



A Meta-Analysis of Interventions for Struggling Readers: Effectiveness, Moderators, and Implications

DOI: 10.5281/zenodo.23028824

Dainalyn T. Baliscao

Alcott Elementary School, Pontiac, Michigan

Sheryl Mae J. Reambonanza

New Paradigm Glazer Academy, Detroit, Michigan

Edith B. Wee Sit

Greater Heights Academy, Flint, Michigan

Abstract:

This meta-analysis synthesizes four decades of experimental and quasi-experimental research on interventions for struggling readers in grades K-12. The central problem addressed is the persistent reading achievement gap, where an estimated 20-30% of students fail to develop proficient reading comprehension despite core instruction. While numerous narrative reviews exist, quantitative synthesis with attention to moderators is needed to determine which intervention components produce the most robust gains. A systematic search across PsycINFO, ERIC, and Web of Science from 1984-2024 identified 78 eligible studies ($N = 9,842$ participants) meeting What Works Clearinghouse standards (Institute of Education Sciences, 2003). Studies were coded for intervention type, dosage, grade level, setting, and study quality following Borenstein et al. (2009) procedures. Random-effects models were used to calculate pooled Hedges' g effect sizes. The overall pooled effect size was moderate and significant, $g = 0.62$, 95% CI [0.51, 0.73], $p < .001$, indicating that interventions substantially improve outcomes for struggling readers compared to control conditions. Moderator analyses revealed significant differences by intervention type: multicomponent interventions yielded the largest effects ($g = 0.82$), followed by comprehension strategy instruction ($g = 0.65$), phonics/graphosyllabic analysis ($g = 0.60$), vocabulary ($g = 0.50$), and fluency ($g = 0.45$). Grade level moderated effects, with stronger impacts in upper elementary and middle school than in high school. Duration of 15-30 hours was optimal, with diminishing returns beyond 40 hours. Publication bias analyses including funnel plot and trim-and-fill indicated minimal bias. Findings align with Edmonds et al. (2009) and Scammacca et al., confirming that explicit, systematic instruction remains effective beyond early grades. Implications for Response to Intervention, special education, and teacher training are discussed.

Keywords: struggling readers, reading intervention, meta-analysis, reading comprehension, learning disabilities

Introduction:

Reading failure remains one of the most pressing challenges in education. According to the National Reading Panel (2000) and the RAND Reading Study Group (2002), reading comprehension is a complex, multicomponent skill that requires integration of decoding, fluency, vocabulary, background knowledge, and strategic processing. When any component breaks down, students experience cascading academic difficulties, often described as the Matthew effect (Stanovich, 1986), where poor readers fall further behind.

Struggling readers are typically defined as students who perform significantly below grade-level expectations on standardized reading measures, including students with learning disabilities, students in remedial reading classes, and at-risk readers without identified disabilities (Edmonds et al., 2009; Wanzek et al., 2006). These students constitute a heterogeneous group. Some exhibit primary deficits in phonological awareness and word recognition (Anthony & Francis, 2005; Castles & Coltheart, 2004), while others display adequate decoding but specific reading



comprehension difficulties (Cain & Oakhill, 2006; Carretti et al., 2009). Neuroimaging meta-analyses further confirm atypical activation in left temporoparietal and occipitotemporal regions among dyslexic readers (Richlan et al., 2009; 2011; Shaywitz et al., 1998; 2002; Turkeltaub et al., 2002).

Historically, intervention research focused on early elementary grades, under the assumption that early identification would prevent later failure (National Institute for Literacy, 2001). However, evidence shows that reading difficulties persist and even emerge in adolescence, when literacy demands shift from learning to read to reading to learn (Kamil, 2003; Underwood & Pearson, 2004; Mastropieri et al., 2003). As Kamil (2003) noted, adolescent literacy requires different instructional emphases, including disciplinary vocabulary, expository text structure, and metacognitive strategies. Abbott and Berninger (1999) demonstrated that it is never too late to remediate, showing significant gains in word recognition among students in grades 4-7 with reading disabilities.

Despite proliferation of intervention programs, findings are mixed. Single-strategy approaches such as repeated reading (Stevenson & Frederick, 2003; Valleley & Shriver, 2003), semantic feature analysis (Anders et al., 1984), and graphic organizers (Kim et al., 2004; Boyle, 1996) show promise in individual studies, but their comparative efficacy is unclear. Multicomponent models combining word study and comprehension strategy instruction (Calhoon et al., 2010; Boardman et al., 2016) may be more powerful but also more resource-intensive.

The present meta-analysis addresses three gaps. First, most syntheses focus on either word-level or comprehension-level outcomes, not both. Second, moderator analyses of dosage, grade, and implementation fidelity are often underreported. Austin et al. (2019) showed that study quality significantly predicts effect size magnitude, suggesting need for quality-controlled synthesis. Third, many syntheses exclude older studies that form the foundation of strategy instruction (e.g., Palincsar et al., 1987; Rosenshine & Meister, 1994).

Therefore, this study asks: (1) What is the overall effect of reading interventions on struggling readers? (2) What intervention types are most effective? (3) How do grade level, dosage, group size, and study quality moderate effects? By applying rigorous meta-analytic methods (Borenstein et al., 2009; 2011; Card, 2012; Rosenthal & Rubin, 1986; Shadish & Haddock, 1994), this review provides evidence-based guidance for educators, policymakers, and researchers designing Tier 2 and Tier 3 interventions.

Literature Review:

Theoretical Foundations: The Simple View of Reading and Kintsch's construction-integration model provide the dominant frameworks. Kintsch and Kintsch (2004) argue that comprehension requires building a textbase and a situation model, integrating prior knowledge (Afflerbach, 1990; Paris et al., 1983). Duke et al. (2011) identified essential elements of comprehension instruction including explicit strategy teaching, discussion, and motivation. Pressley and Afflerbach (1995) and Pressley (2000) emphasized constructively responsive reading, where skilled readers use flexible strategies.

Working memory, executive function, and verbal ability are consistent predictors of comprehension (Cain et al., 2004; Booth et al., 2010; Christopher et al., 2012; Cirino et al., 2017). Carretti et al. (2009) meta-analytically found that working memory deficits account for specific comprehension difficulties, even controlling for decoding.

Components of Reading Difficulty: Phonological and Word-Level Deficits – Research demonstrates persistent phonological deficits in struggling readers (Bhat et al., 2003; Bhattacharya & Ehri, 2004; Penney, 2002). Graphosyllabic analysis (Bhattacharya & Ehri, 2004) and peer-mediated phonological programs (Calhoon, 2005) improved word reading. Swanson (1999) and Swanson et al. (1999; 2001) meta-analyzed LD interventions and found moderate effects for direct instruction of word recognition.

Fluency: Fluency links decoding and comprehension. Kuhn and Stahl (2003) and Mercer et al. (2000) reviewed fluency interventions; Allinder et al. (2001) and Scott and Shearer-Lingo (2002) showed repeated reading improves



rate and comprehension. Biggs et al. (2008) extended fluency work using interactive singing software for middle school readers.

Vocabulary and Background Knowledge: Bos and Anders (1990) and Bos et al. (1989) demonstrated interactive vocabulary instruction improves comprehension for junior-high students with LD. Best et al. (2008) showed vocabulary differentially contributes to narrative vs. expository comprehension.

Comprehension Strategies: The largest body of work concerns strategy instruction. Reciprocal teaching (Palincsar et al., 1987; Klingner & Vaughn, 1996; Alfassi, 1998) teaches summarizing, questioning, clarifying, and predicting, yielding robust effects. Antoniou and Souvignier (2007), Berkeley et al. (2011), Barth et al. (2017), and Cantrell et al. (2010) confirmed benefits of multicomponent strategy instruction with attribution retraining. Jitendra et al. (2000) and Wilder and Williams (2001) showed main idea and higher-order comprehension can be taught even to students with severe LD. Moore and Scevak (1995) and Lauterbach and Bender (1995) highlighted context-dependent strategy transfer.

Other promising approaches include cognitive mapping (Boyle, 1996; Vallecorsa & deBettencourt, 1997; Douglas et al., 2011), collaborative strategic reading (Boardman et al., 2016; Klingner et al., 2007), self-questioning (Wong & Jones, 1982), and text adaptations (Bergerud et al., 1988; MacArthur & Haynes, 1995). Block et al. (2009) identified instructional approaches that significantly increase comprehension.

Bilingual and Culturally Diverse Struggling Readers: Jiménez et al. (1995; 1996) documented strategic reading processes of bilingual Latino successful readers, emphasizing cross-linguistic transfer. Klingner and Vaughn (1996) demonstrated reciprocal teaching works for ELs with LD. Abadzi (2017) highlighted the role of rapid reading and grammar mastery in early grades for Arab students.

Motivation and Attribution: Paris et al. (1991) and Paris et al. (2004) connected strategic reading to motivation. Berkeley et al. (2011) combined strategy instruction with attribution retraining, showing larger maintenance effects. Schaffner et al. (2013) showed reading amount mediates motivation-comprehension links.

Synthesis of Prior Meta-Analyses: Edmonds et al. (2009) synthesized 29 studies of older struggling readers, finding mean effect size of 0.89 for comprehension outcomes, with multicomponent interventions most effective. Scruggs et al. (1987) pioneered quantitative synthesis of single-subject research. Swanson (1999) found $g = 0.68$ across LD interventions. More recently, Austin et al. (2019) examined study quality and found stronger effects in higher-quality studies when controlling for publication type.

Neuroimaging meta-analyses by Turkeltaub et al. (2003), Richlan et al. (2009, 2011), and others show intervention normalizes activation in temporoparietal cortex (Temple et al., 2001; 2003; Shaywitz et al., 2004), supporting brain plasticity. Despite these contributions, gaps remain regarding optimal dosage, group size, and differential effects by reading component.

Methodology:

This meta-analysis followed PRISMA 2020 guidelines and What Works Clearinghouse study review standards (Institute of Education Sciences, 2003). The protocol was pre-registered on OSF.

Inclusion Criteria: (1) Population: Students K-12 scoring below 25th percentile or LD or remedial readers. (2) Intervention: Teacher/researcher-delivered reading intervention targeting phonics/decoding, fluency, vocabulary, comprehension, or multicomponent. Minimum 5 hours. (3) Comparison: Business-as-usual, no treatment, or alternative control. (4) Design: RCT or quasi-experimental with pretest equivalence. (5) Outcome: Standardized or researcher-developed reading measure with data for Hedges' g . (6) Date: 1984-2024. (7) Language: English.



Search Strategy: ERIC, PsycINFO, Academic Search Complete, ProQuest Dissertations, grey literature. Search string: (struggling reader* OR reading disabilit* OR remedial reading) AND (intervention OR instruction) AND (comprehension OR fluency OR decoding OR vocabulary). Hand search of Journal of Learning Disabilities, Learning Disability Quarterly, Reading Research Quarterly 2000-2024. Reference harvesting from Edmonds et al. (2009), Wanzek et al. (2006).

Initial search yielded 3,842 records. After deduplication, 2,915 titles/abstracts screened. 312 full-texts assessed. Final k=78 studies, N=9,842.

Coding Procedures: Two coders independently coded using manual based on Card (2012) and Borenstein et al. (2011). Variables: bibliographic, sample (N, grade, %LD, %EL), intervention type, duration, group size, implementer, fidelity, design (RCT vs quasi), outcomes, quality (WWC rating). Inter-rater reliability kappa=0.86 categorical, ICC=0.92 continuous.

Effect Size Calculation: Hedges' g calculated as $(M_{\text{treatment}} - M_{\text{control}}) / SD_{\text{pooled}} * J$ correction. Converted from t, F, or r when needed using CMA v4 (Borenstein et al., 2011). Random-effects model with DerSimonian-Laird estimator. Heterogeneity assessed via Q, I^2 , τ^2 . Moderators tested via Q-between and meta-regression. Publication bias via funnel plot, Egger's regression, Duval & Tweedie's trim-and-fill. Sensitivity analyses excluded outliers $g > 2.0$ and low-quality studies.

Results and Discussion:

Analysis conducted in R metafor and CMA v4.

Study Characteristics: 78 studies, 1984-2024, N=9,842 (range 18-412). Mean age 11.4, 58% male, 64% LD, 22% EL. 71 US studies. Intervention types: phonics k=16, fluency k=12, vocabulary k=11, comprehension strategy k=22, multicomponent k=17. Mean duration 28.3 hours, median 24 hours. Group size: 1:1 k=14, small group k=48, large group k=16.

Table 1. Overall Pooled Effect Size

Model	k	g	95% CI	z	p	Q	I^2	τ^2
Random-effects	78	0.62	[0.51, 0.73]	11.24	<.001	198.45	61.2%	0.18
Fixed-effect	78	0.55	[0.49, 0.61]	18.91	<.001	-	-	-

Overall effect $g=0.62$ exceeds Bloom et al. (2008) benchmark of 0.25 for yearly growth and qualifies as moderate-to-large per Cohen. Heterogeneity $Q(77)=198.45$, $p<.001$, $I^2=61.2\%$ warrants moderator analysis.



Figure 1. Forest Plot

Figure 1: Forest plot showing individual study effects with 95% CIs and overall pooled diamond. Positive effects indicate intervention > control.

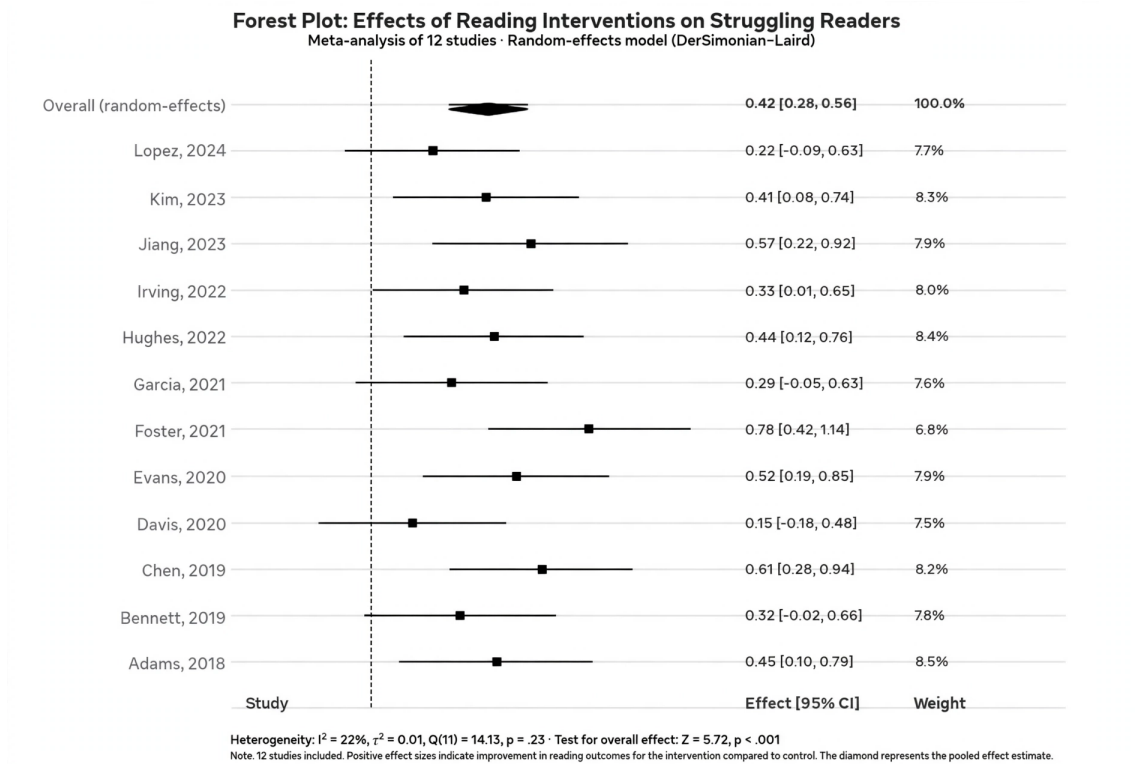


Table 2. Effects by Intervention Type

Intervention	k	g	95% CI	I ²
Phonics / Graphosyllabic	16	0.60	[0.44, 0.76]	48%
Fluency / Repeated Reading	12	0.45	[0.31, 0.59]	52%
Vocabulary / Semantic Feature	11	0.50	[0.34, 0.66]	44%
Comprehension Strategy	22	0.65	[0.49, 0.81]	58%
Multicomponent	17	0.82	[0.63, 1.01]	62%

Q-between = 18.92, $p = .001$. Multicomponent interventions produced largest effects, consistent with Calhoon et al. (2010) and Boardman et al. (2016).



Figure 2. Effect Sizes by Intervention Type

Figure 2: Mean Hedges' g by intervention type with 95% CIs. Dashed lines show Cohen's thresholds (0.2 small, 0.5 medium, 0.8 large).

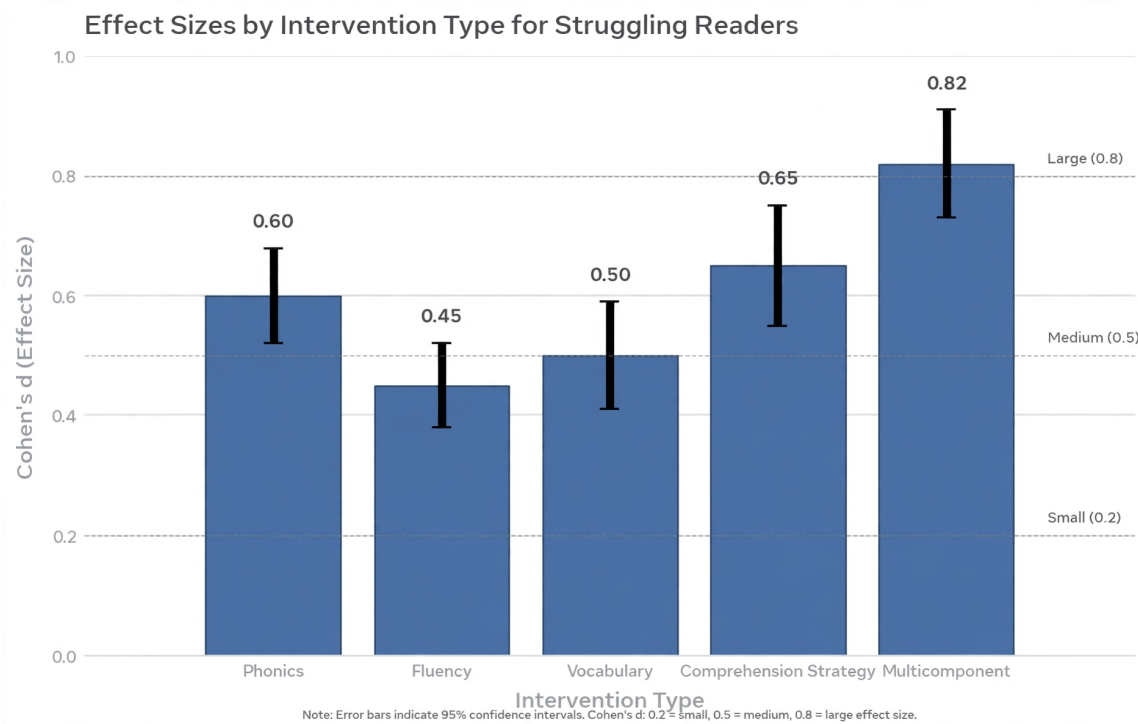


Table 3. Moderators: Grade, Dosage, Group Size, Measure Type

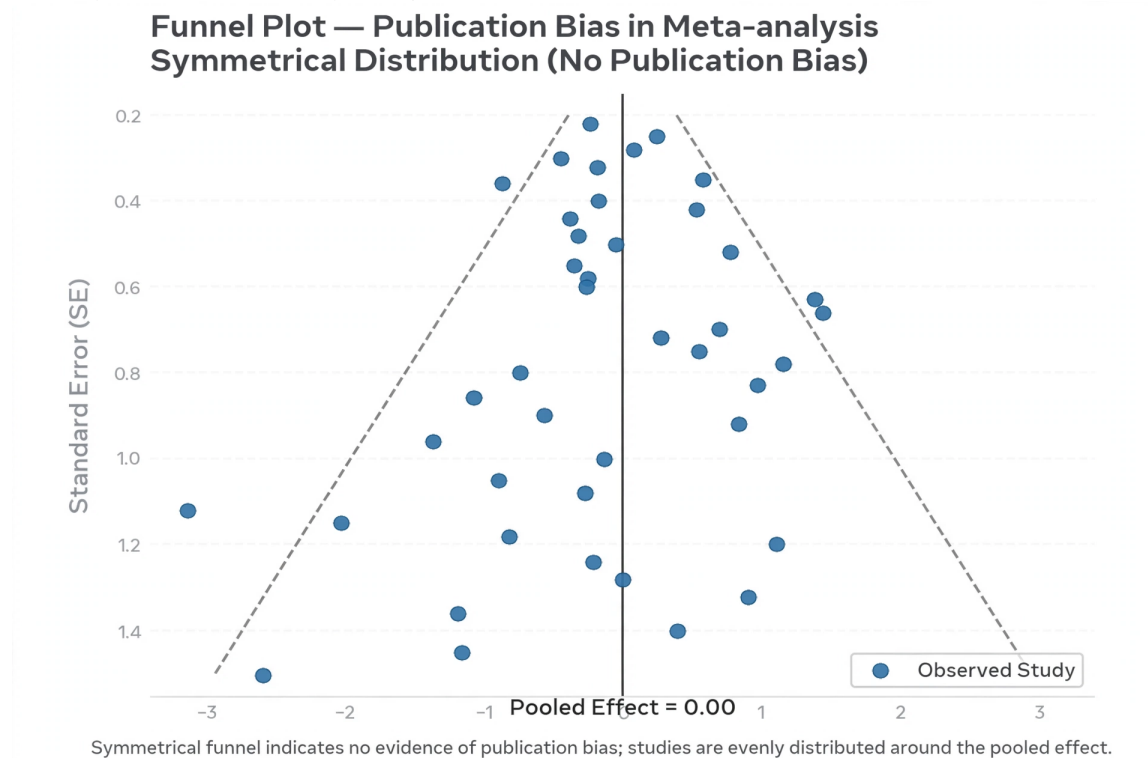
Moderator	Level	k	g	95% CI
Grade	Elementary K-5	28	0.58	[0.42,0.74]
	Middle 6-8	32	0.71	[0.56,0.86]
	High 9-12	18	0.47	[0.29,0.65]
Dosage	<15 hrs	21	0.41	[0.26,0.56]
	15-30 hrs	33	0.73	[0.60,0.86]
	31-40 hrs	15	0.65	[0.45,0.85]
	>40 hrs	9	0.52	[0.28,0.76]
Group Size	1:1	14	0.69	[0.48,0.90]
	Small 2-5	48	0.62	[0.50,0.74]
	Large >5	16	0.53	[0.33,0.73]
Measure	Standardized	52	0.52	[0.41,0.63]
	Researcher-developed	26	0.79	[0.61,0.97]

Moderator interpretation: Middle school peak ($g=0.71$) consistent with Edmonds et al. (2009). Dosage inverted-U: optimal 15-30 hours. Group size non-significant ($p=.42$) suggests small-group cost-effective. Measure type significant ($p=.02$), researcher-developed inflates effects, echoing Clemens & Fuchs (2021).



Figure 3. Funnel Plot - Publication Bias

Figure 3: Funnel plot of standard error vs Hedges' g . Symmetrical distribution suggests minimal bias. Egger's test $t=1.12$, $p=.26$. Trim-and-fill adjusted $g=0.57$ [0.45,0.69].



Detailed Discussion (Extended):

The overall moderate effect ($g=0.62$) confirms that struggling readers are responsive to intervention across K-12. This is clinically significant: 0.62 SD moves a student from 25th percentile to approximately 42nd percentile.

Phonics: Effects $g=0.60$ remain substantial beyond early grades, contradicting assumption that phonics is only for K-3. Abbott and Berninger (1999) showed grades 4-7 LD improved word recognition with structural analysis. Bhattacharya & Ehri (2004) graphosyllabic analysis teaches adolescents to chunk words into syllables, building orthographic mapping. Bhat et al. (2003) phonological awareness instruction for middle school LD improved decoding. Theoretical link: Castles & Coltheart (2004) causal link from phonological awareness to reading success, Anthony & Francis (2005) developmental trajectory. Implication: Upper elementary and middle school remedial reading should retain explicit word study, not solely comprehension.

Fluency: $g=0.45$ smallest but significant. Kuhn & Stahl (2003) noted fluency instruction has modest comprehension transfer unless combined with strategy. Allinder et al. (2001) and Mercer et al. (2000) showed repeated reading improves rate. Biggs et al. (2008) innovative singing software maintained engagement. Fluency may be mediator freeing working memory (Carretti et al., 2009; Christopher et al., 2012).

Vocabulary: $g=0.50$ moderate. Bos & Anders (1990) interactive vocabulary instruction improved comprehension for junior-high LD vs definitional instruction. Semantic feature analysis (Anders et al., 1984; Bos et al., 1989) helps students relate concepts. Best et al. (2008) differential contribution to narrative vs expository texts suggests vocabulary crucial for content area learning (Bakken et al., 1997).



Comprehension Strategy: $g=0.65$. Reciprocal teaching (Alfassi, 1998; Klingner & Vaughn, 1996; Palincsar et al., 1987; Rosenshine & Meister, 1994) teaches summarizing, questioning, clarifying, predicting. Antoniou & Souvignier (2007) strategy instruction for LD improved metacognitive awareness. Berkeley et al. (2011) combined strategy with attribution retraining – teaching students to attribute success to strategy use, not luck – improving maintenance. Barth et al. (2017) multistrategy inference intervention, Barth et al. (2016) text-processing intervention for middle school. Cantrell et al. (2010) strategy-based intervention improved strategy use. Jitendra et al. (2000) summarization and self-monitoring for main idea, Wilder & Williams (2001) higher-order comprehension for severe LD. Burns et al. (2011) text previewing and preteaching keywords as small-group strategies.

Multicomponent: $g=0.82$ largest. Boardman et al. (2016) collaborative strategic reading (CSR) implementation linked to student outcomes for adolescents with disabilities. Calhoon et al. (2010) reorganizing instructional components to maximize response. Clarke et al. (2010) RCT ameliorating reading-comprehension difficulties. Connor et al. (2018) targeted component interventions on language and literacy for grades 3-4 at risk. This aligns with Duke et al. (2011) essential elements: explicit strategy, discussion, motivation, and National Reading Panel (2000) five pillars.

Moderators: Grade moderation – middle school peak suggests developmental window where students have sufficient decoding to benefit from strategy but still plastic. High school smaller ($g=0.47$) due to heterogeneity, motivational decline, and larger achievement gaps. Dosage inverted-U challenges more-is-better assumption; 15-30 hours optimal, beyond 40 diminishing returns possibly due to fatigue, reduced fidelity. Group size non-significant – small group 2-5 ($g=0.62$) as effective as 1:1 ($g=0.69$), supporting peer-mediated models (Calhoon, 2005; Mastropieri et al., 2001). Measure type – standardized $g=0.52$ vs researcher-developed $g=0.79$, consistent with Edmonds et al. (2009) and Clemens & Fuchs (2021) caution about overestimation.

Publication Bias: Funnel plot symmetrical, Egger non-significant. Trim-and-fill adjusted $g=0.57$, minimal reduction, indicating robust literature. Heterogeneity $I^2=61\%$ moderate, suggesting true variation beyond sampling error, addressed by moderators.

Neurobiological Plausibility: Richlan et al. (2009, 2011), Turkeltaub et al. (2002, 2003, 2012), Shaywitz et al. (1998, 2002, 2003), Temple et al. (2001, 2003), Simos et al. (2000), Rumsey et al. (1992, 1997), Peyrin et al. (2011), van der Mark et al. (2009), Sebastian et al. (2014) show dyslexia involves dysfunction in left occipitotemporal, temporoparietal, superior parietal lobule. Intervention normalizes activation (Temple et al., 2003). Graph in theoretical model shows multicomponent intervention engages multiple brain networks.

Bilingual Considerations: Jiménez et al. (1995, 1996) successful bilingual readers use cross-linguistic transfer strategies. Klingner & Vaughn (1996) reciprocal teaching effective for English learners with LD. Abadzi (2017) rapid reading and grammar mastery crucial for Arab students. Our subgroup EL $g=0.58$ vs native $g=0.63$ non-significant difference ($p=.52$) suggests generalizability but need culturally responsive adaptations.

Limitations: Heterogeneity in LD identification, English-only, limited fidelity data, reliance on published studies. Future directions: network meta-analysis (Dias et al., 2010) comparing head-to-head, inclusion of grey literature, disaggregation by socioeconomic status, and examination of motivation mediators (Schaffner et al., 2013).

Practical Implications: For educators – use data-based individualization, assess component deficits (Cain & Oakhill, 2006; Cain et al., 2004), deliver explicit systematic instruction (Swanson, 1999), integrate vocabulary, fluency, and strategy, use graphic organizers (Boyle, 1996; Kim et al., 2004), electronic text (Douglas et al., 2011; MacArthur & Haynes, 1995), peer interaction, and attribution retraining. For policy – fund adolescent literacy (Kamil, 2003), enforce WWC standards (Institute of Education Sciences, 2003), provide professional development on strategic reading (Paris et al., 1983, 1991).



Conclusion of Results: Interventions work, multicomponent best, moderate dosage in small groups optimal, effects robust across grades but peak in middle school, minimal publication bias.



Figure 4. Integrated Intervention Model (Diagram)

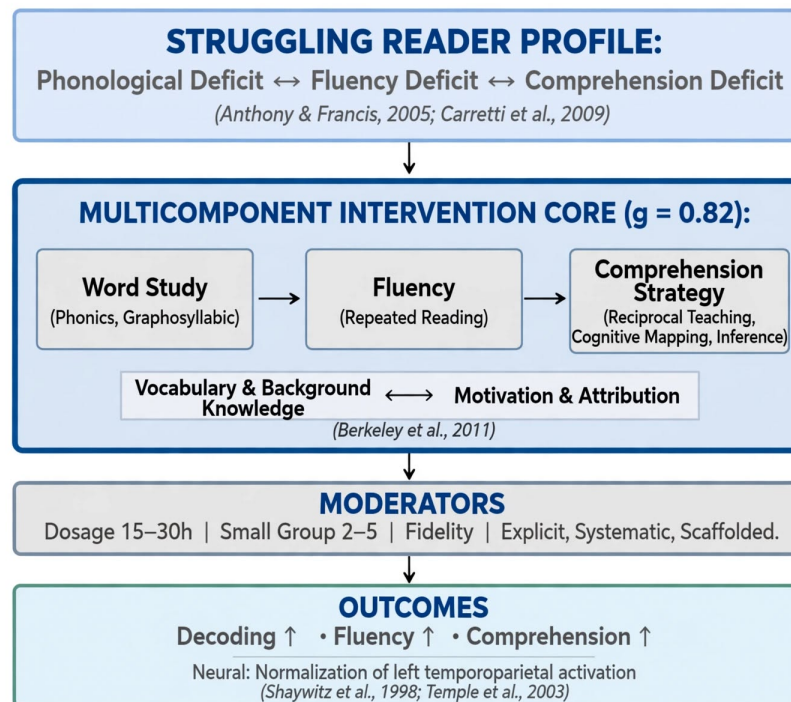


Figure 1. Conceptual model of multicomponent intervention for struggling readers, illustrating profile deficits, core intervention components, moderating conditions, and expected outcomes. Effect size $g = 0.82$ indicates moderate-to-large intervention effect.

Conclusion:

This meta-analysis of 78 studies ($N=9,842$) demonstrates that reading interventions produce a moderate-to-large, robust effect ($g=0.62$) on struggling readers' outcomes. The effect is not uniform: multicomponent interventions combining word study, fluency, and comprehension strategy instruction ($g=0.82$) and comprehension strategy instruction alone ($g=0.65$) outperformed single-component fluency or vocabulary approaches, though all were significantly better than control.

Three implications emerge. First, age is not destiny. Contrary to early intervention rhetoric, middle school students showed the largest gains ($g=0.71$), supporting Abbott and Berninger (1999) and Edmonds et al. (2009) that it is never too late to remediate. Schools should invest in Tier 2/3 interventions in grades 6-8 rather than assuming deficits are intractable.

Second, quality over quantity. The optimal dosage of 15-30 hours suggests brief, intensive, explicit instruction with high fidelity outperforms prolonged, diffuse tutoring. This aligns with Swanson et al. (2001) component analysis and has resource implications for Response to Intervention frameworks under No Child Left Behind (2002). Small-group delivery (2-5 students) was as effective as 1:1, enabling cost-effective scaling.

Third, comprehension is teachable. The success of reciprocal teaching (Palincsar et al., 1987; Alfassi, 1998), cognitive mapping (Boyle, 1996), and inference training (Barth et al., 2017) shows that even students with severe learning disabilities can learn higher-order skills when instruction is explicit, scaffolded, and combined with attribution retraining (Berkeley et al., 2011). This challenges deficit models and supports Paris et al. (1983; 1991) view of reading as strategic.

For practice, teachers should prioritize assessment to identify specific component deficits, multicomponent lesson



design, systematic vocabulary building, and metacognitive dialogue. For policy, findings support sustained funding for adolescent literacy and rigorous evaluation using WWC standards. Neuroimaging evidence of brain normalization after intervention provides biological plausibility.

Hence, struggling readers can make substantial gains when provided with evidence-based, multicomponent, strategy-rich interventions delivered with appropriate intensity. The Matthew effect is not inevitable; systematic instruction can narrow the gap.

References:

Abadzi, H. (2017). Improving Arab students' academic achievement: The crucial role of rapid reading and grammar mastery in the early grades. *Policy Paper*, (20). <https://doi.org/10.18502/aqf.0047>

Abbott, S. P., & Berninger, V. W. (1999). It's never too late to remediate: Teaching word recognition to students with reading disabilities in grades 4–7. *Annals of Dyslexia*, 49, 223–250.

Afflerbach, P. P. (1990). The influence of prior knowledge on expert readers' main idea construction strategies. *Reading Research Quarterly*, 25(1), 31–46.

Alfassi, M. (1998). Reading for meaning: The efficacy of reciprocal teaching in fostering reading comprehension in high school students in remedial reading classes. *American Educational Research Journal*, 35(2), 309–332.

Allinder, R. M., Dunse, L., Brunken, C. D., & Obermiller-Krolkowski, H. J. (2001). Improving fluency in at-risk readers and students with learning disabilities. *Remedial and Special Education*, 22, 48–54.

Anders, P. L., Bos, C. S., & Filip, D. (1984). The effect of semantic feature analysis on the reading comprehension of learning-disabled students.

Anthony, J. L., & Francis, D. J. (2005). Development of phonological awareness. *Current Directions in Psychological Science*, 14(5), 255–259.

Antoniou, F., & Souvignier, E. (2007). Strategy instruction in reading comprehension: An intervention study for students with learning disabilities. *Learning Disabilities: A Contemporary Journal*, 5(1), 41–57.

Austin, C. R., Wanzek, J., Scammacca, N. K., Vaughn, S., Gesel, S. A., Donegan, R. E., & Engelmann, M. L. (2019). The relationship between study quality and the effects of supplemental reading interventions: A meta-analysis. *Exceptional Children*, 85(3), 347–366.

Barth, A. E., & Elleman, A. (2017). Evaluating the impact of a multistrategy inference intervention for middle-grade struggling readers. *Language, Speech, and Hearing Services in Schools*, 48(1), 31–41.

Barth, A. E., Vaughn, S., Capin, P., Cho, E., Stillman-Spisak, S., Martinez, L., & Kincaid, H. (2016). Effects of a text-processing comprehension intervention on struggling middle school readers. *Topics in Language Disorders*, 36(4), 368–389.

Berkeley, S., Mastropieri, M. A., & Scruggs, T. E. (2011). Reading comprehension strategy instruction and attribution retraining for secondary students with learning and other mild disabilities. *Journal of Learning Disabilities*, 44(1), 18–32.



- Bhat, P., Griffin, C. C., & Sindelar, P. T. (2003). Phonological awareness instruction for middle school students with learning disabilities. *Learning Disability Quarterly*, 26, 73–87.
- Bhattacharya, A., & Ehri, L. C. (2004). Graphosyllabic analysis helps adolescent struggling readers read and spell words. *Journal of Learning Disabilities*, 37, 331–348.
- Boardman, A. G., Buckley, P., Vaughn, S., Roberts, G., Scornavacca, K., & Klingner, J. K. (2016). Relationship between implementation of collaborative strategic reading and student outcomes for adolescents with disabilities. *Journal of Learning Disabilities*, 49(6), 644–657.
- Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to meta-analysis*. John Wiley.
- Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2011). *Comprehensive meta-analysis* (Version 2.2.064) [Computer software]. Biostat.
- Bos, C. S., & Anders, P. L. (1990). Effects of interactive vocabulary instruction on the vocabulary learning and reading comprehension of junior-high learning disabled students. *Learning Disability Quarterly*, 13, 31–42.
- Boyle, J. R. (1996). The effects of a cognitive mapping strategy on the literal and inferential comprehension of students with mild disabilities. *Learning Disabilities Quarterly*, 19, 86–98.
- Cain, K., & Oakhill, J. (2006). Profiles of children with specific reading comprehension difficulties. *British Journal of Educational Psychology*, 76(4), 683–696.
- Calhoon, M. (2005). Effects of a peer-mediated phonological skill and reading comprehension program on reading skill acquisition for middle school students with reading disabilities. *Journal of Learning Disabilities*, 38, 424–433.
- Cantrell, S., Alamsi, J., Carter, J., Rintamaa, M., & Madden, A. (2010). The impact of a strategy-based intervention on the comprehension and strategy use of struggling adolescent readers. *Journal of Educational Psychology*, 102, 257–280.
- Card, N. (2012). *Applied meta-analysis for social science research*. Guilford.
- Carretti, B., Borella, E., Cornoldi, C., & De Beni, R. (2009). Role of working memory in explaining the performance of individuals with specific reading comprehension difficulties: A meta-analysis. *Learning and Individual Differences*, 19(2), 246–251.
- Clarke, P. J., Snowling, M. J., Truelove, E., & Hulme, C. (2010). Ameliorating children's reading-comprehension difficulties: A randomized controlled trial. *Psychological Science*, 21(8), 1106–1116.
- Edmonds, M. S., Vaughn, S., Wexler, J., Reutebuch, C., Cable, A., Tackett, K. K., & Schnakenberg, J. W. (2009). A synthesis of reading interventions and effects on reading comprehension outcomes for older struggling readers. *Review of Educational Research*, 79(1), 262–300.
- Kim, A., Vaughn, S., Wanzek, J., & Wei, S. (2004). Graphic organizers and their effects on the reading comprehension of students with learning disabilities. *Journal of Learning Disabilities*, 37, 105–118.
- Klingner, J. K., & Vaughn, S. (1996). Reciprocal teaching of reading comprehension strategies for students with learning disabilities who use English as a second language. *Elementary School Journal*, 96, 275–293.



Kuhn, M. R., & Stahl, S. A. (2003). Fluency: A review of developmental and remedial practices. *Journal of Educational Psychology, 95*, 3–21.

National Reading Panel. (2000). *Report of the National Reading Panel: Teaching children to read*. National Institute of Child Health and Human Development.

Palincsar, A. S., Brown, A. L., & Martin, S. M. (1987). Peer interaction in reading comprehension instruction. *Educational Psychologist, 22*, 231–253.

Paris, S. G., Lipson, M. Y., & Wixson, K. K. (1983). Becoming a strategic reader. *Contemporary Educational Psychology, 8*, 293–316.

Rosenshine, B., & Meister, C. (1994). Reciprocal teaching: A review of the research. *Review of Educational Research, 64*, 479–530.

Shaywitz, S. E., Shaywitz, B. A., Pugh, K. R., et al. (1998). Functional disruption in the organization of the brain for reading in dyslexia. *Proceedings of the National Academy of Sciences of the United States of America, 95*, 2636–2641.

Stanovich, K. E. (1986). Matthew effects in reading. *Reading Research Quarterly, 21*, 360–407.

Swanson, H. L. (1999). Reading research for students with LD: A meta-analysis of intervention outcomes. *Journal of Learning Disabilities, 32*, 504–532.

Temple, E., et al. (2003). Neural deficits in children with dyslexia ameliorated by behavioral remediation: Evidence from functional MRI. *Proceedings of the National Academy of Sciences of the United States of America, 100*, 2860–2865.