

**Matthew Effects in Children
with Learning Disabilities:
Development of Reading, IQ, and
Psychosocial Problems From Grade 2 to Grade 8**

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Reading achievement, IQ, and behavior problems were assessed in second and eighth grade for a longitudinal sample of 57 children. Changes in these scores over time were compared for children with no learning disabilities versus children with math or reading disabilities (research-identified and/or school-identified). A widening of the group difference in IQ was seen between the math disabled and nondisabled groups, but otherwise the gaps between groups remained unchanged or narrowed over the six-year interval, indicating that hypothesized negative consequences of initial academic difficulties ("Matthew effects") did not occur for most of the children with learning disabilities. Elevated rates of behavior problems were seen only for the group with math disabilities, suggesting that the type of learning disability needs to be taken into account in research on the association between academic and psychosocial problems.

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Matthew effects in education (Stanovich, 1986, 1988; Walberg & Tsai, 1983) refer to the rich-get-richer/poor-get-poorer consequences that ensue for students who are stronger versus weaker achievers at the outset of schooling, and whose subsequent academic progress is thus enhanced or impeded in a self-reinforcing way by differential experiences that are triggered by the initial success or failure. By leading to a widening of differences between high and low achievers, Matthew effects may explain the high degree of variability that is generally seen in educational achievement (e.g., Williamson, Appelbaum, & Epanchin, 1991). The hypothesis can also be extended more broadly to account for future adverse cognitive, linguistic, motivational, and psychosocial difficulties of students with learning disabilities (LD) in the primary grades (Butkowski & Willows, 1980; Chall, 1983; Juel, 1988; Kinsbourne & Caplan, 1979; Stanovich, 1986).

Negative Matthew effects in children with learning disabilities might conceivably operate at many levels. The LD itself, and its cognitive (and perhaps constitutional) underpinnings, could directly impede the child's further rate of progress in academic learning. Falling behind at the outset could also limit the child's opportunities for learning more generally; for example, if print exposure is reduced in children with reading disabilities, acquiring new vocabulary and information from written materials would be likely to suffer (Stanovich, 1986). Furthermore, teachers might hold lower expectations for children with LD, and might provide instruction of reduced quantity and/or quality (Allington, 1983; Burstall, 1979; Chapman, Larsen, & Parker, 1979). Classmates, too, may view a child with LD negatively, and peer interactions may reflect this stigmatization (Bryan, 1974; Garrett & Crump, 1980). The child with LD may respond to any of the foregoing experiences with reduced effort, motivation, and self-efficacy, and may exhibit behavior problems. The occurrence, timing, nature, and scope of Matthew effects may depend on how many such consequences (and which ones) occur during a particular child's school years.

According to the Matthew effects hypothesis, rates of progress should be slower for children with initially low achievement and more rapid for children who succeed well at the outset, such that the differences between these groups successively widen over time, increasing the overall degree of variability. Not just achievement, but also various LD-related cognitive abilities (e.g., IQ, vocabulary, memory) and other hypothesized consequences (e.g., motivational and behavior problems), might also be expected to show this "fan spread" pattern

in longitudinal analyses. Stanovich (1986) and Bast and Reitsma (1998) have emphasized that the predicted fan spread will not necessarily be seen when grade- or age-adjusted standardized scores are used, but rather that raw scores or Rasch-scaled measures are more appropriate for such analyses.

To date, the evidence for negative Matthew effects in the reading abilities of children with LD is rather sparse and somewhat mixed. Although many studies have shown that differences between reading ability groups persist strongly over time (e.g., Juel, 1988; Scarborough, 1998), few have examined reading achievement trajectories for the expected fan spread pattern. In longitudinal studies by Shaywitz, Holford, Holahan, Fletcher, Stuebing, Francis, and Shaywitz, (1995) and by Phillips, Norris, Osmond, and Maynard (2002), no evidence for Matthew effects was seen from first through sixth grade. On the contrary, growth curves for poorer readers were actually somewhat steeper than those for nondisabled readers, such that the gap between groups narrowed rather than widened. Catts, Hogan, and Fey (2003) and Jordan, Kaplan, and Hanich (2002) have also observed steeper increases in achievement from second through fourth grades for poor readers than their classmates, with similar patterns seen for word recognition and reading comprehensions skills. Similarly, Baker, Decker, and DeFries (1984) observed no widening of the gaps between reading-disabled and control groups from age 9 to 15 years for word recognition or reading comprehension.

In contrast, McKinney and Feagans (1984) did find a fan spread for reading achievement over a two-year period when they compared children with LD (not specifically in reading) with classmates. In addition, Bast and Reitsma (1998) observed an increase in variability (consistent with fan spread) for word recognition scores from kindergarten through second grade (but not third grade) in an unselected sample, but found no such Matthew effect for reading comprehension. Growth trajectories were not examined separately for good and poor readers, however, in that study. Mixed results have also been obtained within a single study by Juel (1988), who found increasing differences between better and poorer readers for some reading measures, but not others in a low-income sample that was followed from first through fourth grade.

With regard to other hypothesized adverse consequences of initial learning difficulties, there is abundant evidence that compared to other children and adolescents, children with LD have lower IQ, especially verbal abilities (e.g., Torgesen & Dice, 1980); weaker vocabulary and general language skills (e.g.,

Anderson & Freebody, 1979; Catts, Fey, Zhang, & Tomblin, 1999; Roth & Spekman, 1986; Siegel & Ryan, 1984; Wolf & Goodglass, 1986); and higher rates of motivational, social, and behavioral problems (e.g., Butkowski & Willows, 1980; Hinshaw, 1992; Huntington & Bender, 1993; Kavale & Forness, 1996; Stone & LaGreca, 1994). It is not clear, however, whether these represent Matthew effects. In longitudinal samples of children with LD, some studies have observed declines in verbal IQ of about 1 to 1.5 points per year over one to five years (e.g., Bauman, 1991; Vance, Blixt, Ellis, & Debell, 1981), but others have instead found slight increases over three to six years (e.g., Oakman & Wilson, 1988; Vance, Hankins, & Brown, 1987). In a comparison of learning processes of LD versus non-LD children, Brainerd, Kingma, and Howe (1986) found that memory retrieval differences were generally larger, and that other learning differences were somewhat more pervasive, in Grade 6 than Grade 2; however, only cross-sectional age comparisons were examined.

There is also some evidence that children's language abilities may diverge over time as a consequence of initial academic differences. Share and Silva (1987) found that scores on the WISC-R Vocabulary Test and Reynell Developmental Language Scales (Receptive and Expressive combined) were lower for 11-year-old disabled readers than for nondisabled readers whose scores had been equivalent at age 3 on the Peabody Picture Vocabulary Test and the PAT listening comprehension test. The dissimilarity of the tests used at the two ages makes these results difficult to interpret, but they are consistent with Juel's (1988) finding that listening comprehension abilities of the poorer readers were about six months further behind in fourth grade than they had been in first grade, relative to the better readers. Catts et al. (2003), however, did not observe any decline in the listening comprehension scores of poor readers in a large longitudinal sample that was followed through fourth grade.

In Juel's study, differences between higher and lower achievers also emerged by Grade 3 in the children's reading habits and motivation to read. Similarly, it appears that low self-efficacy among children with LD may be a consequence, rather than a cause, of their achievement difficulties (e.g., Bachman & O'Malley, 1977). Behavior problems, on the other hand, are typically found to be present from the outset of learning difficulties or even earlier (Hinshaw, 1992), and although some studies have found a widening of LD-NLD differences over time (Jorm, Share, Maclean, & Matthews, 1986; McGee, Williams, Share, Anderson, & Silva, 1986), others have not observed such fan

spread (Fuerst & Rourke, 1995; Vaughn, Zaragoza, Hogan, & Walker, 1993). There is little agreement among studies as to what kinds of social and psychological problems are most closely associated with LD (Hinshaw, 1992), and it has been suggested that different psychosocial consequences may be associated with different types of learning disabilities (Dickman, 1996).

In this study, our goal was to investigate Matthew effects in reading achievement, IQ, and behavioral problems in a longitudinal sample in which these measures had been taken in Grades 2 and 8. Three main questions were addressed: Do Matthew effects occur for children with reading disabilities and if so, do they extend to IQ and to attentional, social, and behavior problems as well as reading achievement? Is school identification of LD, rather than (or in addition to) the presence of the LD itself, responsible for some Matthew effects, particularly those involving social and behavioral problems? Are similar Matthew effects associated with math disabilities as with reading disabilities?

METHOD

PARTICIPANTS

All of the children were from a longitudinal sample whose development was studied during the preschool years and at the end of the second and eighth grades (Scarborough, 1989, 1990, 1998). These children were from lower to upper middle-class families according to Hollingshead and Redlich's (1958) classification of socioeconomic status on the basis of parental education and occupation. They resided in mainly suburban municipalities throughout the state of New Jersey, and attended public or parochial schools in those communities. All spoke English as a native language.

Data from both Grade 2 (age eight years) and Grade 8 (age 14 years) were available for 57 children. On the basis of our second grade research assessments (see Scarborough, 1989), 19 students were identified as having reading disabilities, with all but four meeting a regression-based IQ-discrepancy criterion (RD-RI group). According to parental interviews, eight of these children, plus six others, were identified by their schools as having reading problems requiring special instruction in elementary school (RD-SI group). The schools also reportedly identified math disabilities during the elementary grades for 11 children, seven of whom also had reading disabilities (MD group). The remaining 28 children were considered normal achievers by our criteria

and by their schools (NLD group). Table I provides additional information about the overlapping composition of these groups. As also shown in the table, there were roughly equal numbers of boys and girls in each group, and a majority of children with reading disabilities were from families in which at least one parent or older sibling also had a reading disability.

With few exceptions (one MD-only and three RD-only), all children with school-identified LD received remedial instruction, typically through pull-out resource room tutoring and/or summer programs. Among children whose RD was not identified by the school, only one received special help (private tutoring) arranged by the parents. Because the children in the sample attended many different schools over a wide geographic region, information could not be obtained about the nature and quality of the remedial instruction that was received.

PROCEDURES

All tests and interviews were individually administered in the children's homes during a single two- to three-hour session at each age. The examiners were not told about any incidence of reading disabilities in the family and were also kept blind about

TABLE I. Frequencies of Reading and Math Disabilities Identified in the Sample on the basis of Research

Criteria and Parent-Reported School Designations.						
Type of LD*						
Group	RD-RI	RD-SI	MD-SI	N	Boys, Girls	Family RD: Yes, No
1.	yes	yes	yes	2	1, 1	2, 0
2.	yes	yes	no	6	3, 3	6, 0
3.	yes	no	yes	2	0, 2	1, 1
4.	yes	no	no	9	5, 4	9, 0
5.	no	yes	yes	3	2, 1	1, 2
6.	no	yes	no	3	1, 2	2, 1
7.	no	no	yes	4	2, 2	0, 4
8.	no	no	no	28	13, 15	7, 21
Total				57	27, 30	28, 29
Total RD-RI				19	9, 10	18, 1
Total RD-SI				14	7, 7	11, 3
Total MD				11	5, 6	4, 7

*RD = reading disability, MD = math disability, RI = research-identified, SI = school-identified.

the child's previous performance on research assessments at younger ages. In addition to the measures described below, various other tests and questionnaires were given that will not be discussed in this report.

MEASURES

Reading and Math Achievement. At both grades, the children were given three reading subtests from the Woodcock-Johnson Psychoeducational Battery, a nationally standardized instrument for which strong reliability and validity have been demonstrated (Woodcock & Johnson, 1978). The *Word Identification* test (WI) assesses the child's ability to read aloud printed words of increasing difficulty. The *Word Attack* test (WA) requires the child to phonologically decode printed pseudowords. On the *Passage Comprehension* test (PC), the child must indicate comprehension of short passages by providing spoken words that would be semantically and syntactically appropriate at locations marked by blanks in the printed texts. Rasch-scaled *W* scores were analyzed, and a composite reading measure was also computed at each age by averaging the three *W* scores.

At Grade 8 only, the Math Computation subtest was also administered. This test requires the child to solve a series of computational problems of increasing difficulty.

IQ. Scores on five subtests of the revised Wechsler Intelligence Scales for Children (WISC-R) (Wechsler, 1989) were available at both grades: *Information*, *Vocabulary*, *Arithmetic*, *Block Design*, and *Picture Arrangement*. Full-Scale IQs were computed following Sattler's (1992) guidelines for scoring the short form. Raw scores for the subtests were also analyzed, and factor scores for verbal and performance IQ were derived from principal components analyses of the three verbal and two performance raw scores, respectively.

Reading Habits. In a Grade 8 interview, each child was asked to estimate the number of books he or she had read in the past year for school, excluding textbooks; the number of books that had been read for pleasure; and the average number of hours per week that had been spent during the year on pleasure reading.

Behavior Problems. At each grade, the child's mother completed the 118-item Child Behavior Checklist (CBCL), a widely used assessment for which national norms are available based on age and gender (Achenbach & Edelbrock, 1981, 1983). Each item is scored 0 if it is "not true" of the child in the preceding six months, 1 if it is "somewhat or sometimes true," or 2 if it

is "very true or often true." In addition to the Total Problems score, separate scores can be derived for eight particular types of problems: aggressive; delinquent; anxious/depressed; somatic complaints; withdrawn; social problems; attention; and thought. In addition, two broad-band scales are usually derived: externalizing (aggressive plus delinquent), which reflects difficulties with interpersonal conflicts; and internalizing (anxious/depressed, somatic, and withdrawn), which reflects internal distress. In this study, we examined scores for total, externalizing, internalizing, social, and attention problems. Raw scores were used in the analyses, and information about standardized *T*-scores ($M = 50$, $SD = 10$) is also provided.

Missing Data. Test scores were not available in Grade 8 for two children, one from the NLD group and the other from the MD group, because these children declined to be tested. For three other participants from the NLD group, CBCL scoresheets were lost or not completed.

RESULTS

SELF-REPORTED READING HABITS OF LD AND NON-LD STUDENTS

Differences in print exposure have been suggested as an important contributor to Matthew effects for reading achievement (Stanovich, 1986). Although longitudinal data were not available, the children's responses to the questionnaire given in Grade 8 could be analyzed. Descriptive statistics for the three questions that were asked about reading habits are provided in table II. Because distributions for these variables were moderately skewed, square root transformations were applied prior to inferential analyses. The number of books read annually for pleasure was correlated with reading ability at both Grade 2 (.43, $p = .002$) and Grade 8 (.46, $p = .001$); the number of books read for school assignments was significantly related to second grade reading (.42, $p = .002$) but not to eighth grade scores (.15); and the number of hours spent on pleasure reading was correlated with the reading composite at both Grade 2 (.30, $p = .029$) and Grade 8 (.34, $p = .009$).

Independent *t*-tests were conducted to compare the NLD group with the RD-RI, RD-SI, and MD groups, respectively, on each questionnaire item. As shown in the table, effect sizes ranged from .28 to .85 and most of the differences were statistically significant, despite the reduced power afforded by the

TABLE II. Self-reported Reading Habits in Grade 8 for Groups Differing in LD Status.

Questionnaire Item	Group							
	NLD		RD-RI		RD-SI		MD	
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>d</i>	<i>M</i> (<i>SD</i>)	<i>d</i>	<i>M</i> (<i>SD</i>)	<i>d</i>	
# books read annually for school, excluding textbooks	7.9 (4.7)	5.0 (3.1)	.68*	4.7 (2.9)	.72*	4.1 (2.5)	.85*	
# books read annually for pleasure	7.5 (8.1)	3.1 (3.7)	.63*	3.3 (3.4)	.58*	3.9 (3.9)	.49*	
# hours of pleasure reading weekly	6.1 (7.9)	3.6 (4.8)	.33	2.6 (2.4)	.52*	4.1 (3.9)	.28	

Note. NLD = no learning disabilities, RD = reading disability, MD = math disability, RI = research-identified, SI = school-identified. * $p < .05$, two-tailed.

small sizes of the groups. These results indicate that the LD groups indeed read considerably less in adolescence than did the NLD group, as expected. It cannot be determined, of course, how long-standing these differences in print exposure were.

MATH ACHIEVEMENT

Because math disabilities were school-identified and parent-reported, we analyzed Grade 8 Math Computation scores (the only available math achievement measure) to determine whether these 11 students were indeed less able in math than the NLD students and others. Mean *W* scores were 533.5 (*SD* 13.6) for the MD group, 549.9 (*SD* = 11.2) for the NLD group, and 542.5 (*SD* = 9.1) for students with reading disabilities only (research- and/or school-identified). Group differences were confirmed in a one-way ANOVA, $F(2, 53) = 9.01$, $p < .001$, $\eta^2 = .254$. Post hoc Tukey tests indicated that the MD group's mean was significantly lower than that of the NLD group ($p < .05$), although the comparison with the reading disability group did not quite meet the significance criterion ($p = .06$). These findings suggest that the schools' classifications of math disabilities were probably based, at least in part, on actual difficulties in math achievement by these students.

TESTS OF GROUP DIFFERENCES AND MATTHEW EFFECTS FOR READING, IQ, AND BEHAVIOR PROBLEMS

Table III summarizes the performance of the NLD group and the three overlapping LD groups on the reading and IQ tests in second and eighth grade. In that table, the last three columns list the differences between means for the NLD group and each LD group. Correlations between Grade 2 and Grade 8 scores indicated considerable temporal stability (all $p < .01$) of individual differences in word identification (.67), decoding (.60), reading comprehension (.39), the reading composite (.72), and IQ (.67).

Table IV provides descriptive statistics for the five CBCL measures at each grade for the various groups. In addition, the table shows the percentages of children whose standardized T scores were 60 or higher, placing them in the top 15 percent in relation to CBCL norms. Correlations between scores at the two grades indicated that individual differences were moderately stable over time (all $p < .01$) on the total problems (.53), internalizing (.53), externalizing (.37), social (.39), and attention (.38) scales.

To examine the main questions of interest, three sets of analyses were conducted. The NLD group was contrasted with the RD-RI group in the first set, with the RD-SI group in the second set, and with the MD group in the third. In each set, Matthew effects for reading achievement were examined within a $3 \times 2 \times 2$ mixed model ANOVA with reading test (WI, WA, PC) and grade as the within-subjects repeated measures and group as the between-group factor. Similarly, to examine Verbal and Performance IQ factors and the five CBCL scores, we conducted 2 (grade) $\times 2$ (group) mixed model ANOVAs.

The group \times grade interaction term in each analysis served as the critical test of whether there was a widening of group differences over time; that is, a Matthew effect. In the analyses of reading scores, the three-way interaction was also examined to determine whether the size of any such Matthew effects depended on the aspect of reading ability that was measured. In the other analyses, the main effect of group was also tested to examine overall group differences in IQ and behavior problems. No other main or interaction effects were of interest. The results are shown in table V. Because sample sizes limited the statistical power of these tests, we focused on effect sizes as well as significance in interpreting the findings. As can be seen in the table, the only evidence for a Matthew effect was obtained for IQ scores for the MD group, which differed more from those of the NLD group at Grade 8 than at Grade 2.

TABLE III. Reading and IQ scores in Grades 2 and 8 for Groups Differing in LD Status.

Measure	Grade	Group				Differences*		
		NLD	RD-RI	RD-SI	MD	Δa	Δb	Δc
Woodcock-Johnson Reading Tests (W Scores)								
Total Reading	2	502.4 (5.9)	481.5 (6.1)	487.2 (12.8)	492.4 (7.9)	20.9	15.2	10.0
	8	528.3 (6.7)	516.6 (6.3)	519.8 (5.8)	521.3 (3.7)	11.7	8.5	7.0
Word Ident.	2	500.7 (10.0)	478.4 (7.0)	483.9 (14.6)	488.8 (12.0)	22.3	16.8	11.9
	8	539.9 (10.3)	524.2 (9.2)	528.7 (8.4)	532.6 (5.2)	15.7	11.2	7.3
Word Attack	2	504.5 (8.6)	484.5 (10.3)	493.5 (15.8)	501.1 (10.8)	20.0	11.0	3.4
	8	514.5 (8.4)	504.9 (10.4)	511.4 (10.7)	513.5 (8.9)	9.6	3.1	1.0
Pass. Comp.	2	500.3 (8.8)	482.1 (9.3)	484.6 (11.2)	487.4 (9.5)	18.2	15.7	12.9
	8	529.0 (7.0)	521.0 (7.5)	519.1 (8.4)	517.6 (6.2)	8.0	9.9	11.4
WISC-R Short-Form IQs and Raw Scores on the 5 Subtests								
Full-Scale IQ	2	123.0 (8.3)	112.2 (11.4)	107.2 (10.2)	110.1 (9.8)	10.8	15.8	12.9
	8	119.0 (8.6)	109.2 (10.2)	104.3 (10.2)	102.1 (12.4)	9.8	14.7	16.9
Information	2	13.7 (2.4)	10.8 (2.0)	10.4 (2.8)	10.7 (2.3)	2.9	3.3	3.0
	8	24.7 (2.0)	21.3 (2.7)	20.7 (2.9)	20.7 (3.7)	3.4	4.0	4.0
Vocabulary	2	28.6 (5.4)	24.4 (4.3)	25.4 (5.1)	27.2 (4.1)	3.6	3.2	1.4
	8	49.5 (5.0)	44.3 (4.5)	43.9 (3.7)	44.6 (3.4)	5.2	5.6	4.9
Arithmetic	2	10.5 (1.5)	9.8 (1.5)	9.4 (1.7)	9.5 (1.4)	0.7	1.1	1.0
	8	15.8 (1.6)	15.0 (2.2)	13.9 (2.2)	14.1 (2.3)	0.8	1.9	1.7
Picture Arr.	2	26.4 (5.0)	24.8 (6.5)	22.6 (7.0)	23.1 (6.6)	1.6	3.8	3.3
	8	34.5 (4.9)	34.0 (4.8)	32.5 (9.1)	28.8 (10.0)	0.5	2.0	5.7
Block Design	2	26.2 (8.2)	23.3 (9.1)	21.0 (8.9)	20.8 (8.7)	2.9	5.2	5.4
	8	52.9 (5.8)	47.3 (10.1)	44.9 (10.4)	41.5 (14.1)	5.6	8.0	11.4

Note. Standard deviations are in parentheses. NLD = no learning disabilities; RD-RI = research-identified reading disabilities; RD-SI = school-identified reading disabilities; MD = math disabilities.

* Δa = NLD - RD-RI; Δb = NLD - RD-SI; Δc = NLD - MD.

TABLE IV. Mean Raw Scores and Percentage of Students Above the 85th Percentile ($T > 60$) on the Child Behavior Checklist at Grades 2 and 8 for Subgroups Differing in LD Status.

Scale	Grade	NLD		RD-RI		RD-SI		MD	
		<i>M</i> (<i>SD</i>)	%	<i>M</i> (<i>SD</i>)	%	<i>M</i> (<i>SD</i>)	%	<i>M</i> (<i>SD</i>)	%
Total Problems	2	23.8 (17.9)	20	26.9 (16.3)	32	28.4 (17.4)	36	39.8 (13.9)	73
	8	15.9 (13.9)	18	19.7 (18.1)	10	23.1 (25.4)	14	25.4 (21.0)	27
Internalizing	2	6.3 (6.4)	24	8.4 (5.5)	42	8.0 (5.4)	29	12.5 (6.0)	64
	8	5.6 (6.7)	18	7.4 (7.9)	10	9.0 (10.1)	14	8.0 (6.1)	9
Externalizing	2	9.3 (7.8)	20	9.5 (6.1)	10	10.5 (7.8)	21	14.5 (5.8)	28
	8	5.4 (5.1)	7	6.6 (6.7)	10	7.8 (10.7)	14	11.1 (11.9)	27
Social	2	1.0 (1.3)	8	2.2 (2.0)	16	2.4 (1.8)	21	3.2 (1.7)	36
	8	1.2 (1.8)	14	0.8 (1.1)	0	0.7 (1.3)	7	0.6 (0.8)	0
Attention	2	3.0 (2.9)	28	2.5 (2.7)	16	2.9 (3.2)	21	4.5 (2.8)	36
	8	2.0 (2.4)	7	2.7 (3.1)	10	2.7 (3.3)	14	3.3 (3.0)	18

Note. NLD = no learning disabilities; RD-RI = research-identified reading disabilities; RD-SI = school-identified reading disabilities; MD = math disabilities.

TABLE V. Results of Inferential Tests: Effect Sizes and Significance.

Dependent Measure(s)	NLD vs. RD-RI		NLD vs. RD-SI		NLD vs. MD	
	F	η^2	F	η^2	F	η^2
Tests of Matthew Effects (Group x Time Interaction)						
Reading: WI, WA, & PC	22.364 ^a	.342	6.648 ^a	.149	1.782	.050
Verbal IQ Factor	0.014	.017	0.907	.023	1.953	.054
Performance IQ Factor	0.066	.002	0.004	.001	2.945 ⁺	.080
CBCL Total	0.024	.001	0.211	.006	0.956	.027
CBCL Internalizing	0.017	.001	0.710	.019	3.297 ^a	.088
CBCL Externalizing	0.269	.006	0.167	.004	0.024	.001
CBCL Attention	1.418	.033	0.595	.016	0.032	.001
CBCL Social Problems	10.794 ^a	.204	10.590 ^a	.223	27.391 ^a	.446
Tests of NLD vs. LD Group Difference (Main Effect)						
Verbal IQ Factor	23.683 ^{***}	.355	23.048 ^{***}	.378	13.975 ^{***}	.291
Performance IQ Factor	0.319	.002	7.989 [*]	.174	12.086 ^{***}	.262
CBCL Total	0.608	.014	1.207	.032	6.566 [*]	.162
CBCL Internalizing	1.135	.026	1.434	.037	4.231 [*]	.111
CBCL Externalizing	0.177	.004	0.752	.020	7.209 [*]	.175
CBCL Attention	0.032	.001	0.139	.004	3.973 ⁺	.083
CBCL Social Problems	0.996	.023	1.137	.030	2.769 ⁺	.075

⁺ $p < .10$, ^{*} $p < .05$, ^{***} $p < .001$.

^aAlthough significant, these interactions were in the opposite direction than predicted; i.e., a narrowing of the group difference over time.

In all other instances, the direction of effect was a narrowing of group differences over time or parallel growth for both groups. Consequently, all Grade 2 reading measures were negatively correlated with the change in those scores from second to eighth grade (all $r > -.40$, $p < .01$), with steeper slopes seen for children with the weaker initial reading scores; changes in reading abilities were not significantly related to sex or SES (all $r < .24$). Consistent with these correlations in the analyses of reading achievement, there were no substantial or significant group \times grade \times test interaction effects in the ANOVAs, indicating that similar developmental trends occurred for word recognition, decoding, and passage comprehension skills.

When the subsample with RD (groups 1 through 6 in table I) was examined separately, growth in reading was negatively correlated with initial reading scores ($r = -.77$) but not with IQ ($-.16$), the degree of discrepancy between reading and IQ ($-.13$), whether the RD was school-identified ($-.04$), nor whether a child had received remedial instruction ($-.10$). Hence, the slightly steeper slope for the RD-RI than the RD-SI group was apparently not attributable to the latter group being school-identified, having lower average IQs, or being more likely to have received extra instruction, but rather to their higher initial reading scores in second grade.

Differences in mean IQ were also seen for the groups with reading disabilities, but the magnitudes of these differences were similar in Grade 2 and Grade 8. Both verbal and performance IQ were lower for the RD-SI group, whereas for the subsample with research-identified reading disabilities, there was a deficit in verbal IQ only. For the sample as a whole, changes in verbal and performance IQ over time were inversely related to initial scores ($r = -.44$ and $-.46$, respectively, $p < .01$) and were unrelated to sex or SES (all $r < .14$).

Only the MD group also had substantially higher rates of behavior problems of every kind, particularly on the externalizing scale. Over time, these differences either narrowed or remained similar relative to the NLD group. Hence, correlations between Grade 2 CBCL scores and the changes in those scores over the succeeding six years were uniformly negative ($r = -.35$ to $-.68$, all $p < .01$). There were no substantial associations of such changes with sex or SES (all $r < .20$).

These differences in CBCL scores were large enough in the MD group to be clinically meaningful, as shown (in table IV) by the percentages of children in each group whose standardized T scores were 60 or higher, placing them in the top 15 percent in

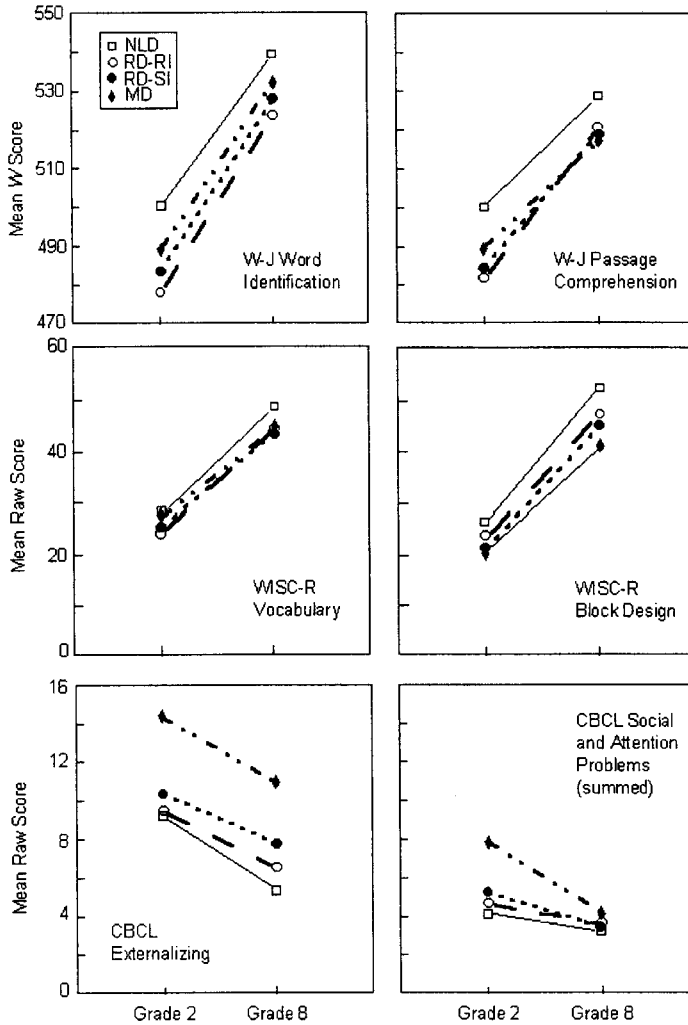


Figure 1. *Developmental patterns for some measures of achievement, IQ, and behavior problems in children with no learning disabilities (NLD) versus those with research-identified reading disabilities (RD-RI), school-identified reading disabilities (RD-SI), and math disabilities (MD).*

relation to CBCL norms. To examine this finding more closely, the distributions of total problems scores on the CBCL at Grade 2 were examined for the NLD group and for three groups of children with LD: those with reading disabilities only, those with math disabilities only, and those with both reading and

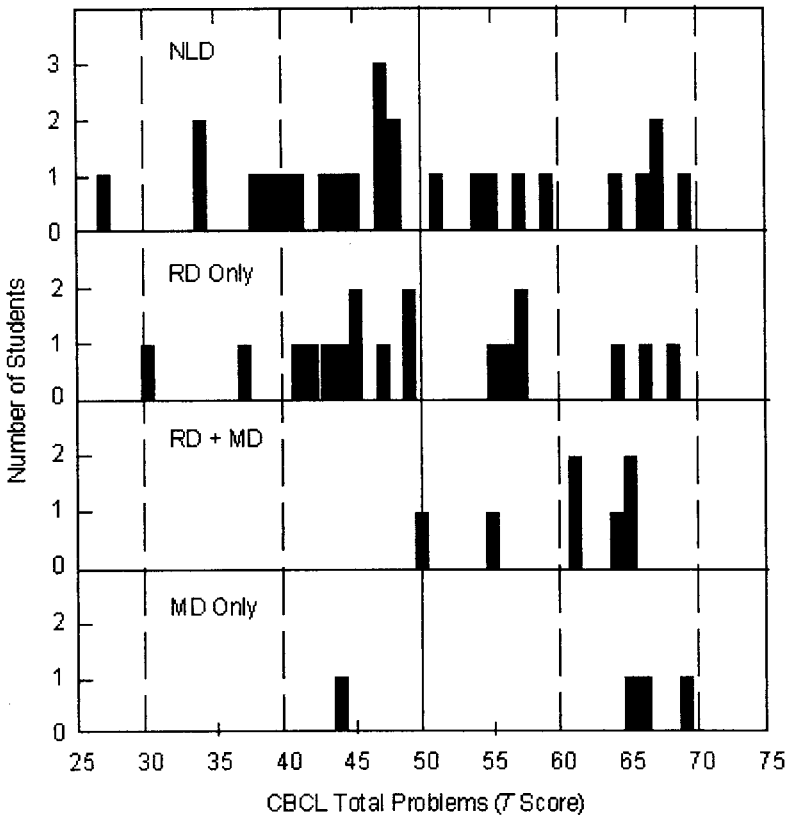


Figure 2. Distributions of total problems T-scores on the child behavior checklist (CBCL) for children with no learning disabilities (NLD), with reading disabilities (RD) only, with math disabilities (MD) only, and with both RD and MD.

math difficulties. By comparing the bottom two panels in figure 2 with the distributions in the upper panels, one can see that in our sample, behavior problems were associated with the presence of a math disability, whether or not it was accompanied by a reading disability.

SUMMARY OF RESULTS

No evidence for Matthew effects was obtained for children with reading disabilities, and a fan spread of group differences from Grade 2 to Grade 8 was seen only for IQ scores of the students with math disabilities. The math disability group was also found to have elevated rates of behavioral, social, and attention

problems at both grades, but these differences did not widen appreciably over time.

DISCUSSION

MATTHEW EFFECTS

In this longitudinal sample, the children with LD were no further behind in reading achievement in Grade 8 than they had been in Grade 2, relative to normally achieving students. On the contrary, differences from the NLD group narrowed significantly over time for two groups with reading disabilities, and remained virtually unchanged for those with math disabilities. These findings are very consistent with those from several prior studies in which parallel or slightly converging growth curves have been observed for better and poorer readers (Baker et al., 1984; Jordan et al., 2002; Phillips et al., 2002; Shaywitz et al., 1995). Such results are in disagreement, however, with those of several studies in which divergence between LD and NLD groups has been seen over time for at least some kinds of reading abilities (Juel, 1988; McKinney & Feagans, 1984; Bast & Reitsma, 1998). Several explanations for the disparate findings merit consideration.

First, because the fan spread pattern was seen for word recognition but not also for comprehension in their sample, Bast and Reitsma suggested that the use of a composite reading score by Shaywitz et al. might have obscured a Matthew effect for word recognition skill in that study. In the present analyses, however, we used the same test as Shaywitz et al. did, and our results for individual reading subtests mirrored those for the composite score. Moreover, the lack of group \times grade \times subtest interactions in our analyses, and the equivalent results for word recognition and reading comprehension in other studies using a variety of tests (Baker et al., 1984; Catts et al., 2003; Jordan et al., 2002; McKinney & Feagans, 1984), suggests that whether Matthew effects were observed cannot be attributed to the kind of reading measure(s) that different researchers have examined.

Second, standardized scores, which can in principle mask Matthew effects, were analyzed in several studies that failed to observe Matthew effects for reading (Baker et al., 1984; Catts et al., 2003; Phillips et al., 2002; Shaywitz et al., 1995). However, the present study and that of Jordan et al. (2002) obtained similar findings when Rasch-scaled reading measures were examined.

Third, the evidence for Matthew effects on reading has been obtained in three studies that examined development over the first few years of reading acquisition, beginning in kindergarten or first grade (Bast & Reitsma, 1998; Juel, 1988; McKinney & Feagans, 1984). In contrast, studies that have failed to find the fan spread pattern have focused on a somewhat later period from second through fourth grade (Catts, et al., 2003; Jordan, et al., 2002), or as in the present study, have looked at longer-term changes in relative reading abilities over the entire elementary school period (Phillips, et al., 2002; Shaywitz, et al., 1995). This suggests that Matthew effects in reading might be very time-limited phenomena, such that all adverse consequences for reading skills emerge by the second or third grade, with no further widening of the achievement gap thereafter. It is intuitively surprising, but possible, that the academic consequences of initial reading ability differences are not cumulative over the later elementary and middle-school years. Clearly, new longitudinal data (or re-analyses of some extant data bases) will be needed to explore this possibility.

In addition to reading trajectories themselves, differential cognitive sequelae to initial success or failure in learning to read have also been hypothesized, but we observed no such Matthew effects on IQ for the groups with reading disabilities. We did find an apparent widening of differences over time for both verbal and nonverbal abilities of the children with math disabilities. However, because this subgroup was slightly less impaired than the other LD groups in Grade 2 reading, it is difficult to attribute their relatively flatter IQ growth curves to poor reading ability. It also bears noting that the amounts by which the IQ differences changed over time relative to the NLD group (increasing by 0.67 points per year for the MD group and decreasing by 0.18 points or less in the other groups) were all quite small, and unlikely to be very educationally meaningful.

The findings are also not consistent with the view that disparities in print exposure underlie Matthew effects for reading and cognitive abilities (Stanovich, 1986). The children with LD reported that they had read considerably less (about half as many books per year) than the non-LD students in eighth grade. Given that poorer readers have been shown to read less than their classmates from a very early age (e.g., Biemiller, 1977–1978), we presume that differences in print exposure in our sample were probably long-standing, even though we documented them only in adolescence. Nevertheless, no negative consequences of diminished reading experience were evident in

the development of the reading and cognitive skills that we examined in children with reading disabilities. It is possible, of course, that Matthew effects might have been observed if other abilities (such as background knowledge or listening comprehension) had been assessed. On the other hand, if Matthew effects are a short-lived phenomenon in the early school years, then print exposure disparities may not be the main mechanism responsible for divergences in reading abilities in kindergarten through second or third grade.

Although the Matthew effects hypothesis was advanced to account for individual differences in academic achievement and cognitive growth, we also examined the possibility that early learning difficulties could have adverse consequences for psychosocial adjustment. However, contrary to Jorm et al. (1986) and McGee et al. (1986), we found no support for this notion. Instead, our findings converge with those of other investigators in showing no Matthew effects in adjustment (Bachman & O'Malley, 1977; Fuerst & Rourke, 1995; Pintrich, Anderman, & Klobucar, 1994; Vaughn et al., 1993). We concur with the conclusions of Hinshaw (1992) and Cornwall and Bawden (1992) that the available evidence indicates that for children who do not already exhibit these kinds of problems in the early school years, the risk that such problems will subsequently emerge in adolescence is not much greater for young students with LD than for other children.

In sum, Matthew effects were elusive, despite the plausibility and widespread acceptance of that well-reasoned hypothesis. Our findings and others instead indicate that although children with LD rarely catch up fully with normally achieving classmates by adolescence, neither do they usually fall further behind in reading skills over time, at least from second grade onward. Any declines in IQ relative to non-LD students appear to be minimal for most children with LD, and the incidence of social, attention, and behavior problems seems not to increase markedly over the elementary and middle school years as a consequence of early academic difficulty.

SOCIAL, ATTENTION, AND BEHAVIORAL PROBLEMS ASSOCIATED WITH LD

The other notable finding of this study was that the type of LD that a child exhibited was related to whether difficulties in psychosocial adjustment were seen. A strong majority (73 percent) of the children with math disabilities, alone or in conjunction with reading difficulties, had high rates of behavior problems in

Grade 2 relative to national norms. In contrast, CBCL scores for children whose disabilities were confined to reading were similar to those of the normally achieving second graders, with most scores falling primarily in the normal range. In eighth grade, the MD group continued to have more problems overall, especially on the externalizing scale, than the other adolescents in the sample.

It is difficult to judge whether these findings coincide with previous research on this question because, as noted by Cornwall and Bawden (1992) and Tsatsanis, Fuerst, and Rourke (1997), very few studies have looked separately at children with different kinds of LD. Instead, most researchers have compared undifferentiated LD samples either to national norms or to a nondisabled control group. In many such samples, the proportion of children with math disabilities may have actually been quite high. For instance, in a school population studied by Badian (1983), about 75 percent of all children with LD had a math disability. Hence, math disabilities (often in conjunction with reading difficulties) will probably predominate in samples drawn from LD classes without regard for type of disability, and the high incidence of social and behavioral problems in most of the literature may simply reflect that.

A few studies, however, have observed moderately elevated rates of behavior problems in samples that were selected on the basis of the presence of an IQ-discrepant RD or low reading achievement (e.g., Jorm et al., 1986; McGee et al., 1986; for a review, see Hinshaw, 1992). Math achievement of those children has not been reported, however. Again, using Badian's (1983) sample as a benchmark, one can estimate that 56 percent of children with specific reading disability would also have a math disability, and in samples that do not meet an IQ-discrepancy criterion ("garden variety" poor readers), the proportion is likely to be higher, we suspect. Hence, the results of those studies, too, could conceivably reflect the inadvertent inclusion of many children with math disabilities in the samples that were examined. Because the composition of our sample was unusual (in its deliberate inclusion of so many children from families with a history of reading disabilities), fewer of the children with reading disabilities had math disabilities (only 21 percent of the RD-RI group and 36 percent of the RD-SI group), which may account for the differences in findings.

In any case, our results are consistent with Dickman's (1996) argument that the risk for psychosocial problems may depend on the type of learning disability, and coincide well with those

of several other studies of child and adolescent social and behavior problems that have found little or no association of such problems with reading disabilities, and/or strong and specific association with math disabilities. For example, Badian and Ghublikian (1983) selected children who had disabilities just in math or just in reading, and compared those groups to controls with low-average achievement in both domains. Only in the math disability group were elevated rates of social and behavioral problems observed. (Unfortunately, a group with both math and reading disabilities was not included.) Consistent with this, Rourke and Fuerst (1995) also found that children with nonverbal learning disabilities (who typically exhibit math difficulties) are at much greater risk for severe psychological problems than are children with verbal disabilities (typically involving reading deficits). Likewise, a recent study (Hynd, Miller, Sanchez, Lindstrom, & Jones, 2002; Miller, 2002) also found CBCL scores to be in the normal range for most children with specific reading disabilities.

At this point, however, no definitive conclusions about the relationship of LD to behavior problems can be drawn. Our results are based on a very small sample of children with MD, and the converging evidence from other studies is quite limited. However, the findings to date are sufficiently compelling, we feel, to support the recommendation that it could be very fruitful in future research to consider the possibility that the incidence of social and psychological problems may be rather different for different types of LD. In particular, we hypothesize that behavioral problems may be relatively rare among children whose achievement difficulties are confined to reading, with little risk for the later emergence of such problems in adolescence, and may be very frequent in children who have math disabilities, and may be present from an early age, possibly antedating the onset of their math difficulties. If so, then taking into account the type of LD in future studies may be very helpful for clarifying the associations between learning difficulties and psychosocial adjustment.

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References

- Achenbach, T. M., & Edelbrock, C. (1981). Behavioral problems and competencies reported by parents of normal and disturbed children aged four to sixteen. *Monographs of the Society for Research in Child Development*, 46(1, Serial No. 188).
- Achenbach, T. M., & Edelbrock, C. (1983). *Manual for the child behavior checklist and revised child behavior profile*. Burlington, VT: University of Vermont.
- Allington, R. L. (1983). The reading instruction provided readers of differing reading abilities. *The Elementary School Journal*, 83, 548-559.
- Anderson, R. C., & Freebody, P. (1979). Vocabulary knowledge (Technical Report No. 136). Urbana-Champaign, IL: Center for the Study of Reading, University of Illinois.
- Bachman, J., & O'Malley, P. (1977). Self-esteem in young men: A longitudinal analysis of the impact of educational and occupational attainment. *Journal of Personality and Social Psychology*, 35, 365-380.
- Badian, N. A. (1983). Dyscalculia and nonverbal disorders of learning. In H. R. Myklebust (Ed.), *Progress in learning disabilities* (vol. V) (pp. 235-264). New York: Grune & Stratton.
- Badian, N. A., & Ghublikian, M. (1983). The personal-social characteristics of children with poor mathematical computation skills. *Journal of Learning Disabilities*, 16, 154-157.
- Baker, L. A., Decker, S. N., & DeFries, J. C. (1984). Cognitive abilities in reading-disabled children: A longitudinal study. *Journal of Child Psychology and Psychiatry*, 23, 111-117.
- Bast, J., & Reitsma, P. (1998). Analyzing the development of individual differences in terms of Matthew effects in reading: Results from a Dutch longitudinal study. *Developmental Psychology*, 34, 1373-1399.
- Bauman, E. (1991). Stability of WISC-R scores in children with learning difficulties. *Psychology in the Schools*, 28, 95-100.
- Biemiller, A. (1977-1978). Relationships between oral reading rates for letters, words, and simple tests in the development of reading achievement. *Reading Research Quarterly*, 13, 223-253.
- Brainerd, C. J., Kingma, J., & Howe, M. L. (1986). Long-term memory development and learning disability: Storage and retrieval loci of disabled/nondisabled differences. In S. J. Ceci (Ed.), *Handbook of cognitive, social, and neuropsychological aspects of learning disabilities* (vol. 1) (pp. 161-184). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Bryan, T. (1974). Peer popularity of learning disabled children. *Journal of Learning Disabilities*, 7, 261-268.

- Burstall, C. (1979). The Matthew effect in the classroom. *Educational Research*, 21, 19–25.
- Butkowski, S., & Willows, D. (1980). Cognitive-motivational characteristics of children varying in reading ability: Evidence for learned helplessness in poor readers. *Journal of Educational Psychology*, 72, 408–422.
- Catts, H., Fey, M., Zhang, X., & Tomblin, J. B. (1999). Language basis of reading and reading disabilities: Evidence from a longitudinal study. *Scientific Studies of Reading*, 3, 331–361.
- Catts, H. W., Hogan, T. P., & Fey, M. E. (2003). Subgrouping poor readers on the basis of individual differences in reading-related abilities. *Journal of Learning Disabilities*, 36, 151–164.
- Chall, J. S. (1983). *Stages of reading development*. New York: McGraw-Hill.
- Chapman, R. B., Larsen, S. C., & Parker, R. M. (1979). Interactions of first grade classroom teachers with learning disordered students. *Journal of Learning Disabilities*, 12, 225–230.
- Cornwall, A., & Bawden, H. N. (1992). Reading disabilities and aggression: A critical review. *Journal of Learning Disabilities*, 25, 281–288.
- Dickman, G. E. (1996). The link between learning disabilities and behavior. In S. C. Cramer & W. Ellis (Eds.). *Learning disabilities: Lifelong issues* (pp. 215–228). Baltimore: Paul H. Brookes Publishing Company.
- Fuerst, D. R., & Rourke, B. P. (1995). Patterns of psychosocial functioning of children with learning disabilities at three age levels. *Child Neuropsychology*, 1, 38–55.
- Garrett, M. K., & Crump, W. D. (1980). Peer acceptance, teacher preference and self-appraisal of social status of learning disabled students. *Learning Disability Quarterly*, 3, 42–47.
- Hinshaw, S. P. (1992). Externalizing behavior problems and academic underachievement in childhood and adolescence: Causal relationships and underlying mechanisms. *Psychological Bulletin*, 111, 127–155.
- Hollingshead, A. B., & Redlich, F. C. (1958). *Social class and mental illness*. New York: Wiley.
- Huntington, D. D., & Bender, W. N. (1993). Adolescents with learning disabilities at risk? Emotional well-being, depression, suicide. *Journal of Learning Disabilities*, 26, 159–166.
- Hynd, G. W., Miller, C. J., Sanchez, J., Lindstrom, W. A., & Jones, L. (2002, November). Findings from the University of Georgia's NIH-funded research clinic. Paper presented to the annual meeting of the International Dyslexia Association, Atlanta.
- Jordan, N. C., Kaplan, D., & Hanich, L. B. (2002). Achievement growth in children with learning difficulties in mathematics: Findings of a two-year longitudinal study. *Journal of Educational Psychology*, 94, 586–597.
- Jorm, A. F., Share, D. L., Maclean, R., & Matthews, R. (1986). Cognitive factors at school entry predictive of specific reading retardation and general reading backwardness: A research note. *Journal of Child Psychology and Psychiatry*, 27, 45–54.
- Juel, C. (1988). Learning to read and write: A longitudinal study of 54 children from first through fourth grades. *Journal of Educational Psychology*, 80, 437–447.
- Kavale, K. A., & Forness, S. R. (1996). Social skill deficits and learning disabilities: A meta-analysis. *Journal of Learning Disabilities*, 29, 226–237.
- Kinsbourne, M., & Caplan, P. J. (1979). *Children's learning and attention problems*. Boston: Little, Brown.
- McGee, R., Williams, S., Share, D. L., Anderson, J., & Silva, P. A. (1986). The relationship between specific reading retardation, general reading backwardness and behavioral problems in a large sample of Dunedin boys: A longitudinal study from five to eleven years. *Journal of Child Psychology and Psychiatry*, 27, 597–610.

- McKinney, J. D., & Feagans, L. (1984). Academic and behavioral characteristics: Longitudinal studies of learning disabled children and average achievers. *Learning Disability Quarterly*, 7, 251-265.
- Miller, C. J. (2002). Parental contributions to child reading achievement, phonological processing, rapid naming ability, and internalizing behaviors. Unpublished doctoral dissertation, University of Georgia.
- Oakman, S., & Wilson, B. (1988). Stability of WISC-R intelligence scores: Implications for 3-year evaluations of learning disabled students. *Psychology in the Schools*, 25, 118-120.
- Phillips, L. M., Norris, S. P., Osmond, W. C., & Maynard, A. M. (2002). Relative reading achievement: A longitudinal study of 187 children from first through sixth grades. *Journal of Educational Psychology*, 94, 3-13.
- Pintrich, P. R., Anderman, E. M., & Klobucar, C. (1994). Intraindividual differences in motivation and cognition in students with and without learning disabilities. *Journal of Learning Disabilities*, 27, 360-370.
- Roth, F., & Spekman, N. J. (1986). Narrative discourse: Spontaneously generated stories of learning-disabled and normally achieving students. *Journal of Speech and Hearing Disorders*, 51, 8-23.
- Rourke, B. P., & Fuerst, D. (1995). Cognitive processing, academic achievement and socioemotional functioning: A neuropsychological perspective. In D. Cicchetti & D. Cohen (Eds.). *Manual of developmental psychopathology* (vol. 1) (pp. 391-423). New York: Wiley.
- Sattler, J. (1992). *Assessment of children* (3rd ed.). San Diego, CA: author.
- Scarborough, H. S. (1989). Prediction of reading disability from familial and individual differences. *Journal of Educational Psychology*, 81, 101-108.
- Scarborough, H. S. (1990). Very early language deficits in dyslexic children. *Child Development*, 61, 1728-1734.
- Scarborough, H. S. (1998). Predicting the future achievement of second graders with reading disabilities: Contributions of phonemic awareness, verbal memory, rapid naming, and IQ. *Annals of Dyslexia*, 48, 115-136.
- Scarborough, H. S., & Layfer, J. (1996, April). A follow-up study of children with learning disabilities: Academic, cognitive, and psychosocial outcomes in adolescence. Paper presented at the meeting of the Society for the Scientific Study of Reading, New York.
- Share, D. L., & Silva, P. A. (1987). Language deficits and specific reading retardation: Cause or effect? *British Journal of Disorders of Communication*, 22, 219-226.
- Shaywitz, B. A., Holford, T. R., Holahan, J. M., Fletcher, J. M., Stuebing, K. K., Francis, D. J., & Shaywitz, S. E. (1995). A Matthew effect for IQ but not for reading: Results from a longitudinal study. *Reading Research Quarterly*, 30, 894-906.
- Siegel, L., & Ryan, E. (1984). Reading disability as a language disorder. *Remedial and Special Education*, 5, 28-33.
- Stanovich, K. E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly*, 21, 360-407.
- Stanovich, K. E. (1988). The right and wrong places to look for the cognitive locus of reading disability. *Annals of Dyslexia*, 38, 154-177.
- Stone, W. L., & La Greca, A. M. (1994). Social deficits in children with learning disabilities. In A. J. Capute, P. J. Accardo, & B. K. Shapiro (Eds.). *Learning disabilities spectrum: ADD, ADHD, and LD* (pp. 155-175). Baltimore: York Press.
- Tsatsanis, K. D., Fuerst, D. R., & Rourke, B. P. (1997). Psychosocial dimensions of learning disabilities: External validation and relationship with age and academic functioning. *Journal of Learning Disabilities*, 30, 490-502.

- Torgesen, J., & Dice, C. (1980). Characteristics of research in learning disabilities. *Journal of Learning Disabilities, 13*, 531-535.
- Vance, H. B., Blixt, S., Ellis, R., & Debell, S. (1981). Stability of the WISC-R for a sample of exceptional children. *Journal of Clinical Psychology, 37*, 397-399.
- Vance, H. B., Hankins, N., & Brown, W. (1987). A longitudinal study of the Wechsler Intelligence Scale for Children - Revised over a six-year period. *Psychology in the Schools, 24*, 229-33.
- Vaughn, S., Zaragoza, N., Hogan, A., & Walker, J. (1993). A four-year longitudinal investigation of the social skills and behavior problems of students with learning disabilities. *Journal of Learning Disabilities, 26*, 404-412.
- Walberg, H. J., & Tsai, S. L. (1983). Matthew effects in education. *American Educational Research Journal, 20*, 359-373.
- Wechsler, D. (1989). *Wechsler intelligence scale for children - Revised*. San Antonio, TX: The Psychological Corporation.
- Williamson, G. L., Appelbaum, M., & Epanchin, A. (1991). Longitudinal analyses of academic achievement. *Journal of Educational Measurement, 28*, 61-76.
- Wolf, M., & Goodglass, H. (1986). Dyslexia, dysnomia, and lexical retrieval: A longitudinal investigation. *Brain and Language, 28*, 154-168.
- Woodcock, R., & Johnson, M. B. (1978). *Woodcock-Johnson Psychoeducational Battery*. Allen Park, TX: DLM Teaching Resources.

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