

Running head: TIERED MODELS OF INSTRUCTION IN EC SYNTHESIS

Tiered Models of Instruction in Early Childhood: A Synthesis of Recent Literature

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TIERED MODELS OF INSTRUCTION IN EC SYNTHESIS

Abstract

This research synthesis endeavors to establish the experimental evidence-base for using tiered models of instruction with young children for the purpose of screening, performance monitoring, and data-driven decision making by examining the way in which such models are currently employed within the field of early childhood (EC). Differentiation of instruction and Response to Intervention (RtI) are the most commonly used models, though the form each takes varies greatly in practice. Specifically, the types, intensity, and frequency of interventions used at specific tiers were explored. Most of the interventions studied focused on improving children's language or reading skills, and a large variety of the intervention techniques that have been investigated were found to be effective for improving student outcomes at Tier 1 and Tier 2; however, many of the studies fail to describe interventions for Tier 3 or do not include a third tier within the study. Implications for implementing tiered models within the performance monitoring aspect of a curriculum framework and suggestions for future research are included.

Keywords: Response-to-Intervention, early childhood, tiered models

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Purpose

The purpose of the current preliminary synthesis is to determine the experimental evidence-base regarding the use of tiered instructional models for screening, performance monitoring, and for making data-driven decisions to inform instruction within early childhood contexts. The research question may be conceptualized as follows: Are the use of tiered models in early childhood useful for screening, monitoring performance, and for making data-driven decisions to inform instruction? This synthesis will serve as the foundation for ongoing future research efforts on behalf of the author and others that evaluate specific models of tiered instruction for use with young children, including the extent to which such models are useful for different purposes. It will also be used to preliminarily identify possible effective interventions that can be put into place within tiered systems.

Background

Tiered instruction can be defined as a method of delivering instruction and intervention based on children's developmental needs. In a tiered model, teachers assess children's current performance and determine whether the child is able to work towards general or universal content standards, goals, or objectives. If the child is missing a component of the skill(s) necessary to meet learning goals or objectives, or if they have yet to obtain the foundational skill(s) required, teachers provide targeted supports or individualized and intentional instruction to address the child's needs. The goal becomes twofold; to provide instruction or intervention that the child needs to succeed, and to assist the child in moving forward to obtain universal outcomes. The concept of tiering instruction has been put into practice in a variety of ways, and different models utilize different numbers of tiers in order to improve instruction and student

outcomes. Two common and widely used forms of tiered instruction include differentiated instruction and Response to Intervention (RtI).

Differentiated Instruction

To differentiate instruction is to recognize students' varying background knowledge, readiness, language(s), preferences in learning and interests, and to react responsively.

Differentiated instruction is a process to teaching and learning for students of differing abilities in the same class. The intent of differentiating instruction is to maximize each student's growth and individual success by meeting each student where he or she is, and assisting in the learning process (Hall, Strangman & Meyer, 2003). Critical elements of differentiated instruction include child choice, flexibility, on-going assessment, and creativity (Anderson, 2007), as well a focus on differentiating content, product, and process (Hall, et al., 2003; Tomlinson, 1999a; b). In many ways, the concept of differentiating instruction adheres to the stated principles of a universal design of learning (UDL) (CAST, 2008). By assessing children's needs and monitoring their performance on learning objectives, teachers are able to deliver instruction and intervention to students that will assist them in meeting curricular goals. By using differentiated instruction, teachers are able to focus on a specific goal or outcome while meeting the different needs of a group (CAST, 2008; Heacox, 2002). If students are missing skills or components of a skill that are foundational for meeting objectives, differentiating instruction will allow these children to obtain the skills they need to work towards the same overall goal. Far from an idealistic and lofty aim, differentiating instruction based on each students' needs can be accomplished in today's standards-based, high-stakes testing educational environment (Brimijoin, Marquissee, & Tomlinson, 2003; Tomlinson, 2000; 1999a; 1999b; and others).

Response to Intervention (RtI)

Response to Intervention (RtI) is a tiered model of instruction that focuses on identifying students that are at-risk of academic challenges or failure, and then providing these students with interventions that will assist them in meeting general curriculum or universal goals and objectives. Within an RtI model, it is also possible that all or most children at Tier 1 (the universal or common tier) will uniformly require additional supports in order to achieve stated goals and objectives. In this case, the screening process can be understood to have identified deficits in content instruction, and as such class-wide interventions or changes to the instructional approach would be employed to improve student performance. In essence, RtI is a preventative model of instruction that seeks to improve classroom instruction and intervention, as well as- in a practical and official sense- to address student's academic difficulties quickly and proactively in an effort to reduce the number of children that are referred for special education eligibility evaluations.

Further, while RtI is a tiered model, not all tiered models are RtI. Tiered instruction, specifically differentiated instruction, has been used in special education programs for some time, long before RtI became a common procedure in the general education classroom. RtI as a means of reducing the amount of children identified as having learning disabilities (in specific) began with the U.S. Department of Education-sponsored 2001 Learning Disabilities Summit; RtI was recognized as a method for addressing the issue of the over-identification of children with LD (Batsche et al., 2006). In fact, a number of sites across the country have shown that RtI has been successful in reducing these numbers (Sugai & Horner, 2002; Walker et al., 1996; as cited in Hawken, Vincent, & Schumann, 2008, p. 213).

In order to evaluate the effectiveness of interventions used within RtI frameworks, ongoing performance monitoring of student achievement is necessary. Most elementary schools

that have implemented RtI as a means of reducing special education eligibility and improving classroom instruction use curriculum-based measurements (CBMs) to monitor students' performance on identified objectives. CBMs were first developed through the Institute for Research on Learning Disabilities at the University of Minnesota, and Deno (1985) defined CBMs as a particular set of simple procedures for measuring student performance on basic skills. The administration of CBMs are designed to be provided to children frequently, often weekly, in order to collect performance data on children's growth on academic objectives. Despite the widespread use of CBMs to achieve the ends of RtI, other measures of performance monitoring can also be employed. These methods include, but are not limited to, anecdotal notes, teacher or district-created curricular assessments, and data collection on student IFSP or IEP goals and objectives.

Tiering Instruction in Early Childhood

Although the concept of tiering instruction for young children has begun to gain popularity within the fields of early childhood education and early intervention, the extent to which states support and fund early learning initiatives, and the services available to the youngest children at-risk, vary state-to-state (Hebbeler, Spiker, Wagner, Cameto, & McKenna, 1999). Despite these differences, the Individuals with Disabilities Education Improvement Act (IDEIA 2004) encourages programs to engage in early intervening. As opposed to 'identifying' children as in need of remedial services, early intervening is a philosophy of prevention: the expectation is that children will be screened universally and that children in need of targeted supports will be identified and provided with the supports that they need. In this sense, early intervening is itself the utilization of RtI; how do children respond to the added supports and interventions, and does this prevent further challenges or longer-term difficulties from arising? Under IDEIA, local education agencies (LEAs) are allotted up to 15% of their annual funds

under Part B (which can be used in conjunction with other funding) in order to develop programs that coordinate early intervening services for children in kindergarten through age 12, and particularly children in k-grade 3 (VanDerHeyden & Snyder, 2006, p. 520). The Division of Early Childhood (DEC) is pushing for such initiatives to be extended to children younger than 5. Further, many early childhood programs have begun to encapsulate this approach, though most do not explicitly state as this intent.

Given the call for early intervening services as called for in the language of the law of IDEIA, approaches similar to RtI have seen more widespread use in early childhood. Bayat, Mindes, and Covitt (2010) described RtI at the PreK level as distinctive from that in children's formal school years given the nature of the problem-solving approach, the reliance on play-based and curriculum-referenced assessments over standardized assessments, and the importance of the family unit in learning about the child and guiding instructional decisions. However, RtI is not the only approach to tiered instruction in early childhood.

Recognition and Response. Coleman, Buysse, & Neitzel (2006) proposed a tiered model known as Recognition and Response. In this model, four components guide the process of tiering instruction. These include an intervention hierarchy; screening, assessment, and progress monitoring; research-based curriculum, instruction, and focused interventions; and a collaborative problem-solving process for decision-making (p. 3). The Recognition and Response model has not yet been widely implemented, but the National Center for Learning Disabilities continues to support research efforts to devise manuals and resources for teachers to assist in applying the system.

Curriculum Framework. Jackson, Pretti-Frontczak, Harjusola-Webb, Grisham-Brown and Romani (2009) suggest the use of a curriculum framework to guide tiering of instruction and

intervention. A curriculum framework consists of four stages that are linked together in a recursive loop; assessment, scope and sequence, activities and instruction, and performance monitoring. In this model, teachers or practitioners assess children's developmental needs in order to determine the scope and sequence of instruction for each child. In doing this, children's needs are sorted into tiers, and the activities and instruction/intervention that is provided is matched to the child's needs. Performance monitoring is used to measure children's performance on learning objectives, and the frequency and intensity with which performance is measured varies. The concept of tiering instruction within a curriculum framework occurs within three tiers. In Tier 1, universal goals and objectives are addressed and instruction is geared for all learners. In Tier 2, instruction is temporary and targeted, and focuses on addressing missing components of skills needed to achieve Tier 1 goals and objectives (Grisham-Brown, Pretti-Frontczak, Hawkins, & Winchell, 2009). Finally, in Tier 3, instruction is individualized, intensive, and intentional. Students that are missing the foundational or prerequisite skills necessary to meet Tier 1 goals and objectives are thought to have Tier 3 needs. Although there are professional development and college programs that instruct preservice and/or inservice teachers on how to implement tiered instruction within a curriculum framework, no research studies that have investigated the extent to which this model improves student outcomes has been published to date.

Search Strategy

A search of the literature was conducted to identify current empirical studies that lend evidence to the use of a tiered model of instruction for early childhood. In order to broaden the search to include studies that assessed models or strategies employed with children in preschool,

the parameters of the search were modified several times. A description of the search process follows.

Search Terms

The preliminary search that was conducted sought both empirical and conceptual articles; empirical articles would be included as a part of the literature synthesis, while conceptual articles would be used to inform the process and to describe the history of tiered models of instruction. Articles were located through the use of roughly a dozen academic databases and included the phrases ‘differentiated instruction’, ‘response to intervention’, and ‘tiered models’, as well as the word ‘education’. The search was further delimited by using the phrases ‘early childhood’ and ‘young children’ as a Boolean condition. Finally, the search parameters were limited to studies published from 2005 to the present that were peer-reviewed.

Sources

The following databases were mined for relevant articles: Academic Search Complete; Access Science; Article First (OCLC); Arts and Humanities Citation Index; BASE (Bielefeld Academic Search Engine); CINAHL Plus with Full Text; EBSCO; Education Full Text; Education Research Complete; Electronic Journal Center; ERIC; Health Services and Sciences Research Resources (HSSR); JSTOR; Linguistics and Language Behavior Abstracts Online; MEDLINE (PubMed); Physical Education Index; Psychology and Behavioral Sciences Collection; PsychINFO- Current file; Social Sciences Citation Index; Sociological Abstracts; and TOPIC Search. Additionally, the same search terms were used to perform a Google Scholar search for relevant literature. While performing the latter search, a research synthesis regarding RtI (Coleman, Buysse, & Neitzel, 2006) was located and several studies from this previous work that met the present search criteria were selected to be included in the current synthesis.

Selection Criteria

Five criteria were used to determine whether studies would be included in this synthesis: (a) a tiered model (2 or more tiers of instruction/intervention) that used increasingly intensive and/or frequent interventions to guide implementation was employed within the study; (b) children had to be between the ages of 2-8 years old during the baseline phase of the study; (c) studies had to be published between 2005 to the present in order to present the most current evidence and to build on the work of Coleman, Buysse, & Neitzel (2006); (d) children characterized as at-risk, non-responders, or as having reading, mathematical, social/emotional, or behavioral disabilities had to be included in the study; and (e) regardless of stated research purpose, the study results had to support or counter the use of the tiered model for improving student outcomes.

Exclusionary criteria. Studies that were not exclusively experimental or quasi-experimental were eliminated from the review. Casual comparative designs, while effective for describing correlations, do not specifically answer the question as to whether a specific tiered model, with particular interventions, improves students' outcomes on dependent measures. Moreover, case studies and studies that sought to provide program evaluation data were also not included. In the case of the former, case studies do not provide an adequate level of generalizeability for the purpose of this synthesis; regarding the latter, program evaluation research does not exercise the amount of experimental control needed to infer whether results were obtained specifically due to the interventions used or the implementation of the tiered model. Finally, studies that were reporting results from research in process were removed so that only studies that were completed and could lend specific evidence (or lack thereof) would be reviewed. Certain studies that seemingly met all the inclusionary and exclusionary criteria were

removed from final review because the evaluation of the intervention was too simplistic (i.e., examining whether a double dose of intervention in a subsequent year reduced academic challenges) or did not explicitly lend evidence as to whether tiering instruction or intervention in a given year improved student outcomes.

Synthesis Search Results

A total of 10 studies that included about 1691 children (one study estimated the number of participants that were screened at Tier 1) met the selection criteria for the research synthesis. Table 1 provides characteristics of study participants and setting; Table 2 presents the purpose, research design, and length of intervention in each of the studies; Table 3 describes independent and dependent variables, outcome measures, and treatment fidelity for each of the studies; in Table 4, inter-observer agreement, primary findings, and rival explanations are provided; and Table 5 lists study effect sizes.

Characteristics of Study Participants

Among the 1691 children that participated in the studies, the children ranged in age from 3 to 8 ½ years at the commencement of each study. The mean age of children participants was about 5 years old. At least 32% of the children were male, although 3 studies did not report gender statistics and one study only reported the gender of children that were placed into Tier 2, so the actual percentage is likely relatively higher. Further, in all but one of the studies that reported race, Caucasians were the majority represented. VanDerHeyden, et al. (2007) reported a majority of African-American child participants, and three studies did not indicate specific race statistics. Across studies a minimum of 44% of children were identified as being at-risk, mostly for language delays though two studies focused on social and behavioral outcomes (Pearce, 2009; VanDerHeyden, et al., 2007) and two studies provided interventions to children experiencing math difficulties (Duhon, et al., 2009; Fuchs, et al, 2005). In one study, a large

majority of participants were not at-risk (Fuchs, et al., 2005). In addition to the child participants, adult participants included 134 teachers/staff, as well as all teachers in six Title 1 and four non-Title 1 schools in one southeastern school district. In most of the studies, teachers and/or staff delivered the intervention, though in three studies experimenters provided all or some of the intervention (Duhon, et al, 2009; VanDerHeyDen, et al., 2007, McMaster, et al., 2005) and performance monitoring data was collected by researchers or their assistants in several studies (Denton, et al., 2010; Duhon, et al, 2009; VanDerHeyDen, et al., 2007).

Settings

All of the interventions were employed within the context of a tiered model and were implemented in child participants' classrooms. Among these, two studies took place in pre-kindergarten classrooms (Koutsoftas, et al., 2009; VanDerHeyden et al., 2007). In regard to geographical localities, four studies included classrooms in rural areas (Denton, et al., 2010; Duhon, et al., 2009; Pearce, 2009; VanDerHeyden et al., 2007), three studies included classrooms in urban areas (Denton et al., 2010; O'Connor, Fulmer, & Harty, 2005; VanDerHeyden et al., 2007), two were in metropolitan areas (Fuchs, et al., 2005; McMaster, et al., 2005), and at least one study each was conducted in a suburb or industrial area (Denton, et al., 2010; O'Connor, Fulmer, & Harty, 2005, respectively). Further, at least four studies were done in the south, and one each in the Northeast, the Upper Plains, and the Midwest. Two studies did not report any geographic information (O'Connor, Harty, Fulmer, 2005; Burns, et al., 2010). Table 1 describes the setting and characteristics of study participants.

Table 1

Tiered Models of Instruction in Early Childhood: Characteristics of Study Participants and Setting

Study	Sample Size	Child Participants				Adult Participants				Developmental Status	Setting
		Child Age	M	F	SES	Race	T	S			
Burns, Scholin, Kosciolk et al. (2010)	30	2 nd grade	20	10	6.8% of student body of school eligible for free or reduced lunches <i>(sample detail n/a)</i>	25- C 2- AAm 1- A 1- H 1- NAm	2	1	Struggling readers introduced to Tier II RtI intervention	K-2 nd grade primary school with 91/1% Caucasian population; RtI began in 2006 for Tier II & III interventions but no eligibility decisions made based on data	
Denton, Kethley, Nimon et al. (2010)	422 total at-risk students 182 RRI 240 TSP (in the analysis stage)	Mean= 78-79 months btwn. groups	RRI - 98 TSP -160	RRI -84 TSP -80	Across all schools, 53.3% at economic dis-advantage Range- about 6 to 92% per school	RRI - C & A= 76 AAm= 33 H= 73 TSP - C & A= 99 AAm= 32 H= 109	40	N/A	LD Speech-Language Disorders Other Health Impairments ADHD symptoms All identified or at-risk	Southwestern state; 31 elementary schools in 16 school districts (3 in Year 1 only, 20 in Year 2 only, and 8 in both years) 17 schools in rural/small towns, 12 in suburbs, and 2 urban	
Duhon, Mesmer, Atkins et al. (2009)	35 assessed at Phase/ Tier 1 3 moved to Phase 2	7- 8 ½ yrs (2 nd grade)	2	1	N/A	C- 2 AAm- 1	0	0	Non-responders to normal classroom mathematics routine implemented by an experimenter	Elementary school serving children K-4 in a Midwest rural community	

Note: M= Male; F= Female; SES= Socioeconomic status; T= Teacher; S= Staff; C= Caucasian; AAm= African-American; A= Asian; H= Hispanic; NAm= Native American; ELL= English Language Learners; LD= Learning Disabled; SPED= Special Education; GENED= General Education; T1= Title One; NT1= Non-Title One; *= All teachers in a given number of schools; (c)= control; (t)= treatment; pop.= population; RRI= responsive reading instruction; TSP= typical school practice

(table continues)

Table 1 (continued)

Tiered Models of Instruction in Early Childhood: Characteristics of Study Participants and Setting

Study	Sample Size	Child Age	Child Participants			Adult Participants			Developmental Status	Setting
			M	F	SES	Race	T	S		
Fuchs, Compton, & Fuchs, et al. (2005)	437 not at-risk 127 at-risk	1 st grade	209 not at-risk 33 at-risk (c) group 30 at-risk (t) group	228 not at-risk 64 at-risk total (c) vs. (t) N/A	More children at-risk received subsidized lunches than those not at-risk	More C than AAm total, but slightly more AAm at-risk. Small H pop. reported as well; similar proportion across groups	*6 T1 *4 NT1	N/A	Not at-risk and at-risk students for math difficulties	Southeastern metropolitan school district
Koutsoftas, Harmon, & Gray (2009)	34	3-4 year olds	53% 9 % SPED	47%	All preschool children were below poverty level placed in Head Start classroom (3)	50 % males ELL 42 % females ELL 11 % of females SPED	4	N/A	Performing below cut scores third time of the Trophies Pre-K Beginning Sound Awareness CBM in January	3 public schools and two head start classrooms in Arizona
McMaster, Fuchs, & Fuchs, et al. (2005)	56	1 st grade	N/A	N/A	4 schools high-poverty T1 4 schools middle class NT1	Not specified, but no significant difference of ethnicity between groups	33	N/A	Non-responders/ low response to reading intervention; classified at-risk	8 metropolitan Nashville schools

Note: M= Male; F= Female; SES= Socioeconomic status; T= Teacher; S= Staff C= Caucasian; AAm= African-American; A= Asian; H= Hispanic; NAm= Native American; ELL= English Language Learners; LD= Learning Disabled; SPED= Special Education; GENED= General Education; T1= Title One; NT1- Non-Title One; *= All teachers in a given number of schools; (c)= control; (t)= treatment; pop.= population; RRI= responsive reading instruction; TSP= typical school practice

(table continues)

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Tiered Models of Instruction in Early Childhood: Characteristics of Study Participants and Setting

Study	Sample Size	Child Age	Child Participants			Adult Participants				Setting
			M	F	SES	Race	T	S	Developmental Status	
O'Connor, Harty, & Fulmer (2005)	300 31 moved into Tier 2	K-3 rd grade	N/A	N/A	Across the 2 schools, 45% received free or reduced lunch	Across the 2 schools, C- 68%	20	0	Across the 2 schools, 15% of 3 rd grade students eligible for SPED, usually LD	School classrooms
O'Connor, Fulmer, Harty, et al. (2005)	103 in K & 1 st grade each	K-3 rd grade	N/A	N/A	School 1: Primarily low SES area; TI school School 2: 11% of 3 rd graders eligible for free or reduced lunches by 2000	School 1: C- 83% AAM- 12% H- 2% NAM- 3% School 2: C- 57% AAM- 15% Other- 28%	22	2	N/A; children identified through layers*	School 1: School classroom in an industrial area of city in NE School 2: University-affiliated laboratory school in an urban area
Pearce (2009)	9	K-5 th grade	7	2	'Extreme' rural	N/A	2+	5+	Various social, emotional, & behavioral disabilities	2 elementary school classrooms in a rural area in an upper plains state (pg. 35)

Note: M= Male; F= Female; SES= Socioeconomic status; T= Teacher; S= Staff C= Caucasian; AAM= African-American; A= Asian; H= Hispanic; NAM= Native American; ELL= English Language Learners; LD= Learning Disabled; SPED= Special Education; GENED= General Education; T1= Title One; NT1- Non-Title One; *= All teachers in a given number of schools; (c)= control; (t)= treatment; pop.= population; RRI= responsive reading instruction; TSP= typical school practice

(table continues)

Table 1 (continued)

Tiered Models of Instruction in Early Childhood: Characteristics of Study Participants and Setting

Study	Sample Size	Child Participants				Adult Participants				Developmental Status	Setting
		Child Age	M	F	SES	Race	T	S			
VanDerHeyden, Snyder, Broussard et al. (2007)	35	4-5	19	16	N/A	AAm-25 C-6 H-4	2	1	All children were receiving services based on social, emotional, or developmental delays	2 preschool classrooms- 1 rural setting (15 kids) 1 urban setting (20 kids)	

Note: M= Male; F= Female; SES= Socioeconomic status; T= Teacher; S= Staff C= Caucasian; AAm= African-American; A= Asian; H= Hispanic; NAm= Native American; ELL= English Language Learners; LD= Learning Disabled; SPED= Special Education; GENED= General Education; T1= Title One; NT1- Non-Title One; *= All teachers in a given number of schools; (c)= control; (t)= treatment; pop.= population; RRI= responsive reading instruction; TSP= typical school practice

Tiered Model Research Purposes

The studies analyzed had different stated primary research purposes; however, all but one of the studies monitored the performance of children in order to determine whether the tiered interventions were improving student outcomes. The study that did not monitor performance used pretest and posttest measures to determine whether student outcomes improved over time (Denton, Kethley, Nimon, Kurz, Mathes, Minyi, et al., 2010). One study centered investigation on whether aimline or dual discrepancy frameworks were more effective in RtI models (Burns, Scholin, Kosciolk, & Livingston, 2010) and three studies evaluated whether the tiered model was useful for screening purposes (Burns, et al., 2010; Pearce, 2009; VanDerHeyden, Snyder, Broussard, & Ramsdell, 2007). Six studies examined the effectiveness of specific interventions

at various tiers of instruction as the primary research focus, while another focused on the utility of using a tiered model to improve student outcomes.

Types of interventions used. While the stated purposes of each of the 10 reviewed studies varied, all of the studies assessed the effectiveness of tiered or differentiated interventions in some way. Across all 10 studies, interventions specific to at least one tier of instruction were identified and evaluated. While several studies examined interventions at multiple tiers, a total of three studies looked at Tier 1 interventions, seven studies evaluated interventions at Tier 2, and three studies assessed Tier 3 interventions. In general, studies used pretest and/or CBMs to determine whether children were in need of different instruction (classwide Tier 1 interventions) or additional supports (Tier 2 or Tier 3). Five of these studies looked at language-related interventions at Tier 2 (Burns, et al., 2010; Denton, et al., 2010; Koutsoftas, Harmon, & Gray, 2009; McMaster, Fuchs, Fuchs, & Compton, 2005; O' Connor, Harty, & Fulmer, 2005), one study examined the efficacy of a Tier 3 reading intervention (O'Connor, Harty, & Fulmer, 2005), one study analyzed a class-wide Tier 1 tutoring intervention (Fuchs, Compton, Fuchs, Paulsen, Bryant, & Hamlett, 2005) and another study evaluated the usefulness of specific interventions at each of three tiers (Pearce, 2009). O'Connor, Fulmer, and Harty (2005) evaluated the effectiveness of using a three-tiered model of instruction to improve reading outcomes. Three studies used small groups to deliver Tier 2 intervention (Burns, et al., 2010; Denton, et al., 2010; O' Connor, Harty, & Fulmer, 2005), and one study used small groups for Tier 1 (Fuchs, et al., 2005). VanDerHeyden, et al. (2007) examined the effect of increasing intervention frequency for each student at Tier 1, while Duhon, Mesmer, Atkins, Greguson, & Olinger (2009) studied whether increasing intervention intensity improved student outcomes. In most of the studies in which children were placed in a higher tier after screening, children were provided with tiered

supports in a consistent manner according to their needs. However, McMaster, et al. (2005) identified children in need of instructional supports through a Tier 1 screening process, but randomly placed children in either Tier 2 (small group peer-mediation) or Tier 3 (individualized intervention). Additionally, one study provided professional development to teachers and staff to improve Tier 1 instruction and evaluated its usefulness through surveys (O'Connor, Fulmer, & Harty, 2005).

Length of interventions. The length of the intervention phase among the 10 studies ranged from 6 weeks to one academic year, although several studies collected data on student outcomes for as long as three academic years. Intervention sessions varied greatly both in terms of length of the session, and the frequency with which the intervention was implemented across the school week and even the school day. Reported lengths of sessions varied from 35 to 90 minutes, and administration of intervention ranged from 3 times weekly up to 10 sessions each day. About half of the studies did not report the length or frequency of sessions, though all studies reported the length of the intervention phase.

Research Design

All of the research designs among the selected studies were either quasi-experimental or experimental. A total of eight studies were quasi-experimental; one employed a longitudinal lagged design (O'Connor, Fulmer, & Harty, 2005), two used a multiple-baseline across participants design (Duhon, 2009; Koutsoftas, 2009), and two specified that data was collected from baseline through intervention (Pearce, 2009; VanDerHeyden, et al., 2007). The other two studies were described as experimental, with one study randomly assigning students to one of three treatment conditions (McMaster, et al., 2005) and the other placing at-risk students in either a treatment or a control group, with non-risk students serving as a second control group (Fuchs,

et al., 2005). For the most part, the designs selected were appropriate for the given purpose of each study. See Table 2 for a description of study purposes, designs, and length of intervention.

Table 2

Tiered Models of Instruction in Early Childhood: Purpose, Research Design, and Length of Intervention

Study	Purpose	Research Design	Length of Intervention
Burns, Scholin, Kosciolik et al. (2010)	To examine the reliability of decisions made with aimline and [Dual Discrepancy- DD] frameworks (p. 105)	Quasi-experimental (studied the consistency of two decision-making RtI models by collecting progress-monitoring data and comparing that to an aimline with a yearly goal to compute DD)	90 minutes each school day; portions of which occurred in the home classroom and portions of which occurred in small pull-out groups Length of time in Tier II intervention varied by need; students making adequate progress- 3-5 data points above aimline- were considered for discontinuing Tier II intervention while those not making adequate progress- 3-5 data points below aimline for two interventions were moved to Tier III
Denton, Kethley, Nimon et al. (2010)	To evaluate the effectiveness of a first-grade small-group reading intervention as a possible Tier 2 intervention by reducing researcher control and implementing the intervention in multiple schools	Quasi-experimental	Requested that each participating classroom keep children in intervention for 40 minutes a day, 5 days/week for 25 weeks
Duhon, Mesmer, Atkins et al. (2009)	To evaluate the efficacy of increasing intervention frequency on the mathematics performance of students; To evaluate the frequency level as a systematic means of increasing and quantifying intervention strength	Non-experimental during Phase 1, but experimental- single subject, multiple-baseline across participants- during Phase 2 (increasing intervention intensity/frequency)	One month for all three students, and then criterion had to be met (reaching or surpassing benchmarks- 40 digits calculated in 2 minutes- for three consecutive sessions). Students not responding to 5 sessions a day had that doubled.

(table continues)

Table 2 (continued)

Tiered Models of Instruction in Early Childhood: Purpose, Research Design, and Length of Intervention

Study	Purpose	Research Design	Length of Intervention
Fuchs, Compton, & Fuchs, et al. (2005)	To examine the effects of preventive tutoring, as well as to evaluate the degree to which mathematics disability (prevalence and severity) is impacted by the end of 1 st grade, and to investigate the cognitive abilities associated with mathematics proficiency in 1 st grade	Experimental 3 groups: At-risk-Tutored At-risk-Control Not At-risk- Control	3 times weekly for 16 weeks (48 sessions)
Koutsoftas, Harmon, & Gray (2009)	To evaluate the effectiveness of a Tier 2 intervention for increasing beginning sound awareness in low-income children who were not progressing as well as their peers on the beginning skill of sound awareness.	Quasi-experimental; multiple baseline across participants All of the children who qualified for Tier 2 intervention entered a baseline condition at the same time, with approximately half of the participants beginning Tier 2 intervention 1 week later than the other half.	2 times per week for six weeks
McMaster, Fuchs, & Fuchs, et al. (2005)	To examine the validity of the dual-discrepancy approach as well as to compare the performance of children receiving one of three interventions that did not respond to general instruction	Experimental; After identifying nonresponders, these children were further classified as low vs. very low scores based upon the results of the CBM. Students in each of these groups were then randomly assigned to one of three treatment conditions	For each intervention condition, students received the interventions for 35 minutes, 3 times a week Data was collected on monitoring measures for the first 7 weeks

(table continues)

Table 2 (continued)

Tiered Models of Instruction in Early Childhood: Purpose, Research Design, and Length of Intervention

Study	Purpose	Research Design	Length of Intervention
O'Connor, Harty, & Fulmer (2005)	To evaluate the effectiveness of 2 nd and 3 rd Tier interventions on the reading achievement of children over time	Quasi-experimental with 3 distinct, pre-existing groups: 1) students at-risk for reading disabilities 2) students with disabilities 3) historical control group	Data collected and tiered reading instruction/intervention provided from kindergarten through third grade
O'Connor, Fulmer, Harty, et al. (2005)	To examine the efficacy of using intervention layers on children's reading achievement over time.	Quasi-experimental; longitudinal lagged design (2 intact treatment groups- layers 1 & 2- and historical controls)	Data collected and layered reading provided from kindergarten through third grade
Pearce (2009)	To evaluate the implementation of an RTI model in the treatment and identification of students in kindergarten through fifth grade who experienced significant emotional and behavioral problems within a rural school setting (p. 35).	Quasi-experimental; student behavior was compared from baseline to intervention	Two successive academic years (2004-2005; 2005-2006)

(table continues)

Table 2 (continued)

Tiered Models of Instruction in Early Childhood: Purpose, Research Design, and Length of Intervention

Study	Purpose	Research Design	Length of Intervention
VanDerHeyden, Snyder, Broussard et al. (2007)	To determine the utility of curriculum-based measurement probes as universal screening tools for identifying preschool children who might need more intensive assessment or intervention and to monitor progress when brief targeted interventions were provided improvements Also to determine effectiveness of the tool to monitor early literacy skills.	Quasi-experimental; student behavior was compared from baseline to intervention	4 weeks baseline and 4 weeks intervention

Measures Used

All but one of the 10 studies (Denton, et al., 2010) used curriculum-based measures (CBMs) to monitor children's performance while receiving tiered interventions, and three of the studies also used the probes for screening purposes (Burns, et al., 2010; Pearce, 2009; VanDerHeyden, et al., 2007). The study that did not use CBMs to monitor performance used pretest and posttest measures to evaluate whether children had responded positively to intervention. Other studies also included pretest and posttest measures in conjunction with more routine performance monitoring. Of the 9 studies that used CBMs, one specifically identified Aimsweb (Burns, et al., 2010) and two identified DIBBELS as the CBM that was used to monitor performance (Koutsoftas, et al., 2009; VanDerHeyden et al., 2007).

Dependent variables. A total of seven studies focused on language-related outcomes, including five studies that identified reading outcomes as the dependent variable (Burns, et al., 2010; Denton, et al., 2010; McMaster et al., 2005; O'Connor, Harty, & Fulmer, 2005; O'Connor, Fulmer, Harty, 2005), one study that specified phonemic awareness (Koutsoftas, et al., 2009),

and the other defined rhyming and alliteration outcomes as the dependent variable (VanDerHeyden, et al., 2007). Of the remaining three studies, two focused on mathematical skill outcomes (Duhon, et al., 2009; Fuchs, et al., 2005) and one identified student behavior and emotional stability (Pearce, 2009). Table 3 describes independent and dependent variables, outcome measures, and fidelity of interventions.

Table 3

Tiered Models of Instruction in Early Childhood: Independent and Dependent Variables, Outcome Measures, and Treatment Fidelity

Study	IV/Intervention	DV	Outcome Measures	Treatment Fidelity
Burns, Scholin, Kosciolk et al. (2010)	Tier II intervention for reading skills provided through small group instruction for daily oral language and guided reading using curricular materials that are matched to the students' skill levels	Oral and language skills	Weekly administration of CBM-R from Aimsweb	Each scorer was required to come within two words correct per minute of the correct score on three consecutive videotaped assessments. Previous CBM-R research has consistently found interrater reliability greater than .99 and test-retest reliability that exceeded .90.

Note: CTOPP= Comprehensive Test of Phonological Processing ; PALS= Peer-assisted Learning Strategies; PPVT-III= Peabody Picture Vocabulary Test, 3rd edition; WJ-III= Woodcock Johnson III; WJ-R= Woodcock-Johnson Psychoeducational Battery-Revised; WRMT-R= Woodcock Reading Master Test- Revised; WDRB= Woodcock Diagnostic Reading Battery; WMTB= Working Memory Test Battery for Children; WASI= Wechsler Abbreviated Scale of Intelligence; WRMT-RN/U= Woodcock Reading Master Test-Revised-Normative Update

(table continues)

Table 3 (continued)

Tiered Models of Instruction in Early Childhood: Independent and Dependent Variables, Outcome Measures, and Treatment Fidelity

Study	IV/Intervention	DV	Outcome Measures	Treatment Fidelity
Denton, Kethley, Nimon et al. (2010)	Small group reading intervention (Responsive Reading Instruction) as possible Tier II intervention within an RTI model	Children's response to the intervention (i.e., reading performance in these areas- blending phonemes, letter sounds, word reading, and oral fluency)	Pre-test and post-test measures of: CTOPP; Blending Words, Blending Nonwords, and Segmenting Words subtests. TOWRE: Word Efficiency subtest WJ-III	2 coaches and a project coordinator observed intervention sessions once about every 9 weeks for 3 total fidelity observations per teacher. Fidelity was assessed using a 4-point Likert scale designed to address key components of intervention. Teachers did not receive feedback and coaches did not observe teachers they coached Average fidelity across teachers was 80.14% with a range of about 57-95%
Duhon, Mesmer, Atkins et al. (2009)	Phase 1 required classwide once-daily intervention for one month prior to determining non-responders for Phase 2 Intensity in Phase 2 intervention varied- first, 5 sessions in one sitting each day; if student was unresponsive to this, that was increased to 10 sessions divided over one morning and one afternoon session. Students meeting criterion/benchmarks discontinued intervention in Phase 2. Skill maintenance was evaluated by administering one probe one month after the last probe in intervention.	Number of digits correct per 2 minutes; timed calculation skills/calculation fluency	Mathematics skill probes incorporating 2 nd grade calculation skills consistent with the state curriculum	Intervention implementation as percentage of steps completed accurately was determined by having a 2 nd experimenter collect data during 25% of sessions. Overall agreement was 91%.

Note: CTOPP= Comprehensive Test of Phonological Processing ; PALS= Peer-assisted Learning Strategies; PPVT-III= Peabody Picture Vocabulary Test, 3rd edition; WJ-III= Woodcock Johnson III; WJ-R= Woodcock-Johnson Psychoeducational Battery-Revised; WRMT-R= Woodcock Reading Master Test- Revised; WDRB= Woodcock Diagnostic Reading Battery; WMTB= Working Memory Test Battery for Children; WASI= Wechsler Abbreviated Scale of Intelligence; WRMT-RN/U= Woodcock Reading Master Test-Revised-Normative Update

(table continues)

Table 3 (continued)

Tiered Models of Instruction in Early Childhood: Independent and Dependent Variables, Outcome Measures, and Treatment Fidelity

Study	IV/Intervention	DV	Outcome Measures	Treatment Fidelity
Fuchs, Compton, & Fuchs, et al. (2005)	Small-group tutoring (provided by doctoral and Masters level students trained by the researchers) on 17 math topics followed by engagement in Math Flash (math fact briefly shown on computer screen, and students must then try to re-enter the fact on their screen) during each session	Children's performance on math-related tasks such as fact recall, story problems, computation, etc.; objectives assessed through the listed measures	7 math measures total; 5 to intact classes (CBMs) and two administered individually (WJ III Applied Word Problems & WJ III Computation). Weekly CBM also assessed Pre-test cognitive battery assessments: WRMT-R WASI WDRB CTOPP WJ-R WMTB	All tutoring sessions audiotaped and tutors unaware which would be viewed. Two sessions- Topics 4 and 16 were assessed for all tutors. A checklist aligned with the intervention was used to check for fidelity Fidelity indexed as percentage of items implemented. Second coder re-checked 25% of videos. Agreement was about 84%. 98% fidelity 1 st check, 94% 2 nd check
Koutsoftas, Harmon, & Gray (2009)	Phonemic awareness instruction	Children's gains on CBM; PALS; PreK Beginning Sound Awareness (DIBELS)	PALS PreK Beginning Sound Awareness (DIBELS)	N/A
McMaster, Fuchs, & Fuchs, et al. (2005)	Three increasingly individualized treatments: PALS, Modified PALS, or tutoring by an adult.	Reading skills	PALS .	PALS was implemented with 92% fidelity.

Note: CTOPP= Comprehensive Test of Phonological Processing ; PALS= Peer-assisted Learning Strategies; PPVT-III= Peabody Picture Vocabulary Test, 3rd edition; WJ-III= Woodcock Johnson III; WJ-R= Woodcock-Johnson Psychoeducational Battery-Revised; WRMT-R= Woodcock Reading Master Test- Revised; WDRB= Woodcock Diagnostic Reading Battery; WMTB= Working Memory Test Battery for Children; WASI= Wechsler Abbreviated Scale of Intelligence; WRMT-RN/U= Woodcock Reading Master Test-Revised-Normative Update

(table continues)

Table 3 (continued)

Tiered Models of Instruction in Early Childhood: Independent and Dependent Variables, Outcome Measures, and Treatment Fidelity

Study	IV/Intervention	DV	Outcome Measures	Treatment Fidelity
O'Connor, Harty, & Fulmer (2005)	<p>Layer 2: Small group reading instruction, 3 days per week</p> <p>Layer 3: Daily Small group reading OR individualized instruction.</p>	Reading outcomes for students in intervention in each layer compared to those in historical control groups	<p>Oral reading fluency (Deno, 1985)</p> <p>PPVT – III</p> <p>WRMT-R/NU</p>	N/A
O'Connor, Fulmer, Harty, et al. (2005)	<p>Layer 1: Professional Development (provided to teachers, teacher assistants, and principals) sessions consisting of three full-day sessions and four to-hour sessions each year</p> <p>Layer 2: Direct interventions (students were identified as risk and provided with a direct intervention if they did not respond to the first layer- i.e., universal reading instruction)</p>	Reading outcomes for students in intervention compared to those in historical control groups	<p>Letter naming</p> <p>Oral reading fluency</p> <p>PPVT-III</p> <p>Phonemic segmentation</p> <p>Teacher surveys</p> <p>WRMT-R</p>	N/A

Note: CTOPP= Comprehensive Test of Phonological Processing ; PALS= Peer-assisted Learning Strategies; PPVT-III= Peabody Picture Vocabulary Test, 3rd edition; WJ-III= Woodcock Johnson III; WJ-R= Woodcock-Johnson Psychoeducational Battery-Revised; WRMT-R= Woodcock Reading Master Test- Revised; WDRB= Woodcock Diagnostic Reading Battery; WMTB= Working Memory Test Battery for Children; WASI= Wechsler Abbreviated Scale of Intelligence; WRMT-RN/U= Woodcock Reading Master Test-Revised-Normative Update

(table continues)

Table 3 (continued)

Tiered Models of Instruction in Early Childhood: Independent and Dependent Variables, Outcome Measures, and Treatment Fidelity

Study	IV/Intervention	DV	Outcome Measures	Treatment Fidelity
Pearce (2009)	<p>Multi-tiered model of instruction; Problem-Solving Model of RtI-</p> <p>Tier 1: Schoolwide interventions</p> <p>Tiers 2 and 3: 6 separate interventions(including applied behavioral analysis, social skills training, counseling, differentiated instruction, cognitive behavioral interventions and parental involvement); Tier 3 was designated as additional outside services and supports and identification as eligible for SPED</p>	<p>Student behavior (quantitative data) and emotional stability (qualitative data)</p>	<p>Curriculum-based Measures (CBMs); specifics not defined</p>	<p>Fidelity of Tier 1 was ascertained through interviews with the principal- fidelity was mixed among participating teachers.</p> <p>Fidelity of Tiers 2 and 3 was assessed weekly and discussed at weekly team meetings. Overall fidelity of the 6 interventions used was over 85%, with ABA being the lowest with 50% in some individual classrooms. Specific measures used to obtain these percentages were not disclosed.</p>
VanDerHeyden, Snyder, Broussard et al. (2007)	<p>Classwide versus individual interventions on growth in alliteration and rhyming.</p>	<p>Alliteration and rhyming proficiency</p>	<p>DIBELS scores</p>	<p>A countdown timer was used to enhance the fidelity of timing, and when the timer rang, both the child and experimenter could hear it. Probes were scored as correct responses per 2 minutes.</p>

Note: CTOPP= Comprehensive Test of Phonological Processing ; PALS= Peer-assisted Learning Strategies; PPVT-III= Peabody Picture Vocabulary Test, 3rd edition; WJ-III= Woodcock Johnson III; WJ-R= Woodcock-Johnson Psychoeducational Battery-Revised; WRMT-R= Woodcock Reading Master Test- Revised; WDRB= Woodcock Diagnostic Reading Battery; WMTB= Working Memory Test Battery for Children; WASI= Wechsler Abbreviated Scale of Intelligence; WRMT-RN/U= Woodcock Reading Master Test-Revised-Normative Update

Intervention Fidelity

Seven studies measured the fidelity of the interventions that were employed. Of the studies that calculated treatment fidelity, the overall average fidelity was 80.14% to 99%. Two studies videotaped all intervention sessions, and one of these used a criterion to determine when fidelity was at an acceptable level to begin scoring (Burns, et al., 2010). Three studies measured fidelity as the percentage of steps implemented correctly (Denton, et al., 2010; Duhon, et al., 2009; Fuchs, et al., 2005), and two studies reported fidelity results but did not specify the procedures (Pearce, et al., 2009; McMaster, et al., 2005). The other study (VanDerHeyden, et al., 2007) described fidelity as a measure of timing 2 minute intervention sessions using a countdown timer.

Results

All 10 of the studies resulted in positive outcomes for children receiving tiered intervention, regardless of tier. In each study, children experienced growth on dependent measures after receiving study treatments. Regardless of the type of intervention or the developmental domain being assessed, children benefited from supports when they were identified as being in need. Given the many different forms interventions took across studies, it is not possible to say which (or whether) particular interventions are definitively more or less effective. However, it is important to note that class-wide tutoring at Tier 1 was an effective practice for a class of at-risk students when screening probes revealed that instruction was not assisting children in meeting identified goals and objectives. Moreover, the use of small group instruction was shown to be an effective Tier 2 strategy across several studies. Additionally, two studies found that the use of dual-discrepancy models were effective for identifying children at-risk (Burns, et al., 2010; McMaster, et al., 2005). Finally, increasing intervention intensity was

found to improve student academic growth when children did not respond to lesser intensity (Duhon, et al., 2009). Moreover, increasing the frequency of intervention also resulted in improved outcomes (VanDerHeyden, et al., 2007), though it should be understood that increasing the frequency and intensity of interventions and performance monitoring efforts underlies the concept of tiering instruction to meet the needs of diverse learners. Table 4 provides information about inter-observer agreement, primary findings, and alternate explanations as well as threats to validity.

Table 4

Tiered Models of Instruction in Early Childhood: Inter-observer Agreement, Primary Findings, and Rival Explanations/Threats to Validity

Study	IOA	Primary Findings	Rival Explanations/Threats to Validity
Burns, Scholin, Kosciolk et al. (2010)	Previous CBM-R research has consistently found interrater reliability greater than .99 and test-retest reliability that exceeded .90	Results showed that decisions resulting from the use of these frameworks could directly affect the decisions that are reached.	Each scorer was required to come within two words correct per minute of the correct score on three consecutive videotaped assessments. Previous CBM-R research has consistently found interrater reliability greater than .99 and test-retest reliability that exceeded .90. Progress may have been due to an ineffective intervention or one that was poorly implemented was not a primary concern. However, the fidelity with which the intervention was implemented likely had some effect on student response. Moreover, agreement estimates in previous research frequently exceeded .99.
Denton, Kethley, Nimon et al. (2010)	Established by co-viewing and independently rating lessons; done for each cycle of data collection. Training continued until 80% agreement reached between program developers and teachers	The study provides evidence for using a specific reading intervention (that had been used among a smaller sample of children at Tier 2) in multiple school settings	Contexts of each school varied, with small numbers of urban schools that were disproportionately economically disadvantaged

(table continues)

Table 4 (continued)

Tiered Models of Instruction in Early Childhood: Inter-observer Agreement, Primary Findings, and Rival Explanations/Threats to Validity

Study	IOA	Primary Findings	Rival Explanations/Threats to Validity
Duhon, Mesmer, Atkins et al. (2009)	The 2 nd experimenter rescored the measures and obtained 98% reliability on scoring.	All but 1 student performed in the frustration range prior to intervention implementation at Phase 2- classwide intervention was implemented for a month before 3 students were identified as non-responders 2 students responded well to increased frequency/intensity of intervention at the 5 sessions/day level. One student required a move to 10 sessions/day in order to meet benchmark criterion	Seems to support the Phase 1 intervention, but with only 3 students at Phase 2 it is hard to generalize results. Further, increasing the intensity/frequency of intervention to 10 sessions for one student begs the question whether this might be conceptualized as a 3 rd distinct phase (individualized and intensive) The probes used were designed by the experimenters, and thus reliability/validity data on use with other children is not possible More of an assessment intensity/intervention as opposed to a true intervention; however, it might lend minimal support to the concept of tiering assessment/performance-monitoring
Fuchs, Compton, & Fuchs, et al. (2005)	Each tester reached 90% accuracy in scoring after training. A second coder looked at a random sample of 15% of audiotapes and averaged about 93%. However, scoring on protocols fell below 80% and so all tests were-checked. Disagreements were flagged and one of the authors/researchers made final scoring decisions	Reduced prevalence rate of MD as a result of the intervention; children at-risk improved performance on three posttest measures	Use of commercial norm-referenced measures like the Woodcock limit interpretation of at-risk possibility for young children- all students in study were low normal although they appeared to be low compared to a nearby urban sample Tutoring was added to regular math instruction in order to generalize findings within an RTI model; universal supports at Tier 1 being the idea
Koutsoftas, Harmon, & Gray (2009)	The intervention required small-group sessions of approximately 20 min twice per week for 6 weeks.	Based on treatment probe results, intervention proved effective for a large proportion (71%) of the children, who had medium to large treatment effect sizes.	It is possible that children's gains on the PALS-PreK occurred as a result of Tier 1 instruction during the first semester instead of as a result of Tier 2 instruction, but data from the treatment probes and CBMs suggest that progress began after Tier 2 intervention was initiated.

(table continues)

Table 4 (continued)

Tiered Models of Instruction in Early Childhood: Inter-observer Agreement, Primary Findings, and Rival Explanations/Threats to Validity

Study	IOA	Primary Findings	Rival Explanations/Threats to Validity
McMaster, Fuchs, & Fuchs, et al. (2005)	Point-by-point method comparing staff members scored protocols with those scored by an experienced tester. Staff were trained until they reached 90% agreement consistently	<p>Results showed that average readers routinely performed better than those identified as at-risk, showing that the method used to identify children in need of supports worked in identifying such children</p> <p>The dual discrepancy approach identifies students performing below most peers. Results suggest dual discrepancy models of response to intervention are better indicators of children at-risk than performance level or growth rate only approaches</p>	<p>No agreement as to how far below average a child should be to warrant intervention/changes.</p> <p>Performance-level and growth-rate indicators vary; more consensus needed on what these should be for various reading skills</p> <p>Length of intervention needed for response needs further investigation</p> <p>CBMs were used to evaluate performance; other measures may yield different results</p>
O'Connor, Harty, & Fulmer (2005)	N/A	<p>Moderate to large effect sizes compared to historical control groups</p> <p>Special education placement averaged 14.6% in the historical control group. The rate of placement was 7.8% following four years of participation</p> <p>Early and ongoing intervention in the early years improves outcomes for children both eligible and un-eligible for special education services</p>	<p>Relatively small sample size</p> <p>Break down of female vs. male participants not reported</p> <p>Mainly norm-referenced assessments used to determine improvements</p> <p>Treatment Fidelity not reported</p> <p>History/maturation could have impacted the results</p>

(table continues)

Table 4 (continued)

Tiered Models of Instruction in Early Childhood: Inter-observer Agreement, Primary Findings, and Rival Explanations/Threats to Validity

Study	IOA	Primary Findings	Rival Explanations/Threats to Validity
O'Connor, Fulmer, Harty, et al. (2005)	<p>20% of video-segments (collected for most of the final year of the study) were transcribed and coded. Two researchers independently coded the data and compared.</p> <p>The number of agreements was divided by the total number of agreements plus disagreements then multiplied by 100.</p> <p>Reliability was found to be at 94%</p>	<p>Children in Layer 1 outscored the historical control group in all measures except Word Identification by the end of 2nd grade</p> <p>Layer 2 children performed better than control groups in all measures at both time points</p> <p>Professional development alone improved reading outcomes dramatically compared to the control group</p> <p>Direct intervention showed larger effect sizes over the control group and significant differences across all areas evaluated</p> <p>Provides evidence that differentiating instruction based on needs and providing ongoing PD to improve Level/layer/tier 1 instruction is useful. Shows that students receiving additional supports may not need special education services, and typical students with unique needs can also get the assistance they require</p>	<p>Students not measured at the same intervals/times from intervention group to control group</p> <p>Fewer children identified as LD by third grade gives researchers cause for pause as eligibility has often been found to increase as the difficulty/complexity of reading increases with age/time</p> <p>Treatment Fidelity not reported</p> <p>Layer 2 was not sufficient for some children and stronger more intense interventions (such as a Layer/Tier 3 may have been needed)</p>
Pearce (2009)	N/A	<p>7 of 9 of the students had behavior that improved dramatically as a result of Tier 2 and 3 interventions</p> <p>Use of the RtI Problem-Solving Model indicated that when students responded to a particular intervention, new or different interventions did not need to be/should not be used</p> <p>Teachers (GENED & SPED), principals, counselors, school psychologists, and parents were all mostly supportive of the program and enjoyed being included on the team. Most reported positive perceptions of the program and the improvement of outcomes for the majority of students</p>	<p>Study sample small and not generalizable outside of similarly rural and removed communities</p> <p>Without IOA, it is difficult to assess the reliability of data collection (though qualitative, social validity measures indicate the data seems correct)</p> <p>Fidelity measures/procedures not described</p>

(table continues)

Table 4 (continued)

Tiered Models of Instruction in Early Childhood: Inter-observer Agreement, Primary Findings, and Rival Explanations/Threats to Validity

Study	IOA	Primary Findings	Rival Explanations/Threats to Validity
VanDerHeyden, Snyder, Broussard et al. (2007)	33% of all sessions balanced by session and probe type throughout the study. Alliteration measure, agreement was 99.18% (range 88%–100%) Rhyming measure, agreement was 98.07% (range 80%–100%) LNF (DIBELS), IOA was computed as 98.33% (range 90%–100%). ISF (DIBELS), IOA was 96.00% (range 88%–100%) IOA for the experimenter-constructed letter sounds measure was 99.32% (range 91%–100%).	Children in the bottom 25% increased their alliteration and rhyming scores under both individual and class wide conditions. High performers showed decreases in their scores, with the exception of rhyming, which improved for Head Start children who were provided rhyming intervention in a class wide format Use of curriculum-based measurement probes as universal screeners might lead to enhance decision-making about children who are at risk for reading difficulties, particularly when combined with brief class wide interventions designed to address opportunities to learn systematically	No manipulation of Tier 1 or core instruction. No meaningful link from intervention procedures to classroom instruction

Effect sizes. Six studies reported the effect sizes of the intervention on student outcomes, and of these, most were generally moderate to large. Effect sizes were most often calculated as Cohen's *d*, which was computed by dividing the mean difference between groups by the pooled standard deviation. However, growth was relatively small in isolated cases in two studies (Denton, et al., 2010; O' Connor, Harty, & Fulmer, 2005). One study reported a reverse effect on several measures between control and treatment groups (Fuchs, et al., 2005), but large gains on most measures. Another study found that younger children experienced larger effect sizes (Kousoftas, et al., 2009). Table 5 illustrates the range of effect sizes for each study.

Table 5.

Effect Sizes across Studies

Study	Independent Variable	Range of Effect Sizes
Burns, Scholin, Kosciolk et al. (2010)	Small group reading intervention	Not reported
Denton, Kethley, Nimon et al. (2010)	Small group reading intervention	.08 to 1.58 (growth on oral reading)
Duhon, Mesmer, Atkins et al. (2009)	Math interventions	Not Reported
Fuchs, Compton, & Fuchs, et al. (2005)	Math intervention	-.70 to 1.48 <i>(between combinations of control group not at-risk, control group at-risk, and treatment group at-risk)</i>
Koutsoftas, Harmon, & Gray (2009)	Phonemic awareness instruction	.64 to 1.94
McMaster, Fuchs, & Fuchs, et al. (2005)	Three reading interventions	0.15 to 1.29
O'Connor, Fulmer, & Harty (2005)	Reading interventions at Tiers 1 and 2	.09 to .052
O'Connor, Harty, & Fulmer (2005)	Reading interventions as Tiers 2 and 3	0.4 to 1.8
Pearce (2009)	6 Tier 2 intervention approaches; additional SPED services and supports identified as Tier 3	Not Reported
VanDerHeyden, Snyder, Broussard et al. (2007)	Classwide vs. individual interventions (fluency) for alliteration and rhyming	Effect sizes only reported for differences on prescreens between public school and Head Start participants

Conclusions

The results of this preliminary research synthesis indicate that there continues to be a growing evidence-base for the use of tiered instructional approaches in early childhood contexts. In specific, the current synthesis has shown that intervening and providing targeted interventions

for young children at-risk can have a positive effect on children's academic growth. Other strengths of the current research that have emerged as a result of this review include the revelation that across all of the studies, children were placed into intervention treatments based on their need, which lends support to the concept of tiering instruction. Moreover, the use of PALS was also found effective in two studies in the present synthesis. PALS is a specific method of peer-mediated intervention that teachers and students can be trained to use. While none of the studies explicitly stated using other forms of peer-mediated intervention, it has been suggested as a possible Tier 2 intervention. Across studies it did appear that Tier 2 interventions tended to utilize small group strategies. Both peer-mediated intervention and small group instruction have been suggested as appropriate Tier 2 supports within the literature (Pfeiffer-Fiala, Pretti-Frontczak, Moore, & Lyons, 2010; Jackson, et al., 2009).

Further, while the present synthesis focused mainly on the use of tiered performance monitoring, the results of these studies also imply that researchers have intuitively endeavored to assess children's needs, determined what activities and instruction would be appropriate to address these needs, and have monitored children's performance on objectives to determine whether learning goals are being met. While the frequency of data collection varied, it did tend to correlate with the frequency and intensity of interventions; a finding that supports a tiered model of performance monitoring. Each of these practices fit well within the context of a curriculum framework, and pave the way for future research efforts regarding the effectiveness of using tiered models within each aspect of a curriculum framework.

Limitations

The results of this synthesis also present a number of limitations in terms of generalizability. For example, different models of tiered instruction were utilized across

studies. While there were a handful of studies that intended to evaluate the use of specific interventions for use within an RtI framework, the actual conceptualization of RtI differed slightly or was not specified. As such, there remains little evidence as to which type of tiered model is most effective. Further, studies had either 2 or 3 levels of tiers; there was little agreement beyond this. Additionally, studies did not sufficiently justify why they lacked a third tier or why they used just two. Studies that used three tiers attempted to explain their use, but only one study evaluated a Tier 3 specific intervention (O'Connor, Harty, & Fulmer, 2005). Other studies randomly placed children at-risk in either Tier 2 or Tier 3 (McMaster, et al., 2005), or described Tier 3 as the resources and supports provided through Special Education (Pearce, 2009). Also, most of the studies focused on children in the early elementary grades; only two studies included children in prekindergarten (Koutsoftas, et al., 2009; VanDerHeyden, et al., 2007). Therefore, it is difficult to presume that the same approaches would be appropriate for the youngest children. Additionally, most of the studies evaluated whether tiered interventions were effective for improving language-related outcomes. Few studies have been done that focus on mathematics and social skills, though such studies are direly needed. Finally, although most of the studies monitored student performance, it was not clear whether they did so in order to collect frequent outcome data or as part of a systematic effort to improve instruction in a tiered fashion.

Future research

The present research synthesis suggests that identifying children that are struggling and providing these children with supports and/or interventions improves student outcomes. However, future research must focus on what model(s) of tiered instruction best support early intervening efforts, as well continued investigation into the types of interventions most

appropriate at each tier of instruction. Further, future studies should closely and specifically examine whether performance monitoring efforts increase with each tier, as well as whether different models are needed to address the scope and sequence of children's academic year instruction. Another possible angle future research should take is whether tiering instruction improves performance data collection when compared to classrooms that do not tier instruction. Collecting objective and meaningful data is not only best practice (DEC/NAEYC, 2009), but it also informs instructional efforts and improves student outcomes, whether or not a tiered model is in use. Therefore, the field would be wise to continue research efforts evaluating the relationship between tiered models, performance monitoring, and improved student outcomes.

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