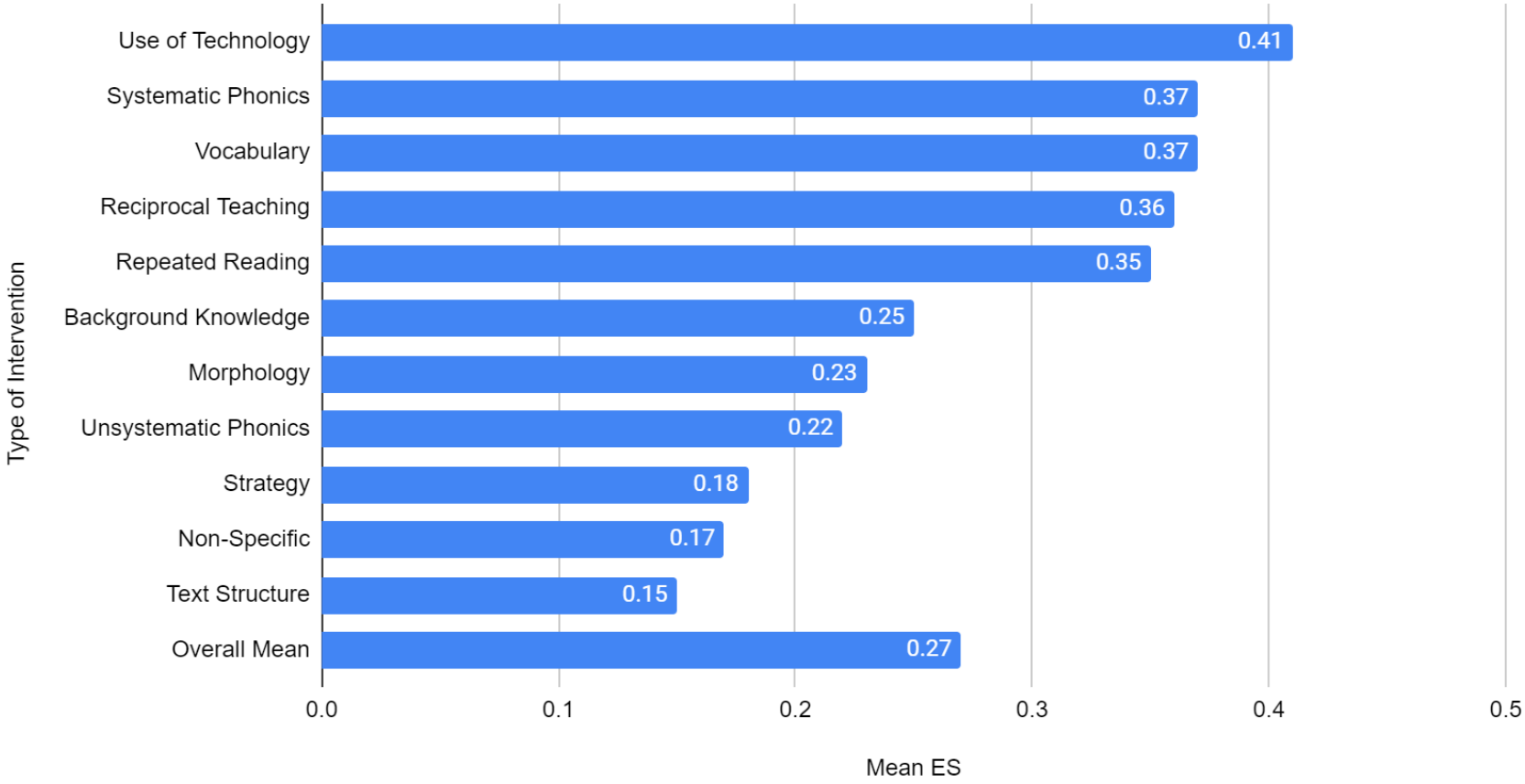
Article Summary

In this article, I summarize the findings of two new meta-analyses on reading comprehension conducted by Burns (2023) and Peng (2023). Additionally, I provide a review of 44 previously conducted meta-analyses concerning the topic of reading comprehension. Furthermore, I present a secondary meta-analysis that calculates the mean results from the highest quality meta-analyses included within the aforementioned 44 meta-analyses (refer to the results on the following page). High-quality meta-analyses were defined as those excluding single-group design studies and including results for standardized versus non-standardized assessments. Lastly, I offer updates to my own meta-analysis on this topic, which have been incorporated during the peer-review process.

A Synthesis of 13 High Quality Reading Comprehension Meta-Analyses

Hansford 2023 (Teaching by Science)



Introduction

Last year, I conducted a meta-analysis on reading comprehension with the collaboration of Joshua King and Sky McGlynn. In this meta-analysis, we specifically compared standardized test results to non-standardized test results for strategy and background knowledge instruction. Previous meta-analyses had consistently shown significantly lower results for background knowledge instruction when standardized tests were employed. Our curiosity led us to investigate whether this trend would persist for strategy instruction.

Upon completing our analysis, I posted a summary of our findings on this blog and submitted it for peer review. The blog post sparked significant controversy, largely because it revealed that background knowledge instruction yielded negligible reading comprehension benefits when standardized tests were used, and that strategy slightly better. This finding challenged a widely held belief within the SOR community. Some also expressed concerns about me publishing my results before undergoing peer review.

Navigating the peer review process has proven to be a long and arduous journey, particularly in mastering the tedious formatting rules. It seems my skills in crafting table headings left much to be desired. So far, one journal rejected the paper primarily due to the absence of a Praxis flow chart, and two other journals declined it simply because it was a meta-analysis. Presently, it's under consideration by a new journal, and I've been asked to minimize the similarity between my blog post summarizing the findings and the full manuscript.

Throughout this process, I've made several updates to the original meta-analysis. Most notably, I removed one outlier study (Fuchs, 2018) and employed the inverse variance method to weight my effect sizes, enhancing the correction for sample size bias. With these improvements in place, I believed it would be valuable to share my updated results.

Furthermore, I believed that reviewing other peer-reviewed meta-analyses on this topic would offer a transparent basis for comparison with my findings. With this in mind I attempted to review every meta-analysis conducted on reading comprehension (it was far more than I was anticipating). In total, I identified 44 other reading comprehension meta-analyses that met my inclusion criteria. However, before delving into the findings of these 44 studies, I wanted to highlight the discoveries from two exceptional meta-analyses on the topic that were published after I submitted my work for peer review.

Burns 2023

The first noteworthy paper is a secondary meta-analysis authored by Matt Burns, Nell Duke, and Kelly Cartwright. Their study encompassed 333 studies and 26 meta-analyses on the subject of reading comprehension and generalized reading improvement. Their research identified four generalized forms of instruction contributing to reading improvement: self-regulation, word recognition, bridging processes, and language comprehension. They employed this secondary meta-analysis to construct a robust empirical argument for The Active View of Reading theory, defined as follows: "Duke and Cartwright proposed the active view of reading (AVR), a heuristic that (a) identifies a larger number and wider

array of reading components that are potentially malleable and can be targeted for intervention, (b) acknowledges the substantial overlap between decoding and language comprehension with various component skills bridging the two, (c) integrates a self-regulation component into the representation of reading, and (d) considers the impact of cultural knowledge on reading, which holds significant potential for enhancing social justice in reading" (Burns, 2023).

Overall, this paper provides compelling support for the notion that reading comprehension relies on a multitude of factors. It also underscores that the Simple View of Reading is outdated. I wholeheartedly encourage individuals to read the complete article, available here: https://www.researchgate.net/publication/368307234_Evaluating_components_of_the_active_view_of_reading_as_intervention_targets_Implications_for_social_justice

However, you can find the results of the Burns 2023 study in Table 1 on the following page.

Table 1

Burns 2023 Results

Median Effect Sizes for Reading Comprehension for Studies From Included Meta-Analyses, by Active View of Reading Domains and Components

Variable	Average readers			Striving readers		
	k	*ES*	*SE*	*k*	*ES*	*SE*
Self-regulation	34	0.30*	0.08	50	0.46*	0.05
Executive function	3	0.11	0.22	6	0.23	0.20
Motivation	27	0.33*	0.09	18	0.51*	0.09
Strategy	4	0.16	0.23	26	0.54*	0.10
Word recognition	14	0.33*	0.08	47	0.44*	0.05
Phonics	8	0.19*	0.08	32	0.48*	0.06
Phonological awareness[a]	6	0.59*	0.08	15	0.21*	0.09
Bridging processes	53	0.30*	0.06	66	0.70*	0.07
Fluency	6	0.70*	0.18	37	0.44*	0.08
Morphology	3	0.16	0.08	1	0.14	NA
Vocabulary	44	0.26*	0.06	28	1.09*	0.10
Language comprehension	71	0.31*	0.05	15	0.62*	0.16
Text structure	44	0.33*	0.07	5	1.31*	0.20
Language structure	17	0.23*	0.07	4	0.51*	0.20
Verbal reasoning (inferencing)	8	0.47*	0.07	3	0.92*	0.46
Cultural and content knowledge	2	0.32	0.35	3	0.13*	0.06
Total	172	0.31*	0.03	178	0.52*	0.04

Note. ES = effect size; *SE* = standard error.

[a] phonemic awareness.

* $p < .05$.

Peng 2023

The second study was a meta-analysis conducted by Peng Peng, Wei Wang, Marissa Filderman, and Lifeng Lin. This meta-analysis focused on 53 reading comprehension studies involving struggling readers in grades 3-8. To explore the interconnected effects of various instructional elements, including graphic organizers, inference instruction, main idea instruction, prediction instruction, retell instruction, text structure instruction, and self-monitoring instruction, this study employed Bayesian Network Meta-Regression for Moderation Analysis.

Instead of calculating the effect size for individual moderator variables, the authors instead used regression analysis to investigate how instructional components influenced study outcomes when used in combination. **The study revealed that the highest reading comprehension results were achieved when background knowledge and strategy instruction were simultaneously implemented.** For a detailed presentation of the study's findings, please refer to table 2 below.

Table 2

Peng 2023 Results

G = graphic organizers; I = inference; M = main idea; P = prediction; R = retell; S = self-monitoring; T = text structure.

Strategy	With Background Knowledge	95 CrI	Strategy	Without Background Knowledge	95 CrI
MTR	3.27	(1.00, 9.75)	MTR	1.38	(−1.83, 3.61)
MTSG	3.07	(0.83, 10.15)	MTSG	1.12	(−0.93, 3.24)
I	2.85	(0.23, 10.45)	I	0.94	(−1.92, 3.90)

MG	2.54	(−0.02, 10.15)	MG	0.66	(−2.28, 3.60)
IG	2.42	(0.29, 8.19)	IG	0.52	(−3.00, 2.61)
MIP	2.17	(0.20, 8.23)	MITRSG	0.26	(−2.64, 3.15)
MITRSG	2.16	(−0.43, 9.74)	MIP	0.25	(−2.24, 1.85)
TRG	2.10	(−0.46, 9.58)	TRG	0.22	(−2.71, 3.09)
ISG	2.08	(−0.51, 9.55)	ISG	0.18	(−2.71, 3.03)
MPS	2.06	(0.34, 7.60)	MS	0.15	(−3.53, 1.38)
MS	2.05	(0.75, 5.85)	T	0.12	(−2.76, 3.08)
T	2.02	(−0.56, 9.52)	MP	0.06	(−2.65, 1.32)

MP	1.97	(0.32, 7.14)	MPS	0.06	(−1.76, 0.97)
M	1.96	(0.79, 5.31)	M	0.04	(−3.93, 1.31)
R	1.80	(0.23, 6.67)	MTG	−0.09	(−3.55, 1.38)
MTG	1.79	(0.12, 6.61)	R	−0.11	(−3.15, 1.24)
G	1.70	(0.61, 4.92)	G	−0.23	(−4.06, 0.98)
IT	1.31	(−1.25, 8.87)	IT	−0.60	(−3.46, 2.27)
TG	1.08	(−0.55, 5.22)	TG	−0.80	(−5.04, 0.81)
MITPS	0.98	(−0.64, 5.18)	MITPS	−0.90	(−5.07, 0.73)
MTPSG	0.89	(−0.41, 3.93)	MTPG	−1.01	(−6.95, 1.19)

MTPG	0.89	(−1.29, 4.48)	MTPSG	−1.02	(−5.87, 0.60)
MITRP	0.85	(−2.03, 3.78)	MITRP	−1.04	(−8.60, 1.58)
MITPSG	0.84	(−1.38, 4.41)	MITPSG	−1.07	(−6.98, 1.18)
MTRPS	0.79	(−2.16, 3.69)	MTRPS	−1.11	(−8.71, 1.52)
MRS	0.65	(−2.30, 3.53)	MRS	−1.24	(−8.84, 1.33)
TRS	0.58	(−1.61, 4.15)	TRS	−1.33	(−7.37, 0.88)
MIS	0.53	(−2.41, 3.40)	MIS	−1.36	(−8.92, 1.21)
MIPS	0.52	(−2.39, 3.37)	MTRPSG	−1.38	(−8.93, 1.18)
MTRPSG	0.51	(−2.36, 3.40)	MIPS	−1.39	(−8.99, 1.23)

MTRS	0.40	(−2.50, 3.32)	MTRS	−1.47	(−9.02, 1.11)
RSG	0.20	(−2.67, 3.12)	RSG	−1.68	(−9.23, 0.88)
IS	0.16	(−2.72, 3.11)	IS	−1.73	(−9.29, 0.83)
MI	0.12	(−2.77, 3.05)	MI	−1.76	(−9.30, 0.81)
RG	−0.02	(−2.91, 2.99)	RG	−1.91	(−9.53, 0.74)

A Review of 44 Meta-Analyses on Reading Comprehension

Meta-analyses were considered for inclusion in this review if they employed meta-analytic methods, were written in English, and specifically assessed the impact of instructional methods on reading comprehension outcomes. To identify relevant meta-analyses, searches were conducted in the Education Source Database, the Burns 2023 secondary meta-analysis, and the non-peer-reviewed literature review by Willingham in 2014. Meta-analyses were excluded if they were correlational, did not utilize Cohen's d or Hedge's g as effect size measures, did not provide mean effect size data, did not report on reading comprehension outcomes, or did not pertain to English reading instruction. In the case of the secondary meta-analysis, simple averages were calculated for related studies.

Figure 2

Prisma Flow Chart: Secondary Meta-Analysis Screening Results

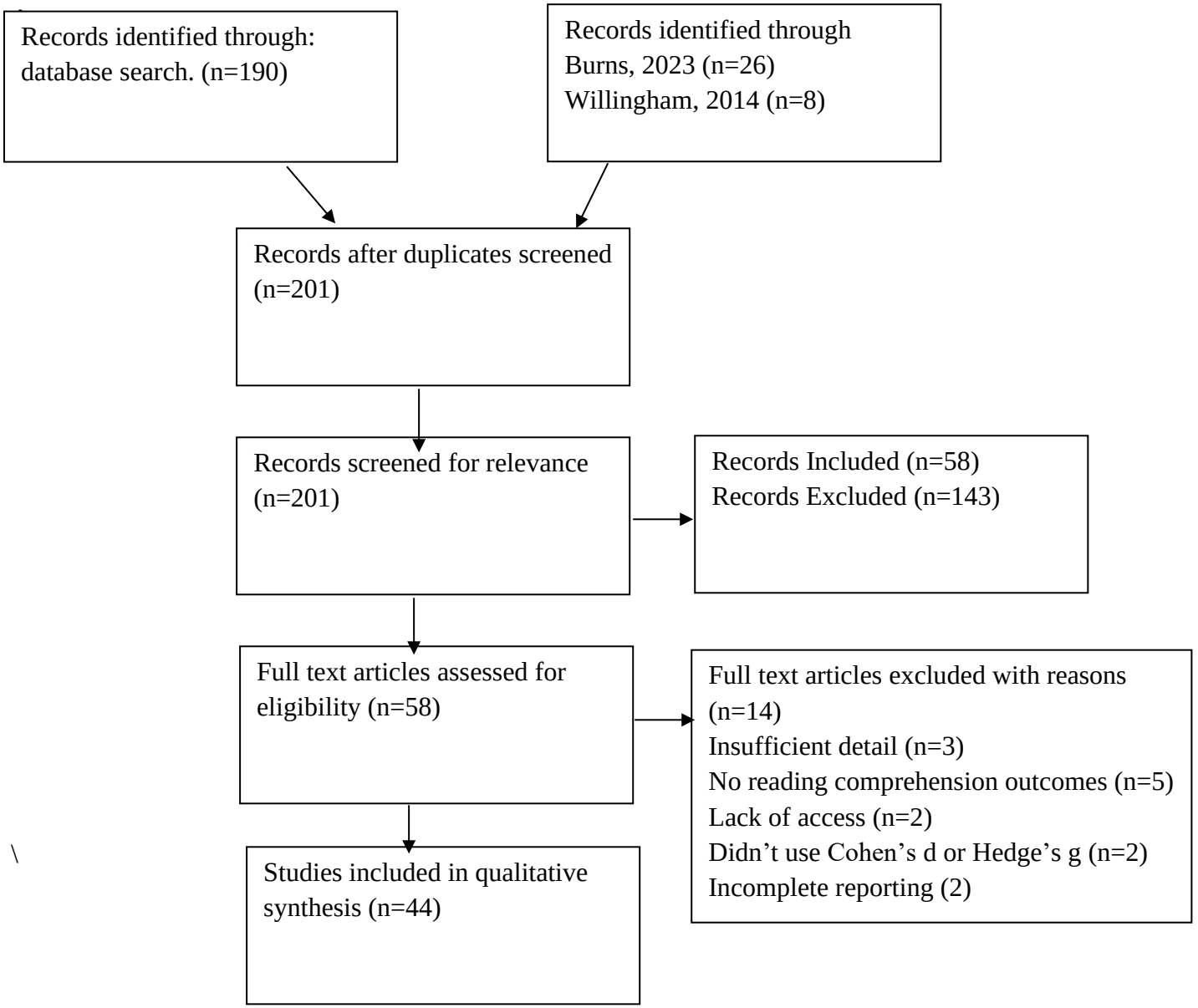


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Table 3

A Review of 44 Meta-Analyses

Meta-Analysis	Inclusion Criteria Strength	Type of Instruction	Standardized Assessment Effect Size	Non-Standardized Assessment Effect Size	Mean Effect Size
Berkley 2006 (40 Studies)	Weak	-Comprehension interventions for struggling readers -Grades k-12	0.52		0.69
Bogaerds-Hazenberg 2020 (44 studies)	Moderate	-Text structure -Grades 4-6 -Core			0.39
Edmonds 2009 (29 Studies	Weak	-Decoding, fluency, vocabulary, and comprehension instruction -Grades 6-12 -Struggling Readers	0.47	1.19	Fluency = -.03 Word Study = .34 Multi-Component = .72 Strategy = 1.23
Elbaum 2000 (29 studies)	Weak	1-1 Reading interventions -Grades 1-6			0.67
Elleman 2009 (37 Studies)	Weak	-Background knowledge and vocabulary -Grades pre-k to 12 -87.5% core instruction	Background Knowledge = .10 Vocabulary = .29	Background Knowledge = .50 Vocabulary = .79	Background Knowledge = .30 Vocabulary =.54
Elleman 2017 (25 Studies)	Weak	-Inference instruction -Grades k-12 -Mixed	0.53		0.58
Filderman 2022 (64 Studies)	Moderate	-Expository Texts -Narrative Texts			Expository = .72 Main Idea = .72

		-Strategy -Vocabulary -Background Knowledge -Text Structure -Graphic Organizer -Grades 3-12 -Mixed tiers			Strategy Only = 0.69 Content Knowledge ..64 Predicting = .60 Retelling = .59 Multiple Strategies = .59 Background Knowledge Only = .59 Inferencing = .56 Background Knowledge Included = .55 Text Structure = .47 Vocabulary =.39 Graphic Organizer = .39 Narrative Texts =.31
Flynn 2012 (10 Studies)	Moderate	-Generalized reading interventions -Grades 5-9			0.73
Fukkink & de Glopper 1988 (28 Studies)	Moderate	-Context clues for word meaning -Mixed tiers -Grades 6-10			0.43
Gajira 2007 (29 Studies)	Weak	-Cognitive strategies and reciprocal reading -Grades k-12 -Low IQ		RCTs 1.59 Non-RCTs 1.17	1.38
Goodwin 2010 (27 Studies)	Moderate	-Morphology -Grades Pre K to 12 -Learning disabled			.24
Hall 2018 (26 Studies)	Unclear	-Small groups reading interventions -Grades k-12			

Hall 2022 (47 Studies)	Strong	-Foundational instruction (ie: phonics or phonemic awareness) -Struggling readers -Primary	0.37		0.37
Hansford 2023 *not peer reviewed (11 Studies)	Moderate	-Structured literacy vs Balanced literacy -Mixed -Grades k to 5	Structured literacy = .37 Balanced literacy = .22		Structured literacy = .30 Balanced literacy = .22
Herbert 2016 (45 Studies)	Moderate	-Text structure -Grades k-12 -Mixed	0.15	0.57	0.36
Hwang 2022 (35 Studies)	Moderate	-Background knowledge vocabulary -Grades k-5 -Mixed	Background Knowledge = .25 Vocabulary = .64	Background Knowledge = .54 Vocabulary = .86	Vocabulary = .91 Background Knowledge = .89
Hyojong 2023 (37 Studies)	Moderate	-Strategy -Text type -Text structure -Grades 6-12 -Struggling readers			0.63
Kaldenberg 2018 (20 Studies)	Moderate	-Impact of vocabulary instruction and expository text practice on science comprehension -Grades 5-11 -Learning disabled	0.39	1.23	Overall = .98 Vocabulary = 1.25 Multi-component = .64

Katharina Galuschka 2014 (3 Studies)	Strong (Standardized measurements & RCTs only)	-Generalized comprehension instruction -K to adult	0.17		0.17
Lee 2016 (14 Studies)	Weak	-Comprehension instruction for "word callers" -Grades 1-10			Reciprocal teaching = .85 Vocabulary = .39 Multiple strategies = .37 Metalinguistic = .80 Inference making = .67 Mental imagery = .96 Story Mapping .33
Lee 2017 (14 Studies)	Weak	-Strategy instruction -Struggling readers -Upper elementary			Reciprocal Teaching = .85 Metalinguistic = .50
Melby-Lervag 2016 (87 Studies)	Moderate	-Working memory training -Children and adults -Mixed			0.15
Moran 2008 (20 studies)	Moderate	-Use of technology -Grades 6-8 -Mixed	0.3	0.56	0.48
Murphy 2009	Weak	-The impact of class discussions on comprehension -Core -Grades 4-6			Experimental studies =.41 Single group studies = 2.39
Okkinga 2018	Moderate	-Strategy instruction -Grades 3-12 -Mixed	0.18	0.43	0.3

Peng 2023 (52 studies)	Moderate	-Struggling readers -Strategy and background knowledge			-See results in the chart below. -Instruction that combined main idea, text structure, retell, and background knowledge showed the highest result.
Pyle 2017 (19 Studies)	Weak	-Text structure -Grades k-8 -Mixed	0.1	0.85	0.93
Rhu Li (17 studies)	Moderate	-Use of mobile assisted language learning -ESL -Primary to adult	0.73	0.86	0.81
Rosenshine 1996 (21 Studies)	Moderate	-Reciprocal teaching -Grades 3-9 -Instructional tier not listed	0.36	0.86	0.61
Sanders 2019 (5 SCD Studies & 4 RCTs)	Weak	-Strategy and self regulation -Grades k-12 -Learning disabilities			1.82 (RCTs Only)
Silverman 2020 (43 Studies)	Moderate	-Word meaning instruction -Grades Pre K to Grade 5 -Mostly core	0.08	0.68	0.38
Solis 2010 (12 Studies)	Weak	-Strategy -Grades 6-8 -Learning disabled	0.86	0.33	Summarization + Self Monitoring = 1.87 Summarization = .35 Self Questioning = .56 Main idea = 2.25

					Mnemonics = 1.41 Background knowledge = 2.15
Stevens 2019 (24 relevant studies)	Weak	-Cognitive Strategies -Grades 3-12 -Struggling Readers			0.97
Suggate 2010 (85 Studies)	Moderate	-Comprehension interventions -Preschool to grade 8 -Struggling readers			Comprehension Studies Mean =.58 Longitudinal Results =.69
Swanson 2012 (16 Studies)	Weak	-Background knowledge -k-12 -Learning disabled			1.02
Talbot 1994 (48 Studies)	Moderate	-Comprehension strategies and vocabulary -Grades k-12 -Mixed tiers			Overall = 1.13 Cognitive = 1.0 Computer Assisted = .87 Vocabulary = .69
Therrien 2004 (4 Relevant studies)	Moderate	-Repeated Reading -Mixed			0.18
Van der Sande 2022 (7 relevant studies)	Moderate	-Motivation interventions -Grades 1-12 -Mixed			0.29
Wanzek 2013 (10 Studies)	Weak	-Intensive reading interventions -Grades 4-12 -Struggling reader			0.1
Wanzek 2016 (72 Studies)	Weak	-Tier 2 reading interventions -K-3	0.36	1.02	0.69

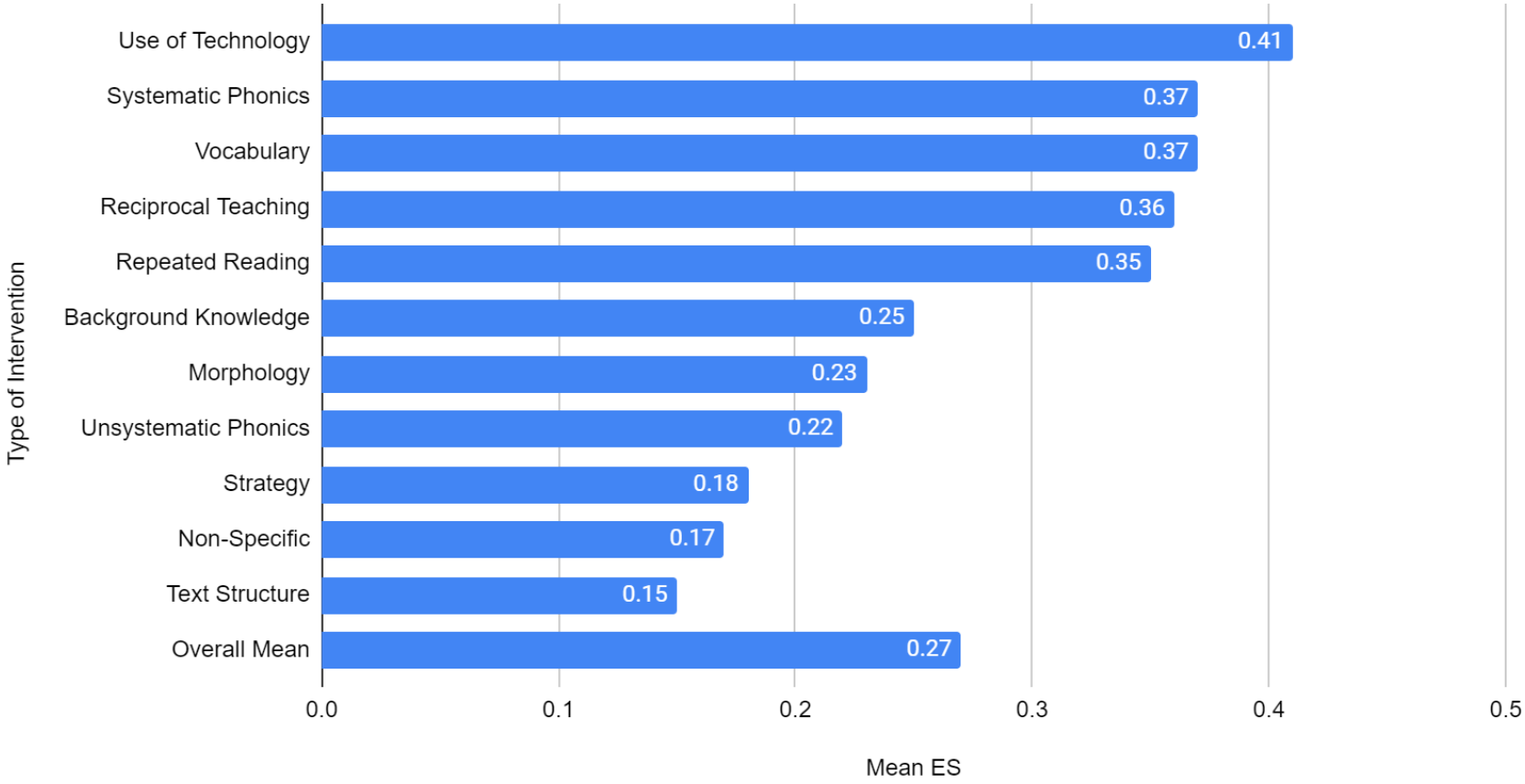
Wood 2017 (22 Studies)	Weak	-Text to speech -Struggling reader -Grades 3-12			0.35
Yoon 2017 (34 Studies)	Moderate	-Repeated reading -K-12 -Struggling readers	0.35		0.35
Zhihong 2019 (13 Studies)	Moderate	-K-12 -Use of technology -Mixed	0.2	1.01	0.2
Zimmerman 2019 (8 Studies)	Moderate	-Non-repetitive fluency interventions			0.23

Secondary Meta-Analysis

This secondary meta-analysis takes the mean moderator effect sizes of the highest quality meta-analyses on reading comprehension, reviewed in the above table. High quality meta-analyses were defined as meta-analyses that excluded single group design studies, and controlled for distal vs proximal assessments. This process was then duplicated for core instruction and intervention instruction to control for how results change according to student samples. Only standardized test results were included.

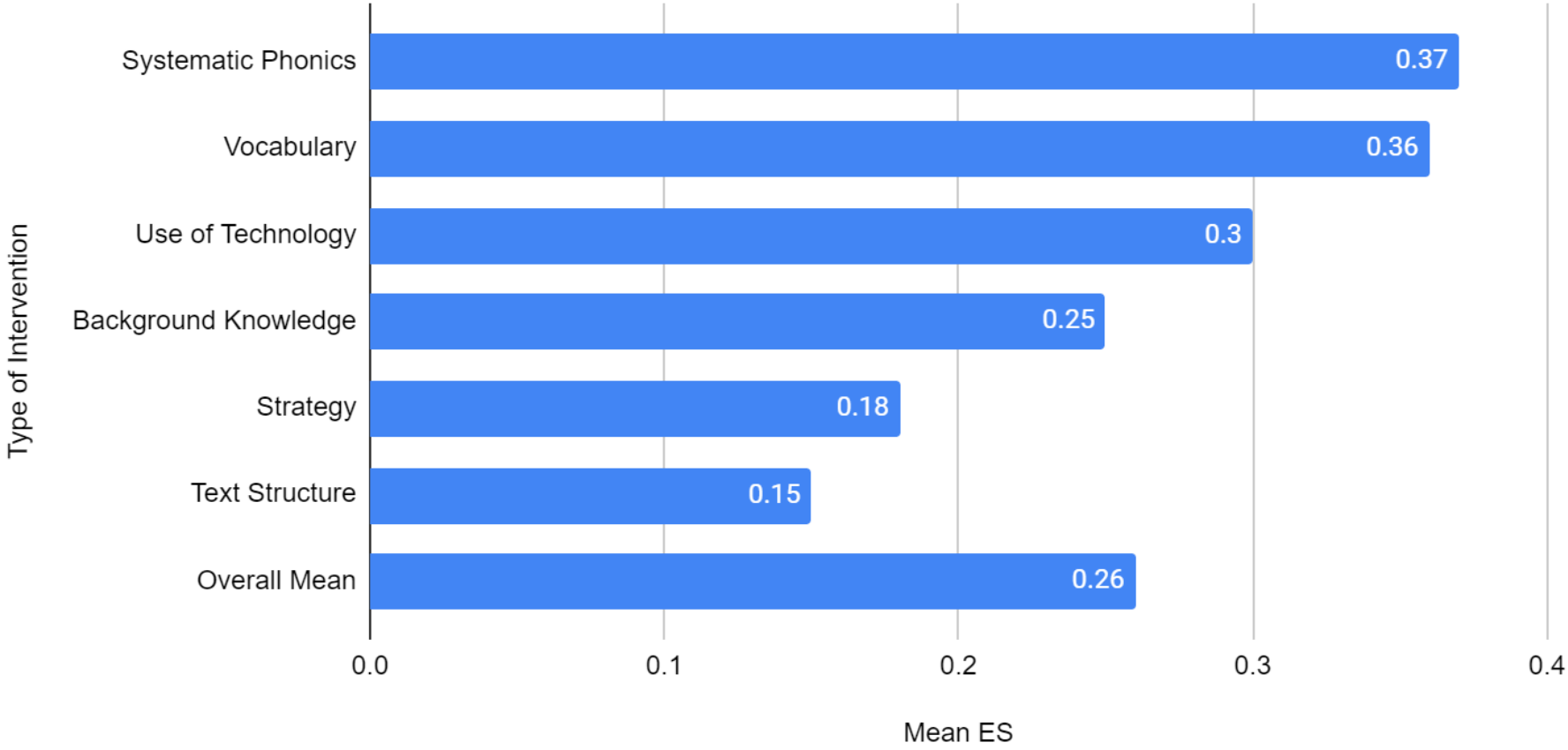
A Synthesis of 13 High Quality Reading Comprehension Meta-Analyses

Hansford 2023 (Teaching by Science)



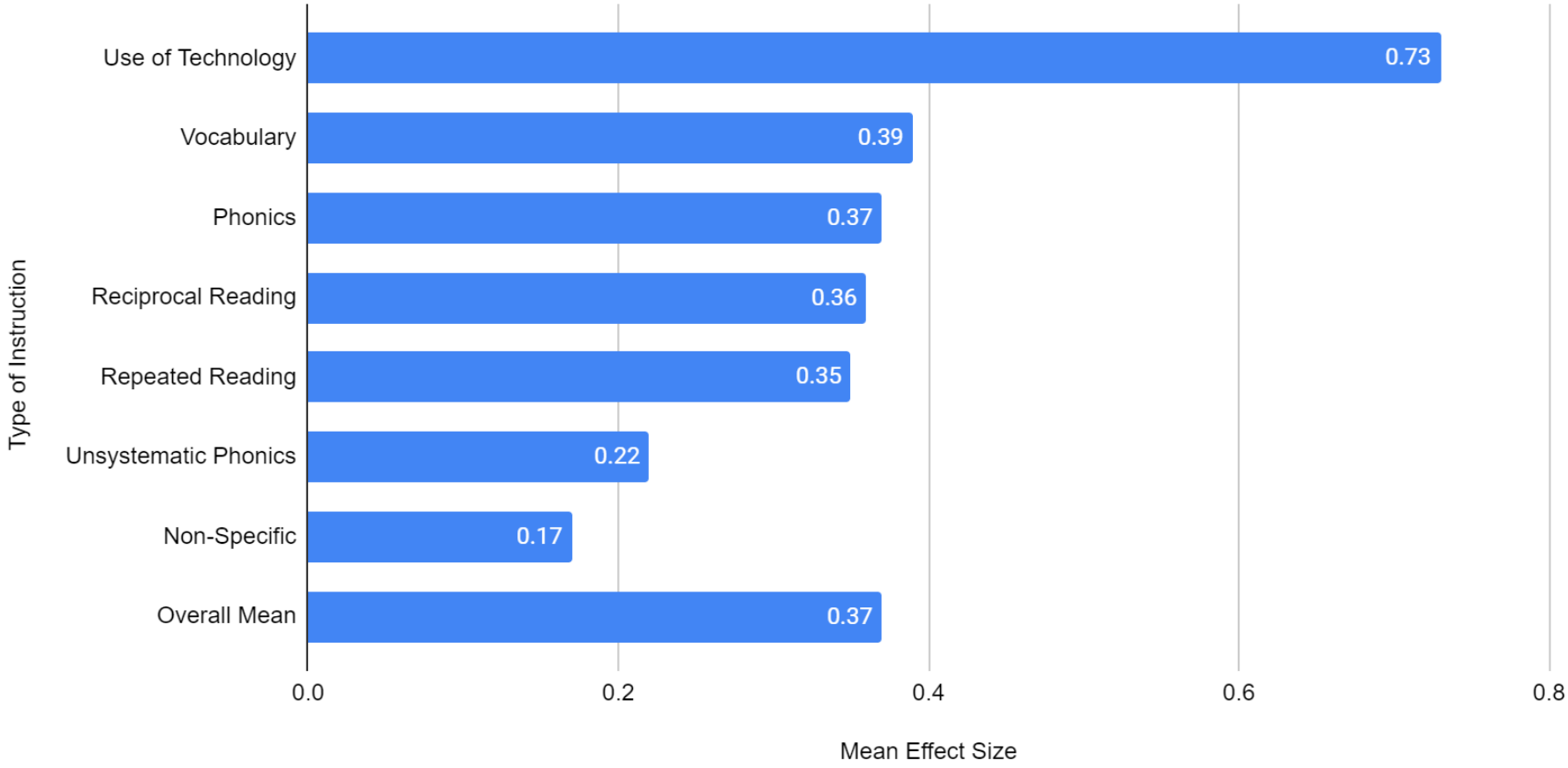
A Synthesis of 8 High Quality Reading Comprehension Meta-Analyses for Core Instruction

Hansford 2023 (Teaching by Science)



A Secondary Meta-Analysis of 7 High Quality Reading Comprehension Meta-Analyses on Struggling Readers

Hansford 2023 (Teaching by Science)



Updated Results for Hansford, McGlynn, & King (2023)

The purpose of this meta-analysis was to determine if strategy instruction results were higher in previous meta-analyses than background knowledge results, due to less distal assessments or due to genuine benefits. Studies were looked for in the ERIC data-base, using the search terms “reading comprehension”, in the (Filderman, 2022) meta-analysis, and in the (Silverman, 2020) meta-analysis. Studies were included, if they examined English reading instruction, included reading comprehension outcomes, compared a treatment condition to a control condition, and had sufficient reporting to calculate effect sizes. Screening protocols can be found in figure 3 and overall results can be found in table 4 & 5.

Figure 3

Prisma Flow Chart

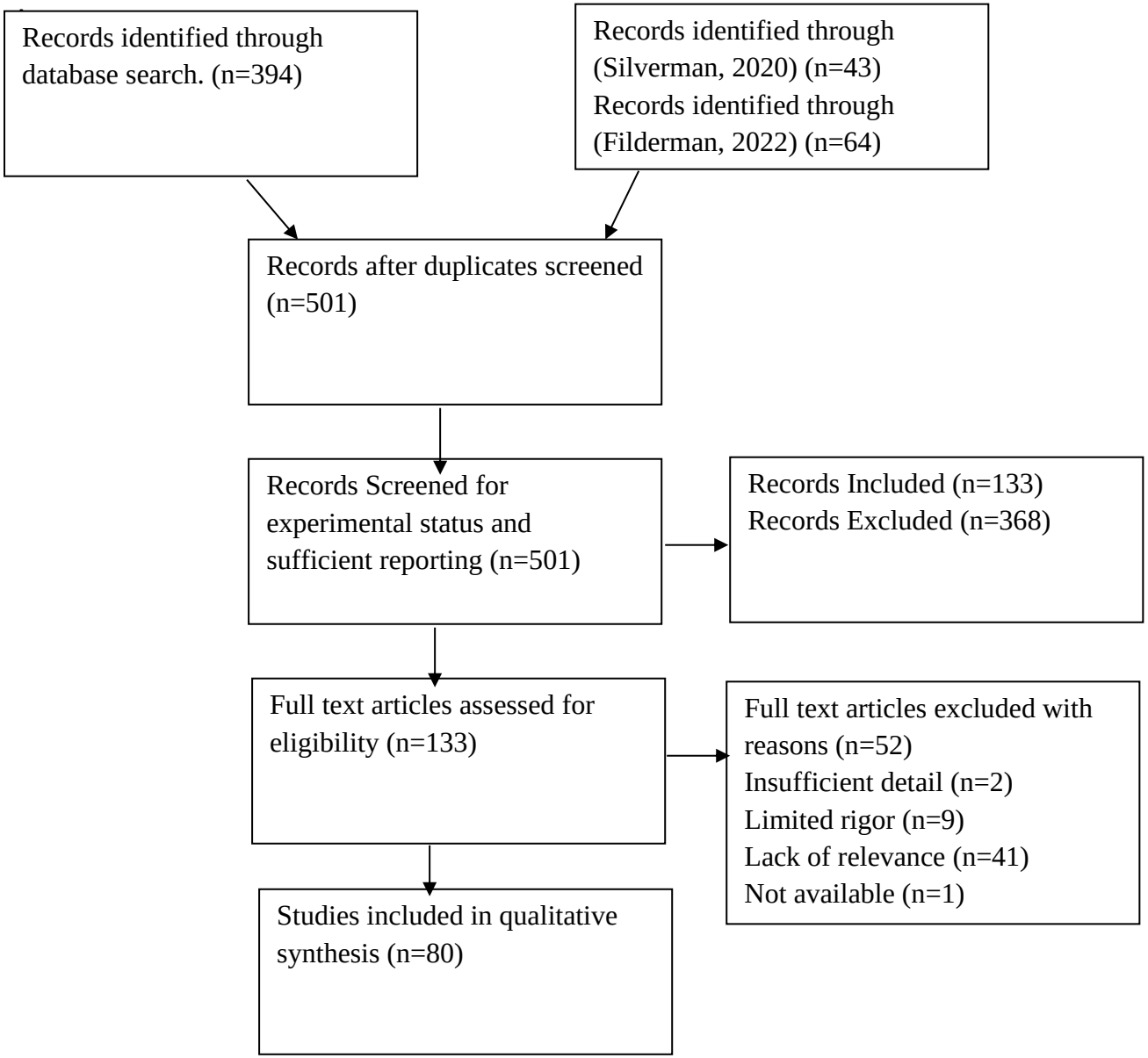


Table 4

Results for Researcher Designed Assessments:

Type of Instruction	Number of Effects	Raw Effect Size	Weighted Effect Size	95% CI
Vocabulary	18	.69	.32	[.34, 1.03]
Content	11	1.08	.44	[.39, 1.78]
Cognitive Strategy/Skill	25	.98	.67	[.54, 1.52]
Miscellaneous Strategy	22	.26	.26	[.29, .82]
Meta-Cognition Strategies	13	.81	.58	[.25, 1.38]
Reciprocal	4	1.17	1.09	[.35, 1.99]
Morphology	1	.24	.24	NA
Graphic Organizer	10	1.08	.44	[.32, 1.83]
Technology Based	9	.87	.34	[.00, 1.74]

Table 5

Results for Standardized Assessments:

Type of Instruction	Number of Effects	Raw Effect Size	Weighted Effect Size	95% CI
Vocabulary	18	.26	.12	[.11, .42]
Content	9	.17	.11	[.05, .30]
Cognitive Strategy/Skill	26	.29	.20	[.05, .53]
Miscellaneous Strategy	33	.13	.07	[0, .26]
Meta-Cognition Strategies	14	.30	.24	[.15, .44]
Reciprocal	7	.62	.77	[.16, 1.08]
Morphology	4	.03	.06	[-.14, .21]
Graphic Organizer	8	.29	.35	[.06, .52]
Technology Based	5	.19	.11	[0, .38]

Discussion

If there's one lesson I've gleaned from reviewing these 44 meta-analyses, scrutinizing the Burns 2023 secondary meta-analysis, and conducting my extensive meta-analysis, it's that reading comprehension is an intricate subject. Consequently, I find it highly improbable that simplistic explanations of reading comprehension can withstand rigorous scrutiny. It appears that students' reading comprehension outcomes are optimized when multiple instructional modalities are employed, encompassing decoding, fluency, strategy, vocabulary, background knowledge, and meta-cognition instruction. Any assertion that reading comprehension is primarily attributable to one or two of these modalities is likely to be erroneous.

Limitations

None of the content within this article has undergone peer review. While the original meta-analysis involved collaboration among multiple authors, the presented secondary meta-analysis did not benefit from such scrutiny, thereby limiting its reliability. Ideally, the secondary meta-analysis should undergo peer review, but time constraints make it impractical. Furthermore, given the substantial number of meta-analyses on this topic already in existence, it may be best to avoid redundancy and refrain from further exploration in this regard.

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