reading skills than controls but similar spelling skills at 8 years of age. However, in another study of children with expressive language delay at 2 years of age and persistent language problems at 8 years of age, Paul et al. (1997) found that their reading and spelling skills at 8 years of age were similar to controls and children with transient language delay, but that their mathematic skills were poorer (Paul et al., 1997). Thus, literacy outcomes for children with persistent expressive language delay may be better than those for children with persistent expressive/receptive language delay. Paul et al. (1997) were the only ones who examined mathematical achievement in children with transient and persistent language delay. No study has

compared academic achievement in children with transient and persistent language delay beyond the age of 8 years.

Psychosocial Adjustment Outcomes in Children With Early Language Delay

Coping with and regulating emotions and behaviors during elementary school is necessary for children to develop healthy relationships with their classmates and to benefit from learning opportunities in school. However, language delay may impact such self-regulation skills (Dionne, 2005; Dionne et al., 2003; Girard et al., 2014; Kopp, 1989; St Clair et al., 2019). Poor self-regulation skills are associated with internalizing symptoms, such as anxiety and depression (Aldao et al., 2010), and externalizing behaviors, such as aggression (Dionne, 2005; Dionne et al., 2003; Girard et al., 2014); these in turn can cause social difficulties (Rice, 1993). Moreover, language problems are often associated with attention-deficit/hyperactivity disorder (ADHD) behaviors (Craig et al., 2016; Sciberras et al., 2014; Webster & Shevell, 2004). Internalizing, externalizing, and ADHD behaviors and social difficulties are common in children with early language delay in elementary school (Benasich et al., 1993; Curtis et al., 2018; Redmond & Rice, 1998, 2002; Shevell, Majnemer, Platt, et al., 2005; Shevell, Majnemer, Webster, et al., 2005; Toseeb & St Clair, 2020; Yew & O'Kearney, 2013) and during adolescence (Aram et al., 1984; Beitchman, Brownlie, et al., 1996; Curtis et al., 2018; Yew & O'Kearney, 2013). Conversely, Whitehouse et al. (2011) found no differences in internalizing and externalizing behaviors between 2-year-olds with expressive language delay and controls at ages 5, 8, 10, 14, and 17 years.

It is unclear whether psychosocial difficulties vary according to language delay persistence. Three different pictures emerged in three studies. Snowling et al. (2006) have shown that children with persistent expressive or receptive language problems at ages 4 and 5.5 years, but not those whose language problems resolved, had more parent-reported ADHD behaviors than controls at ages 15–16 years. However, groups did not differ on rates of psychiatric disorders (e.g., ADHD, conduct disorder, general anxiety disorder, dysthymia) based on psychiatric interview conducted with the child at the same age (Snowling et al., 2006). Beitchman, Brownlie, et al. (1996) found that 42%–43% of children with early persistent or transient expressive/receptive language problems between the ages of 5 and 12 years had at least one psychiatric disorder (e.g., ADHD, conduct disorder, anxiety disorder or depression) at 12 years of age. By contrast, McGrath et al. (2008) reported that children with transient speech sound disorder between the ages of 4 and 7 years had more parent-reported inattention behaviors at 7 years of age than children with persistent disorder.

In summary, children with early language delay appear to be at a higher risk of long-term difficulties in language, academic achievement, and psychosocial adjustment. However, it is unclear whether these differ for persistent versus transient early language delay. Difficulties in language seem to remain a problem, especially in children with persistent early language delay, but few studies have addressed differences in academic and psychosocial adjustment as a function of persistence. No unique study has documented all three types of outcomes. In light of the above, the objective of this study is to compare children with persistent or transient expressive/receptive language delay between 18 months and 5 years of age on their language, academic, and psychosocial outcomes in kindergarten and Grades 1, 3, 4, and 6.

Method

Participants

The Québec Newborn Twin Study

Data came from the Québec Newborn Twin Study (QNTS; Boivin et al., 2012), a prospective longitudinal follow-up of a population-based birth cohort of twins born between November 1995 and July 1998 in the greater Montréal area, Québec, Canada (662 families). The study conducted quasi-annual assessment of cognitive, behavioral, and social-emotional development. To be included in the QNTS, children had to be born without any major medical conditions, have available birth data, and have one parent fluent in either French or English. Attrition averaged 3% per year (Boivin et al., 2012). The family characteristics of the QNTS are very similar to those of a parallel representative sample of singletons (Boivin et al., 2012). Twin cohorts are typically used to quantify the genetic and environmental etiology of phenotypes; however, given the extent of the longitudinal data they typically collect, they are also used as convenience samples to address developmental issues (Dale et al., 2014, 2003; Oliver & Plomin, 2007), as is the case here.

The Current Study

The current study used a subsample of children from the QNTS. Before selecting the subsample, all dependent variable scores were *Z*-standardized within the QNTS sample. To be included in the current study, children had to have expressive and receptive vocabulary scores at 18 months of age and to have expressive and receptive vocabulary scores at 5 years of age (see the description of the vocabulary measures below). Since French was the first language for 96.1% of children (3.2% were English speakers and 0.7% were bilinguals), bilinguals and English speakers were excluded. A total of 564 children (49.1% boys, 56.7% dizygotic twins) met inclusion criteria. Their mean birth weight was 2.5 kg, and their mean 5-min Apgar score was 9. Average family income was CND 40,000–50,000/year. Mothers' mean age at birth was 30.2 years, 15.3% had no high school diploma, and 6.3% were single mothers.

Measures

Identification of Early Language Delay and Persistence

Among the 564 children included in the study, we first identified children with early language delay at 18 months of age and then divided them up into persistent versus transient language delay groups, based on the presence or absence of language delay at 5 years of age. To identify early language

delay at 18 months of age, expressive and receptive vocabularies were assessed with a French in-house checklist of 77 words drawn or adapted from the MacArthur Communicative Development Inventories (Fenson et al., 1994, 1993) and lists used in clinical settings in French Canadian populations (the French Canadian adaptation of the MacArthur Communicative Development Inventories was not yet available). Parents checked words the child could say (expressive vocabulary) and words the child could say or understand (receptive vocabulary). Expressive and receptive scores were corrected for age and gestational age and averaged ($r = .55$, $p < .01$) to yield a total vocabulary score at 18 months of age. Vocabulary checklists are extensively used to identify early language delay in research and clinical settings (Dale et al., 2014; Dionne et al., 2011; Ghassabian et al., 2014; Horwitz et al., 2003). Moreover, vocabulary checklists completed by parents have high internal consistency and show good concurrent validity with other language measures (Feldman et al., 2005; Fenson et al., 1994, 1993).

To identify language delay persistence at 5 years of age, the French Canadian version of the Peabody Picture Vocabulary Test (PPVT; Dunn & Dunn, 1997; Dunn et al., 1993) was used. The PPVT is a standardized language test that is widely used and displays good internal consistency (Dunn & Dunn, 1997; Dunn et al., 1993). In this study, the administration of the test was adapted, based on the Developmental Indicators for the Assessment of Learning (Mardell & Goldenberg, 1998) procedure, to assess both expressive and receptive vocabularies. In the expressive task, children were asked to name an illustrated noun, verb, or adjective until they reached the stop criterion (six failed items within the last eight). In the receptive task, children were asked to choose from four illustrations the one best representing a word they had failed to name in the expressive task until the stop criterion was reached. This procedure had been used previously by Malenfant et al. (2012) and shown to provide reliable expressive and receptive scores. Expressive and receptive scores were corrected for age and prematurity and then averaged ($r = .72$, $p < .01$) to yield a total vocabulary score at 5 years of age.

Early language delay at 18 months of age was defined as a total vocabulary score of ≤ 15th percentile based on the whole QNTS sample (Dionne et al., 2011; Ghassabian et al., 2014; Henrichs et al., 2013, 2011; Rescorla & Achenbach, 2002). To maximize group sizes, language delay at 5 years of age was defined as a total vocabulary score of ≤ 25th percentile based on the whole QNTS sample. Figure 1 shows the sample's language distribution and the creation of subgroups. A total of 67 children had early language delay at 18 months: 30 (18 girls, 12 boys) had a delay at 5 years of age (persistent language delay group), 29 (nine girls, 20 boys) did not (transient language delay group), and eight had scores of ≥ 75th percentile and were excluded from the transient language delay group to avoid overamplifying between group differences. A total of 293 children had a vocabulary score within the population mean (i.e., 25th–75th percentiles) at 18 months of age. Among them, 163 (77 girls, 86 boys) still had a score within the population mean at 5 years of age and comprised the control group. Table 1 shows the three groups' (persistent language delay, transient language delay, controls) language scores at ages 18 months and 5 years, as well as p values of t tests comparing groups.

The three groups were not different for family income, mother's mean age at birth, marital status, children's sex, zygosity, birth weight, 5-min Apgar score, and nonverbal IQ at 5 years of age, assessed with the Block Design subtest of the Wechsler Intelligence Scale for Children (WISC-III; Wechsler, 1991). However, groups differed on the proportion of mothers not having a high school diploma (10% of mothers did not have a high school diploma for persistent language delay, 20.7% for transient language delay, and 12.7% for controls, $p = .012$), so mother's education was entered as a covariate (see the Statistical Analyses section).

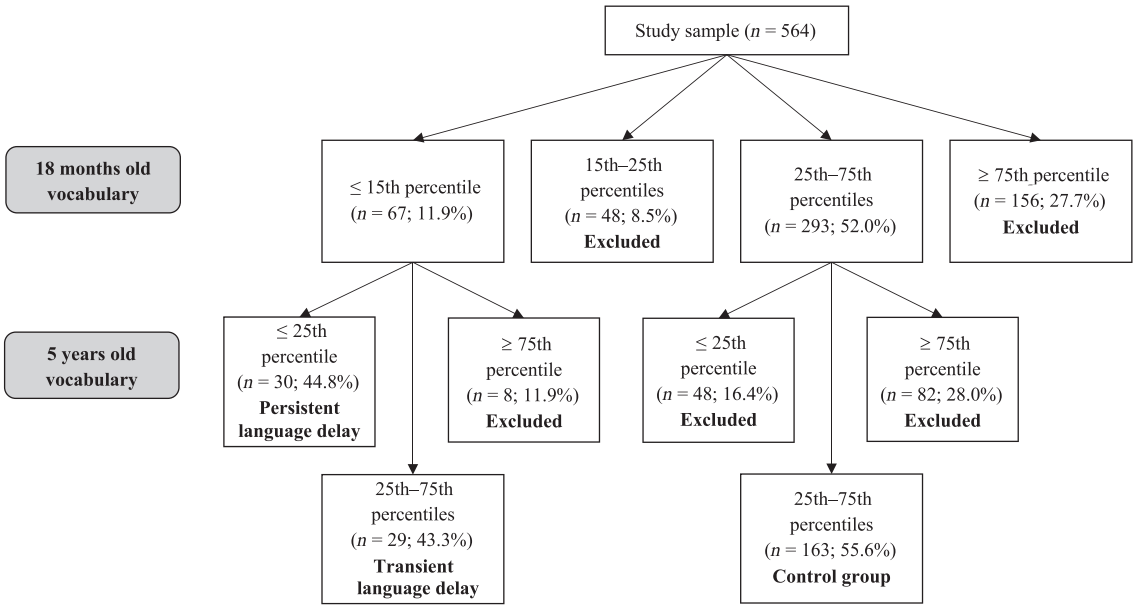
School-Age Outcomes

Language. Vocabulary was assessed in Grade 1 by a research assistant at school with the standard French Canadian version of the PPVT (the assistant asked the child to choose the illustration from a set of four that best represented a particular word given until the stop criterion was reached; Dunn & Dunn, 1997; Dunn et al., 1993) and the Vocabulary subtest of the WISC-III (Wechsler, 1991). For the Vocabulary subtest of the WISC-III, the assistant asked the child to define words (rated 0–2 based on the accuracy of the definition) from a list of 25 until the stop criterion was reached (four consecutive scores of 0). Both tests have well-documented psychometric properties (Dunn & Dunn, 1997; Dunn et al., 1993; Wechsler, 1991) and are extensively used in clinical and research settings. PPVT and WISC-III Vocabulary subtest scores were averaged ($r = .54$, $p < .01$) to provide a total vocabulary score in Grade 1. Outliers of < 1st percentile ($n = 5$) were winsorized (i.e., replaced with the next lowest score).

Expressive morphosyntax was assessed in Grade 1 with mean length of utterance (MLU; total words/total utterances) and clause density (dependent and independent clauses/independent clauses) derived from child answers on the WISC-III Vocabulary subtest. Answers were recorded and then transcribed to calculate MLU and clause density. This way of calculating MLU and clause density had been used previously and shown to be valid by Mimeau et al. (2015). MLU and clause density scores were averaged ($r = .69$, $p < .01$) to yield an expressive morphosyntax score in Grade 1. Outliers of > 99th percentile ($n = 5$) were winsorized.

Oral communication was assessed by teachers in kindergarten and Grade 1 with six items (uses correct grammar, able to relate a factual event, communicates well with others, articulates clearly, able to tell a story, able to communicate their needs) from the Early Development Instrument (Janus & Offord, 2007) on a 5-point scale (1 = *very poor* to 5 = *excellent*). Oral communication was assessed by teachers in Grades 4 and 6 using one item ("How would you rate this child's current academic achievement in oral expression?") on a 5-point scale (1 = *greatly under average* to 5 = *greatly above average*). Scores in kindergarten and Grades 1, 4, and

Figure 1. Sample's language distribution and creation of subgroups.



6 were averaged to provide an oral communication score in elementary school (α = .94).

Academic achievement. In Grades 1 and 3, teachers rated reading, writing, and mathematical achievement on a 5-point scale (1 = *greatly under average* to 5 = *greatly above average*) using one item ("How would you rate this child's current academic achievement in …"). In Grades 4 and 6, teachers rated oral reading, reading comprehension, writing, calculation, and mathematical problem-solving on the same 5-point scale using the same item. Reading and writing scores in Grades 1, 3, 4, and 6 were averaged to yield a literacy score (α = .95). Mathematic scores in Grades 1 and 3 and calculation and mathematical problem-solving scores in Grades 4 and 6 were averaged to yield a numeracy score (α = .92).

Psychosocial adjustment. Teachers in kindergarten and Grades 1, 3, 4, and 6 rated the occurrence of ADHD (eight items assessing hyperactivity and inattention), externalizing (13 items assessing aggression and opposition), and internalizing (six items assessing anxiety and depression) behaviors in the last 12 months on a 3-point scale (0 = *never*, 1 = *sometimes*, and 2 = *often*) using the Social Behavior Questionnaire (Tremblay et al., 1987). The Social Behavior Questionnaire is similar to the Child Behavior Checklist (Achenbach, 1991) and has been shown to be reliable (Tremblay et al., 1987). We averaged kindergarten and Grade 1 scores for each scale (α = .93 for ADHD, α = .93 for externalizing, and α = .80 for internalizing behaviors) and averaged Grade 3, 4, and 6 scores for each scale (α = .95 for ADHD, α = .96 for externalizing, and α = .86 for internalizing behaviors) to yield three psychosocial scores at the beginning of elementary school (kindergarten and Grade 1) and three psychosocial scores at the middle/end of elementary school (Grades 3, 4, and 6).

Peer rejection and victimization were assessed in kindergarten and Grades 1 and 4 using a within-class sociometric procedure described more thoroughly by Boivin et al. (2013). Booklets of photographs of all children in a given class were handed out to all participating children in the class. They were asked to circle photos of (a) three peers they most liked to

Table 1. Group means and standard deviations for expressive and receptive vocabulary scores at ages 18 months and 5 years and *p* values of *t*-test results.

Age	Measure	Persistent language delay *n* = 30	Transient language delay *n* = 29	Controls *n* = 163	Persistent vs. transient language delay *p*	Persistent language delay vs. controls *p*	Transient language delay vs. controls *p*
18 months	Expressive vocabulary	–1.32 (0.49)	–1.27 (0.40)	–0.07 (0.62)	.690	.000	.000
	Receptive vocabulary	–1.75 (0.67)	–1.33 (0.64)	0.11 (0.55)	.017	.000	.000
5 years	Expressive vocabulary	–1.13 (0.35)	–0.18 (0.54)	0.03 (0.59)	.000	.000	.082
	Receptive vocabulary	–1.24 (0.59)	–0.05 (0.49)	0.10 (0.53)	.000	.000	.161

play with (positive nominations), (b) three peers they least liked to play with (negative nominations), and (c) two peers who got "called names most often by other children" and were "often pushed and hit by other children" (victimization nominations). Nominations were summed and *Z*-standardized for each child within the different classrooms and grades. Peer rejection equaled negative nominations minus positive nominations. Victimization nominations were summed. We averaged kindergarten and Grade 1 scores for peer rejection ($r = .28$, $p < .000$) and victimization ($r = .24$, $p < .000$) separately.

Statistical Analyses

To compare children with persistent language delay and transient language delay and without early language delay (controls) on school-age outcomes, we used a series of linear regressions in Stata (StataCorp, 2019), in which we entered group (persistent language delay, transient language delay, controls) and covariates as predictors in separate models for each outcome. Stata allows to use clusters and maximum likelihood estimator to correct standard error estimates for the nonindependence of twin data and to fit the model to all nonmissing data. For all analyses, the alpha threshold was set at .05.

Covariates

To select covariates, we examined correlations between children's sex, zygosity, birth weight, 5-min Apgar score, family income, mother's mean age at birth, mother's education and marital status, and each outcome. The criterion to select covariates was a significant correlation ($p < .05$) with outcome. Sex was entered as a covariate for each outcome; zygosity was entered as a covariate for externalizing behaviors and peer rejection; birth weight was entered for each outcome except for oral communication and morphosyntax; Apgar score was entered for numeracy and morphosyntax; income was entered for each outcome except for ADHD behaviors, externalizing behaviors, and victimization; mother's age at birth was entered for oral communication, literacy, numeracy, and vocabulary; marital status was entered for ADHD and externalizing behaviors. Mother's education was entered as a covariate in all models because, as mentioned above, groups were different.

Results

Language and Academic Outcomes

Table 2 shows group means and standard deviations for school-age outcomes. Table 3 presents group coefficients, *p* values, and confidence intervals, adjusted for covariates (covariates results not shown) from regression models. Because we used *Z* scores, regression coefficients can be interpreted as mean differences (adjusted for covariates) and can be compared. Mean differences can be interpreted as Cohen's *d*: 0.2, small effect; 0.5, medium effect; and > 0.8, large effect (Cohen, 1988).

The results showed that children with persistent language delay had poorer outcomes than children with transient language delay in vocabulary and oral communication (medium to large effect sizes). Moreover, children with persistent language delay had poorer vocabulary, morphosyntax, oral communication, and numeracy outcomes than controls (medium to large effect sizes), whereas children with transient language delay did not differ from the controls on any language and academic outcomes.

Psychosocial Outcomes

Table 4 shows group coefficients, *p* values, and confidence intervals, adjusted for covariates (covariates results not shown) from regression models. Results indicated that children with persistent language delay and children with

Table 2. Group means and standard deviations for language, academic, and psychosocial outcomes.

Grade	Outcome	Persistent language delay *n* = 30	Transient language delay *n* = 29	Controls *n* = 163
Language and academic outcomes				
Grade 1	Vocabulary	–1.03 (0.81)	0.16 (0.76)	0.07 (0.59)
Grade 1	Morphosyntax	–0.47 (0.85)	0.08 (0.83)	–0.04 (0.81)
Kindergarten to Grade 6	Communication	–0.80 (0.95)	–0.02 (0.87)	0.04 (0.70)
Grades 1–6	Literacy	–0.44 (0.84)	0.23 (0.86)	–0.01 (0.79)
Grades 1–6	Numeracy	–0.51 (0.94)	0.17 (0.88)	0.10 (0.74)
Psychosocial outcomes				
Kindergarten and Grade 1	ADHD behaviors	0.62 (0.82)	0.19 (0.85)	–0.10 (0.75)
	Externalizing behaviors	0.43 (1.07)	0.37 (0.98)	–0.16 (0.64)
	Internalizing behaviors	0.18 (0.67)	–0.07 (0.70)	–0.05 (0.65)
	Peer rejection	0.46 (1.06)	0.15 (0.64)	–0.02 (0.72)
	Victimization	0.29 (0.91)	0.32 (0.87)	–0.13 (0.73)
Grade 4	Peer rejection	0.35 (1.08)	–0.13 (0.72)	–0.14 (0.87)
	Victimization	0.34 (1.34)	0.05 (0.97)	–0.14 (0.84)
Grades 3, 4, and 6	ADHD behaviors	0.06 (0.66)	0.12 (0.80)	0.06 (0.82)
	Externalizing behaviors	0.26 (0.94)	0.20 (1.04)	0.03 (0.87)
	Internalizing behaviors	0.23 (0.68)	0.12 (0.75)	0.04 (0.69)

Note. ADHD = attention-deficit/hyperactivity disorder.

Table 3. Group coefficients, *p* values, and 95% confidence intervals (CIs) for language and academic outcomes (adjusted for covariates).

		Persistent vs. transient language delay			Persistent language delay vs. controls			Transient language delay vs. controls			
Grade	**Outcome**	**Coef. (*SE*)**	***p***	**95% CI**	**Coef. (*SE*)**	***p***	**95% CI**	**Coef. (*SE*)**	***p***	**95% CI**	***n***
Grade 1	Vocabulary	−0.79 (0.19)	.000	[−1.16, −0.42]	−0.92 (0.14)	.000	[−1.19, −0.66]	−0.13 (0.15)	.371	[−0.42, 0.16]	183
Grade 1	Morphosyntax	−0.43 (0.26)	.107	[−0.94, 0.09]	−0.43 (0.19)	.025	[−0.81, −0.05]	−0.01 (0.21)	.975	[−0.41, 0.40]	172
Kindergarten to Grade 6	Communication	−0.70 (0.21)	.001	[−1.12, −0.29]	−0.80 (0.15)	.000	[−1.10, −0.49]	−0.09 (0.17)	.576	[−0.42, 0.23]	193
Grades 1–6	Literacy	−0.43 (0.23)	.060	[−0.88, 0.02]	−0.30 (0.17)	.071	[−0.62, 0.03]	0.13 (0.18)	.467	[−0.22, 0.49]	189
Grades 1–6	Numeracy	−0.27 (0.22)	.229	[−0.70, 0.17]	−0.40 (0.16)	.014	[−0.71, −0.08]	−0.13 (0.18)	.468	[−0.47, 0.22]	189

Table 4. Group coefficients, *p* values, and 95% confidence intervals (CIs) for psychosocial outcomes (adjusted for covariates).

		Persistent vs. transient language delay			Persistent language delay vs. controls			Transient language delay vs. controls			
Grade	**Outcome**	**Coef. (*SE*)**	***p***	**95% CI**	**Coef. (*SE*)**	***p***	**95% CI**	**Coef. (*SE*)**	***p***	**95% CI**	***n***
Kindergarten and Grade 1	ADHD behaviors	0.63 (0.22)	.005	[0.19, 1.06]	0.83 (0.16)	.000	[0.51, 1.15]	0.20 (0.18)	.244	[–0.14, 0.55]	181
	Externalizing behaviors	0.32 (0.21)	.133	[–0.10, 0.74]	0.78 (0.16)	.000	[0.47, 1.08]	0.46 (0.16)	.005	[0.14, 0.78]	191
	Internalizing behaviors	0.18 (0.20)	.371	[–0.21, 0.57]	0.19 (0.14)	.188	[–0.09, 0.47]	0.01 (0.16)	.938	[–0.29, 0.32]	181
Grade 1	Peer rejection	0.07 (0.22)	.748	[–0.36, 0.50]	0.31 (0.16)	.054	[–0.01, 0.63]	0.24 (0.17)	.156	[–0.09, 0.58]	191
	Victimization	0.07 (0.22)	.753	[–0.37, 0.50]	0.50 (0.16)	.002	[0.18, 0.82]	0.43 (0.17)	.013	[0.09, 0.76]	191
Grade 4	Peer rejection	0.53 (0.29)	.073	[–0.05, 1.11]	0.50 (0.23)	.030	[0.05, 0.94]	–0.03 (0.21)	.880	[–0.45, 0.39]	157
	Victimization	0.37 (0.30)	.227	[–0.23, 0.96]	0.53 (0.24)	.026	[0.06, 0.99]	0.16 (0.22)	.478	[–0.28, 0.59]	157
Grades 3, 4, and 6	ADHD behaviors	0.03 (0.23)	.891	[–0.42, 0.48]	0.04 (0.17)	.789	[–0.28, 0.37]	0.01 (0.18)	.943	[–0.34, 0.37]	185
	Externalizing behaviors	0.28 (0.25)	.262	[–0.21, 0.78]	0.38 (0.19)	.040	[0.02, 0.74]	0.10 (0.20)	.623	[–0.29, 0.48]	193
	Internalizing behaviors	0.09 (0.21)	.660	[–0.32, 0.51]	0.18 (0.15)	.253	[–0.13, 0.48]	0.08 (0.17)	.626	[–0.25, 0.41]	185

Note. ADHD = attention-deficit/hyperactivity disorder.

transient language delay were different on ADHD behaviors at the beginning of elementary school (medium effect size); children with persistent language delay had higher scores than children with transient language delay. Moreover, children with persistent language delay had higher scores than controls at the beginning of elementary school for ADHD behaviors (large effect size). Throughout elementary school, they had higher scores than controls for externalizing behaviors, peer rejection, and victimization (small to large effect sizes). Children with transient language delay also had higher scores than controls at the beginning of elementary school, but only for externalizing behaviors and victimization (medium effect sizes).

Discussion

The objective of this study was to document language, academic, and psychosocial outcomes in elementary school in children presenting persistent or transient expressive/receptive language delay between 18 months and 5 years of age. Results showed that children with persistent language delay had language, academic, and psychosocial difficulties throughout elementary school. Children with transient language delay did not differ from controls on all language and academic outcomes. However, they had psychosocial difficulties at the beginning of elementary school; they had more externalizing behaviors and were more victimized than controls. Nonetheless, they had fewer psychosocial difficulties than children with persistent language delay who cumulated them throughout elementary school. Thus, children with transient language delay seem to lie between children with persistent language delay and controls on psychosocial outcomes, having an intermediate level of difficulties. Therefore, results highlighted that there are distinct profiles of language, academic, and psychosocial outcomes for children with early expressive/receptive language delay as a function of persistence.

Stability of Language Skills Into the Elementary School Years

Proportions of children with persistent versus transient language delay in the current study were similar to those of previous studies (Caglar-Ryeng et al., 2020; Ellis Weismer, 2007; Law et al., 2000; Rescorla & Dale, 2013). In addition, in line with previous studies, there were differences in early receptive skills between children with transient language delay and those with persistent language delay (Bishop & Edmundson, 1987; Ellis Weismer, 2007; Ghassabian et al., 2014; Rescorla & Dale, 2013). Although children with transient language delay were considered to have caught up to their peers by the age of 5 years, their expressive and receptive language skills at this age were slightly lower than those of controls (marginally significant differences), which has been reported in previous studies (Ellis Weismer, 2007; Law et al., 2000; Rescorla, 2013; Rescorla & Dale, 2013). However, in elementary school years, they were no more distinguishable from controls. Thus, we replicate results from Dale et al. (2014) and expand the scope to cover oral communication throughout elementary school, suggesting that children with transient language delay do recover from early language delay, whether the early language delay was expressive and identified at 2 years of age, as in the Dale et al. (2014) study, or mixed, and identified earlier, as in the current study.

Our results also concur with previous studies in showing that children with persistent language delay have a broad range of language difficulties at school age, including vocabulary and morphosyntax difficulties (Bishop & Adams, 1990; Paul et al., 1996, 1997). Similar to Bishop and Adams (1990), we found that children with persistent language delay showed continuing difficulties in vocabulary and morphosyntax at the beginning of school age. Though methods used in the current study do not allow to identify/diagnose DLD, this language profile is consistent with DLD (Caglar-Ryeng et al., 2020; Ellis Weismer, 2007; Rescorla, 2013).

In summary, at 18 months of age, children with transient language delay appeared to fall between children with persistent language delay and those with typical language development on the language endowment spectrum. Between 18 months and 5 years of age, they seemed to move toward children with typical language development to reach their language levels by the beginning of elementary school. Children with persistent language delay were found to have a language profile consistent with DLD. Therefore, in line with previous studies (Ellis Weismer, 2007; Rescorla & Dale, 2013), our findings support to a certain degree a dimensional account of early language delay.

Differing Trajectories of Academic Achievement

Children with persistent and transient language delay did not differ on academic achievement in the literacy and numeracy domains. However, we found that children with persistent language delay had poorer outcomes in numeracy, but not in literacy, compared to controls. Previous studies indeed generated conflicting results with respect to reading difficulties in children with persistent language delay. Bishop and Adams (1990) found reading difficulties at 8 years of age in children with persistent expressive or receptive language problems, whereas Paul et al. (1997) did not find persistent reading problems at 8 years of age in children with expressive language delay at 2 years of age and persistent language problems at 8 years of age. Furthermore, Paul et al. (1997) found that the mathematic skills of children with persistent expressive language delay were poorer than those of controls. Thus, our results replicate their findings in children with persistent expressive/receptive language delay in early elementary school and expand on them through to the end of elementary school.

Psychosocial Adjustment Difficulties in Elementary School

The story regarding psychosocial adjustment is slightly different. We found that, regardless of persistence, children

with early language delay had psychosocial difficulties, but that children with transient language delay seem to fall between children with persistent language delay and controls with respect to psychosocial difficulties. Our study is the first to highlight this contrast between language/learning and psychosocial outcomes in children with early persistent or transient language delay.

ADHD, externalizing, and internalizing behaviors as well as social difficulties have been documented in children with early language delay in previous studies (Aram et al., 1984; Beitchman, Brownlie, et al., 1996; Benasich et al., 1993; Curtis et al., 2018; Redmond & Rice, 1998, 2002; Shevell, Majnemer, Platt, et al., 2005; Shevell, Majnemer, Webster, et al., 2005; Toseeb & St Clair, 2020; Yew & O'Kearney, 2013). We also found social difficulties (victimization and peer rejection) as well as ADHD and externalizing behaviors, but not internalizing behaviors, in children with persistent language delay. In children with transient language delay, we found social difficulties (victimization) and externalizing behaviors, but only at the beginning of elementary school. Our results suggest that psychosocial difficulties at the elementary school period vary according to language delay persistence, replicating in part results reported by Snowling et al. (2006) and Beitchman, Brownlie, et al. (1996) but in adolescence. They showed that both children with persistent or transient expressive/receptive language problems displayed more ADHD behaviors or psychiatric disorders than controls in adolescence (12–16 years; Beitchman, Brownlie, et al., 1996; Snowling et al., 2006). However, our study is the first to suggest that children with transient language delay may experience an intermediate level of psychosocial difficulties.

Hypotheses for Later Difficulties

The main innovative feature of our study is the variety of outcomes examined concurrently, at multiple time points, and throughout elementary school. The study highlighted the pervasive contrast in the nature of school-age difficulties experienced by children with persistent versus transient language delay. Children with persistent language delay experienced a wider range of difficulties in elementary school. Though it was hypothesized that these difficulties stem from their persistent poor expressive/receptive language skills (Dionne, 2005, Dionne et al., 2003; Girard et al., 2014; Kopp, 1989; St Clair et al., 2019), it is unclear, however, whether they stem from something else. Gilger and Kaplan (2001) argued that the combinative and interactive effects of genetic and environmental risk factors during the pre- and postnatal periods could have subtle effects on brain development leading to co-occurring developmental difficulties in children. Indeed, language, academic, and psychosocial difficulties share some genetic and environmental etiological factors (Cragg & Gilmore, 2014; Craig et al., 2016; Dionne et al., 2013; Harlaar et al., 2010; Hoff, 2014; Rvachew, 2010; Webster & Shevell, 2004). However, more empirical evidence is needed to support the atypical brain development hypothesis (Gilger & Kaplan, 2001) as a basis for the wide scope of difficulties experienced by children with persistent language delay.

In contrast, children with transient language delay appear specifically vulnerable to later behavioral and social difficulties. The possibility of ensuing difficulties in children with transient language delay inspired the term *illusory recovery* (Scarborough & Dobrich, 1990). The hypothesis is that catching up to children with typical language development by the end of the preschool years does not eliminate the risk of difficulties. Dale et al. (2014) found that children with transient expressive language delay between 2 and 4 years of age did no worse than children with typical language development when their language and reading skills were assessed at ages 7 and 12 years, thus refuting the phenomenon of illusory recovery. We also found little evidence for ensuing language and academic difficulties in children with transient language delay. Still, we did find that transient language delay was associated with more externalizing behaviors and victimization in the early school years.

Beitchman, Brownlie, et al. (1996) proposed two explanations for psychosocial difficulties in children with early language delay, regardless of recovery status. First, they suggested that socioeconomic adversity, which is more prevalent in families of children with early language delay, could be at play. However, this hypothesis appears rather unlikely in our study given that children with persistent language delay, transient language delay, and no language delay (controls) did not differ on most family characteristics and because we included covariates to control for socioeconomic risk factors. Yet, the proportion of mothers not having a high school diploma in the transient language delay group was double than in the persistent language delay group. Mothers' input to children may have been of poorer quality (Hawa & Spanoudis, 2014), and transient early language delay may have been environmental in origin (Bishop et al., 2003). Therefore, as suggested by Beitchman, Brownlie, et al. (1996), socioeconomic adversity could partly be at play, at least in children with transient language delay.

Second, they proposed that early language delay could have an effect on later psychosocial adjustment (Beitchman, Brownlie, et al., 1996). This hypothesis has received some empirical support (Dionne, 2005, Dionne et al., 2003; Girard et al., 2014). For instance, Dionne et al. (2003) and Girard et al. (2014) found that low language skills lead to an increase in aggressive behaviors in toddlers and preschoolers. It is possible that limited language skills during the early years, a sensitive period in self-regulation development (Cole et al., 2010; Kopp, 1989; Roben et al., 2013; Vallotton & Ayoub, 2011), have enduring effects on externalizing behaviors (Dionne, 2005; Dionne et al., 2003; Girard et al., 2014) and ADHD behaviors, even when early language delay resolves, which could put children at risk of victimization and peer rejection (Boivin et al., 2013; Rice, 1993). However, these hypotheses need to be verified in further studies.

Clinical Implications

Clinicians should consider that children with persistent language delay are at risk of a wide range of difficulties in

elementaryschool years, whereas children with transient language delay may only be at risk of psychosocial difficulties. Early identification of language delay and early interventions to prevent language delay persistence should therefore be a priority. The efficacy of early language interventions by speech-language pathologists or parents is well established (Baxendale & Hesketh, 2003; Buschmann et al., 2015; Girolametto, 2010; Roberts & Kaiser, 2015). For instance, Girolametto et al. (2001) reported a recovery rate of 86% at 5 years of age following a parent intervention implemented in children with expressive language delay identified at 2 years of age, a rate much higher than the expected 50% remission rate without intervention (Buschmann et al., 2015; Law et al., 2000). In addition to language-focused interventions, since directionality and causality of difficulties still need to be established, interventions could target common denominators for various developmental difficulties. For instance, executive functions and working memory are involved in language and numeracy as well as in ADHD (Cragg & Gilmore, 2014; Craig et al., 2016). Interventions could also target emotional and behavioral regulation through cognitive behavioral therapy (Chaloult, 2008). Its efficacy in reducing externalizing (Furlong et al., 2012) and social difficulties (Kalvin et al., 2015) is well established, but its efficacy in children with early language delay needs to be demonstrated, since cognitive strategies rely largely on verbal interactions.

Strengths and Limitations

This study presents some limitations that are important to consider in interpreting the findings. First, because we used data from a longitudinal population-based study, the identification of early language delay and persistence did not rely on comprehensive language assessments nor on diagnosis tools to identify DLD. However, both vocabulary checklists and the PPVT show good concurrent validity with other language measures (Dunn & Dunn, 1997; Dunn et al., 1993; Fenson et al., 1993, 2000), were used in previous studies to identify early language delay and persistence (Dale et al., 2014; Dionne et al., 2011; Ghassabian et al., 2014; Henrichs et al., 2013), and are used in clinical settings on a regular basis. Furthermore, we used arbitrary cutoffs to identify early language delay and persistence, based on previous studies (Ghassabian et al., 2014; Henrichs et al., 2013, 2011; Rescorla & Achenbach, 2002). Though our results (i.e., the stability of language skills into the elementary school years) support the chosen methods of identification (i.e., ages, developmental span, measures, cutoffs), future studies could use alternative strategies, such as clinical diagnoses (e.g., DLD) or group-based multitrajectory modeling (Nagin et al., 2018) to identify distinct language trajectories among children with early language delay. In addition, comparison with a group of children with late-emerging language delay would have improved the design but was beyond the scope of this study.

Second, the use of a twin sample implies the nonindependence of data, but this was minimized by the use of a cluster for family in statistical analyses, a 2-week delay between parental assessments of each child at 18 months of age, direct assessment at 5 years of age, and different teacher assessments throughout elementary school. In addition, though twins are at higher risk of language delay than singletons (Rice et al., 2014; Rutter et al., 2003; Thorpe, 2006), origins of language delay appear to be the same and language development not qualitatively different (Rice et al., 2014; Rutter et al., 2003; Thorpe, 2006).

Third, missing data and attrition need to be considered. Nevertheless, the attrition rate in the QNTS was low (average of 3% per year; Boivin et al., 2012), and maximum likelihood estimator was used to fit the model to all nonmissing data. Finally, even given the large population sample, group sizes of children with persistent and transient language delay were small, and thus, statistical power was low. We also opted for a conservative approach and limited our typical language group to those who fell between the 25th and 75th percentiles to avoid overinflating comparisons. This study, however, remains exploratory in nature, and results need to be replicated in future studies with a larger sample size and using multivariate analyses.

In conclusion, this study examined a variety of school-age outcomes concurrently at multiple time points throughout elementary school and highlighted the contrast between persistent and transient language delay on language, academic, and psychosocial outcomes. The persistence of early language delay was associated with a wide range of difficulties in elementary school, whereas recovery from early language delay, even though associated with good language and academic outcomes, may be "illusory" with regard to psychosocial difficulties.

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