

Three-Tier Models of Reading and Behavior: A Research Review



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Abstract: The purpose of this study was to analyze the research literature on three-tier models of reading and behavior and to provide a descriptive analysis and meta-analytic review of these models. An in-depth review of 17 articles was conducted on the similarities and differences between and among three-tier models of reading ($n = 5$), models of behavior ($n = 7$), and integrated models (combining reading and behavior; $n = 5$). Descriptive analyses were conducted across three areas: student populations, intervention level, and setting. Finally, a meta-analytic review was completed of 11 of the 17 investigations. Scientific evidence shows that one or more levels of these three-tier models leads to improved reading or behavior performance; however, there is a paucity of research detailing the integration of three-tier reading and behavior models. Limitations and directions for future research are discussed.

Students must learn to read to be successful in our educational system and our society as a whole (Kame'enui, Carnine, Dixon, Simmons, & Coyne, 2002). Even though reading is one of the most valued skills in the nation, many students continue to struggle with learning to read. Precious resources are devoted to remedying the skills of struggling readers, who are estimated to make up as much as 70% of older students (Biancarosa & Snow, 2004). Additionally, reading is the primary area of difficulty for 80% to 85% of students identified as having learning disabilities (Kame'enui et al., 2002). Deficits in reading achievement are associated with a host of negative outcomes, including below-grade-level performance across the curriculum, grade retention, and failure to graduate (U.S. Department of Education, 2003). Consequently, classroom instruction has focused on the use of research-based reading curricula, especially since the passage of the No Child Left Behind Act of 2001.

Recently the three-tier reading model has been developed to aid in improving the reading skills of students who are poor readers (Vaughn & Linan-Thompson, 2003). So far there is no universally agreed-upon definition of this model, which is a conceptual framework designed to be implemented in a schoolwide setting using research-based

programs. This framework is descriptive rather than prescriptive and can be adjusted for grouping practices. It "is a prevention model that is aimed at catching students early—before they fall behind—and providing the supports they need throughout the first four years of schooling" (The University of Texas at Austin, 2005, p. 9).

Tier I is the core reading program and is designed for all students in a school. The core program should result in approximately 70% to 80% of the students meeting the benchmarks of the *Dynamic Indicators of Basic Early Literacy Skills* (DIBELS; Kame'enui & Simmons, 1998). In Tier II, supplemental reading instruction is provided to students who are not making progress in the core reading program. These students account for 20% to 30% of the school population (Coyne, Kame'enui, & Simmons, 2004; The University of Texas at Austin, 2005). Tier III consists of focused intervention programs and is for those students (5%–10%) who did not make progress during Tier II instruction. Often these Tier III students are already failing in school or are seriously at risk for reading failure (e.g., students with learning disabilities).

Like reading difficulties, student behavior problems remain a primary concern to the general public and to teachers (Martella, Nelson, & Marchand-Martella, 2003).

Not only is the proportion of individual students with severe behavior problems continuing to grow, but the severity and frequency of the antisocial behaviors displayed by these students also continue to erode school climate and interfere with the academic performance of all students (U.S. Department of Health and Human Services, 1999; Walker, Ramsey, & Gresham, 2004). Developing and implementing effective methods for managing and responding to student misbehavior are critical, given that misbehavior wastes instructional time, is disruptive to all students, creates safety problems, and decreases the chance that the students who misbehave will achieve educational success (Walker, Ramsey, & Gresham, 2003). Without the use of effective management programs, schools can expect to observe more than 20% of their students exhibiting problem behaviors (Scott, 2001). Additionally, Walker et al. (2003) noted, "Schools can do a lot to minimize bad behavior—and in doing so, they help not only antisocial children, they greatly advance their central goal of educating children" (p. 6).

As with reading, a three-tier model has been proposed to aid in the improvement of student behavior. This model is a continuum of behavior support composed of three different levels of intervention designed to prevent, respond to, and reduce problem behaviors. Additionally, this is a hierarchical model in which the intensity of the intervention must match the intensity of the problem behavior (Sugai, Sprague, Horner, & Walker, 2000).

Tier I implements universal behavioral procedures for all students (Gresham, 2004; Walker et al., 2003). Approximately 80% to 90% of students will respond to these procedures (Sugai et al., 2000). In Tier II, behavioral interventions are implemented in small groups for students who are at risk for school failure. These interventions are designed for students who are unresponsive to universal approaches (Eber, Sugai, Smith, & Scott, 2002; Sugai, Horner, & Gresham, 2002). Students in the secondary level make up 5% to 10% of the school population and are considered to be at risk for future behavioral problems (Sugai et al., 2002). Tier III is composed of focused interventions for students who are failing in school. These students exhibit chronic patterns of violent, disruptive, or destructive behavior (Gresham, 2004; Sugai et al., 2002) and account for 40% to 50% of all behavior disruptions in the school (Sugai et al., 2002). Approximately 1% to 5% of students (*treatment resisters*) will need Tier III interventions (Sugai et al., 2002).

Although three-tier reading and behavior models have promise, they have a shared weakness: Despite the fact that reading and behavior problems often coexist, these models typically view them in isolation from one another. Integrated three-tier models have been proposed to address both issues simultaneously (Horner, Sugai, Todd, & Lewis-Palmer, 2005; Stewart, Martella, Marchand-Martella, & Benner, 2005). Horner et al. (2005) noted,

The basic message is that academic and behavioral supports must be intertwined. Children will not learn to read by being taught social skills, but they also will not learn to read if a good curriculum is delivered in a classroom that is disruptive and disorganized. (p. 382)

Thus, O'Shaughnessy, Lane, Gresham, and Beebe-Frankenberger (2003) posed the following question: "How can schools better assist children who enter school without the necessary knowledge, skills, or attitudes they need to be successful?" (p. 27). Integrated three-tier reading and behavior models target those students who lack the necessary academic and behavioral resources for a successful education. As stated by Horner et al., "Combining behavior support and effective instruction may be an important theme for school reform in the United States" (p. 382).

Although researchers have greatly contributed to our understanding of three-tier models in reading, behavior, and integrated systems, two notable gaps in the literature remain. First, there have been no systematic reviews of the research on three-tier models. Second, no studies have used meta-analytic review procedures to evaluate the effects of each model on reading skills and behavior. Thus, we have a very limited understanding of the relative contribution of each model to reading and behavioral outcomes. Such research would not only fill a notable gap in the research literature but also provide useful information to help district and school leadership teams make systematic school-wide reforms.

The purpose of this investigation was twofold:

1. to provide a descriptive analysis of the research literature on three-tier models and
2. to carry out a meta-analysis to evaluate the relative impact of each model (reading only, behavior only, integrated) on reading and behavior outcomes.

Specifically, reading, behavior, and integrated models were examined to determine the magnitude of the effect these models had on student behavior.

Method

LITERATURE IDENTIFICATION

All investigations were selected using the ERIC, ProQuest, Questia, and First Search databases. Search terms included *trilevel reading model*, *three-tier intervention reading model*, *three-tier intervention behavior model*, *schoolwide interventions*, *reading and behavior problems*, and *response to intervention*. Additional search terms included the names of selected authors in the area of three-tier models for instruction and behavior management (e.g., Good, Horner, Kame'enui, Keogh, Lane, Linan-Thompson, Nelson, O'Shaughnessy, Simmons, Sugai, Swanson, Vaughn, Walker). Ancestral searches of reference lists were conducted to ob-

tain other research articles about similar topics. Hand searches of peer-reviewed journals were also conducted to gather the most recent articles. Journals searched included the 2003 and 2004 volumes of *The Journal of Special Education*, *Exceptional Children*, *School Psychology Review*, the *Journal of Positive Behavior Interventions*, *Behavioral Disorders*, and the *Journal of Emotional and Behavioral Disorders*. Finally, various relevant publications and technical reports were obtained from the University of Oregon, the University of Texas at Austin, and the University of South Florida.

DESCRIPTIVE ANALYSIS

Inclusion criteria were chosen to ensure that the studies sampled would reflect the larger literature on three-tier models in reading and behavior. The inclusion criteria were also chosen to provide data on reading and behavioral outcomes for each model (reading only, behavior only, integrated). Studies included in the descriptive analysis met four inclusion criteria:

1. They were published in peer-reviewed journals (ERIC documents and conference proceedings were excluded).
2. They indicated their intent to assess a three-tier model and/or one or more levels of a three-tier model.
3. They targeted reading and/or behavior (studies investigating the effects of nonreading interventions [e.g., perceptual training] on reading outcomes were excluded).
4. They addressed reading and/or behavioral outcomes.

Seventeen intervention studies met these criteria.

META-ANALYSIS

A fifth criterion was added to allow for an analysis of the magnitude of the effect of each model:

5. The studies reported outcomes in a manner permitting the computation of at least one Z_r effect size estimator between a model and an outcome (reading or behavior; e.g., beta weights, means and associated standard deviations, F statistics).

Six of the 17 studies did not meet the fifth inclusion criterion and were excluded from further review (e.g., Colvin & Fernandez, 2000; Scott, 2001; Sprague et al., 2001). Thus, 11 studies became the focus of subsequent analysis.

CODING PROCEDURE

The first author coded the following characteristics for each investigation: (a) study identification (author, year,

and source of publication); (b) tier level; (c) type and number of schools; (d) type and number of participants; (e) research design; (f) research purpose; (g) independent variable or intervention; (h) dependent variable and/or measures; and (i) outcomes (e.g., effect size, statistically significant findings, author's conclusions). The other authors also reviewed study characteristics. Authors agreed on all characteristics of each investigation.

DESCRIPTIVE ANALYSIS AND META-ANALYSIS STRATEGIES

The descriptive review involved an analysis across several areas: grade level, student classification, level or levels of intervention, and setting. Meta-analytic literature review guidelines were used to reduce redundancy or over weights. These guidelines were used in the selection of studies (see Decision 1: independence of samples) and after studies were selected for review (Decisions 2 and 3). Several decisions were made during the literature review process based on commonly used meta-analytic literature review guidelines to reduce redundancy or over weights of estimates from interdependence in the research samples or measures (Cooper & Hedges, 1996; Glass, McGraw, & Smith, 1981; Rosenthal, 1995).

First, studies were reviewed to ensure the independence of the samples. Each of the studies represented an independent sample.

Second, effect size estimates were calculated, weighting average Z_r s by sample size according to the procedures recommended by Hedges and Olkin (1985). The two primary forms of summary statistics used in the studies to compute Z_r s were descriptive and those used to test statistical significance. Studies using descriptive summary statistics reported effect sizes, means, and standard deviations. Studies using summary statistics to test statistical significance generally reported a t , F , or p value. Calculations of average unweighted Z_r were also conducted. All effect size estimates (e.g., d) were converted to r and subsequently to Z_r (see Figure 1 for the formulas used). The Z_r transformation was used to reduce the effects of skewness associated with the sampling distribution of r (Hinkle, Wiersma, & Jurs, 1994). In instances where no means or standard deviations were provided, Z_r s were computed using F or t (following the recommendations by Cooper and Hedges [1996] and Rosenberg, Adams, and Gurevitch [2000]) and converted to r and subsequently Z_r (see Figure 1). The MetaWin 2.0 (Rosenberg et al., 2000) statistical program was used to calculate all effect sizes and conversion to r .

Finally, single average unweighted and weighted Z_r effect sizes were calculated for both model and (where applicable) tier to reduce redundancy or over weights of estimates from the use of multiple intercorrelated measures. For a model, for example, if researchers used several measures of reading (e.g., curriculum-based measurements,

$$t \quad r = \sqrt{\frac{t^2}{t^2 + df}}$$

$$z = \frac{1}{2} \ln \left(\frac{1+r}{1-r} \right)$$

$$F \quad r = \sqrt{\frac{F}{F + df}}$$

Figure 1. Formulas used to convert the summary statistics to a Z_r effect size.

standardized measures), we calculated a single within-study average Z_r effect size estimate for the contribution of the intervention to outcomes. Additionally, we calculated a single within-study average Z_r effect size estimate for each tier to provide a more revealing analysis of the levels addressed by each three-tier model. For example, if researchers used several measures of behavior (e.g., office referrals, attendance, behavior rating scales), we calculated a single within-study average Z_r effect size for the contribution of the intervention to behavioral outcomes. We also calculated 95% confidence intervals for all of the obtained Z_r effect sizes to provide an index with which to judge whether the relative magnitude of the intervention's effect on behavioral and/or reading outcomes was statistically significant. Finally, measures that did not provide a reading or behavior score were not included (e.g., measures of teacher stress, consumer satisfaction, archival school records).

Results

DESCRIPTIVE ANALYSIS

Reading, behavior, and integrated studies were analyzed across grade level, student classification, level or levels of intervention, and setting variables, and similarities and differences were found. Tables 1, 2, and 3 show descriptive information about reading, behavior, and integrated investigations, respectively. Results are summarized in Table 4.

Grade Level

Student populations were analyzed across grade level (e.g., elementary, middle, and high school). Thirteen of the 17 investigations (76.5%) involved elementary school students. Of these 13 studies, 5 were reading investigations (Coyne, Kame'enui, Simmons, & Harn, 2004; Gunn, Smolkowski, Biglan, & Black, 2002; Nelson, Benner, & Gonzalez, 2005; O'Connor, 2000; Vaughn, Linan-Thompson, & Hickman, 2003), 4 were behavior investigations (Colvin &

Fernandez, 2000; Lewis, Sugai, & Colvin, 1998; Nelson, 1996; Scott, 2001), and 4 were integrated investigations (Lane & Menzies, 2003; Lane, O'Shaughnessy, Lambros, Gresham, & Beebe-Frankenberger, 2001; Lane et al., 2002; Nelson, Martella, & Marchand-Martella, 2002).

One of the 17 investigations (Turnbull et al., 2002) included a middle school and focused on behavior. One (Sprague et al., 2001) included both elementary and middle schools and again focused on behavior. Finally, 2 of the 17 investigations included high school as well as elementary and middle school populations; 1 investigation (Sugai et al., 2000) was a behavior investigation, and 1 (Fulk, 2003) was an integrated investigation.

Student Classification

Most investigations included students classified as being at risk for school failure. Overall, 10 of the 17 investigations (59%) identified participants as at risk for academic and/or behavioral difficulties. Of these, 4 were reading investigations (Coyne, Kame'enui, Simmons, & Harn, 2004; Gunn et al., 2002; Nelson et al., 2005; O'Connor, 2000), 3 were behavior investigations (Lewis et al., 1998; Scott, 2001; Sprague et al., 2001), and 3 were integrated investigations (Fulk, 2003; Lane & Menzies, 2003; Nelson et al., 2002).

Four of the 17 investigations (24%) included participants with disabilities, specifically, students identified as having learning disabilities, antisocial tendencies, attention and conduct disorders, or autism. Of these studies, 1 study was a reading intervention (Vaughn et al., 2003), 1 was a behavior intervention (Turnbull et al., 2002), and 2 were integrated investigations (Lane et al., 2001; Lane et al., 2002). Finally, 3 of the investigations (18%), all behavior interventions (Colvin & Fernandez, 2000; Nelson, 1996; Sugai et al., 2000), included all students in a school without specifying a particular category.

Level(s) of Intervention

Six of the 17 investigations (35%) focused on Tier I (school-wide or primary) interventions. Of these, 5 were behavior investigations (Colvin & Fernandez, 2000; Lewis et al., 1998; Nelson, 1996; Scott, 2001; Sprague et al., 2001) and 1 study was an integrated investigation (Fulk, 2003).

Five investigations (29%) focused on Tier II (supplemental) interventions. Of these, 3 were reading investigations (Coyne, Kame'enui, Simmons, & Harn, 2004; Gunn et al., 2002; Vaughn et al., 2003), and 2 were integrated investigations (Lane et al., 2001; Lane et al., 2002).

One investigation (6%) addressed both Tier I and Tier II interventions and focused on reading and behavior (Lane & Menzies, 2003). One investigation (6%) focused on Tier III interventions in reading (Nelson et al., 2005).

The remaining 4 investigations (24%) addressed all three levels of intervention. Of these, 1 study was a reading investigation (O'Connor, 2000), 2 studies were behavior investigations (Sugai et al., 2000; Turnbull et al., 2002), and

Table 1. Three-Tier Reading Investigations

Study	Tier level	School	Participants	Outcome measures	Findings	Average correlations
Coyne, Kame'enui, Simmons, & Harn (2004) ^a	Tier I (Read Well, Reading Mastery, or Open Court) Tier II (Write Well and practice in reading words and connected text)	Elementary (N = 7)	Grade 1 (N = 59)	<i>Dynamic Indicators of Basic Early Literacy Skills</i> (DIBELS), <i>Woodcock Reading Mastery Test-Revised</i> (WRMT-R)	Between 75% and 100% of participants scored above the 30th percentile on all posttest measures. Students (56%–75%) initially identified as at risk for reading difficulty demonstrated average reading performance in the middle of first grade. Participation in the Tier II program did not significantly affect the magnitude of the effects seen from the Tier I program.	Reading: .09
Gunn et al. (2002) ^a	Tier II (Reading Mastery and Corrective Reading ^b)	Elementary (N = 14)	Grades K–3 (N = 299 [148 intervention + 151 control])	<i>Woodcock-Johnson-Revised</i> (WJ-R), curriculum-based measure of oral reading fluency	Intervention students performed significantly better than their controls on measures of entry-level reading (letter–word identification and word attack) and advanced literacy (oral reading fluency, vocabulary, comprehension). Hispanic students benefited as much as or more than non-Hispanic students.	Reading: .16
Nelson et al. (2005) ^a	Tier III (Stepping Stones to Literacy)	Elementary (N = 7)	Grade K (N = 36 [18 experimental + 18 comparison])	<i>Comprehensive Test of Phonological Processing</i> (CTOPP), DIBELS	The majority of children showed statistically significant gains in prereading skills compared to children in the comparison group.	Reading: .60
O'Connor (2000) ^a	Layer 1 (Ladders to Literacy); Layer 2 (one-on-one tutoring); Layer 3 (small group instruction); Layer 4 (one-on-one instruction)	Elementary (N = 3)	Grade K (N = 146)	<i>Peabody Picture Vocabulary Test-Revised</i> , WJ-R; DIBELS	Participants in each layer of intervention progressed significantly better in target skills and reading and spelling than did children beginning at similar skill levels who did not receive that layer of intervention. 70% of the children with disabilities responded well but did not catch up to grade level.	Reading: .38

(table continues)

(Table 1 continued)

Study	Tier level	School	Participants	Outcome measures	Findings	Average correlations
Vaughn et al. (2003) ^a	Tier I (Harcourt and trade books) Tier II (5 elements of reading development)	Elementary (N = 3)	Grade 2 (N = 45)	<i>Texas Primary Reading Inventory: Screening, Test of Oral Reading Fluency, WRMT-R, CTOPP, Woodcock-Munoz Language Survey</i>	Thirty-four students met exit criteria (early, midterm, and late), and 11 never met exit criteria. Of the 24 who met early and midterm exit criteria, 22 continued to thrive without supplemental instruction. Pretest scores were significant predictors of which students did not meet exit criteria.	Reading: .34

^aIncluded in meta-analysis. ^bTwo other components were present: parent training for all parents and social behavior intervention training for 27 students. However, the main focus of the investigation was on improvement of reading skills using supplemental reading programs.

1 study was an integrated investigation (Nelson et al., 2002).

Setting

Settings were analyzed across all 17 studies, including school-wide (e.g., hallways, playground, and/or cafeteria), general education classroom, and special education (pull-out and/or one-on-one tutoring) settings. Six investigations (35%) implemented an intervention in the schoolwide setting. Of these, 4 were behavior investigations (Colvin & Fernandez, 2000; Lewis et al., 1998; Scott, 2001; Sprague et al., 2001), and 2 were integrated investigations (Fulk, 2003; Nelson et al., 2002).

Five investigations (29%) implemented interventions in the general education classroom. Of these, three were reading investigations (Coyne, Kame'enui, Simmons, & Harn, 2004; Gunn et al., 2002; Vaughn et al., 2003), and two were integrated investigations (Lane & Menzies, 2003; Lane et al., 2002).

Two investigations (12%) focused on reading (Nelson et al., 2005) or reading and behavior (Lane et al., 2001) in a pull-out or individualized setting. The remaining four investigations (24%) addressed all three settings. Of these, one study was a reading investigation (O'Connor, 2000), and three studies focused on behavior (Nelson, 1996; Sugai et al., 2000; Turnbull et al., 2002).

META-ANALYSIS

The number of Z_r effect sizes for each intervention focus area (reading, behavior, and integrated) and outcome (reading and behavior), mean Z_r effect sizes (unweighted and weighted), 95% confidence intervals, and total num-

ber of children contributing information to the effect size are presented in Table 5. There was considerable variation in the number of Z_r effect sizes per focus area and outcome. The reading-only focus area had 5 Z_r effect sizes, behavior-only had 2, and integrated had 5. The number of Z_r effect sizes for the outcome areas ranged from 0 (reading-only interventions on behavior) to 5 (reading-only interventions on reading). A majority of studies provided information on the influence of reading only ($n = 5$) or integrated ($n = 5$) models on reading outcomes. The total number of children per study represented by the Z_r effect sizes per focus area (range = 585–3,668) and outcome also varied widely (range = 21–3,668).

The weighted mean Z_r effect sizes for the intervention focus areas ranged from .18 (behavior intervention models on reading outcomes) to .53 (integrated models on reading outcomes). The strength of effect size correlation was assessed using the scale developed by Cohen (1988). Correlations of .10 through .29, .30 through .49, and .50 and above were considered small, moderate, and large, respectively. A large effect size was found for integrated models on reading outcomes ($Z_r = .53$). Moderate effect sizes were found for integrated models on behavior ($Z_r = .31$) and reading models on reading outcomes ($Z_r = .30$). Small effect sizes were found for behavior models on reading ($Z_r = .18$) and behavior ($Z_r = .28$). The 95% confidence intervals for the weighted mean Z_r s revealed that the effect sizes for reading-only intervention on reading, behavior-only intervention on behavior, and integrated models on reading and behavior were statistically significantly different from 0 (see Table 5). In contrast, the obtained weighted mean Z_r effect size (.18) for behavior-only on reading was not statistically significantly different from 0. There was no effect size for reading intervention models on behavior.

Table 2. Three-Tier Behavior Investigations

Study	Tier level	School	Participants	Outcome measures	Findings	Average correlations
Colvin & Fernandez (2002)	Tier I (schoolwide discipline plan)	Elementary (N = 1)	Grade not reported	Office referrals	Benefits included a positive school environment for all students, more effective teaching, and an increase in the school's capacity to provide high-quality instruction and behavior management.	
Lewis et al. (1998)	Tier I (schoolwide discipline approach)	Elementary (N = 1)	Grades 1-5 (N = 110)	Daily counts of problem behaviors	Interventions produced modest reductions in the overall level of problem behaviors but did not completely eliminate the behaviors. A small number of students accounted for the majority of behavior problems.	
Nelson (1996) ^a	Tier I (schoolwide program)	Elementary (N = 4 [2 experimental + 2 matched])	Grades K-6 (average of 590 students per school)	Teachers: <i>Effects of Stress Inventory (ESI)</i> ^b Students: <i>Dev-ereux Behavior Rating Scale-School Form</i> ; school district's Academic; Work Habits Scale and Social Growth Scale of the <i>Skill Development Matrix</i>	Among experimental schools, suspensions decreased by more than 40% and were accompanied by decreases in expulsions and emergency removals; these increased in comparison schools. Academic performance and school survival skills among students at the experimental schools increased. Positive effects on teachers were reported.	Reading: .24 Behavior: .38
Scott (2001)	Tier I (schoolwide behavior support plan)	Elementary (N = 1)	Grades K-5 (N = 500)	Length of time in referral room, number of suspension days	Results indicated a decrease in the number of referrals accompanied by a 61% decrease in the total number of hours spent in the referral room. Students gained more than 775 classroom hours through prevention and with the decrease in referrals. In addition, there were decreases in the number of suspensions from the baseline to the intervention year. Suspension days dropped by 65%, and there was a 75% decrease in the total number of students suspended.	

(table continues)

(Table 2 continued)

Study	Tier level	School	Participants	Outcome measures	Findings	Average correlations
Sprague et al. (2001)	Tier I (universal intervention package)	Elementary and middle (N = 15 [9 treatment + 6 comparison])	Grades K-8 (N = 7,131 [3,699 treatment + 3,432 comparison])	<i>Oregon Safety Survey: Assessing Behavior Support Checklist</i> , student <i>Second Step Knowledge Tests</i> , discipline referrals	Results indicated a reduction in office referrals for both the elementary and middle schools. There was also an increase in social skills, but there was no measurable change in school safety.	
Sugai et al. (2000)	Schoolwide discipline program including Tiers I, II, and III	Elementary and middle (N = 20 [11 elementary + 9 middle])	Grades K-9 (N = 18,598 [9,070 elementary + 9,528 middle])	Number of office referrals	Based on the number of office referrals recorded, the authors concluded that universal interventions should be the focus if the number of referrals exceeded 2.5 per student, total referrals per day exceeded 8, and/or the percentage of students with one or more referrals was greater than 45%.	
Turnbull et al. (2002) ^a	Tier I (universal) Tier II (group) Tier III (individual)	Middle (N = 1)	Grade 8 (N = 1 student with autism) Tier I: ^c Grades 6-8 (N = 762)	Interviews, direct observations, school records, timeouts, suspensions, office referrals, progress reports, <i>Interval Observations Scatterplot</i> , <i>Motivation Assessment Scale</i> , <i>Checklist for Multiple Intelligences</i> , <i>Checklist for Teachers/Staff of Problematic Routines and Classes</i>	Developing and implementing a positive behavior support plan were beneficial for the student and the middle school staff, but the student continued to exhibit problem behavior that did not meet the school's universal expectations. Tier II was "group support" using a behavioral momentum approach and Tier III was individual support using explicit instruction. Tier I was a universal set of expectations taught to all students as well as replacement behaviors.	Behavior: .13

^aIncluded in meta-analysis. ^bResponses from 98 teachers included in meta-analysis. ^cTier I participants included in meta-analysis. The researchers provided a case study (single student) within a case study (focus on an urban middle school). The study did not specify how many students were in the "group support" (Tier II) level of intervention. Tier I consisted of all students at the middle school, Tier II focused on group support (did not specify participants), and Tier III focused on the single participant.

Discussion

The majority of the investigations were conducted at the elementary level. Reading was always conducted at the elementary level, and all but one of the behavior investigations and one of the integrated investigations were conducted at or included students from the elementary

level. Behavior investigations were conducted in more diverse grade levels, including middle and high schools as well as elementary grades.

Most of the investigations targeted students who were at risk for school failure due to reading or behavior difficulties. The majority of reading and integrated investigations were conducted with students at risk for school

Table 3. Integrated Studies

Study	Tier level	School	Participants	Outcome measures	Findings	Average correlations
Fulk (2003)	Tier I (school-wide)	High (N = 1)	Grade 9 (N = 265)	Two surveys (addressing academics and behavior) designed by the authors and administered to teachers and students	The areas of greatest concern for teachers were time management, motivation, and homework. Students ranked themselves lowest on study habits, self-regulation, and test anxiety. After intervention, the rate at which ninth graders failed courses decreased.	
Lane & Menzies (2003) ^a	Tier I (district literacy plan and schoolwide behavior plan) Tier II (phonics program and social skills training)	Elementary (N = 1)	Grades 1-6 (N = 210)	<i>Harcourt Brace Reading Comprehension Tests, Stanford Achievement Test-9th Edition, Student Risk Screening Scale, Scholastic Comprehension Tests</i> , curriculum-based reading measure, archival records	Results indicated no statistically significant changes on behavioral measures. Primary students showed limited improvement in reading. The multilevel intervention had a greater impact on reading than on behavior.	Tier I: Reading: .41; Behavior: .11 Tier II: Reading: .20 Tier III: Reading: .17
Lane et al. (2001) ^a	Tier II (phonological awareness training)	Elementary (N = 3)	Grade 1 (N = 7)	<i>Dynamic Indicators of Basic Early Literacy Skills</i> (DIBELS [oral reading fluency]), direct observation measures (total disruptive behaviors, negative social interactions)	Improvement in reading (word attack and oral reading fluency). Decrease in total disruptive behaviors from baseline to intervention conditions.	Reading: .80; Behavior: .17
Lane et al. (2002) ^a	Tier II (early literacy program with Sheffeltine's <i>Phonics Chapter</i> books)	Elementary (not reported)	Grade 1 (N = 7)	DIBELS (non-sense word fluency, oral reading fluency); negative social interactions); total disruptive behaviors	Results for literacy indicated that all participants make significant progress in decoding skills. Four students experienced decreases in oral reading fluency. Results for behavior revealed significant decreases in disruptive behavior as well as negative social interactions.	Reading: .39; Behavior: .41

(table continues)

(Table 3 continued)

Study	Tier level	School	Participants	Outcome measures	Findings	Average correlations
Nelson et al. (2002) ^a	Tier I (school-based program) Tier II (Sound Partners, Talk It Out) Tier III (functional behavior assessment)	Elementary (N = 7)	Grades K-6 (Tier I: n = 3,444 ^b Tiers II and III: n = 217 [178 experimental + 39 criterion])	<ul style="list-style-type: none"> School climate and achievement (<i>Student Safety Survey</i>, administrative disciplinary actions, <i>Comprehensive Test of Basic Skills</i>, <i>Washington Assessment of Student Learning</i> [WASL]); Academic achievement and social competence (WJ-R, <i>Behavioral and Emotional Rating Scale</i>) Consumer satisfaction 	Improvements in the areas of reading, language arts, spelling, science, and social studies on the <i>Comprehensive Test of Basic Skills</i> were noted. Decreases in disruptive student behavior were also noted. The WASL outcomes showed improvements in reading and math. Improvements in academic performance are for the experimental group; criterion students remained the same. Decreases in disciplinary actions were observed at the same time as other schools in the district noted increases.	Tier I: Reading: .49; Behavior: .45 Tiers II and III: Reading: .55; Behavior: .37

^aIncluded in meta-analysis. ^bTier I participants included in meta-analysis.

failure, while the majority of behavior investigations included all students in a given school's population. None of the reading and integrated investigations targeted total school populations.

Interventions were conducted equally across Tiers I, II, and III. Most behavior investigations were applied at the Tier I (schoolwide) level. Most reading and integrated investigations were conducted at the Tier II level. Reading investigations implemented mostly supplemental, or Tier II, instruction in small groups (e.g., Reading Mastery, phonics programs, Read Well). Only two of the studies (Nelson et al., 2005; Turnbull et al., 2002) addressed Tier III interventions. This finding is not surprising because most students with disabilities who need Tier III interventions have traditionally received these separately from the schoolwide system.

Most investigations were conducted in a schoolwide setting. Behavior investigations focused primarily on schoolwide positive behavior intervention and support (PBIS) interventions. Nelson (1996) noted, "Focusing on universal strategies and interventions may lead to a school environment that is both preventative and remedial in nature" (p. 159). Furthermore, Walker et al. (2003) stated, "Schools have substantial power to prevent it [antisocial behavior] in some children and greatly reduce it in others" (p. 10). Most of the reading investigations were applied in the general education classroom. Integrated investigations were

evenly split between schoolwide and general education classroom settings.

The following general conclusions can be made. First, reading investigations typically occurred at the Tier II level and were implemented in the general education setting with elementary students at risk for school failure. Second, behavior investigations typically occurred at the Tier I level in the most diverse grade levels with the largest variety of students and were implemented schoolwide. Finally, integrated investigations were usually carried out at the Tier II level in schoolwide or general education settings with elementary students who were at risk for school failure. Although many of the schools in the research studies implemented only one of the three tiers (e.g., schoolwide or universal), the model represents a continuum of prevention and intervention through which students may move fluidly depending on their response to intervention. Thus the model should really be implemented using all three tiers simultaneously.

Three primary findings of the meta-analysis warrant discussion. First, the magnitude of the effect size for the integrated model on reading outcomes ($Z_r = .53$) was large. By comparison, the magnitude of the effect sizes for the reading ($Z_r = .30$) and behavior ($Z_r = .18$) models on reading outcomes were moderate and small, respectively. Although the differences between the models on reading outcomes were not statistically significant, the integrated

model appeared to produce larger improvements in reading skills than reading-only or behavior-only approaches. The findings from this meta-analysis align with the work of McIntosh, Chard, Boland, and Horner (in press), who compared the percentage of students needing additional support (i.e., those in Tiers II and III) in one northwestern school district that was implementing an integrated model to national estimates. In this district, only 3% of third-grade students required additional support in reading, compared to 40% nationally. A potential explanation for the effectiveness of an integrated approach on reading may be that reducing problem behavior makes responding to reading instruction and developing reading skills more likely (Bower, 1995; Nelson, Benner, & Gonzalez, 2003). Indeed, a moderate to strong inverse relationship has been demonstrated between problem behaviors and responsiveness to reading intervention (Nelson et al., 2003).

Second, a moderate effect size was found for the integrated model on behavioral outcomes ($Z_r = .31$), whereas the magnitude of the behavior-only model on behavior ($Z_r = .28$) was slightly lower. McIntosh et al. (in press) found that only 8% of third graders in a school district using an integrated approach needed additional support in behavior, compared to 14% nationally. It appears that the integrated model produces not only large gains on reading outcomes but moderate effects on behavioral outcomes. Yet the impact of integrated models on behavioral outcomes appears to be not much greater than that of behavior-only models. Although we were unable to determine the impact of reading-only approaches on behavioral outcomes, researchers have found that improving reading skills using scientifically based reading interventions improves social adjustment (Benner, Kinder, Beaudoin, Stein, & Hirschmann, 2005; National Reading Panel, 2000; Simmons & Kameenui, 1998). For example, the results of the

follow-through study indicated that children who received direct instruction in reading made greater gains in reading and social adjustment than those who received instruction under other models (Adams & Engelmann, 1996).

Overall, the goal of three-tier reading and behavior models is to provide prevention and intervention simultaneously. The intensity of intervention increases as students move from Tier I to Tier III, and a student's response to an intervention will determine when he or she exits one tier

Table 4. Number of Investigations in Each Category

Category	<i>n</i>
Grade level	
Elementary	13
Middle school	1
Elementary/middle school	1
Elementary/middle/high school	2
Student classification	
At risk	4
Disability	10
All students	3
Level of intervention	
Tier I	6
Tier II	5
Tiers I & II	1
Tier III	1
Tiers I, II, & III	4
Setting	
Schoolwide	6
General education	5
Individualized	2
All settings	4

Table 5. Descriptive Statistics for Intervention Focus/Outcome

Intervention focus and outcomes	Number of effect sizes	Unweighted mean Z_r		Weighted mean Z_r		<i>N</i>
		Z_r	95% C.I.	Z_r	95% C.I.	
Reading-only intervention	5					585
Reading	5	.32 (.20)	.11-.52	.30 (.20)	.10-.51	585
Behavior	0	—	—	—	—	—
Behavior-only intervention	2					860
Reading	1	.24	-.22-.70	.18	-.22-.701	21
Behavior	2	.30 (.15)	.09-.51	.28 (.21)	.01-.561	839
Integrated intervention	5 ^a					3,668 ^b
Reading	5	.50 (.20)	.30-.70	.53 (.21)	.32-.74	3,668
Behavior	4	.30 (.15)	.14-.47	.31 (.20)	.11-.51	3,668

Note. C.I. = confidence interval.

^aTwo effect sizes were derived based on Nelson et al. (2002). ^bSample sizes include Nelson et al., 2002 ($N = 3,444$); Lane et al., 2001 ($N = 7$); Lane et al. 2002 ($N = 7$); and Lane & Menzies, 2003 ($N = 210$). The experimental and participating students receiving Tiers II and III intervention in Nelson et al. (2002; $N = 217$) were not added because they were already included in the 3,444 students receiving schoolwide behavioral and reading supports.

and enters another. However, given the strong correlation between low academic achievement and behavior problems (Heward, 2006), there is a need to integrate reading and behavior into a cohesive model. For example, approximately 67% of students with behavior problems cannot pass competency exams for their grade level and have low grade point averages (Heward, 2006). Additionally, approximately 75% of individuals in prison are poor readers (Kamps, Wills, Greenwood, & Thorne, 2003). Unfortunately, an integrated model of reading and behavior is not being used on a large scale.

Reading and behavior experts need to combine their expertise to form an integrated three-tier model to reach students who are having significant difficulties in both areas. Results from integrated studies show improved academic performance and reduced behavior problems. An integrated system would be beneficial to both administrators and teachers as it would save time, would save money, and has been shown to be effective. Walker et al. (2003) noted, "The fact is, academic achievement and good behavior reinforce each other: Experiencing some success academically is related to decreases in acting out; conversely, learning positive behaviors is related to doing better academically" (p. 10). Given the fact that research strongly supports a link between reading and behavioral difficulties, it is imperative that schools address these issues simultaneously.

STUDY LIMITATIONS

Several limitations of the investigations were identified. First, there were very few research validation studies regarding the three-tier reading model. The University of Texas at Austin is currently completing a 3-year longitudinal study investigating the effectiveness of the three-tier reading intervention model. In addition, the University of Oregon is conducting investigations on Project CIRCUITS (Center to Improve Reading Competence Using Intensive Treatments Schoolwide), considered a three-tier reading intervention model incorporating the DIBELS assessment. At this time, only technical reports are available. Further descriptive analyses are needed when research is completed.

Second, most investigations did not report the intervention at all three levels and the related outcomes at each level. In fact, many of these investigations did not have the evaluation of the three-tier model as an explicitly stated purpose.

Third, investigations addressing special education and the tertiary level of intervention that are fully integrated within a schoolwide approach are needed. The population of students with disabilities and level of intervention requires the most individualized and intensive instruction.

Fourth, further investigations are needed at the high school level. The majority of studies targeted only elemen-

tary and/or middle school students. However, high school intervention and/or prevention programs are still critical for reading and behavioral issues.

Fifth, the number of studies that met inclusion criteria was very small and may not have specifically addressed a schoolwide or three-tier program (e.g., providing Tier II-level support but not addressing Tiers I and III). For example, Turnbull et al. (2002) reported the effects of a case study with a student with autism. Likewise, Lane et al. (2001) and Lane et al. (2002) reported the results of an investigation using multiple-baseline designs with students who were at risk for antisocial behavior and reading difficulties (i.e., having academic and/or behavioral difficulties). These investigations likely occurred in schools that happened to have schoolwide programs.

Additionally, although every attempt was made to collect all investigations addressing the three-tier model, it is likely that not all studies were found. Given that behaviorally based schoolwide models targeting reading or behavior are relatively new, the terminology has not yet been standardized. It is likely that some investigations targeted relevant programs that were not described within the three-tier model. Likewise, tertiary interventions are conducted all the time, but these interventions may not be described as part of a schoolwide system. Finally, secondary interventions such as double dosing may have been going on in research investigations on programs such as Reading Mastery but may not have been described in the larger context of a schoolwide model. Future investigations should describe how primary, secondary, and/or tertiary interventions fit within a schoolwide reading or behavior management system.

Sixth, we were unable to account for the quality of the included studies (i.e., the degree to which they accounted for threats to their internal and external validity). Our criterion was publication in a peer-reviewed journal. Exclusion of dissertations, professional presentations, ERIC documents, and conference proceedings was one way to address the need for some standard of quality. Within the sample of articles that passed peer-review standards, there was a wide range of strengths and weaknesses that we overlooked. The limited number of studies in particular areas did not enable us to examine if there were significant interactions among study characteristics and the strength of the obtained effect sizes. Such analyses would illuminate, for example, whether the type and intensity of the interventions used by researchers had an influence on the obtained effect sizes. Such questions can be addressed in the future as researchers begin to provide more detailed analyses and information on the impact of three-tier approaches.

Finally, many of the investigations had only weak experimental control. Much of the research on the schoolwide integrated three-tier model includes program evaluations or simple descriptions of implementation effects. More rigorous research is needed to determine the effects

of a schoolwide model on reading and behavior. For example, the use of quasi-experimental (e.g., nonequivalent control group) or true experimental (e.g., pretest-posttest control group) design would provide enhanced experimental control (Martella, Nelson, & Marchand-Martella, 1999). At this point, all that can be reliably claimed based on the current research is that a three-tier schoolwide model has promise.

CONCLUSION

This investigation should be seen as a first attempt to provide a comprehensive description of the three-tier model for reading and behavior. It is recommended that replications of this descriptive analysis are conducted to explore the effectiveness, similarities, and differences between and among reading and behavior models further.

The results of this review and work from other researchers indicate that the three-tier integrated model produces larger gains in literacy skills than the reading-only model. This finding should be an important consideration for educators when deciding how to allocate resources to improve reading outcomes, as mandated by the No Child Left Behind Act of 2001 (U.S. Department of Education, 2002). An integrated systems approach to preventing reading difficulties and behavioral challenges may not only maximize outcomes but also be a resourceful tactic to address both issues simultaneously. In other words, an integrated model is a more preventive and cost-effective approach to addressing reading and behavioral challenges than continuing to expend resources on ineffective programs or services (Sugai & Horner, 1999).

Overall, when considering the issue of three-tier models, important concerns and areas of future research emerge. First, if school or district personnel conclude that a comprehensive, integrated three-tier model is not feasible, they may address problem behavior and reading difficulties in an integrated fashion with students receiving strategic (Tier II) or targeted (Tier III) literacy supports who have not been responsive to core and supplementary reading interventions. At a minimum, school personnel could apply positive behavior supports to manage the behaviors of students in strategic and targeted reading intervention classes or groups. As previously discussed, the rationale for such an approach is that problem behaviors have a moderate to large impact on responsiveness to reading intervention (e.g., Nelson et al., 2003). However, more research is clearly needed. Second, responses from school personnel to the disruptive classroom behaviors exhibited by the student with reading difficulties (e.g., sending the student to the office, escalating prompts, ignoring) may have the effect of allowing him or her to escape or avoid intensive reading instruction. Such responses may increase the likelihood that the student will engage in problem behaviors to escape undesirable reading intervention activi-

ties in the future (i.e., negative reinforcement), broaden the reading achievement gap between the student and his peers, and reduce the responsiveness of classmates to reading instruction. Thus, researchers must demonstrate the effectiveness of behavioral and reading interventions that are based on scientific evidence, implemented with fidelity and in sufficient dosage, and embedded into a three-tier model.

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