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Reading Comprehension Interventions for Middle School Students With Learning Disabilities: A Synthesis of 30 Years of Research

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Abstract

The authors conducted a synthesis of studies of reading comprehension interventions for middle school students (Grades 6–8) identified with a learning disability. They identified 12 studies between 1979 and 2009 with treatment and comparison designs and 2 single-participant studies. Findings from the studies indicate large effect sizes for researcher-developed comprehension measures. Few studies (n = 4) reported standardized measures of reading comprehension, which indicated medium effect sizes. The majority of study treatments (n = 13) utilized strategy instruction related to main idea or summarization.

Keywords

reading comprehension, middle school, learning disabilities, synthesis

Reading to learn is an essential skill for middle school students (Grades 6–8); however, reading for understanding still remains to be a challenge for many such students (Gajria, Jitendra, Sood, & Sacks, 2007; U.S. Department of Education, 2007). Middle school students with learning disabilities (LD) are particularly vulnerable to the challenges of reading for understanding (Edmonds et al., 2009). For example, middle school students are expected to read greater amounts of information across subject areas compared to students in upper elementary grades (Gajria et al., 2007); however, 21% of secondary students with LD are estimated to be at least five grade levels below their peers in reading (National Joint Committee for Learning Disabilities, 2008). Finn, Rotherham, and Hokanson (2001) report that the identification of students with LD increased 44% for 12- to 17-year-olds over a 10-year period. In addition, students with LD drop out of high school at a rate 3 times more than that for normally achieving peers (U.S. Department of Education, 2007). Without effective instruction to facilitate access to reading for understanding, reading difficulties at the middle school level can lead to grim outcomes for students with LD.

The goal of comprehending text can be particularly challenging for middle school students with LD (Edmonds et al., 2009). Reading comprehension is a skill that requires students to read, interact with text, and extract meaning from stories or passages (Honig, Diamond, Cole, & Gutlohn, 2008). The task of understanding, summarizing, or learning from complex reading material is increasingly difficult in middle school (Gardill & Jitendra, 1999). Comprehension has been called "the essence of reading" (Durkin, 1993). Although educators may agree that understanding written material may be the goal of reading (Edmonds et al., 2009; Honig et al., 2008), the troubling statistics previously cited for students with LD underscore the fact that comprehension is difficult for many students. Strategy instruction in comprehension is imperative for helping students understand the purpose of reading and for equipping them with the practical skills that are necessary to understanding text (Honig et al., 2008).

Recently, educational reform and policies requiring the use of evidence-based practices have reinvigorated the researcher and practitioner communities' need to locate and

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apply practices with a history of proven effectiveness. The No Child Left Behind Act (see http://ed.gov/nclb/landing.jhtml) and the Individuals with Disabilities Education Act of 2004 (see www.idea.ed.gov/) have brought reading research for students with LD to the forefront. Since schools are required to apply evidence-based teaching methods, there is a need to understand how research can inform and improve reading comprehension practice for students with LD. Conducting a synthesis of research is a thorough and descriptive technique for coherently informing instruction and identifying topics requiring further investigation.

We were unable to identify a review focused specifically on interventions implemented to improve reading comprehension for middle school students with LD. Previous synthesis articles have examined reading outcomes for students with LD at the secondary level, but a broad spectrum of grades (e.g., 4th through 12th grades) and intervention types (e.g., phonics, fluency) as well as participant characteristics (e.g., reading difficulties broadly) were emphasized (Edmonds et al., 2009; Wanzek, Wexler, Vaughn, & Ciullo, 2009). This made it difficult to determine which practices were most effective for improving reading comprehension for middle school students with LD or to determine topics requiring further investigation by researchers. Thus, there is a need for an exhaustive and focused synthesis examining evidence-based approaches to reading comprehension for middle school students with LD. Furthermore, summarizing extant research at the middle school level is significant since increasingly teachers are asked to provide reading intervention to middle school students with LD. The purpose of this article is to summarize the findings of reading comprehension intervention studies specifically designed for middle school students (Grades 6–8) with LD and assist in identifying both strengths and weaknesses within this body of research. This synthesis provides statistical results from intervention studies as a means of specifying evidence-based practices for improving reading comprehension and informing educators about the effectiveness of targeted practices.

This synthesis was designed to answer the following research question: How effective are reading comprehension interventions based on experimental, quasi-experimental, and single-participant research studies in improving reading comprehension outcomes for middle school students with LD?

Method

Search Procedure and Criteria

A four-step process was used to conduct a comprehensive search of intervention studies. First, electronic searches of the ERIC and PsycINFO databases were completed to locate studies published in peer-reviewed journals between 1979 and 2009. Every combination of the descriptors or root words of those descriptors (*reading*, *reading comprehension*, *middle school*, *junior high*, *LD*, *learning disab**, *reading strategies*, *middle grades*, *reading disab**, *intervention*) was used to maximize the articles located from the electronic search. The initial search yielded 2,974 abstracts. Second, abstracts were searched to determine if they met the synthesis criteria as described in the next paragraph. Third, references from previously published syntheses for Grades 6 through 12 reading comprehension outcomes for students with LD (Edmonds et al., 2009; Gajria et al., 2007; Scammacca et al., 2007) were reviewed to ensure that all studies were identified. Fourth, a hand search of four major journals including *Exceptional Children*, *Journal of Learning Disabilities*, *Learning Disability Quarterly*, and *Reading and Writing* was completed for volumes starting in 2007 through 2009. These journals were hand searched because they represented the prominent journals in the field of LD with an emphasis on reading and the journals where previous syntheses identified research articles.

A total of 14 studies met the selection criteria for the synthesis. Studies were selected based on the following criteria:

1. Participating students were in Grades 6 through 8 (ages 12–14). Studies were also included if the study disaggregated data for any student or students who fell in this grade or age range.
2. Participants were identified with an LD. Studies were included if a minimum of 50% of the participants met the grade or age range and were identified with an LD.
3. Only studies that targeted reading comprehension as the treatment were included. Studies that included other areas of reading instruction such as phonemic awareness, phonics, fluency, or vocabulary as part of the treatment were excluded (e.g., Bryant et al., 2000).
4. The studies had an experimental, quasi-experimental, or single-participant design. Studies had to show evidence of a control or comparison group within the design to be included.
5. The language of instruction was English and articles were published in English.
6. Studies that identified students only as struggling readers and not as LD were excluded (e.g., Graham & Wong, 1993).
7. Studies included a dependent measure of reading comprehension. If studies had only listening comprehension or content learning as the outcome measure, they were excluded (e.g., DiCecco & Gleason, 2002; Wilder & Williams, 2001; Williams, Brown, Silverstein, & DeCani, 1994).

Data Analysis

Coding procedures. An extensive coding sheet was adapted from a previous synthesis (Edmonds et al., 2009) and included elements specified in the *What Works Clearinghouse Design and Implementation Assessment Device* (Institute of Education Sciences, 2003). The coding sheet was used to organize the following essential information: (a) participants, (b) methodology, (c) intervention and comparison information, (d) clarity of causal inference, (e) measures, and (f) findings. The coding sheet used a combination of forced-choice items (e.g., research design, assignment method, fidelity of implementation), open-ended items (e.g., age as described in text, duration of intervention, selection criteria), and written description of the treatment condition.

Four raters were trained on the use and interpretation of items from the coding sheet for 8 hours. Responses from the raters were used to calculate the percentage agreement (i.e., agreements divided by agreements plus disagreements). Each rater independently coded an article, and the percentage agreement was calculated. Interrater reliability was established by having the raters independently code an article and achieve an interrater reliability of 90%. An interrater reliability of greater than 90% was achieved for all four raters, with a range of 90% to 100% for all of the articles read. Each article was independently coded and then double coded by a second rater to check for accuracy. If disagreements occurred, meetings were held to review article information and reach consensus.

Once the coding had been completed, the studies were summarized in a table format. Table 1 provides a summary of treatment-comparison and single-participant study features. Table 2 provides a summary of measures and outcomes.

Effect size calculation—Experimental and quasi-experimental studies. Effect sizes were calculated for treatment-comparison studies that provided adequate statistical information including means and standard deviations or F test scores and sample sizes. For treatment-comparison studies, effect sizes were calculated using a formula that also accounts for pretest differences, which follows the trend of recently published reading synthesis (Edmonds et al., 2009; Wanzek et al., 2009). The formula we chose to use was Hedges's g because it is less subject to error than are other effect size calculations when used with small samples (i.e., $n < 30$; Hedges & Olkin, 1985). This is calculated as the difference between the mean posttest score of the treatment group minus the mean pretest score of the treatment group divided by the standard deviation of the control group on pretest (see http://ies.ed.gov/ncee/wwc/references). From this, we subtracted the mean posttest score of the control group minus the mean pretest score of the control group divided by the standard deviation of the control group on pretest. Each effect size was calculated independently and then checked for accuracy by a second team member. Of the studies, 12 used a treatment-comparison design (9 experimental and 3 quasi-experimental). Data for calculation of effect sizes were available in all 12 studies.

Percentage of nonoverlapping data—Single-participant studies. Single-participant studies' results were calculated with percentage of nonoverlapping data (PND). This procedure requires identifying the points of performance that are above the highest data point existing in the baseline condition. The total number of treatment sessions is divided by the number of data points above the highest baseline point (Scruggs & Mastropieri, 1998), which identifies a PND score. The interpretation of PND scores is as follows: (a) more than 90% of PND = very effective treatment, (b) 70% to 90% of PND = effective treatment, (c) 50% to 70% of PND = questionable treatment, and (d) less than 50% of PND = ineffective (Scruggs & Mastropieri, 1998). PND was calculated for all reading measures that included a line graph to display results.

Results

Study Features

A total of 14 studies met our inclusion criteria: 9 experimental studies, 3 quasi-experimental studies, and 2 single-participant studies examined reading comprehension interventions for middle school students with LD. A total of 491 students were represented, including 410 students identified as LD. The number of treatment sessions ranged from 1 to 40 (M = 16 sessions). A total of 12 studies reported session duration ranging from 30 minutes to 120 minutes (M = 47 min). Researchers implemented treatments in the majority of studies (n = 11). Of the studies, 5 reported fidelity of treatment.

Of the 14 studies coded for this synthesis, 10 reported information regarding the criteria that were applied for identifying students as LD. Four of the studies included in this article did not report how students were identified as LD (Gajria & Salvia, 1992; Jitendra, Hoppes, & Xin, 2000; Kim et al., 2006; Mastropieri et al., 1996). Of the 10 studies, 2 reported that classification was based on state or federal guidelines as the criteria (Jitendra, Cole, Hoppes, & Wilson, 1998; Malone & Mastropieri, 1992). The 8 remaining studies reported a "discrepancy" model, comparing reading achievement to IQ or ability as the method for reporting how students were identified as LD (Bakken, Mastropieri, & Scruggs, 1997; Boyle, 1996; Brailsford, Snart, & Das, 1984; Gardill & Jitendra, 1999; Graves & Levin, 1992; Klingner & Vaughn, 1996; Snider, 1989; Wong & Jones, 1982).

A total of 12 studies reported information about reading material, which was described by the authors in the following manner: fluency passages (n = 3), remedial reading

Table 1. Study Features

Study	Study Design	Participants	Grade	Duration	Reading Material	Person Implementing
1. Bakken, Mastropieri, and Scruggs (1997) *Treatment fidelity* NR	Random assignment Treatment comparison (multiple treatments)	54 students (LD) 18 students each for T1, T2 and C	8th	3 sessions (94 min total)	Expository text (GE = 8th)	Researcher
2. Boyle (1996) *Treatment fidelity* Scripted training procedure and strategy monitoring checklist	Quasi-experimental Treatment comparison	30 students (20 LD, 10 EMR) 15 students each for T and C	6th –8th	11 sessions, (3–5/week; 50 min)	Timed reading series passages (grade level and below grade level)	Researcher
3. Brailsford, Snart, and Das (1984) *Treatment fidelity* NR	Quasi-experimental Matched comparison	24 students (LD) 12 students each for T1 and C	NR (9–12 years)	30 sessions (5/week; 30 min)	NR	NR
4. Gajria and Salvia (1992) *Treatment fidelity* NR	Random assignment Treatment comparison	30 students (LD) 15 students each for T1 and C	6th–9th	35 sessions (35–40 min)	Timed Readings Series (modified)	Researcher
5. Gardill and Jitendra (1999) *Treatment fidelity* Intervention checklist and scripted direct instruction lessons	Single participant	6 students (5 LD, 1 neurological disorder)	6th–8th	30 sessions (50 min)	Narrative text (GE = 4th to 7th)	Researcher
6. Graves and Levin (1989) *Treatment fidelity* NR	Random assignment Stratified by race/sex Treatment comparison (multiple treatments)	30 students (LD) 10 students each for T1, T2, and C	5th–8th	1 session (68 min)	*Reading for Concepts*, Book C (GE = 2nd to 3rd)	Researcher
7. Jitendra, Cole, Hoppes, and Wilson (1998) *Treatment fidelity* Intervention checklist	Single participant	4 students (LD)	6th	20–40 sessions (40–50 min)	Narrative text (GE = 3.3)	Teacher
8. Jitendra, Hoppes, and Xin (2000) *Treatment fidelity* Scripted lessons with instructional checklist	Random assignment Treatment comparison	33 students (29 LD, 4 SED) 18 for T and 15 for C	6th–8th	15 sessions (30–40 min)	Main idea comprehension program (mean GE = 2.88)	Researcher
9. Kim et al. (2006) *Treatment fidelity* 3-point Likert-type scale evaluating levels of implementation	Random assignment Treatment comparison	34 students (28 LD, 5 other) 16 for T and 18 for C	6th–8th	20–24 sessions (2/wk; 50 min)	Read Naturally expository text passages (independent and instructional level)	Researcher and teacher, computer-assisted instruction program

Table 1. (continued)

Study	Study Design	Participants	Grade	Duration	Reading Material	Person Implementing
10. Klingner and Vaughn (1996) *Treatment fidelity* NR	Random assignment Treatment comparison	26 students (LD) 13 for T1 and 13 for T2	7th, 8th	27 sessions, (6 wks; 35–40 min)	Social Studies text (grade-level passages)	Researcher
11. Malone and Mastropieri (1992) *Treatment fidelity* NR	Random assignment Stratified by grade/sex Treatment comparison multiple treatments	45 students (LD) 15 each for T1, T2, and C	6th–8th	2 sessions (1/day)	*Reading for Concepts*, Level D (GE = 3.2)	Researcher
12. Mastropieri et al. (1996) *Treatment fidelity* NR	Random assignment Treatment comparison	29 students (LD)	7th, 8th	2 sessions	Characteristics about vertebrate animals	Researcher
13. Snider (1989) *Treatment fidelity* NR	Quasi-experimental Treatment comparison	26 students (LD) 13 for T and 13 for C	8th	13 sessions (3 wks, 50 min)	*Corrective Reading Program*–adapted; *Reading Mastery* III and IV	Researcher
14. Wong and Jones (1982) *Treatment fidelity* NR	Random assignment Treatment comparison	120 students (60 LD) 30 for T and 30 for C	8th, 9th	5 sessions (three 1 hr, two 2 hr)	1–5 paragraph passages	Researcher

Note: C = control or comparison group; LD = learning disabled; GE = grade equivalence; NR = not reported; EMR = emotionally and mentally retarded; SED = special education; T = treatment group; T1 = Treatment Group 1; T2 = Treatment Group 2.

comprehension materials (n = 3), expository text (n = 3), narrative text (n = 2), and decodable text (n = 1). A wide range of text readability was reported for 8 of the studies. Readability levels of text were from 2nd grade to 8th grade (M = 4.7 grade equivalency [GE]). Summaries of the study features are presented in Table 1.

Previous research has differentiated between researcher-developed and standardized measures (Edmonds et al., 2009; Scammacca et al., 2007). Researcher-developed outcomes are consistently associated with larger effect sizes and may not have the same rigor with respect to reliability and validity (Swanson, Hoskyn, & Lee, 1999). In some cases, researcher-developed measures are highly proximal to treatments (Weisz, Weiss, Granger, Morton, & Morton, 1995), which may be an indication of target effects. Summaries of the study measures and outcomes are presented in Table 2.

Treatment conditions included strategy instruction, mapping, mnemonics, questioning, reviewing, and self-monitoring procedures. A review of the studies revealed 18 separate treatment conditions. Based on the description of the intervention provided by the authors, we organized the treatments into the following sections: summarization–main idea, summarization–main idea with self-monitoring strategies, multiple strategy interventions, and other treatments. The majority of outcome measures were researcher developed (n = 17), whereas four studies used standardized measures of reading comprehension.

Summarization–Main Idea

A summary or main idea strategy teaches students to capture the most important information about the overall idea of a paragraph or a body of text and expresses this information in a condensed form. Seven studies focused on summarizing or identifying main ideas (Bakken et al., 1997; Brailsford et al., 1984; Gajria & Salvia, 1992; Malone & Mastropieri, 1992; Mastropieri et al., 1996; Snider, 1989; Wong & Jones, 1982; Shapiro & Cole, 1994). One study used a standardized outcome measure (Brailsford et al., 1984), whereas the other studies used researcher-developed assessments designed to measure the specific skills taught during the intervention.

Gajria and Salvia (1992) provided a treatment condition in which students were taught text summarization through explicit modeling, guided practice, independent practice, and feedback with an emphasis on mastery learning. Over the course of the treatment, responsibility for learning shifted from the instructor to the students. As outlined by Brown and Day (1983), students were taught five summarization rules: (a) superordination, (b) deletion of redundant information, (c) selection, (d) invention, and (e) deletion of unimportant information. The control condition was not

Table 2. Summary of Measures and Outcomes

Intervention	Measures	Findings
1. Bakken, Mastropieri, and Scruggs (1997)	*Researcher developed*	Immediate recall
Treatment	Immediate, delayed, and transfer recall of central and incidental idea units	T1 vs. C, ES = 2.22
T1—Text-based strategy—Students taught to identify passage type, main idea, list and order		T2 vs. C, ES = 0.71
T2—Paragraph restatement strategy—Students wrote brief statements about what they read		T1 vs. T2, ES = 0.49
		Delayed recall
		T1 vs. C, ES = 3.11
		T2 vs. C, ES = 1.32
		T1 vs. T2, ES = 1.01
		Transfer recall
Comparison		T1 vs. C, ES = 2.56
Students read passages, answer questions, and review responses		T2 vs. C, ES = 1.40
		T1 vs. T2, ES = 0.67
2. Boyle (1996)	*Standardized*	FRI
Treatment	*Formal Reading Inventory* (FRI)	T vs. C, ES = 0.33
Students taught to create cognitive maps through the use of a mnemonic device, TRAVEL (topic, read, ask, verify, examine, link)	*Researcher developed*	Below grade level
	CB reading measure of below-grade-level and grade-level passages, 15 comprehension questions (10 literal, 5 inferential)	Literal, T vs. C, ES = 0.86
		Inferential, T vs. C, ES = 0.76
Students took notes and made check marks		Grade level
		Literal, T vs. C, ES = 0.87
		Inferential, T vs. C, ES = 0.95
Comparison		
Students took notes and created outlines of the passages		
3. Brailsford, Snart, and Das (1984)	*Standardized*	SRI
Treatment	*Standard Reading Inventory* (SRI)	T vs. C, ES = 0.97[b]
Cognitive strategy training—simultaneous and successive synthesis and verbalization		
Comparison		
Comprehension and interrelated word analysis		
4. Gajria and Salvia (1992)	*Researcher developed*	Passage comprehension test—Condensation questions
Treatment	Passage comprehension—main ideas, cause and effect, concepts and inferences	T vs. C, ES = 6.66[b]
Explicit and direct instruction to teach summarization	Passage comprehension test—factual questions	Passage comprehension test—Factual questions
Control		T vs. C, ES = 1.98[b]
Not reported		
5. Gardill and Jitendra (1999)	Basal comprehension test	Marvin = 67%
Treatment	Story grammar	Mark = 50%
Explicit instruction in story map completion for key story elements of narrative text.	Story elements recalled (mean percentage)	Chad = 20%
		Mitch = 10%
		Tara = 80%
Control		Jack = 100%
Baseline		100% for all students
		Pretest = 35.8%
		Posttest = 56.5%
6. Graves and Levin (1989)	*Researcher developed*	Main idea identification
Treatment	Main idea identification	T1 vs. C, ES = 2.55
T1—Monitoring—taught to self-question about identification of main idea and record responses on 3 × 5 cards		T2 vs. C, ES = 1.41
		T1 vs. T2, ES = 1.13
T2—Mnemonic—taught to use a mnemonic method to generate a main idea and generate interactive images on 3 × 5 cards		
Comparison		
Scripted main idea instruction lessons		

Table 2. (continued)

Intervention	Measures	Findings
7. Jitendra, Cole, Hoppes, and Wilson (1998) *Treatment* Main idea instructional program including character names and actions, group names and action, examine main ideas (i.e., how, where, why questions), and review; prompt cards with steps for finding the main idea *Control* One student did not receive instruction	*Researcher developed* Narrative comprehension probes Expository comprehension probes	Chris = 85 Tanya = 85 Brian = 33 Chris = 42 Tanya = 71 Brian = 50 No PND available fourth student
8. Jitendra, Hoppes, and Xin (2000) *Treatment* Main idea strategy instruction and self-monitoring procedures utilizing a checklist card (i.e., "Name the important person/group the main thing they did? Answer where, why, when and how questions.") *Control* Reading instruction with decoding and comprehension activities	*Researcher developed* Main idea: training passages (identify and produce main idea for narrative passages); near transfer (similar narrative passages); far transfer (expository passages)	Training posttest T vs. C, ES = 2.19[b] Training delayed T vs. C, ES = 1.02[b] Near transfer T vs. C, ES = 2.47[b] Near transfer delayed T vs. C, ES = 0.66[b] Far transfer T vs. C, ES = 1.81[b] Far transfer delayed T vs. C, ES = 0.61[b]
9. Kim et al. (2006) *Treatment* Researcher developed computer program. Interactive learning of comprehension strategies (preview, click & clunk, gist, and wrap up) utilizing expository text at varied reading levels and performance based feedback *Comparison* Fluency instruction, timed readings with student partners; vocabulary instruction and some comprehension instruction by one control teacher	*Standardized* *Woodcock Reading Mastery Test–Revised* Passage Comprehension subtest (WRMT-R PC) *Researcher developed* CSR proximal measure of main ideas and questions; passages at instructional reading level and 4th grade level	WRMT-R PC T vs. C, ES = 0.40[b] Main idea—instructional T vs. C, ES = 0.54[b] Questions—instructional T vs. C, ES = 0.87[b] Main idea—4th grade T vs. C, ES = 0.81[b] Questions—4th grade T vs. C, ES = 1.56[b]
10. Klingner and Vaughn (1996) *Treatment* T1—Reciprocal teaching + tutoring: Reciprocal teaching plus peer tutoring on comprehension strategies T2—Reciprocal teaching + cooperative learning: Reciprocal teaching plus strategy practice in cooperative learning groups	*Standardized* *Gates-MacGinitie* Comprehension subtest *Researcher developed* Passage comprehension test	*Gates-MacGinitie* T1 vs. T2, ES = −1.42[a] Passage comprehension test T1 vs. T2, ES = 0.35[a]
11. Malone and Mastropieri (1992) *Treatment* T1—Summarization strategy training ("Who or what is the paragraph about? What is happening? Use the answers to form a summary.") T2—Summarization strategy training with self-monitoring (Cue card used to check use of the summarization strategy) *Control* Typical practice in reading comprehension	*Researcher developed* Summarization measures: Posttest of training, near transfer, and far transfer	Test of training T1 vs. C, ES = 2.87 T2 vs. C, ES = 2.12 T1 vs. T2, ES = −0.35 Near transfer T1 vs. C, ES = 1.31 T2 vs. C, ES = 1.43 T1 vs. T2, ES = 0.02 Far transfer T1 vs. C, ES = 1.13 T2 vs. C, ES = 2.07 T1 vs. T2, ES = −0.74

Table 2. (continued)

Intervention	Measures	Findings
12. Mastropieri et al. (1996)	*Researcher developed*	Facts
Treatment	Facts test	T1 vs. C, ES = .052 (p = .886)
Students asked by instructor to reason actively through each sentence of the text. Students ask themselves, "Why does that make sense?"	Explanations test	
Comparison		Explanations
Encouragement to remember passage facts		T1 vs. C, ES = 0.89
13. Snider (1989)	*Researcher developed*	Comprehension test
Treatment	Explicit and implicit text with multiple choice questions	T vs. C, ES = 1.57
Factual information or vocabulary concepts consisting of structured oral presentation, group application, and independent practice		
Control		
Read and answer questions with vocabulary instruction		
14. Wong and Jones (1982)	*Researcher developed*	Comprehension test
Treatment	Comprehension of key ideas	T vs. C, ES = 0.56
Main idea and self-questioning training (i.e., "Think of a question about the main idea you have underlined"); prompt card including steps to self-questioning and space to write questions		
Control		
Read and assess text quality; assistance with decoding and vocabulary		

Note: C = control group or comparison group; CB = curriculum based; CSR = collaborative strategic reading; ES = effect size; PND = percentage of nonoverlapping data; T1 = Treatment Group 1; T2 = Treatment Group 2.
[a]As cited in Edmonds et al. (2009).
[b]Effect size adjusted for pretest differences.

reported. The students in the treatment condition outperformed students in the control condition on researcher-developed measures assessing main ideas, cause and effect, and inferences (ES = 6.66) and on measures of factual questions (ES = 1.98).

For one of the two treatments provided in Malone and Mastropieri (1992), students were taught a summarization strategy that utilized self-questioning to develop summary statements about the most important information. Below-grade-level reading materials from the *Reading for Concepts* series were used for the treatment. Intervention training included answering two questions after reading each paragraph: "Who or what is the paragraph about?" and "What is happening to them?" Students used the answers to these questions to form summary statements. The control condition included reading stories, answering questions, and practicing difficult words. Researcher-developed measures included posttest of training, near transfer, and far transfer. Passages from *Reading for Concepts* were used for posttest of training and near-transfer measures. The posttest of training measure was formatted with lines for summary statements to be written, whereas the near-transfer measure was not altered in any way. The far-transfer measure was a social studies passage similar to the other passages in terms of length and text difficulty. All three measures were administered the day after the treatment ended. Findings indicated that students who were taught the summarization strategy outperformed the students in the control condition (M ES = 1.77).

Mastropieri et al. (1996) also investigated the use of questioning through student and teacher discussion to facilitate thinking skills and reflection about text meaning. After each sentence, questions asked by the researcher were designed to illicit reflection and clarify meaning (e.g., "Why does that make sense?"). Corrective feedback was provided for incorrect answers until mastery of the concept was acquired. In the comparison condition, researchers encouraged students to remember facts. The dependent measure included a combination of fact recall and explanations about the text. For the fact recall measure, differences

were not significant (ES = 0.05); however, on the explanations recall measure, the treatment condition outperformed the control condition (ES = 0.89).

Bakken et al. (1997), compared the effects of two treatment conditions and a comparison condition. One treatment was a text-based strategy and the other treatment was a paragraph restatement strategy. The text-based strategy taught students to identify three different passage types: main idea, list, and order. Then, a main idea strategy was taught using a two-step process: (a) read, identify, and underline the main idea; (b) identify supporting evidence and summarize the main idea through writing in the students' own words. For the paragraph restatement strategy, students wrote brief summaries in their own words after reading. Students then studied the summaries to assist them in remembering what the passage was about. Students in the comparison condition participated in a traditional instruction strategy where they read passages and answered questions related to the information. Grade-level science readings were used as indicated by text readability reported at the eighth-grade level.

Three researcher-developed measures were administered: immediate recall, delayed recall, and transfer recall. The immediate recall and delayed recall measures used science passages equivalent to the passages used during the treatment. The transfer recall measure used social studies passages. The immediate recall measure was administered the day after the treatment, whereas the delayed recall and transfer recall measures occurred 2 days after treatment. Students were reminded of the strategy they had learned, read the passage, and were given 4 minutes to study content, and then testers provided free-recall prompts. Responses were scored for central and incidental idea units by raters unaware of the treatments. Students in the text-based strategy group outperformed students in the comparison condition on the immediate recall measure (ES = 2.22) and on the delayed recall and transfer recall measures (*M* ES = 2.83). Students who received the paragraph restatement strategy also outperformed students in the comparison condition on the immediate recall measure (ES = 0.71) and on the delayed recall and transfer recall measures (*M* ES = 1.36). The text-based strategy outperformed the paragraph restatement strategy on the immediate recall measure (ES = 0.49) and the delayed recall and transfer measures (*M* ES = 0.84).

Summarization–Main Idea and Self-Monitoring

Self-monitoring is defined as occurring when an individual assesses whether or not a targeted behavior has occurred and then records the results (Shapiro & Cole, 1994). Five experimental studies (Boyle, 1996; Graves & Levin, 1989; Jitendra et al., 2000; Malone & Mastropieri, 1992; Wong & Jones, 1982) and two single-participant studies (Gardill & Jitendra, 1999; Jitendra et al., 1998) included a main idea treatment with some form of self-monitoring. Self-monitoring techniques included checklists, forms, cue cards, story maps, question generation, and interactive images.

One treatment condition in Malone and Mastropieri (1992) utilized the generation of summary statements described previously (summarization–main idea) and added a self-monitoring component. Students were taught to use a self-monitoring card that included steps in the summarization procedure that students checked off after completion. For example, after identifying the important "who or what" of the paragraph, students placed a check mark showing completion of the step. Students in the summarization with self-monitoring treatment outperformed students in the control condition (*M* ES = 1.87). Across treatment conditions, students in the summarization with self-monitoring condition outperformed students in the summarization only condition (*M* ES = 0.35).

Wong and Jones (1982) taught main idea identification through the use of self-questioning. The intervention consisted of 3 days of main idea instruction, or until students met a criterion of mastery established at 80% on tests administered at the end of the session. Then students were taught two days of self-questioning instruction consisting of the following steps: (a) What are you studying the passage for? (b) find and underline the main ideas in the paragraph; (c) think of a question about the main idea; (d) answer your question; and (e) look back at your questions and answers to learn more information. The comparison condition also received the main idea instruction in attempt to isolate the effect of the self-questioning strategy. Other comparison condition instruction included assessment of text quality and assistance with decoding and vocabulary. Students in the self-questioning condition outperformed the comparison condition at posttest on the researcher-developed measure of comprehension questions about test passages (ES = 0.56).

An experimental study by Graves and Levin (1989) investigated main idea generation through self-questioning in combination with a self-monitoring tool compared to a treatment utilizing a mnemonic device. The comparison condition used scripted main idea lessons. Below-grade-level reading material at the second-to third-grade level was used for the treatment. A researcher-developed measure of main idea identification assessed treatment impact. In the main idea treatment, students were taught to ask themselves if they had identified the main idea after reading the passage; they then reread the passage and recorded their monitoring by placing check marks on a 3 × 5 card. Questions, feedback, and correction procedures were also part of the main idea treatment. In the mnemonic treatment condition, students were taught to identify main ideas through

mnemonic devices utilizing keywords in the story title and illustrations and how they related to the main idea. Keywords were provided, and students developed illustrations depicting story action to assist in recall of main ideas. For example, the keyword *pot* was used as a mnemonic device for a story about the Potawatomi Indians who were forced from their land by settlers. The story action included throwing pots to try and stop settlers. According to results of the main idea identification measure, both treatment conditions outperformed the comparison condition, main idea (ES = 2.55) and mnemonic (ES = 1.41). A comparison of the treatments was in favor of the main idea condition versus the mnemonic condition (ES = 1.13).

Boyle (1996) compared two conditions: cognitive mapping through the use of a mnemonic device and a comparison condition that included notes and outlines of passages. In the cognitive mapping condition, the mnemonic *TRAVEL* (topic, read, ask, verify, examine, link) provided a sequential process for developing cognitive maps. The cognitive mapping component taught students to write key ideas for each step in the TRAVEL procedure. The researcher implemented the treatment condition. The study did not report who implemented the comparison condition. Grade-level and below-grade-level reading materials were used for the treatment condition. One standardized reading measure, the *Formal Reading Inventory* (FRI), and researcher-developed curriculum-based measures (CBMs) were used as dependent measures. The CBM included literal and inferential measures for below-grade-level and grade-level passages. Results of the FRI indicated a small to medium effect in favor of the treatment condition (ES = 0.33). Researcher-developed measures also favored the treatment condition (*M* ES = 0.86).

Jitendra et al. (2000) compared the effects of main idea and self-monitoring strategies to a comparison condition that stressed methodical decoding and comprehension exercises. The main idea strategy asked students to find and produce the main idea of the text, which included the identification of the most important person, thing, or action. In addition, students were taught to identify where, why, when, and how information related to the passage. A four-step self-monitoring strategy was integrated throughout the instruction: (a) read, (b) recall the strategy from the prompt card, (c) use the strategy, and (d) identify or write the main idea. Reading materials included a below-grade-level (*M* GE = 2.88) main idea reading comprehension program. Researcher-developed measures assessed main idea comprehension. Students were administered three 12-item measures (n = 18 multiple choice and n = 18 short answer) that required them to identify the main idea. The first measure, referred to as training, included items that were similar to the training materials and were designed to measure utilization of the skills taught during the treatment. The second measure, referred to as near transfer, included items that were based on a narrative text from a basal reading series. The remaining measure, referred to as far transfer, included items based on social studies texts and were used to assess far transfer of skills. All three measures were administered immediately after the treatment (posttest) and again after a 6-week delay (delayed posttest). Across all three outcome measures, students in the treatment condition outperformed the comparison condition at posttest (*M* ES = 2.15) and delayed posttest (*M* ES = 0.76).

Two single-participant studies implemented interventions with main idea and self-monitoring strategies (Gardill & Jitendra, 1999; Jitendra et al., 1998). Both studies utilized scripted lessons and built on previous direct instruction methods (Carnine, Silbert, & Kame'enui, 1997). Gardill and Jitendra (1999) investigated the effectiveness of a story map procedure between a baseline and independent phase condition. Elements of the story map included story conflict, main characters, setting, story action, and theme. During intervention, students initially received extensive, direct modeling and completion of story maps with the instructor. Gradually, responsibility shifted to the students completing the maps with less support. Reading material with difficulty from fourth to seventh grade was used. The test of story grammar mirrored items listed on the story map previously described. Basal comprehension questions included both literal and inferential questions. All students achieved a PND of 100% on the story grammar measure. These scores are interpreted as being a highly effective treatment (Scruggs & Mastropieri, 1998). However, the basal comprehension test yielded less impressive PND scores: 10%, 20%, 50%, 67%, 80%, and 100%. Therefore, three of the students in the study were in the range of questionable or "ineffective" according to previously identified PND standards (Scruggs & Mastropieri, 1998). However, it is important to note that for two of the students, several data points were commensurate with the highest baseline point, which does not demonstrate a decrease in performance.

Jitendra et al. (1998) examined main idea, summarization, and self-monitoring with four sixth-grade students. One student did not receive instruction and served as the control. The main idea intervention included a series of seven lessons, which progressed from easier to more difficult tasks. In the self-monitoring phase, students were taught to use prompt cards that outlined the use of the main idea strategies previously taught. PND performance for narrative comprehension probes indicated that two out of the three students demonstrated results associated with an effective treatment with PND scores of 85%, 85%, and 33%. On the expository comprehension probes, the results were less positive. One student's PND was in the effective range (PND = 71%), whereas the other two students improved when compared to baseline, but the results were less robust with PNDs of 42% and 50%.

Multiple-Strategy Intervention

Two studies examined the effects of multiple-strategy reading interventions (Kim et al., 2006; Klingner & Vaughn, 1996), which are interventions that use three or more reading strategies. Both studies used researcher-developed measures and standardized measures (Kim et al., 2006; Klingner & Vaughn, 1996).

Klingner and Vaughn (1996) utilized a reciprocal teaching model (Palinscar & Brown, 1984), which includes previewing, clarifying, generating questions, and summarizing. Klingner and Vaughn compared the reciprocal teaching model with different student grouping methods of peer tutoring and cooperative groups. Student participants were identified with LD and as English language learners. Grade-level social studies texts were used for both treatment conditions. Results were mixed on outcome measures based on the different grouping methods. Findings from the *Gates-MacGinitie* Comprehension subtest (MacGinitie & MacGinitie, 1989) indicated that students who received reciprocal teaching combined with cooperative groups outperformed students who received reciprocal teaching combined with peer tutoring (T2 vs. T1, ES = 1.42). However, outcomes on the researcher-developed measure of comprehension were in favor of the peer tutoring learning treatment (T2 vs. T1, ES = −0.35).

Using a different multiple-strategy reading intervention, Kim et al. (2006) examined the effects of a *Computer-Assisted Collaborative Strategic Reading* (CACSR) on reading outcomes for students with LD. The comparison condition targeted fluency, vocabulary, and some comprehension instruction (Kim et al., 2006). The CACSR program teaches students the following four strategies: preview, click and clunk, get the gist, and wrap up. These strategies were modified from reciprocal teaching and make up the strategies used in collaborative strategic reading, (Klingner & Vaughn, 1999; Klingner, Vaughn, & Schumm, 1998). Independent reading level material and fourth-grade reading material were used for the treatment condition. First the strategies were taught in different sections of the computer program, and then the strategies were applied to assist with comprehension of text. Students worked in pairs on the CACSR program and received instruction from a researcher and teacher based on feedback provided by the CACSR program.

A standardized measure, the *Woodcock Reading Mastery Test–Revised* Passage Comprehension subtest (WRMT-PC), was administered. Effect sizes were medium for the WRMT-PC (ES = 0.40). Researcher-developed measures focused on students' ability to write main ideas and ask questions about passages at their instructional level and passages at the fourth-grade level. Effect sizes for both measures were medium to large in favor of the treatment condition (main idea: *M* ES = 0.84; questions: *M* ES = 1.19).

Other Treatments

Snider (1989) used a design that included a treatment condition that drew heavily on direct instruction, specifically Comprehension B of the *Corrective Reading Program* (Engelmann, Becker, Hanner, & Johnson, 1978) and *Reading Mastery* (Engelmann & Hanner, 1983). Intervention lessons focused on factual content and consisted of structured oral presentation, application of the information, and written exercises for independent practice. In the comparison condition, students read and answered questions from literature books. The researcher-developed measure of explicit and implicit text items indicated that the treatment condition outperformed the control condition (ES = 1.57).

Brailsford et al. (1984) examined a treatment that focused on developing strategic behaviors related to simultaneous and successive synthesis. Students were taught to synthesize parts into wholes, to make predictions, and to sequence randomly chosen numbers within cells of a matrix. Students verbalized their actions throughout the strategy training. The comparison condition included remedial comprehension instruction and word analysis. The treatment condition outperformed the control condition on the *Standard Reading Inventory* (SRI), a standardized measure (ES = 0.97).

Discussion

We summarize findings from 12 studies utilizing treatment and comparison groups and 2 studies utilizing single-participant designs as a means of understanding the effectiveness of interventions aimed at improving reading comprehension of students identified as LD in middle school grades (6th, 7th, and 8th; ages 12–14). We selected these grades because many special and general education middle school teachers are increasingly asked to provide reading interventions to students with reading problems as a means of increasing their understanding of text (Reed & Vaughn, 2010). The goal was to identify those practices with high impact so as to influence educational practice. A number of research syntheses have addressed reading comprehension with older students but have emphasized a range of grade levels—often 4th grade through 12th grade—providing valuable information about effective instructional practices in reading but little specific guidance for middle school teachers (Edmonds et al., 2009; Scammacca et al., 2007; Wexler, Vaughn, Edmonds, & Reutebuch, 2008).

Findings from the studies synthesized in this article indicate outcomes largely characterized by medium to large effect sizes derived primarily from researcher-developed comprehension measures. Few studies ($n = 4$) reported standardized measures of reading comprehension, which yielded on average lower effect sizes than researcher-developed

measures. Consistently lower outcomes on standardized versus researcher-developed measures have been reported repeatedly in research syntheses (e.g., Edmonds et al., 2009; Elleman, Lindo, Morphy, & Compton, 2009; Swanson et al., 1999). Typically more proximal measures, researcher-developed measures can provide indications of whether students in the treatment condition are applying the particular practice they were taught in a specified condition (e.g., writing summaries from text supplied by the researcher); however, they do not yield the same confidence derived from more distal measures of reading comprehension, which typically provide better information about technical adequacy and norms (Swanson et al., 1999).

The vast majority of study treatments utilized strategy instruction related to main idea or summarization. Teaching students with LD instructional practices for reading text and identifying the most critical information (i.e., main idea) and then how to link these main ideas across paragraphs to create summaries has strong context validity. Many classroom teachers ask students to do these very same tasks on a daily basis; further, these tasks correspond well with the type of tasks students perform on high-stakes assessments such as state-level reading and social studies tests. Effective summarization–main idea interventions had several common features of instruction across studies that practitioners may consider as means for supporting improved text comprehension for students with LD. To support improved text comprehension, practitioners should consider instructing students to identify the most important who or what and the most important ideas about the who or what. The studies reviewed indicated several strategies to accomplish summarization including a sequential process, self-questioning, mnemonics, and graphic organizers. Further support may be provided to students through self-monitoring tools such as a checklist or a prompt card. Despite the importance of main idea and summary, we think it is valuable to ask whether there are additional instructional practices that might be associated with improved outcomes for middle-grade students with LD in reading for understanding.

Kamil and colleagues (2008) provided a review with implications for instruction on effective practices for improving comprehension of students in Grades 4 through 12. Although they recommend direct and explicit comprehension strategy instruction much like the majority of studies represented in this synthesis, it is only one of the four practices they highlight. They indicated that vocabulary instruction that directly teaches students both word meanings and use as well as how to be independent vocabulary learners was excellent practice for improving students' comprehension. They also identified extended discussion of text meaning and interpretation as a means for improving comprehension. In our review of studies for this synthesis, we did not identify a single study for middle school students with LD for whom this practice was directly tested, though it was incorporated into such practices as collaborative strategic reading (Klingner & Vaughn, 1999). The fourth practice they recommend is increasing student motivation and engagement, a practice not directly tested in any of the studies in this synthesis. Thus, based on a practice guide to improve reading comprehension for older readers that was targeted at a much broader participant group (e.g., students with reading difficulties), many of these practices have not been validated with middle school students with LD.

Limitations

As with any synthesis, the findings are limited by the quality of the research included. First, difficulties with measurement of comprehension (Snow, 2003) including the limited use of standardized measures and the wide use of researcher-developed measures must be taken into account when considering the findings. Second, researchers rather than school personnel taught the majority of treatments. Third, several studies provided very brief intervention periods. However, considering the small number of studies located, we believe this synthesis provides useful insight to practitioners and researchers.

Implications for Practice

One of the intentions from this review was to provide educators instructing middle school students with LD about instructional practices associated with improved outcomes in reading comprehension. There are several instructional practices that teachers can use with confidence to improve reading comprehension. The findings from this synthesis support the use of summarization or main idea strategy instruction as a means to improve understanding of text. Providing students with self-monitoring tools or ways to record the results of their efforts related to a particular behavior also may improve comprehension outcomes. Other strategies that were found to be effective include mnemonics, mapping, and questioning. The most consistent finding across this body of studies was the use of explicit instruction including modeling, feedback, and opportunities for practice. Middle school students with LD will benefit from explicit instruction designed to support better understanding of text.

Implications for Future Research

This synthesis provides ample support for the need for additional research on improving reading comprehension for middle school students with LD. In particular, motivation and engagement, cooperative grouping, use of discourse, and reader response are all recommended practices from research syntheses with older students that have been inadequately validated for students with LD.

Duke and Pearson (2002) provided a summary of effective practices for developing reading comprehension that include making predictions, using visual representations such as graphic organizers and semantic maps to improve comprehension, and teaching students to generate questions to improve their understanding of text. We think that further understanding the efficacy of these practices with middle-grade students with LD for improving their comprehension would be valuable.

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