Learning and Individual Differences 26 (2013) 177–184

Contents lists available at SciVerse ScienceDirect

Learning and Individual Differences

journal homepage: www.elsevier.com/locate/lindif

Late talking, typical talking, and weak language skills at middle childhood

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ARTICLE INFO

Article history:
Received 29 November 2011
Received in revised form 15 January 2013
Accepted 22 January 2013

Keywords:
Late talking
Language disorders
Language impairment
Learning disabilities
Language development

ABSTRACT

To better understand early predictors of weak language and academic abilities, we identified children with and without weak abilities at age 8. We then looked back at age 2 vocabulary and word combining, and evaluated these measures as predictors of age 8 outcomes. More than 60% of children with weak oral language abilities at 8 were not late talkers at 2. However, no word combining at 2 was a significant risk factor for poor oral language, reading comprehension, and math outcomes at 8. The association of no word combining with age 8 reading comprehension and math ability was mediated by age 8 oral language ability. The findings indicate that children take different developmental pathways to weak language abilities in middle childhood. One begins with a delayed onset of language. A second begins with language measures in the typical range, but ends with language ability falling well below typical peers.

1. Introduction

Weak oral language skills in middle childhood are a major concern for educators and parents. Children with poor oral language often have problems with academic and social functioning (Conti-Ramsden, Durkin, Simkin, & Knox, 2009; Whitehouse, Line, Watt, & Bishop, 2009) and in the long term, have more limited academic and vocational attainment (Clegg, Hollis, Mawhood, & Rutter, 2005). Oral language skills at school entry predict later reading skills (Scarborough, 1998) and children with weak oral language are more likely to have word reading, reading comprehension and math learning disabilities (Stothard, Snowling, Bishop, Chipchase, & Kaplan, 1998; Young et al., 2002).

From a clinical and educational perspective, it is desirable to predict, prior to kindergarten, which children will have weak language skills in middle childhood. Late talking is a widely studied indicator of language development at age 2, and is a risk factor for later weakness in language ability (Oliver, Dale, & Plomin, 2004; Reilly et al., 2010; Rice, Taylor, & Zubrick, 2008). Two main definitions of late talking are found in the literature. One definition uses vocabulary size, and usually classifies late talkers as those children falling below the 10th percentile of a normative sample (Henrichs et al., 2011; Reilly et al., 2010). The other definition is failure to combine two or more words by 24 months (Preston et al., 2010; Rice et al., 2008). In the present study, unlike most previous work, we employed both criteria, and compared the results that were obtained with each. This approach is supported by evidence that early word combining ability and early vocabulary size exhibit different patterns of heritability, suggesting that causal factors for delays in one may not be the same as for delays in the other (Van Hulle, Goldsmith, & Lemery, 2004).

Many late talkers later move into the range of normal age expectations for language (Ellis Weismer, 2007; Paul, Murray, Clancy, & Andrews, 1997; Rescorla, 2002); however, Rescorla (2005) has shown that measurable language and reading deficits exist in these "late bloomers." Although considerable research has investigated how many and which late talkers will later catch up, and how they fare over time (Paul et al., 1997; Rescorla, 2002; Rice et al., 2008; Whitehurst & Fischel, 1994), less notice has been given to data suggesting that many children with weak language may not have a history of late talking (Ellis Weismer, 2007; Henrichs et al., 2011; Reilly et al., 2010). The existence of such children poses a predictive problem. What is the developmental pathway for children who have weak oral language in middle childhood but did not exhibit language delay as toddlers?

Several current theoretical approaches in developmental psychology propose that developmental trajectories are dynamic and multiply influenced in complex ways (Elman et al., 1996; Karmiloff-Smith, 1998; Sameroff, 2010). Individuals who begin with similar ability profiles may diverge as their differing genotypes interact with their differing environments, and small differences become larger over time. Conversely, individuals that begin with different genetic endowments may converge to similar ability profiles over time, despite different underlying etiologies (Karmiloff-Smith, 2007; Thomas & Karmiloff-Smith, 2002). In the current study, we started with oral language ability at middle childhood, and looked back to ask whether children with weak oral language had been late talkers. We hypothesized that there are two main developmental trajectories resulting in weak language ability at age 8. One, as found in many previous studies, begins with late language

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http://dx.doi.org/10.1016/j.lindif.2013.01.008

emergence at age 2 (Reilly et al., 2010; Rice et al., 2008). The second trajectory begins with "typical" language performance at age 2. A subset of these on-time talkers will follow a developmental pathway that diverges from peers who continue to develop typically, and will form a substantial proportion of the children with weak oral language at age 8.

Given the associations between weak oral language and weak academic skills that have been observed (Catts, Fey, Tomblin, & Zhang, 2002; Gibbs & Cooper, 1989; Scarborough, 1998; Young et al., 2002), we also investigated whether late talking status at age 2 was predictive of poor reading and math skills at age 8. Rescorla (2002) and Preston et al. (2010) found that at middle childhood, late talkers performed at a lower level on reading measures compared to non-late talkers. We might therefore expect that oral language ability mediates any relationship between late talking and academic performance; however, factors that cause late talking might also directly cause academic difficulties. We used mediation analysis to assess the relationship between late talking, oral language, and academic skills. Mediation models are often used to evaluate causal relationships; however, our purpose was not to assess causality. We do not propose that late talking causes either weak oral language or weak academic skills. Rather, late talking may be an early indicator of either or both outcomes.

In this study, we evaluated evidence for varied developmental pathways to language weakness in middle childhood by measuring the proportions of children with weak oral language at age 8 who would and would not have been classified as late talkers at age 2, using data from the National Institute of Child Health and Human Development's Study of Early Childcare and Youth Development (SECCYD) (NICHD Early Child Care Research Network, 1992). This unique population-based dataset provides measures that allow classification by language ability at age 2 and age 8, measures of academic ability, measures of general intelligence, and measures related to socio-economic status allowing us to examine relationships between academic skills and early and later language ability. Our research questions were as follows.

1 What proportions of children with weak oral language at age 8 would and would not have qualified as late talkers at age 2? How do those proportions vary by the measure of language emergence, i.e., vocabulary size vs. word combining?
2 Are late talking measures predictive of poor oral language outcomes and poor academic skills at age 8, independent of other plausible predictors?
3 If late talking is predictive of weak academic skills as well as weak oral language, does oral language mediate the relationship between late talking and academic skills?

2. Methods

To assess the late talking history of children with weak language skills at age 8, we identified children with poor oral language or poor academic skills (cases) and randomly selected children of the same age with normal range oral language or academic skills (controls). For both cases and controls, we obtained age 2 vocabulary and word combining ability measures and important covariates of language ability, including maternal education and non-verbal intelligence. When the case and control groups differed on the covariates, these differences were statistically controlled in the analyses (Hotopf, 1998). Control groups were approximately three times as large as the case groups to enhance the statistical power to detect associations of late talking with later language ability (Hotopf, 1998).

2.1. Participants

Participants were drawn from the SECCYD (NICHD Early Child Care Research Network, 1992). There were 1015 children who participated in phase III of the longitudinal study, which included language and cognitive measures taken when the children were age 8 or 9. The study originally enrolled 1364 newborn children from 10 hospitals around the United States. Excluded from the study were children with serious medical issues at birth, mothers under age 18 at the child's birth, mothers who were known to be substance abusers, and mothers who did not speak English.

All participants qualified for the current study with scores of 74 or greater on the performance scale (PIQ) of the Wechsler Abbreviated Scale of Intelligence (WASI) (Wechsler, 1999) at age 9. The standard error for this measure was 4, so a score of 74 was selected to rule out intellectual disability.

2.2. Oral language measures

Children's oral language ability was measured using standard scores from the Picture Vocabulary and Memory for Sentences subtests of the Woodcock–Johnson Test of Cognitive Ability, Revised (WJ-R) (Woodcock & Johnson, 1990) and the Word Definitions subtest of the WASI. A fourth measure was narrative ability. Children told a story from a wordless picture book. The mean and *SD* of the narrative measure was determined by the complete SECCYD sample. The score was a total based on component scores for narrative structure, language complexity, and emotional content. The narrative total score had a mean of 34.8, and 1 *SD* below the mean was 25.2 based on 987 available scores.

Both categorical and continuous measures of language and academic ability were used in this study. To assess proportions of children with oral language weakness and a late talking history, and the associations of late talking with poor oral language outcomes, a categorical variable for weak versus typical oral language ability was created (see Table 1 notes). For the mediation analyses, a continuous measure of oral language ability was developed (see Table 7 notes).

2.3. Academic ability measures

The academic ability measures were the Word Attack, Passage Comprehension, and Broad Math subtests of the WJ-R. Scores at or below the 25th percentile were categorized as weak ability (Catts, Adlof, & Ellis Weismer, 2006; Lyon, 1996; Shaywitz et al., 2002). For the mediation analyses, continuous standard scores from these measures were used.

Table 1
Proportions of late talkers among children with weak and typical oral language at age 8.

Measure	Weak ability[a]	Typical ability
Oral language *N*	72	241
Late talking measures at age 2		
Late: Vocabulary ≤10th percentile[b]	36%	18%
Typical: Vocabulary >10th percentile	64%	82%
Late: No word combining[c]	23%	8%
Typical: Combining sometimes	36%	25%
Typical: Combining regularly	40%	67%

[a] Children with weak oral language at age 8 scored 1 *SD* or more below the mean on at least 2 of 4 oral language measures, or 2 *SD* or more below the mean on 1 oral language measure (Cohen et al., 1993). The age 8 oral language measures were the Picture Vocabulary and Memory for Sentences subtests of the Woodcock–Johnson Test of Cognitive Ability, Revised (Woodcock & Johnson, 1990), the Word Definitions subtest of the Wechsler Abbreviated Scale of Intelligence (Wechsler, 1999), and the narrative ability total score from the SECCYD.

[b] Late talking identified by expressive vocabulary at or below the 10th percentile of the MacArthur Communicative Development Inventory (MCDI) (Fenson et al., 1993). Percentiles adjusted for sex of child. Parents completed checklist indicating words used by the child.

[c] Late talking identified by parent report (MCDI) of whether the child was not yet combining words, combining words sometimes, or combining regularly.