Raising educational outcomes for students with Special Educational Needs and Disabilities

Jo Van Herwegen, Julie Dockrell, Michael S.C. Thomas, Chloe Marshall, Rebecca Gordon & Thomas Masterman.

August 2024

UCL

Centre for Educational Neuroscience

MetaSENse

About the authors

Jo Van Herwegen is Professor of Developmental Psychology and Education at UCL Institute of Education and director of the Child Development and Learning Difficulties lab. Her research focuses on improving educational outcomes, especially mathematical outcomes, using evidence from developmental psychology, educational neuroscience, and neurodevelopmental disorders.

Julie Dockrell is Professor of Psychology and Special Needs at UCL, Institute of Education. Her research focuses on language and writing difficulties and environmental barriers to learning. Much of her work strives to identify quality first practices for language and learning and staff CPD to reduce the need for additional interventions.

Michael S.C. Thomas is Professor of Cognitive Neuroscience at Birkbeck University of London. Since 2010, Michael has been Director of the Centre for Educational Neuroscience, a cross-institutional research centre which aims to further translational research between neuroscience and education and establish new transdisciplinary accounts in the learning sciences, including neurodevelopmental conditions.

Chloe Marshall is Emerita Professor of Psychology, Language and Education at the UCL Institute of Education and former director of the Acquiring Language and Literacy in Challenging Circumstances lab. Her research focuses on language, literacy and cognitive development, including in children who are deaf and learning a sign language.

Rebecca Gordon is an Associate Professor of Developmental and Cognitive Psychology at UCL Institute of Education and director of the Motor Executive Cognitive Interaction lab. Her research focus is on the mechanisms and measurement of working memory/executive function, and their relationships with typical and atypical outcomes, including Dyslexia.

Thomas Masterman is a Research Fellow at the UCL Institute of Education in the Department of Psychology and Human Development.

Contact details: j.vanherwegen@ucl.ac.uk

Acknowledgements

We would like to thank the members of our advisory board for their insights and support: Professor Lani Florian, Professor Alison O'Mara-Eves, Jonathan Kay, Vijita Patel, Dr Jeremy J. Monsen, Dr Erin Early, and Dr Aikaterini Kassavou.

In addition we would like to thank all of the student volunteers who helped with the screening of the titles and abstracts, full text screening, and data extraction: Duasha Aluthgamage, Rosie Casterton, Anson Chan, Claudia Civinini, Ruofei Du, Emma Fulford, Enkhzaya Ganzorig, Aaron Giuliano, Shiyu Ji, Isha Kala, Justine Kum, Shun Yan Kung, Jaimie Leung, Xiaoxuan Li, Feiying Na, Dr Roisin Perry, Alyssa Seriniyom, Huimin Shao, Dr Zahra Siddiqui, Hongjing Wang, Tiffany Wai, Peige Wang, Sophie Wong, Yiyang Xu, and Jintong Yan.

We thank Faye Howard for helping with the interviews and Sagarika Saproo for transcribing the interviews. Our special thanks go to Dr Catherine Antalek for her help with analysing and writing up the interviews.

Thank you to all the educational professionals who contributed their time and expertise during the interviews.

We also thank the Nuffield Foundation for their generosity in funding this research, with special thanks to Ruth Maisey and Alice Reeves for their support and guidance.

Disclaimer:
The Nuffield Foundation is an independent charitable trust with a mission to advance social well-being. It funds research that informs social policy, primarily in Education, Welfare and Justice. The Nuffield Foundation is the founder and co-funder of the Nuffield Council on Bioethics, the Ada Lovelace Institute and the Nuffield Family Justice Observatory. The Foundation has funded this project, but the views expressed are those of the authors and not necessarily the Foundation. Visit www.nuffieldfoundation.org

Table of contents

List of Tables

List of Figures

List of Abbreviations

ADHD – Attention Deficit (Hyperactivity) Disorder
ADOS - Autism diagnostic observation schedule
ASD – Autistic spectrum disorder
BMI – Body mass index
CHE – Correlated and hierarchical effects models
DCD – Developmental Coordination Disorder
EHCP – Education, Health and Care Plan
FASD – Foetal Alcohol Spectrum Disorder
IQ – Intelligence quotient
Moderate LD – Moderate Learning Difficulties
MSI – Multisensory Impairment
NSA – No specialist assessment of type of need
PD – Physical disability
PMLD – Profound and Multiple Learning Difficulties
QED – Quasi-experimental design
RCT – Randomised control trial
RD – Reading Difficulties
RTI – Response to intervention
SEMH – Social, Emotional and Mental Health
SEND – Special Educational Needs and Disabilities
SLCN – Speech, Language and Communication Needs
Severe LD – Severe Learning Difficulties
SENCO – Special Educational Needs Coordinator
SpLD – Specific Learning Difficulties

Executive summary

Improving educational outcomes for students with SEND

Students with special educational needs and disabilities (SEND) have been found to have lower educational outcomes compared to their peers (Tuckett et al., 2021) and many receive additional support. Beyond universal support through good quality teaching, these students often receive specific support through targeted interventions delivered either in small groups or on a one-to-one basis. These targeted interventions often make use of a named and 'manualised' (i.e., has a published and accessible manual) approach. However, to improve the outcomes of students with SEND, it is critical to identify: (a) which practices are effective and evidence-based; (b) which practices are being implemented in educational settings; and (c) where there are barriers to implementing the effective, evidence-based practices (i.e., a research-to-practice gap). This study addressed each of these.

Students with Special Educational Needs and Disabilities (SEND)

The term SEND refers to a wide range of barriers that affect a child's ability to learn and engage in typical educational activities. These include a wide range of difficulties such as physical, cognitive, communicative, emotional, and sensory needs. Children and young people with SEND may require additional support and tailored educational strategies to access the curriculum and achieve their potential. Whilst some children and young people have just one type of SEND (e.g., autism), others have multiple types due to high comorbidity within SEND. Equally, whilst some studies focus on students with one type of SEND, others include students with different types of SEND. We refer to groups of students with multiple types of SEND within or between individual children (or both) as 'Mixed SEND'.

Methodology

The study included three phases:

Phase 1 explored the current evidence base on targeted interventions and their effects on reading, writing, mathematics, science and general attainment[1] outcomes for children with any type of SEND through a systematic review and meta-analysis. This review only included randomised controlled trials and quasi-experimental designs, as both include a control group and so provide stronger evidence of intervention effects. Studies had to be published between the years 2000 and 2023 but could include any type of control group and any type of school setting (i.e., mainstream schools, special schools, clinics, and after-school sessions that took place at the school). We included studies focused on primary, secondary, and/or post-18 education up until age 25. Any intervention study that included a reading,

[1] General attainment was defined as outcomes assessed through standardised tests, grades, or other measures of academic performance and learning outcomes (such as GCSE or A-level performance as well as overall grade outcomes).

writing, mathematics, science or general attainment outcome for students with SEND from across the globe but published in English was included.

In Phase 2, we conducted in-depth interviews with educational professionals to identify what practices are being implemented in schools and explore any barriers they face in implementing the most effective practices as indicated by the evidence.

In Phase 3, we co-produced a toolkit with practitioners that summarises the findings from Phases 1 and 2. This toolkit includes a searchable database of the intervention approaches identified in Phase 1 as well as further information about how teachers can evaluate what might work in their classroom. The database was designed with input from the educational professionals interviewed in Phase 2 and can be found on the MetaSENse webpage.

Key findings

What does the current evidence base look like?

Our systematic review identified 467 studies from across the globe that reported on 1,758 outcomes. Most of these outcomes related to reading (*n* = 1,139), while fewer related to writing (*n* = 279) and mathematics (*n* = 284). Very few studies reported on science (*n* = 3) or general attainment outcomes (*n* = 53). The majority of the studies came from the USA (*n* = 225) and **only 21 studies from the UK were eligible for inclusion**.

Most studies (50%) focused on students with Dyslexia/Reading Difficulties and Dyscalculia/Mathematical Difficulties. Very few studies focused on students with Physical Disabilities, sensory disabilities such as Vision Impairment or Hearing Impairment, or Intellectual Disabilities.

Most interventions focused on primary school students (58%) or students from more than one phase of education (27%). As such, there is a lack of research that has evaluated targeted interventions for secondary school or post-18 students specifically.

Most interventions (53%) were implemented for a short period of time (less than 12 weeks) in terms of duration. Regarding the intensity, while almost half the studies (45%) implemented the intervention for 19 hours or less, about a fifth implemented the intervention for 20 to 49 hours (21%) or did not report the number of hours (18%) respectively.

Concerning the setting, most studies focused on mainstream schools (58%). Only 22% of the interventions were implemented by a researcher with the remaining being implemented by educational practitioners or specialists.

Finally, only a few studies (7%) were scored to be of low quality. However, 50% of all studies had fewer than 50 participants in the intervention and control groups combined.

What does good quality evidence show about the potential to improve academic outcomes for students with SEND using targeted interventions?

Manualised interventions targeting specific difficulties can improve the educational outcomes of students with some types of SEND[2]. They deliver an average of five months of additional progress compared to other students with SEND receiving business-as-usual or active control interventions. This finding highlights the positive impact of targeted interventions and can be used to inform power calculations for future studies.

There was clear evidence that targeted interventions could improve reading outcomes among students with Dyslexia/Reading Difficulties (g = 0.33) and mathematics outcomes among those with Dyscalculia/Mathematical Difficulties (g = 0.68). The evidence that writing outcomes could be improved for those with Writing Difficulties was inconclusive (g = 0.37). This finding might stem from challenges in identifying specific writing difficulties.

The findings also suggest that **targeted SEND interventions have a larger positive effect on mathematics (6 months of progress) than on reading (5 months of progress)** ($p < .01$).

The fact that the interventions had positively impacted the reading, writing, and mathematical outcomes of students with Mixed SEND shows that type of need rather than diagnostic label is important when choosing which intervention to use, as interventions seem to be effective across different types of SEND.

What factors impact on what works?

Primary school interventions generate larger effect sizes for mathematical outcomes than interventions that include students from both the primary and secondary school phases, but students in the secondary and post-18 phases of education showed larger improvements in writing. For reading outcomes, phase of education made no difference to the effectiveness of interventions.

The type of setting in which an intervention was delivered had no effect on reading or writing outcomes, but **interventions delivered in mainstream schools showed a larger positive effect on students' mathematical outcomes than those delivered in special schools**. Further research is required to determine whether this reflects the fact that students with more complex needs are more likely to attend special schools.

Intervention effects did not vary according to whether they were delivered in a small group versus one-on-one; who implemented them; or the type of control group used. However, in line with previous research (Dietrichson et al., 2020; Slavin et al., 2011), studies

[2] Across all outcome measures and different types of interventions, there were positive effects for those with Dyslexia/Reading difficulties, Dyscalculia/Mathematical difficulties, ADHD, SCLN, Mixed SEND, and SEMH. Reading outcomes had been improved for those with Reading difficulties and SCLN, as well as mixed SEND groups. Mathematical outcomes had been improved for those with Mathematical learning difficulties, ADHD, and Mixed SEND. Interestingly, however, whilst writing outcomes had been enhanced for those with Dyslexia or Reading difficulties as well as Mixed SEND, there is no evidence that interventions positively impact the writing outcomes of students with Writing Difficulties.

using researcher-created measures did show larger effects for reading and mathematics outcomes than those using standardised or referenced measures.

The current study identified several gaps in the research as well as methodological issues related to the design of the studies and some reporting issues, including: 1) a lack of detail about implementation, 2) a lack of detail about randomisation, 3) a lack of baseline equivalence (i.e., members of the control group have similar outcomes pre-intervention as the intervention group), 3) small sample sizes, and 4) a lack of examination of the impact of individual differences on outcomes (i.e., impact of socio-economic status, gender, or ethnicity).

How do educational practitioners use evidence?

The interviews with the practitioners highlighted three main themes that related to:

- How they explored and evaluated research evidence related to specific targeted interventions,
- How they balanced fidelity to the intervention instructions and adaptation when implementing the targeted interventions,
- How they monitored the effectiveness of the interventions, in terms of the assessment strategies they used but also when and how they reviewed which targeted approaches should be replaced.

Teachers reported a limited understanding of the research evidence on targeted interventions for SEND, as well as a lack of knowledge about how to access it. Perhaps unsurprisingly then, there was a gap between the approaches that interviewees mentioned they were using in their practice and those that have been evaluated in the literature. These findings re-affirm the existence of a research-practice gap, which our toolkit will hopefully be the first step towards closing.

Ways forward

Recommendations

1. Invest in a more balanced evidence base

Across the various outcomes, it is evident that the evidence base is skewed towards certain types of SEND, with notable gaps that warrant attention. Specifically, there is a need for more research targeting students with physical disabilities, sensory needs, and intellectual disabilities. Additionally, there is a need for more studies involving secondary school and post-18 students, and focusing on science and general attainment outcomes. There is also a lack of UK-based evidence. As such, funders and academics should invest in a more diverse evidence base.

Recommendations (continued)

2. Establish a new national database on the outcomes of SEND interventions

The findings show that there is a need to enhance the quality of the research on SEND interventions, particularly by facilitating access to larger sample sizes and longer-term outcome measurements across diverse schools. Our research has shown that teachers often do track the outcomes of the interventions they use with their students, but this data is often stored locally, and the assessments may not always be reliable. Together with researchers, teachers could agree on the best measures to be used (see Outhwaite et al., 2024), and the data collected could then be stored in a newly developed national database. This database, containing information about each student and the type of practice or intervention implemented, along with baseline, post-intervention and even follow-up evaluation data, would enable researchers to conduct more robust studies, yielding findings that were representative and generalisable, and ultimately advancing our understanding of effective educational practices. This recommendation is relevant to policy makers.

3. Increase collaboration between researchers and educational practitioners

Priority should be placed on aligning interventions evaluated by researchers with those being implemented by practitioners, ensuring a seamless integration of evidence-based practices into educational settings. Additionally, there is a need to consider ways to make research evidence more readily accessible to teachers, empowering them with the knowledge and resources needed to effectively support student learning and development. These objectives can be achieved by academics working more closely with educational practitioners and by producing materials with practitioners, such as the database created through this study, so that these materials are accessible to them. We expect this recommendation to be of relevance to academics and funders.

4. Offer practitioners training in evaluating evidence related to interventions and what works in their classrooms

It is essential that teachers receive training on understanding evidence related to interventions (from research as well as from practice) and how to evaluate its credibility. This training will enable them to effectively apply robust research findings in classroom settings, particularly for students with SEND, as well as helping them evaluate their own practices effectively. We have included a video and other materials in our toolkit to start addressing this need but policy makers and Higher Education providers should consider including additional training in Initial Teacher Training courses as well as SENCO training.

Further research

The data gathered have established an evidence base that can now be further explored and built upon. There will be opportunities to assess new studies published post-2023, and to expand to include additional phases of education (e.g., early years), secondary outcomes, and/or the cost of implementing the targeted approaches. The existing data

could also be further mined to explore how students' needs, rather than their SEND labels, might impact on outcomes.

A further important way forward will be to develop a framework using a data-driven approach to **understand what components make for a successful targeted intervention** – in other words, what exactly works for whom. This will be a challenging task, however, as many studies lack detailed information on intervention components.

1. Educational outcomes for students with special educational needs and disabilities

1.1. Defining special educational needs and disabilities

The number of students identified with Special Educational Needs and Disabilities (SEND) continues to rise (Office for National Statistics, 2023), and in England over 1.5 million students have been identified with at least one type of SEND. Educational outcomes for students with SEND are often lower compared to those without, and this gap has widened since the COVID-19 pandemic (Tuckett et al., 2021). To address this learning gap, it is important to understand which interventions work best for students with different SEND.

The SEND code of practice (DfE, 2015) categorises students with SEND into those with primary needs in four domains:

1) Communication and Interaction,
2) Cognition and Learning,
3) Social, Emotional and Mental Health, and
4) Physical and/or Sensory Needs.

However, these categories are not mutually exclusive and can include different sub-groups with diverse needs of different levels of severity. For example, the category Cognition and Learning can include students with Down Syndrome as well as students with Reading Difficulties. For this reason, we will use the more specific sub-categories set out in Box 1 as much as possible in this report.

Box 1. Students with Special Educational Needs and Disabilities (SEND)

Students with Special Educational Needs and Disabilities (SEND) encompass a diverse group of individuals who may require additional support or accommodations to access education and reach their full potential due to physical, cognitive, sensory, emotional, or developmental differences or challenges.

The SEND code of practice (DfE, 2015) divides students with SEND into those with primary needs in the following categories:

1) **Communication and Interaction**: Includes students with speech, language, and communication needs (SLCN), as well as autism. Students in this category may have difficulties with verbal and non-verbal communication, social interaction, and understanding language.
2) **Cognition and Learning**: Encompasses students with learning difficulties, such as specific learning difficulties (e.g., Dyslexia, Dyscalculia), Moderate Learning Difficulties (Moderate LD), Severe Learning Difficulties (Severe LD), and Profound and Multiple Learning Difficulties (PMLD), but also students with specific neurodevelopmental conditions such as Down Syndrome and Developmental Coordination Disorder (DCD). Students in this category may have challenges with acquiring, retaining, or processing information, which can impact their academic progress and attainment.

3) **Social, Emotional, and Mental Health**: Includes students with social, emotional, and mental health needs (SEMH), including those with Attention Deficit (Hyperactivity) Disorder (ADHD). These students may experience difficulties with managing emotions, behavior, or relationships, which can affect their well-being and ability to engage in learning.

4) **Sensory and/or Physical Needs**: Encompasses students with sensory impairments, such as vision or hearing impairment, and those with physical disabilities (PD) or medical conditions that impact their access to education. Students in this category may require support with mobility, sensory aids, or access to adapted resources and environments.

Many interventions have been designed to mitigate the impact of students' SEND on their educational outcomes. However, it is currently unclear which interventions work for different students with different SEND, in different educational contexts (mainstream or specialist schools) or different phases of education (primary versus secondary).

1.2. Interventions for students with SEND in the classroom

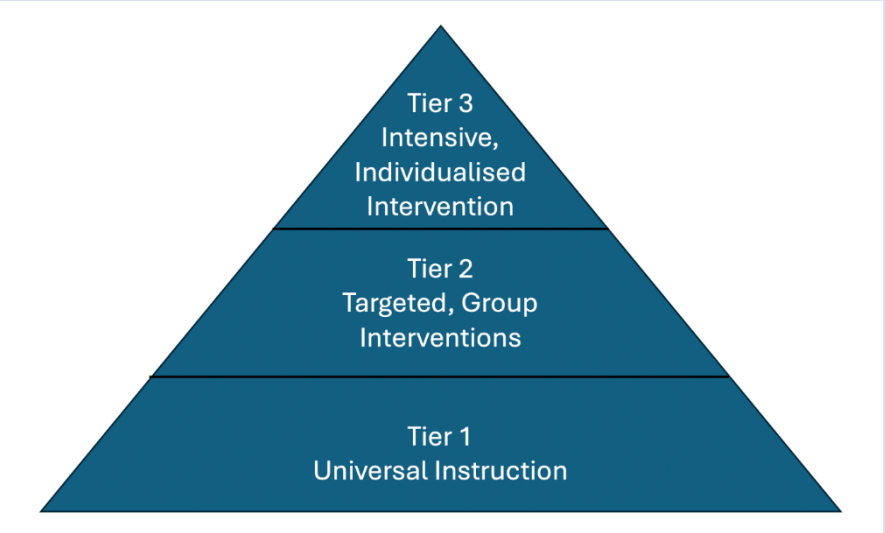
To improve educational outcomes for students with SEND, support is often provided according to a graduated or tiered approach (See Box 2), starting with universal or primary (i.e., Tier 1) support, which includes good quality teaching and general study skills support. Universal support is provided within the classroom for all students. However, 13% of students in the UK fail to make progress within general classrooms and require additional support (Office for National Statistics, 2023). This extra support can be provided as Tier 2 interventions, typically involving small group work, or Tier 3 interventions, typically involving one-to-one support. In practice, it is not always possible to separate Tier 2 from Tier 3 approaches as this division relies on the frequency of the implementation and of progress monitoring as well as the assessment framework used, and different descriptions and criteria of Tier 2 and Tier 3 in the literature have been used (see Harlacher et al., 2014 for a discussion). In addition, in some schools targeted approaches are implemented at a classroom level. However, both Tier 2 and Tier 3 approaches provide additional instruction delivered via targeted support, which often includes delivering a specific intervention or named programme in line with a manual. Staff might require specific training to deliver this targeted approach.

Box 2. Response to Intervention

Response To Intervention (RTI) is a structured, multi-tiered approach to help identify and support struggling students. It focuses on providing high-quality instruction and interventions, typically at three different levels (i.e., tiers). All students should be provided with high-quality classroom instruction and screening as part of Tier 1. It is anticipated that around 80 percent of students will achieve the targeted goals through Tier 1 instruction. However, some students, especially those with SEND, may require additional support. Tier 2 interventions are often provided in small-group sessions in the classroom during independent work or during times that do not conflict with other critical content areas. Tier 3 provides intensive intervention sessions for individual students with more significant

needs or whose needs are not sufficiently met by Tier 2 supports, and this support is often provided on a 1-to-1 basis (Fuchs & Fuchs, 2006).

The current project focuses on "manualised" (i.e., has a published and accessible manual) targeted intervention approaches (either Tier 2 or Tier 3) that go beyond good quality teaching (Tier 1).



1.3. Research evidence and research-informed practice

It has long been established that research should inform educational practice, as it is recognised that teaching practitioners' engagement with research evidence can lead to increased knowledge and skills around approaches that are effective for including all children in the classroom (Mintz et al., 2020). There is also a current consensus among teachers that practice should be informed by research (Coldwell et al., 2017). However, despite multiple efforts, the uptake of research evidence in practice is still low (Coldwell, 2022). In addition, it is not always clear what teachers consider to be "evidence" in relation to evidence-based practice.

The term "evidence-informed teaching" is used to mean practice that is influenced by robust research evidence (Coldwell et al., 2017). However, there has been ongoing discussion regarding what constitutes high-quality evidence of effective practices in classroom settings. Randomised control trials (RCTs; see Box 3) have long been the gold standard for evaluating the efficacy of interventions (Shawn Green et al., 2019). These research methodologies allow for objective assessment to establish causal relationships between an intervention and its outcomes. However, they can be difficult to implement in school environments, due to the requirements to randomise students to particular interventions and to match control groups.

Box 3. Randomised Control Trials and Quasi-Experimental Designs

Randomised Control Trials (RCTs) are seen as the 'gold standard' way of evaluating what works. In RCTs, participants are randomly assigned to one of two groups: the experimental group receiving the intervention or the control group which either receives business-as-usual support in the classroom or another type of activity that is not of interest (an "active control trial").

Quasi-Experimental Designs (QEDs) are studies in which two groups of participants are matched based on one or more characteristics, and one group receives the intervention whilst the other receives either business-as-usual or an active control intervention. QEDS are different from RCTs because participants are not randomly allocated to groups.

As teachers use multiple strategies to support students with their learning (Guldberg, 2017), it is important for them to know what works for addressing different types of learning need, and to have a clear and compelling justification for the educational strategies they use in practice. In addition, understanding what an intervention's key ingredients are (i.e., the cause and effect of the intervention) allows for greater fidelity in its implementation (Mintz & Roberts, 2023).

However, before teachers can implement evidence-informed practice, certain conditions must prevail (Slavin, 2017). First, a wide variety of proven programmes must be available in various educational areas (e.g., reading, writing, mathematics, science, and general attainment[3]) for every phase of education, as students' needs are likely to vary across tasks and educational phases. Secondly, educators but also policymakers like the DfE, who define teacher training programmes and the availability of support and budgets, must have access to trusted, impartial, and educator-friendly reviews of research to identify which specific programmes and practices have been proven effective through rigorous evaluations.

1.4. Research synthesis

To consolidate evidence, researchers conduct systematic reviews and meta-analyses. These two research methods involve gathering all the research pertaining to a specific research question and scrutinising it systematically. Systematic reviews are frequently conducted to assess the impact of interventions or programmes on particular outcomes, such as academic achievement, for a defined population. Thus, systematic reviews seek to derive conclusions regarding intervention effectiveness based on the highest quality research evidence available, and to identify any research gaps. Statistical meta-analyses build on systematic reviews, as they take the quantitative findings from multiple studies and summarise these results into a single summary estimate of effect size to estimate the magnitude and direction of the treatment effect across the body of literature as well as any mediators that might impact on these effects.

[3]General attainment was defined as outcomes assessed through standardised tests, grades, or other measures of academic performance and learning outcomes (such as GCSE or A-level performance as well as overall grade outcomes).

The first stage in a systematic review and meta-analysis involves formulating a research question, followed by identifying key search terms that allow for database searches to identify relevant research studies. Once the studies have been screened against the pre-set inclusion criteria of the review (first based on information provided in the title and abstract, followed by full-text screening), data from each study are extracted.

1.5. Previous reviews and meta-analyses

Although several previous systematic reviews have examined which interventions are effective for those with SEND (e.g., Carroll et al., 2017; Cullen et al., 2020; Davis & Florian, 2004), there are limitations with the current literature. First, previous reviews have tended not to consider the different tiers used in educational services or to separate evidence-based instruction (Tier 1) from targeted interventions (see Box 2). Secondly, previous narrative reviews and meta-analyses have focused on particular groups of SEND (e.g., Bond et al., 2016 for autism; Ebbels et al., 2019 for language disorders) or focused on particular curricular areas. As such, it is not yet known whether targeted interventions can benefit multiple groups of students with SEND to a similar extent, or what contextual factors might impact the effectiveness of targeted interventions for particular groups or academic domains. For example, it is unclear what works in different phases of education (primary versus secondary school) or school context (mainstream versus special school setting).

Interventions are allocated based on the diagnostic label applied to the child rather than their needs (Dockrell et al., 2019). However, there is evidence that diagnostic labels are often determined by contextual factors outside of the child, such as their ethnicity and gender, the socio-economic status of the parents, and the local authority in which the family lives (Lee et al., 2024). For example, one study of 530 children with various problems in attention, memory, language, or poor school progress showed that a child's cognitive profile was not predicted by diagnosis or referral reason (Astle et al., 2019). It also identified four transdiagnostic groups of children with specific cognitive profiles and distinct patterns of brain organisation. This reflects other recent research showing that there is high co-morbidity between different types of SEND. For example, students with mathematical learning difficulties are 16 times more likely to have a diagnosis of another learning difficulty or developmental condition (Morsanyi et al., 2018). Together these studies suggest that a transdiagnostic approach should be used when supporting students with SEND and that similar targeted interventions might work for students with different but comorbid diagnostic labels.

In sum, to improve outcomes of students with SEND, it is critical to identify: (a) which practices are effective and evidence-based; (b) which practices are being implemented in practice; and (c) where there are barriers to implementing the effective, evidence-based practices (i.e., a research-to-practice gap). The current study addresses each of these.

Box 4. Report overview and target audience

The report is aimed at educational practitioners, policy makers, people who support and work with individuals with SEND, parents and the public, as well as researchers and funders. Short summary infographics and accessible briefings can be accessed via the QR code below. This report is unique in providing an overview of the Tier 2 and Tier 3 interventions that have been evaluated for different groups with SEND, what the outcomes of these studies were, how practitioners use this evidence base, and what gaps should be addressed in future research to raise educational outcomes for students with SEND. We use our findings to recommend what interventions could be implemented in practice, and have produced a database that educational practitioners can use. Our findings, and the database, provide a new opportunity to raise the educational outcomes of individuals with SEND.

Links to short and accessible briefings of this report as well as the database can be found on the CDLD lab webpage and the Centre for Educational Neuroscience MetaSENse webpage.

2. About this study

This study synthesises evidence of what works for students with different types of SEND aged 4 to 25 in a systematic review followed by a meta-analysis (Phase 1). A broad scope in terms of target groups and educational outcomes was used. This allowed us to scope the current evidence base and examine:

a) whether targeted interventions can raise educational outcomes for those with diverse SEND,
b) whether the impact of these interventions differs for educational domains and groups of SEND,
c) whether certain interventions work better in some educational contexts (special versus mainstream) and/or for different phases of education (primary versus secondary).

We were able to address these questions within one review, rather than requiring stakeholders to compare findings across reviews.

In Phase 2, we used in-depth interviews to identify what practices are being implemented in schools and explore barriers that educational professionals face in implementing the most effective practices as indicated by the evidence.

In Phase 3, we produced a toolkit that summarises the findings from Phases 1 and 2. This toolkit includes a searchable database of the intervention approaches identified in Phase 1. The database was co-designed with input from the educational professionals interviewed in Phase 2.

3. Research questions

1. What does good quality evidence show about the potential for improving academic outcomes (i.e., reading, writing, mathematics, science, and general attainment) for students with SEND using targeted interventions?

    - How many studies have been conducted on different types of targeted interventions (Tier 2/ Tier 3), aimed at raising academic outcomes for students of different ages with different types of SEND?
    - What are the key methodological characteristics (study design, outcome measures, potential risks of bias, etc.) of the studies that have evaluated targeted interventions to raise academic outcomes for students with SEND?
    - What are the conclusions from the research examining targeted interventions to raise academic outcomes for students with SEND, and how do these relate to their populations, methods, outcomes measured, and questions asked?
    - What is the external validity of the current evidence base?
    - What gaps can be identified based on the current evidence base?

2. What is the overall effect size of targeted interventions aimed at improving educational outcomes for students with SEND, and which factors—such as educational context, phase of education, delivery methods, subject matter, type of SEND, and type of outcome measure used—contribute to variations in the effect sizes of primary outcomes?

3. How do educational professionals currently select which targeted interventions to use, and what are the barriers to their implementing the most effective strategies as indicated by the evidence?

4. What does the current evidence base look like?

To address research questions 1 and 2, we carried out a systematic review and meta-analysis of the current evidence that critically evaluates the impact of targeted interventions for students with SEND.

4.1. Methods: How were studies selected?

The review reported adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021) and the review protocol was pre-registered at https://osf.io/2hy5t/.

4.1.1. Searching the literature

To identify all eligible studies, an extensive search was conducted using the following databases:

- PsycINFO
- PsycEXTRA
- Web of Science
- Scopus
- Education Resource Information Centre (ERIC)
- British Education Index (BEI)
- Applied Social Sciences Index & Abstracts
- Education Database
- PubMed

The following additional resources were also searched:

- Nuffield Foundation research reports
- Education Endowment Foundation completed projects
- What Works Clearinghouse
- Council for Exceptional Children
- Blueprints for Healthy Youth Development
- Early Intervention Foundation
- Evidence for ESSA/Best Evidence Encyclopedia
- European Platform for Investing in Children
- National Dropout Prevention Centre
- British Psychological Society
- Nesta
- National Foundation for Educational Research (NFER)

The search terms used in the electronic databases are listed in Table 1. These terms were entered into each of the databases above to identify materials containing them.

Table 1. Search terms

Population	SEND OR SEN OR “Special education* need*” OR “Special need*” OR “learning difficult*” OR “learning disab*” OR “intellectual disab*” OR “intellectual disorder” OR disab* OR “additional needs” OR disorder* OR impair* OR autism OR asperger* OR “autis* spectrum” OR ADHD OR “attention deficit disorder” OR “attention deficit hyperactivity disorder” OR dyslexi* OR “speech difficult*” OR “speech language and communication needs” OR “language difficult*” or “reading difficult*” or “sensory processing difficult*” OR “multi-sensory impair*” OR dysgraphi* OR dyscalculi* OR “mathematical learning difficult*” OR MLD OR “reading impairment*” OR “speech impairment*” OR “hearing impair*” OR “visual impair*” OR “vision impair*” OR blind OR “hearing difficult*” OR deaf* OR “hard of hearing” OR “conduct disorder” OR “behavioural emotional and social difficult*” OR “communication and interaction needs” OR “serious emotional disturbance” OR “social emotional and mental health difficult*” OR SEBD OR “attachment disorder” OR “moderate learning difficult*” OR “profound and multiple learning difficult*” OR “severe learning difficult*” OR “specific learning difficult*” OR “specific learning disab*” OR “traumatic brain injur*” OR syndrome OR “pragmatic difficult*” AND child* OR adolescent* OR “young people” OR preschool* OR kindergarten* OR "school aged" OR student* OR pupil* AND
Intervention	school* OR educat* OR classroom OR inclus* OR learning OR “Special educat* provision*” OR “special educat*” OR “Alternat* educat* setting*” OR mainstream* OR “primary school*” OR “primary education*” OR “secondary school*” OR “secondary education*” OR “elementary school*” OR “middle school*” OR “high school*” OR “comprehensive school*” OR “grammar school*” OR “learning environment*” OR “extra-curricular setting*” OR playground OR “breakfast club” OR “holiday club” OR “holiday camp” OR “whole school” OR “remedi* class*” OR “higher educat*” OR “higher educat* setting*” OR “further educat*” OR “further educat* setting*” AND

Outcome	*Note: each search was rerun using one of the below subject specific search strings combined with all other search terms for a total of 5 searches* *General outcome search terms (i.e., not subject specific):* "educational assess*" OR "academic assess*" OR "educational measure*" OR "academic measure*" OR "educational performance" OR "academic performance" OR "educational attainment" OR "academic attainment" OR achiev* OR "educational outcome*" OR "academic outcome*" OR attainment OR abilit* OR SAT* OR GCSE OR A-Level OR T-level OR "Grade Point Averag*" OR "Phonics screening check" OR NVQ OR "vocational qualification*" OR diploma* OR apprenticeship* OR certificate *Reading outcome search terms:* read* OR literacy OR "letter recognition" OR "letter-sound knowledge" OR "word reading" OR phonic* OR phonolog* OR "reading comprehension" OR "reading accuracy" OR "reading fluency" OR "reading delay*" OR "print knowledge" OR decod* OR "alphabet knowledge" OR "listening comprehension" OR "word recognition" OR "sentence completion" *Writing outcome search terms:* writ* OR literacy OR punctuation OR spelling OR "sentence writing" OR "free writing" OR "early writing" OR "emergent writing" OR "guided writing" OR "writing fluency" OR handwriting OR "interactive writing" OR "letter typing" OR "sentence completion" *Mathematics outcome search terms:* math* OR numer* OR numb* "number sense" OR arithmetic* OR geomet* OR shape OR calcul* OR algebra OR counting OR addition OR subtraction OR multiplication OR division OR fractions OR statistics* OR "place value" OR "math* competenc*" OR "math* concept*" OR "math* knowledge" OR "problem solving" *Sciences outcome search terms:* science OR chemistry OR geology OR physics OR biology OR astronomy OR "natural science*" OR "earth science*" OR STEM NOT "stem cell*" OR ICT OR IT OR "information technology" OR "computer science" OR "engineer*" AND
Study type	RCT OR QED OR "control trial" OR "controlled trial" OR "randomised control trial" OR "randomized control trial" OR "randomised controlled trial" OR "randomized controlled trial" OR "quasi-experimental design" OR "quasi experimental design" OR "quasiexperimental design" OR "intervention group*" OR "control group*" OR "experimental group*" OR intervention* OR randomised OR randomized

4.1.2. Criteria for inclusion and exclusion from the search

- **Study type:** Included studies used research designs that are high on the evidence base hierarchy (i.e., randomised control trials (RCTs) and quasi-experimental designs (QEDs)). Studies using matched group designs, cross-over designs, single-subject designs, and correlational designs were excluded.

- **Publication year**: Studies included were published between January 2000 and February 2023.
- **Location and language:** No restriction was placed on geographical location, but all studies had to be published in English.
- **Population:** Studies included reported on an intervention targeting at least one group of students with SEND aged between 4 and 25 years old. The individuals with SEND had an independent pre-existing indicator or diagnosis that placed them into a SEND category. This could take the form of a clinical diagnosis of a SEND condition or be indicated by an Education, Health and Care Plan (EHCP) or standardised diagnostic measure (e.g., ADOS). In addition, we included studies that screened students who may fall into a SEND category using a norm-referenced measure. Studies that focused on at-risk populations were included if the students' performance fell within the bottom 25th percentile or they had IQ scores below 70. We only included studies based on a sample with age ranges that extended beyond the range of 4 to 25 if the mean age of the sample fell within this range.
- **Intervention:** Included studies had to evaluate a named and "manualised" (i.e., has a published and accessible manual) targeted intervention approach (either Tier 2 or Tier 3). Interventions administered on a universal basis and practices such as good teaching, professional career development, or whole-school approaches were excluded, as were interventions that merely used a tool (e.g., visual overlays). We placed no limits on the type of intervention under investigation (e.g., explicit academic focus, social and emotional learning focussed intervention, etc.). However, interventions had to be based in educational or specialist settings (such as schools, special educational settings, speech and language clinics, as well as before and after school settings and holiday camps/clubs, etc.). We included studies of interventions delivered across multiple settings (e.g., schools and in the home) as long as 50% of the sessions were delivered in a school or educational setting. Interventions that solely focussed on working with parents or were delivered by parents in the home were not included. Pharmacological interventions, i.e., those that prescribed medication or drug-based therapies as the primary treatment method, were excluded.
- **Comparison**: Included studies had to include at least one comparison group. However, we placed no limits on the type of control condition (e.g., waitlist, business as usual, alternative treatment, active comparison, etc.).
- **Outcomes**: Studies had to report on at least one attainment score or educational outcome (reading, writing, mathematics, or science). Studies that measured educational outcomes using observational protocols or holistic teacher judgements (e.g., teacher perceptions of improvement), as opposed to quantitative aggregation of marks from multiple test items, were excluded.
- **Type of publication**: Narrative reviews and summary chapters were excluded, as were studies that did not include a description of the targeted intervention that was explicit and replicable (e.g., conference papers or extended abstracts).

4.1.3. Selection of studies

Screening of studies was undertaken in EPPI-Reviewer Web (Thomas et al., 2022) and the 'Mark Automatically' deduplication feature was used to remove any duplicates. Trained research assistants (N = 11) completed the initial screening on title and abstract

following the pre-registered search strategy. Ten percent of titles and abstracts were checked independently by the first and second author against the inclusion/exclusion criteria. The inter-rater reliability (based on percentage agreement) was very high at .93. Full texts of potentially eligible studies were located and again screened independently by seven research assistants. Ten percent of full texts were independently double screened by two members of the review team and a very high inter-rater reliability of .85 was achieved. Reasons for excluding studies were documented.

4.1.4. Data extraction and coding of the different types of interventions

Data from each study was extracted by nine trained researchers and 10% of the extracted data was coded independently by two members of the review team (inter-rater reliability was very high with .82 for data extraction and .84 for study quality analysis).

The targeted interventions were coded in terms of their focus or the mechanism of change they used. We coded for three aspects: 1) whether the proposed mechanism involved narrow (domain specific), wider (domain general), or mixed processes; 2) the sub-category of skill they focused on (i.e., core, procedural, application, mixed, or tools); and 3) the outcome domain targeted by the intervention (i.e., reading, writing, mathematics, science, general attainment, or any combination of these). Some further detail on the coding of 1) and 2):

- **Narrow approaches (Domain specific)**: These are interventions that train specific aspects of cognitive development or learning related to the academic areas of reading, writing, mathematics, or science. Domain specific interventions were sub-coded using the following categories:
    - Core knowledge = interventions that focus on the foundations or core concepts related to the specific academic area
    - Procedures = interventions that focus on how to perform a specific skill or task better or more fluently (e.g., those that focus on how to solve a mathematics word problem or how to read for comprehension, or those that improve fluency for reading/ calculations)
    - Application = interventions that focus on how to apply knowledge (e.g., those that focus on manipulatives or on reducing reading out loud)
    - Mixed = interventions that include any combination of the above
    - Tools = interventions that used a specific tool (e.g., daily behavioural cards).
- **Wider approaches (Domain general)**: Interventions that include strategies or mechanisms that are potentially relevant to all aspects of learning (e.g. working memory, meta-cognitive strategies, wellbeing, moving/ swimming/ self-regulation, behaviour, music therapy).
- **Mixed**: Interventions that use a wider approach but apply it to a narrow area.

4.1.5. Assessment of the quality of RCT and QED studies

Studies were not excluded from the synthesis and meta-analysis based on quality, as this allowed us to examine the impact of varied methodologies on effect sizes, as well as to obtain an indication of the rigour of current research. The quality of the studies was assessed using adapted versions of the Joanna Briggs Institute quality assessment tools for

quasi-experimental (Barker et al., 2024) and RCT (Barker et al., 2023) study designs. As studies often included different interventions, and analyses often differed based on the outcome measures used, study quality was assessed for each outcome measure separately. This also allowed us to include the quality category of the study into sensitivity analyses in the meta-analysis described below (see Table 2).

The RCT quality assessment tool included 12 questions and the QED tool included 10 (See Appendix B). Each question received a score of 0 (criteria not met), 1 (criteria partially met), or 2 (criteria fully met).

Table 2. Total score thresholds for study quality for RCTs and QEDs

Total Score threshold	Low Quality	Moderate quality	High quality
RCT	0-9	10-17	18-24
QED	0-8	9-15	16-20

4.1.6. Meta-analysis methods description

Studies that reported effect sizes or allowed the research team to calculate effect sizes were included in a series of meta-analyses and meta-regressions to explore how the effectiveness of interventions differed by individual SEND category as well as intervention and delivery characteristics. Where studies did not report descriptive statistics, such as means and standard deviations, a numerical effect size and corresponding standard error effects sizes were calculated from F ratios, t-values, regression coefficients, etc.

Studies for which we could not retrieve the information necessary to calculate an effect size and standard error were included in the narrative review but excluded from the meta-analysis. Multiple outcomes from within a study were included and all analyses made use of Correlated and Hierarchical Effects (CHE) models, an extension of three-level meta-analysis methods that accounts for dependence between effect sizes drawn from the same studies (Pustejovsky & Tipton, 2022). We opted to include all available outcomes in the analyses to avoid bias from selecting one effect size over another, and to increase the number of effects available to us to conduct meta-regressions to explore moderating effects, such as the quality of the outcome measure used (e.g., standardised vs non-standardised outcome measures).

In this report, we only focus on short-term outcomes, as based on previous research (see Dietrichson et al., 2020) very few studies were expected to report long-term outcomes. We only extracted data related to the educational outcomes (e.g., reading, mathematics, etc.).

4.1.6.1. Publication bias

A funnel plot analysis was used to interrogate whether there was publication bias in the currently available evidence. Publication bias was assessed using Egger's regression test of asymmetry (Egger et al., 1997). The "Duval and Tweedle's trim and fill technique" was used to measure the effect of publication bias on the estimated treatment effect(s) when

publication bias was indicated by a significant Egger's test (Duval & Tweedle, 2000). Results of the publication bias analysis can be found in appendix C.

4.1.6.2. Power analysis

We undertook a priori power analysis using a randomly selected pilot sample (1.63%; n = 906) of data drawn from our de-duplicated searched records. However, this pilot sample did not represent the full set of SEND categories that were included in the final sample, since some types of SEND are underrepresented in the available literature and our pilot sample was not big enough to pick them up. As a result, we undertook a second round of post-hoc power analyses after data-extraction.

4.1.6.3. Moderation analyses

We used meta-regression to investigate how different types of SEND, as well as intervention characteristics, impacted the reported effect sizes of targeted interventions to raise educational outcomes. We first examined the overall effect of the interventions. We then examined the effectiveness of interventions for students with different types of SEND and in different outcome domains (i.e., reading, mathematics, writing, science, and general attainment), and how, within each outcome domain, intervention characteristics altered effectiveness.

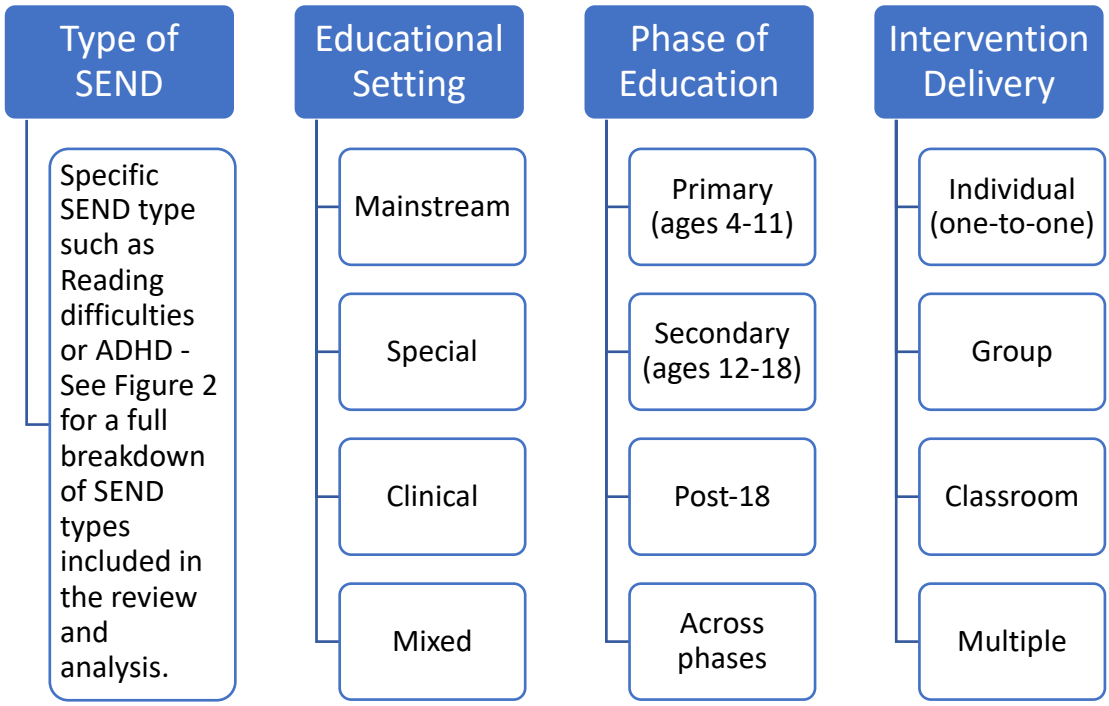
We examined the following characteristics to explore their impact on intervention effectiveness:

- Phase of education (primary, secondary, post-secondary or across phases -i.e., interventions that included students from more than one phase of education)
- Educational setting (mainstream, special education, clinical setting, or mixed setting)
- Intervention delivery format (classroom based, small group, individual or multiple delivery formats)
- Type of SEND of the participants in the study according to Census categories:
    - Specific Learning Difficulties (SpLD);
    - Moderate Learning Difficulties (Moderate LD);
    - Severe Learning Difficulties (Severe LD);
    - Profound and Multiple Learning Difficulties (PMLD);
    - Speech, Language and Communication Needs (SLCN);
    - Social, Emotional and Mental Health (SEMH);
    - Autistic Spectrum Disorder (ASD);
    - Vision Impairment;
    - Hearing Impairment;
    - Multisensory Impairment (MSI);
    - Physical Disability (PD);
    - 'SEN support' but no specialist assessment of type of need (NSA).

However, we did use sub-categories for specific named conditions where possible (e.g., ADHD, Dyslexia/Reading Difficulties, Dyscalculia/Mathematical Difficulties), to allow for a fine-grained insight into what groups were included. When participants with multiple types

of SEND (within or between individuals) were combined into one group, this group was labelled 'Mixed SEND'.

Box 5. Moderators used to examine the impact of type of SEND and intervention characteristics on targeted intervention effectiveness.



All moderators also included a 'Not Reported' category for studies that did not report in sufficient enough detail to be coded according to the above categories.

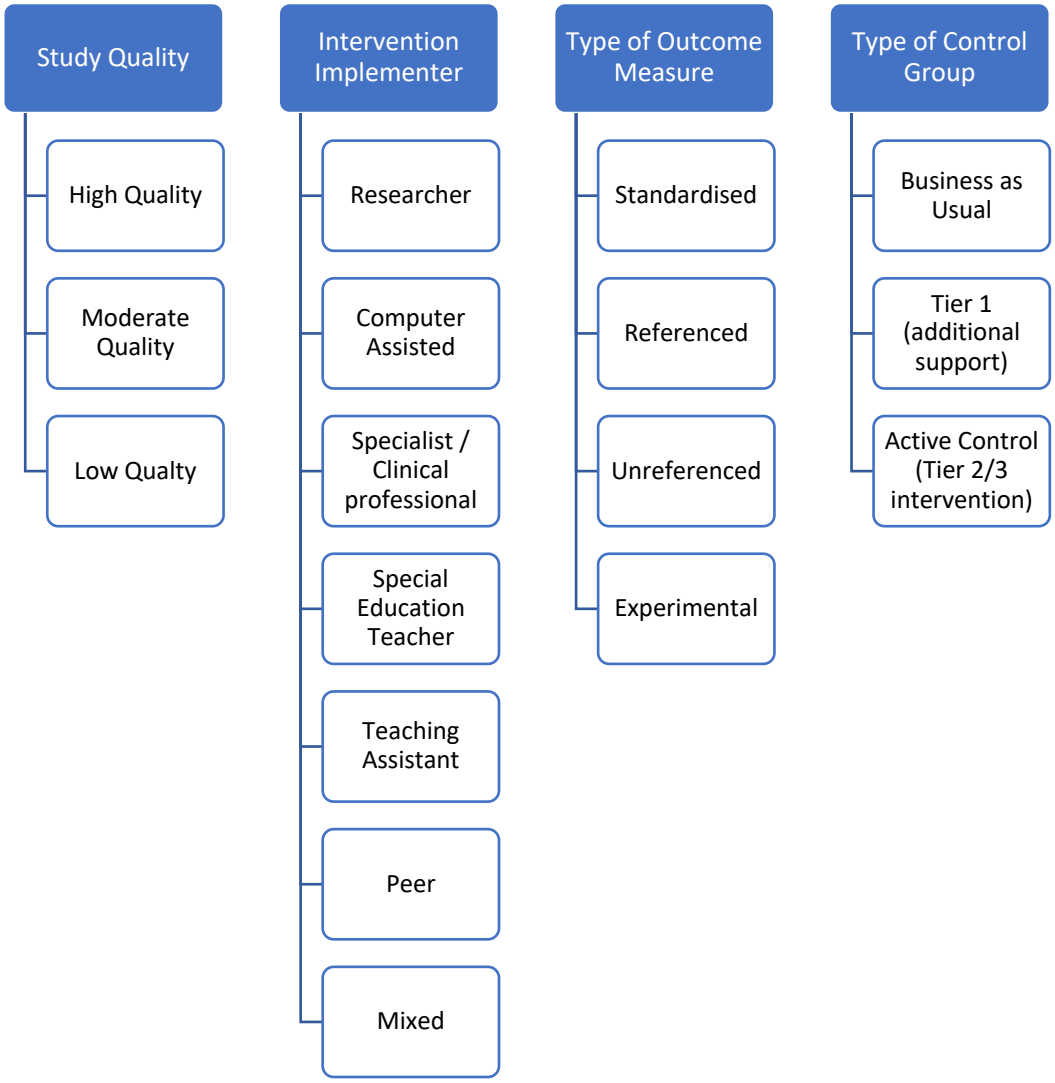
4.1.6.4. Sensitivity analyses

We use subgroup analysis to examine whether there was a systematic difference in the size of observed effects across the included studies based on:

- The quality of included studies (i.e., high, moderate or low quality)
- Intervention implementer (researcher, computer assisted, specialist professional, classroom teacher, specialist teacher, teaching assistant, mixed or not reported)
- The type of outcome measure used (standardised/normed measures, researcher created, referenced measures[4], and unreferenced or unclear)
- The type of control group (business as usual, active control group that receives Tier 2/3 intervention, control group that receives Tier 1 intervention).

[4] These include outcome measures that have been published or used in previously published research. These may be normed or created by other researchers.

Box 6. Study characteristics used in sensitivity analysis.



All moderators also included a 'Not Reported' category for studies that did not report in sufficient enough detail to be coded according to the above categories.

4.2. Findings of the systematic review and meta-analysis

4.2.1. Overview of included studies

Overall, the search identified 120,369 potential records. After removing duplicates, 55,546 records remained, which were screened for inclusion at title and abstract followed by full text. Through screening, 55,111 studies were excluded, leaving a total of 435 included records reporting on 467 studies. See Appendix A for the Prisma Flow Diagram.

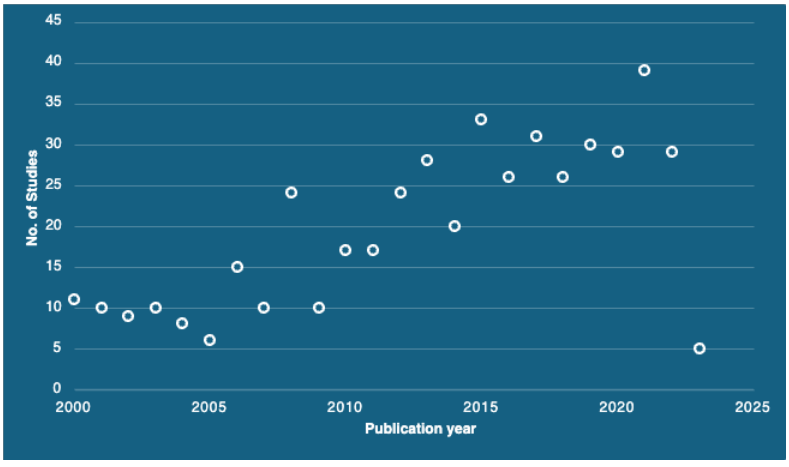
As can be seen in Table 3, included studies were drawn from at least 43 different countries across the world. The USA provided the greatest number of studies (48%), with only 21 studies (4.5%) coming from the UK.

Table 3. Number of studies from each country

Country	No. of studies	Country (continued)	No. of studies (cont.)
USA	225	Belgium	2
Netherlands	26	India	2
UK	21	New Zealand	2
Spain	19	Norway	2
Canada	18	Pakistan	2
Italy	17	Saudi Arabia	2
Iran	15	Thailand	2
Germany	14	Tunisia	2
China	13	*Unclear*	2
France	9	Algeria	1
Sweden	8	Brazil	1
Israel	7	Chile	1
South Africa	7	Egypt	1
Australia	6	Ireland	1
Finland	6	Kuwait	1
Brazil	5	Malaysia	1
Greece	5	Nigeria	1
Hong Kong	5	Oman	1
Taiwan	5	Poland	1
Turkey	4	South Korea	1
Singapore	3	Switzerland	1
Austria	2	UAE	1
		Total	471[5]

An average of 20 studies were published per year but, as can be seen in Figure 1, the number of published studies included rose steadily over the years. The number of studies for 2023 is low as we only included studies published before March 2023.

Figure 1. Number of studies included by publication year



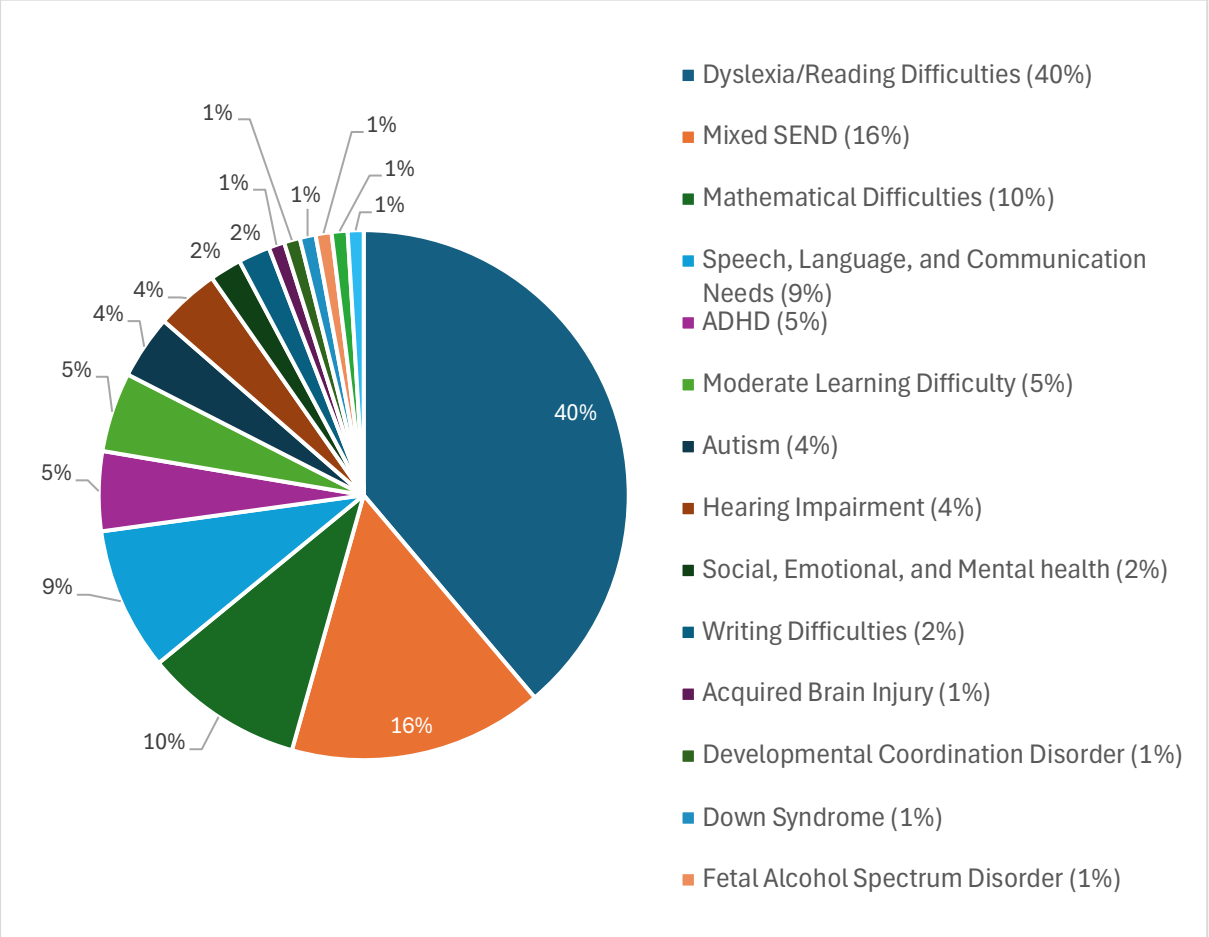
[5] Four studies were undertaken across two countries. Therefore, these studies are counted twice, once for each country the sample was drawn from.

The 467 studies reported on 279 RCTs (59%) and 188 QEDs (41%), with data from 58,721 students included. The average number of participants in each study was 126 and numbers ranged from 6 to 6,888. However, 50% of all studies had fewer than 50 participants in the intervention and control groups combined.

Over half of the studies (58%) were carried out in mainstream settings, with 27% in special schools, 4.5% in clinical settings, and 5% in mixed settings. For 5.5% of the studies the setting was not reported. Most studies included primary school children alone (58%) or students from more than one phase of education (27%). Only a small number of studies (14%) focused specifically on secondary school or older students.

Studies reported on interventions trialled with students from 16 different types of SEND. Those classified as 'mixed' were trialled with individuals with multiple overlapping SEND and/or groups of students with a range of different types of SEND. Interventions that included students with Dyslexia/Reading Difficulties represented by far the largest group (40%). This was followed by the Mixed group (16%), then interventions that were trialled with those with Dyscalculia/Mathematical Difficulties (10%); Speech, language, and communication needs (9%); ADHD (5%); and Moderate LD (5%). Interventions that included other Types of SEND represented less than 5% of the studies included in the review. See Figure 2 for a full breakdown of studies by SEND type.

Figure 2. Type of SEND of participants in the studies included in the review



Most of the studies (84%) included a control group that had SEND, with a small number of studies including typically developing students matched to the intervention group on age (7%) or abilities (<1%). The remaining studies used a mix of control groups. In nearly half of the studies (48%) control groups continued with their business-as-usual practices. The other studies included control groups that received a Tier 1 intervention (22%) or active control (Tier 2/3) approach (21%). For the remaining studies it was unclear what activities the control group completed (5%) or multiple different control groups were used (5%).

In terms of the interventions examined in these studies, 25% focused on wider approaches (domain general) and 68% focused on specific approaches (see section 4.1.4). As can be seen in Table 4, the wider or domain general interventions used a wide range of approaches.

Table 4. Overview of approaches used in domain general interventions by number of studies and outcomes for all studies included in the narrative review.

Types of approaches included in domain general interventions	No. of studies	% of studies	No. of outcomes	% of outcomes
Art therapy	2	1	2	1
Attention training	4	3	11	2
Auditory processing	10	6	50	9
Behavioural intervention	4	3	5	1
Buddy system	1	1	1	1
Computer games	1	1	4	1
Executive functioning	4	3	14	2
Language programme	2	1	6	1
Meta-cognitive strategies	28	18	107	19
Mixed	13	8	38	7
Multi-sensory	5	3	10	2
Music	6	4	31	6
Physical activity	10	6	50	9
Study strategies and tutoring	11	7	41	7
Technology	1	1	3	1
Tools	16	10	63	11
Visual attention	12	8	39	7
Visualisation	1	1	2	1
Working memory	21	14	86	15
Total	153		563	

Most domain specific interventions focused on reading (63%), followed by mathematics (21%), then writing (10%) (see Table 5). In addition, across the different outcome domains, most of the interventions focused on improving core abilities or a

mixture of core and other abilities (see section 4.1.4). Very few interventions focused on science.

Table 5. Overview of approaches used in domain specific interventions broken down by outcome domain (core, procedure, application, etc.) for all studies in the narrative review (see section 4.1.4 for a description).

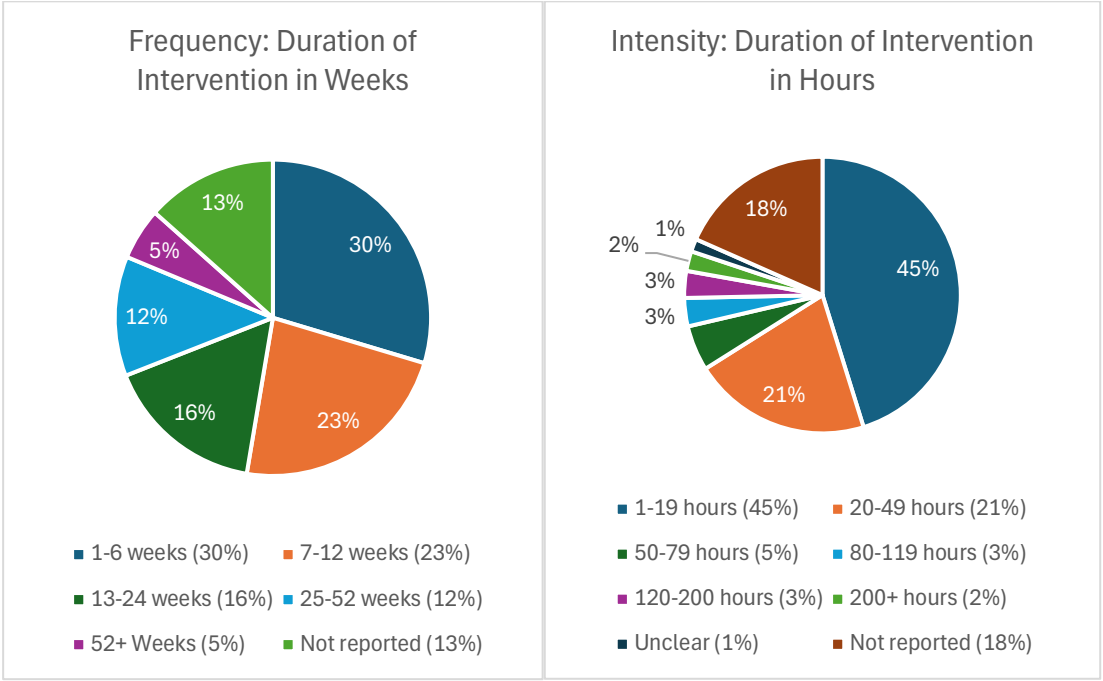
Type of domain specific intervention	No. of studies	% of studies	No. of outcomes	% of outcomes
Reading Core	130	51	709	52
Reading Procedure	36	14	162	12
Reading Application	13	5	36	3
Reading Mixed	77	30	455	33
Reading Tools	2	1	7	1
Reading Unclear	0	0	0	0
Total	257		1,369	
Writing Core	15	36	64	29
Writing Procedure	8	19	45	21
Writing Application	6	14	32	15
Writing Mixed	13	31	77	35
Writing Tools	0	0	0	0
Writing Unclear	0	0	0	0
Total	42		218	
Mathematics Core	40	47	138	36
Mathematics Procedure	9	10	37	10
Mathematics Application	3	3	6	2
Mathematics Mixed	31	36	188	49
Mathematics Tools	2	2	8	2
Mathematics Unclear	1	1	5	1
Total	86		382	
Science Core	0	0	0	0
Science Procedure	0	0	0	0
Science Application	0	0	0	0
Science Mixed	3	100	6	100
Science Tools	0	0	0	0
Science Unclear	0	0	0	0
Total	3		6	
Mixed Core	5	23	24	15
Mixed Procedure	0	0	0	0
Mixed Application	1	5	3	2
Mixed Mixed	16	73	131	83
Mixed Tools	0	0	0	0
Mixed Unclear	0	0	0	0
Total	22		158	

Combined domain general and domain specific (domain mixed)				
Mixed	41	100	198	100
Total	41		198	41

There were further differences between interventions falling into the same category, e.g., whereas some core reading interventions focused on just phonological awareness being delivered through computerised games, other core reading interventions focused on a wide range of pre-reading and oral language abilities. However, a comparison of the impacts of these differences would require a component analysis, which we have not attempted here. Whilst various frameworks have been developed for coding the design features of educational apps (e.g., Hirsh-Pasek et al., 2015), there are currently no existing theoretical frameworks that can be applied across targeted interventions that focus on different educational outcomes. As a result, such a framework would need to be developed using a bottom-up approach, drawing on the descriptions available in the studies. Not only did this fall outside the scope of the current study, but the description of the interventions in the included studies was often too limited to complete such an analysis (see also Hall et al., 2023, who describe similar issues).

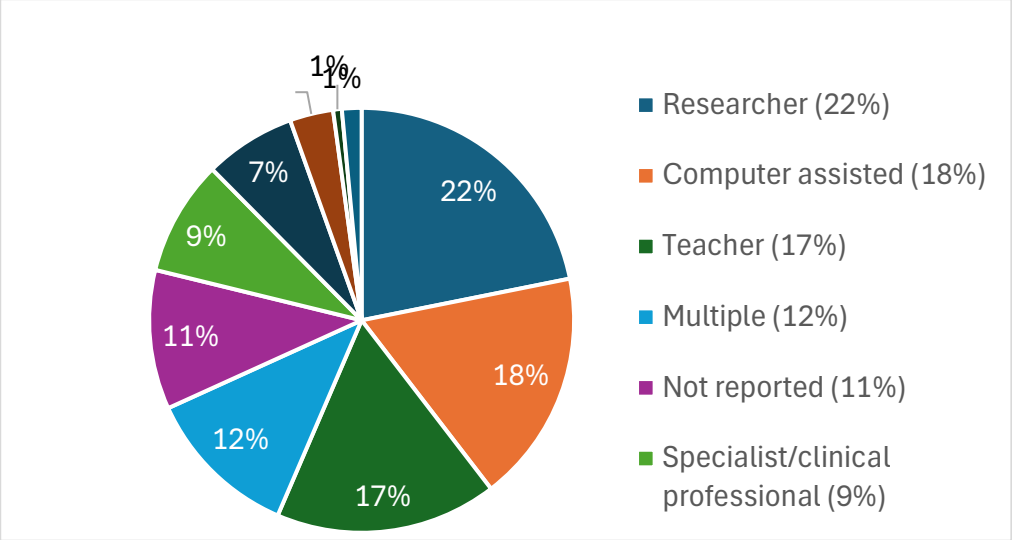
In terms of the duration of the interventions (See Figure 3 below), 53% of all interventions took between 1 and 12 weeks (which in the UK is just short of one term). Only 5% took longer than 1 year (52+ weeks). In terms of intensity (i.e., hours of intervention time), almost half the studies (45%) implemented the intervention for 19 hours or less. A significant number of studies did not report the length of the intervention in weeks (13%) or in total number of hours (18%).

Figure 3. Duration of interventions in weeks (left panel) and in hours (right panel)



A variety of individuals delivered the interventions (See Figure 4), with only 22% of interventions being implemented by researchers.

Figure 4. Implementers of the interventions included in the narrative review



In terms of outcomes, 65% of interventions measured reading performance, 17% mathematics, 15% writing, and 3% general attainment. Only 11 interventions (<1%) focused on science.

4.2.2. Overview of quality of studies

As the meta-analysis is performed on the outcomes of each study included and the impact of the quality of the study was included as a sensitivity analysis in the meta-analysis, the quality of the studies was assessed at the level of the outcomes. Of all outcomes, 25% were rated as being high quality, 68% moderate quality and only 7% low quality. Of the RCT studies, 88% did not include full information about how the groups were randomised, 89% did not explicitly state that allocation to treatment groups was concealed, and 40% did not include any information about implementation. Of the QED studies, for 61% of the outcomes no information about the implementation of the intervention was included and 37.5% involved groups that were not equal at the start of the intervention. Furthermore, for 34% of all outcomes there were issues with the statistical analyses. For all other quality items, most criteria were either fully or partially met.

4.2.3. Studies excluded from the meta-analysis

In total, 118 studies were excluded from the meta-analysis (See Table 6 below). As a result, 349 studies were included in the meta-analysis which reported on 1,758 outcomes.

Table 6. Overview of number of studies and total outcomes included in the narrative review and meta-analysis.

	Studies	Outcomes
Narrative review		
Included	467	2,891
Meta-analysis		
Excluded		
Effect size data not reported	80 (k = 387)	585 (n = 2306)
Subscale measures[6]	15 (k = 372)	342 (n = 1964)
Outliers	5 (k = 367)	47 (n = 1917)
Typically developing controls only	18 (k = 349)	159 (n =1758)
Included	349	1,758

Studies were not excluded on the basis of quality or publication bias. Rather, sensitivity analyses were run for each of the analyses for study quality and publication bias to see if these factors influenced the outcomes. Not excluding the studies based on these criteria allowed for a more representative overview of the current evidence base.

However, outcome effect sizes that were outliers and were larger or smaller than 3.5 (g = 3.5 / g = -3.5) were excluded from the analyses. In total, 47 outcomes were removed as outliers, leaving 1758 included outcomes.

For the moderation analyses, categories that had fewer than 10 outcomes were excluded from the analyses as recommended in the *Cochrane handbook of systematic reviews of interventions* (Higgins et al., 2023).

4.2.4. What works to raise outcomes for students with SEND? Evidence from meta-analysis

4.2.4.1. Overall impact of targeted interventions

The overall effect of all targeted interventions across all educational outcomes (i.e., reading, writing, mathematics, science and general attainment) for students with any type of SEND was g = 0.44, with confidence intervals ranging from 0.38 – 0.50[7]. This shows that, in general, targeted interventions do have a positive impact for students with SEND, who showed an average of five months additional progress compared to students with SEND in the control group[8]. However, as these interventions were implemented across students with

[6] Some studies will use multiple measures (i.e., subscales) which are then combined into an overall summary score (i.e., a main measure) and report effect sizes for both. To avoid double counting in our analysis where studies report both we use only main measures and not their component subscales.
[7] Publication bias analysis showed no significant funnel plot asymmetry.
[8] Effect sizes describe the size of the difference between two groups in a standard and comparable way. However, it can be difficult to understand what a given effect size actually means for the progress of children and young people. That is why we have used the conversion tables from the Education Endowment Foundation to translate the effect sizes into months of progress.

different types of SEND, in different contexts (special versus mainstream schools) and age groups (primary versus secondary schools), and they had different outcome measures (i.e., reading, writing, mathematics, science, and general attainment), there was a high level of heterogeneity[9] (93% overall heterogeneity and 61% between studies). Further analyses were therefore conducted to examine how the impact of these interventions differed depending on educational setting, phase of education, delivery format, type of SEND, and outcome domain (See Box 5 for a description of these factors).

There were insufficient outcomes for three types of SEND – Acquired brain injury (*n* = 2), DCD (*n* = 6), and Vision impairment (*n* = 1) – and so these were excluded from the meta-analysis (See Table 7).

https://d2tic4wvo1iusb.cloudfront.net/production/documents/toolkit/Toolkit_guide_v1.2_-_2023.pdf?v=1719672724

[9] Heterogeneity refers to the variability or differences between the studies being analysed. High heterogeneity in a meta-analysis indicates that the studies might be different in terms of the participants, interventions, outcomes measured, and/or methods used. This variability can affect the overall conclusions of the meta-analysis because the findings may not be consistent across different contexts or populations.

Table 7. Types of SEND that had fewer than 10 outcomes per outcome domain and were therefore excluded from moderation analyses.

	All outcomes together	Reading outcomes	Mathematics outcomes	Writing outcomes
Acquired Brain Injury	Excluded (*n* = 2)	Excluded (*n* = 0)	Excluded (*n* = 0)	Excluded (*n* = 0)
ADHD				
Autism			Excluded (*n* = 0)	Excluded (*n* = 0)
DCD	Excluded (*n* = 6)	Excluded (*n* = 2)	Excluded (*n* = 1)	Excluded (*n* = 3)
Down syndrome			Excluded (*n* = 8)	Excluded (*n* = 1)
Dyslexia/Reading Difficulties				
FASD			Excluded (*n* = 3)	Excluded (*n* = 3)
Hearing impairment			Excluded (*n* =1)	Excluded (*n* = 1)
Moderate LD				Excluded (*n* = 1)
Dyscalculia/Mathematical Difficulties		Excluded (*n* = 2)		Excluded (*n* = 0)
Mixed				
Severe LD			Excluded (*n* = 4)	Excluded (*n* = 0)
SEMH			Excluded (*n* = 0)	
SLCN			Excluded (*n* = 0)	Excluded (*n* = 0)
Writing Difficulties		Excluded (n = 6)	Excluded (*n* = 0)	
Vision impairment	Excluded (*n* = 1)	Excluded (*n* = 0)	Excluded (*n* = 0)	Excluded (*n* = 0)

As shown in Figure 5 below, there was clear evidence that interventions produced positive educational outcomes for those with Dyslexia and Reading Difficulties (*n* = 879), Dyscalculia/Mathematical Difficulties (*n* = 142), ADHD (*n* = 98), Moderate LD (*n* = 56), SLCN (*n* = 162), and SEMH (*n* = 26). However, for students with Down syndrome (*n* = 24), Autism, (*n* = 36), FASD (*n* = 18), Severe LD (*n* = 17), and Writing Difficulties (*n* = 49), the evidence is variable, with some effect sizes dropping below zero. More research on students with these types of SEND is required. Comparison between the average effect sizes for students with different types of SEND showed that there was a borderline significant effect (*p* = .06) for the different groups. However, given the significant variation in number of outcomes per type of SEND, it is likely that this analysis was insufficiently powered to detect differences by type of SEND.

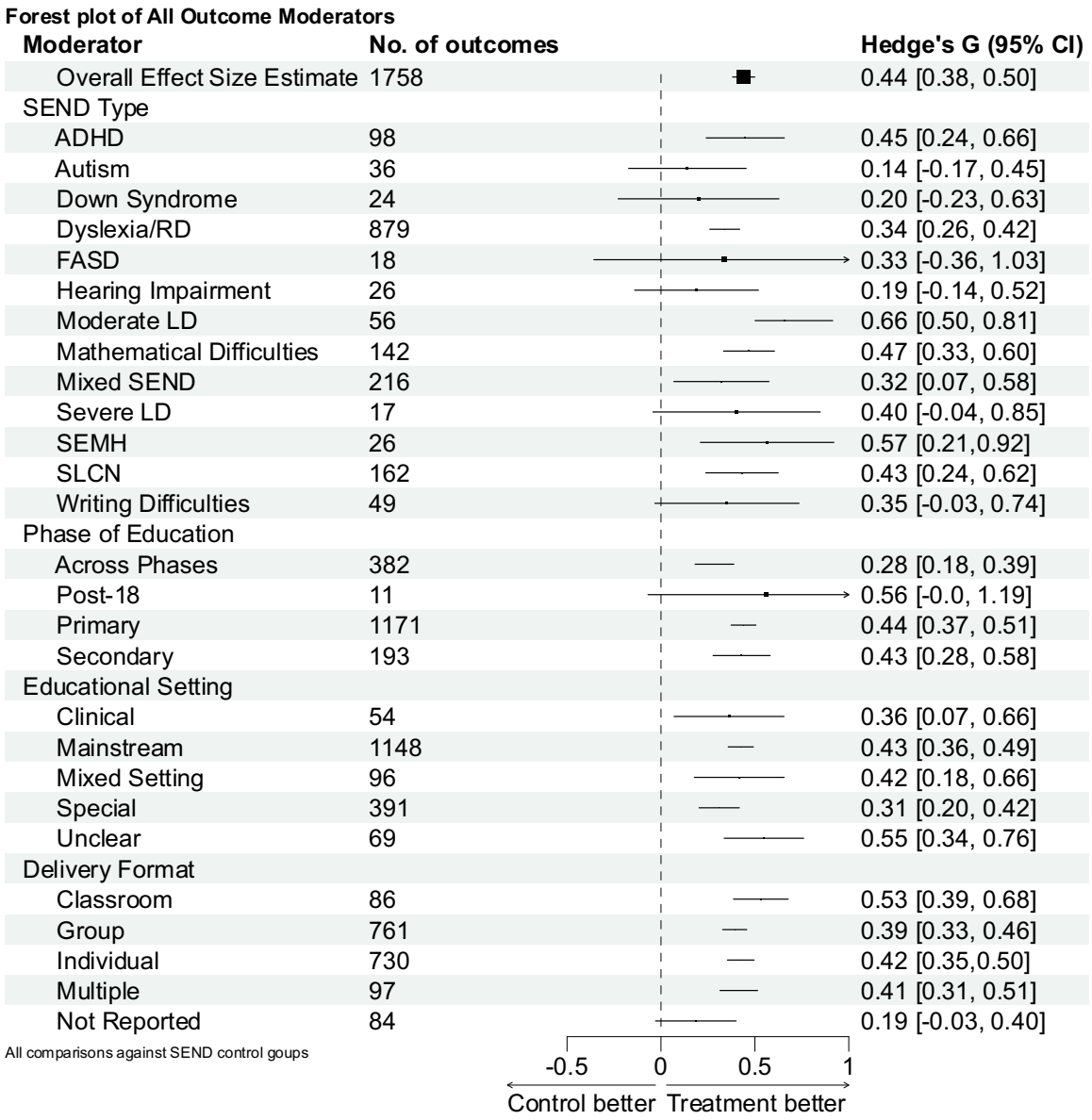
There were no differences in effect sizes depending on the different educational settings where interventions were delivered (p = .27). However, as can be seen from the forest plot below (Figure 5), there were large coefficients for interventions delivered in clinical settings, those delivered in mixed settings (at school and a clinical setting, for example), and those for which the setting was not reported. This shows that although there are no significant differences in effect sizes between interventions being implemented in mainstream versus special schools, there is some variation in effect sizes that warrants further investigation in the future, especially with respect to interventions implemented in clinical and mixed settings.

Comparing the effect sizes of interventions delivered in mainstream versus special schools showed a borderline significant difference (p = .07), with those delivered in mainstream schools resulting in slightly larger effects (g = 0.43, n = 1,148, equivalent to six months progress) than those in special schools (g = 0.31, n = 391, equivalent to four months progress). This difference likely reflects the fact that students with more complex needs are more likely to attend special schools (Pinney, 2017).

In terms of the phase of education, there was a borderline effect (p = .08). The forest plot in Figure 5 shows that effect sizes in the post-18 category varied greatly (from -0.0 to 1.19). As there were only 11 outcomes for this phase in our data, we excluded it from the analysis to see if this would influence the outcome. Once these post-18 outcomes are excluded, there is still a borderline significant difference for the phase of education (p = .05). This borderline significant difference is driven by the fact that the effect sizes for studies that included students from across different educational phases were significantly smaller than those in primary school settings only. However, there was no significant difference between the effect sizes for studies that included either only primary or only secondary school students. It is important to note that, whilst studies focused only on primary school children included 1,171 outcomes, those focused on secondary school students included only 193, those implemented in post-18 settings only 11, and those implemented across different phases 382 (the phase of education was not reported for one outcome, which was excluded from the meta-analysis). This shows that interventions delivered across a large age range (i.e., students across different phases) had lower effect sizes, and that there is less evidence around what interventions work for secondary school students.

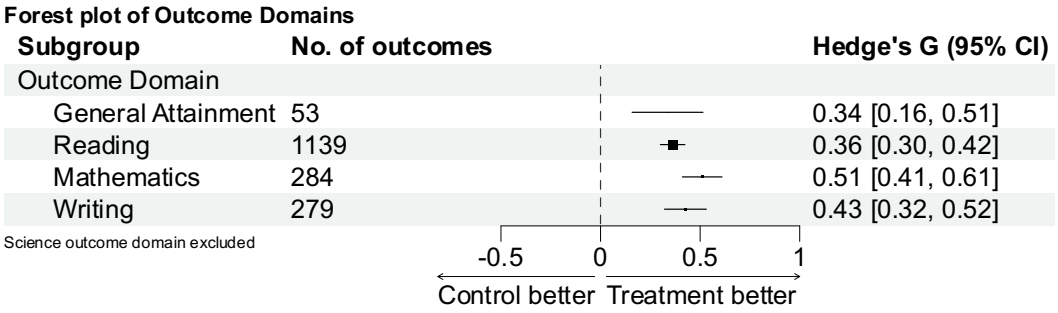
In terms of delivery format, there was no significant difference (p = .09) in effect sizes when the interventions were delivered on a one-to-one basis (g = 0.42, range: 0.35-0.50, n = 730, equivalent to 5 months progress), in a small group (g = 0.39, range: 0.33-0.46, n = 761, equivalent to 5 months progress), at a whole classroom level (g = 0.53, range: 0.39-0.68, n = 86, equivalent to 7 months progress), or when formats were combined (g = 0.41, range: 0.31-0.52, n = 97, equivalent to 5 months progress). However, there were larger confidence intervals in those studies that did not report the delivery format (g = 0.19, range: -0.03-0.40, n = 84, equivalent to 3 months progress).

Figure 5. Forest plot of effect sizes by type of SEND, Phase of education, Education setting and Delivery format for all outcomes



Subgroup analysis was used to examine whether effect sizes differed by outcome domain. As there were fewer than 10 outcomes for science (*n* = 3), this category was not included in further analysis. As can be seen from the forest plot in Figure 6, for all outcome categories the confidence intervals were well above zero, suggesting that the targeted interventions worked across all categories and there were large effect sizes across all outcome domains compared to SEND students in the control groups. Subgroup analysis indicated borderline significant differences overall between the four outcomes ($p = .05$). A significant difference was found between the reported mean effect sizes for reading and mathematics outcomes, indicating that those for mathematics outcomes were significantly larger ($p < .01$). There were no other significant differences between outcome domains. For mathematics outcomes (*n* = 284), students with SEND made an average of 6 months additional progress compared to controls with SEND as a result of the intervention. For reading (*n* = 1,139), students made an average of 5 months additional progress.

Figure 6. Forest plot showing average effect sizes by outcome domain



As there was substantial heterogeneity (I2) between studies within each outcome domain (general attainment I2: 74%; reading I2: 92%; mathematics I2: 98%; writing I2: 99%), we further analysed the impact of different intervention approaches (wider vs. specific) separately for each outcome domain. Table 8 shows that most reading outcomes were related to measuring the impact of reading specific interventions (69%), most mathematics outcomes to mathematics specific interventions (68%), and most general attainment outcomes to wider approaches, (e.g., arts, behavioural, meta-cognitive approaches (62%)). However, while more than a third of writing outcome measurements were related to interventions aimed at improving writing (35%), substantial proportions of writing outcome measurements were taken in relation to reading interventions (19%) and wider approaches (25%). This shows that a broader range of interventions are implemented to improve writing outcomes than to improve reading and mathematics outcomes.

Table 8. Type of targeted interventions by outcome domain (excluding science).

	Specific Approaches (n =1303)				**Wide approach**	**Mixed approach**	**Total**
Measured Outcome Domain	Reading *n*	Mathematics *n*	Writing *n*	Mixed *n*	(All) *n*	(All) *n*	
General attainment	3 (6%)	1 (2%)	7 (13%)	3 (6%)	33 (62%)	6 (11%)	**53 (100%)**
Reading	785 (69%)	10 (1%)	27 (2%)	80 (7%)	187 (16%)	50 (4%)	**1139 (100%)**
Mathematics	8 (3%)	194 (68%)	0 (0%)	2 (1%)	63 (22%)	17 (6%)	**284 (100%)**
Writing	54 (19%)	4 (1%)	99 (35%)	23 (8%)	69 (25%)	30 (11%)	**279 (100%)**
Total	850	209	133	108	352	103	1755[10]

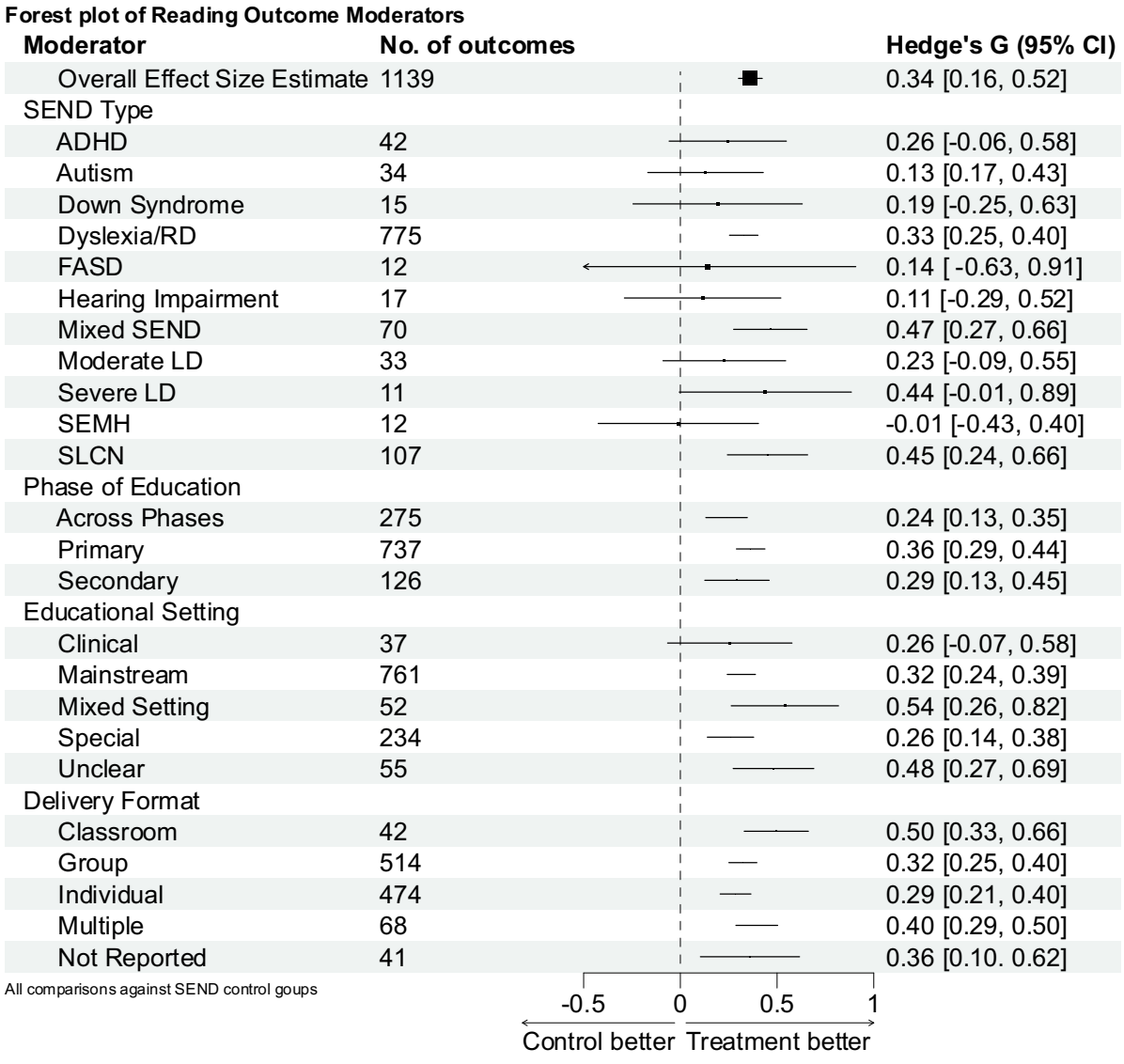
[10] Total figure excludes science outcome domain for which there were 3 outcomes.

4.2.4.2. Improving reading outcomes for students with SEND

There were 1,139 reading outcomes available for analysis. We first examined the impact of the interventions on reading outcomes for students with different types of SEND. The following types of SEND were excluded because there were fewer than 10 outcomes: DCD (*n* = 2), Mathematical Difficulties (*n* = 2), Vision impairment (*n* = 1), Writing Difficulties (*n* = 6), and Acquired brain injury (*n* = 0) (See Table 7).

As can be seen from Figure 7, only for students with Dyslexia (g = 0.33, *n* = 775, equivalent to 4 months progress), mixed SEND (g = 0.47; *n* = 70, equivalent to 6 months progress), and SLCN (g = 0.45; *n* = 107, equivalent to 6 months progress) was there a reliable positive impact of the interventions on reading outcomes, compared to SEND control groups. For all the other groups, the evidence was inconsistent. There were no significant differences between the intervention effect sizes for students with the different types of SEND listed in Figure 7 when directly compared through regression (*p* = .44).

Figure 7. Forest plot for effect sizes by type of SEND, Phase of education, Education setting and Delivery format for reading outcomes



There were no significant differences in effect sizes between the different phases of education (p = .17): interventions delivered in primary school (g = 0.36, range: 0.29-0.44; n = 737, equivalent to 5 months progress) had similar effect sizes on reading outcomes to those delivered in secondary schools (g = 0.29, range: 0.13-0.46, n = 126, equivalent to 4 months progress), or across different phases of education (g = 0.24, range: 0.13-0.35, n = 275, equivalent to 3 months progress). For one outcome the phase was not reported.

There were also no differences in effect sizes for reading outcomes in relation to the setting in which the interventions were delivered in (p = .21) or according to whether the intervention was delivered on a one-to-one basis, on a small group basis, to a whole classroom, in multiple formats, or where the implementation was unclear (p = .22).

4.2.4.3. Improving mathematical outcomes for students with SEND

There were 284 mathematics related outcomes available for analysis. For several types of SEND there were fewer than 10 outcomes for mathematics and thus, these SEND categories were excluded from further analyses (See Table 7). As can be seen in Figure 9, when comparing treatment and control groups with SEND, there was a large effect size for those with ADHD (g = 0.52; n = 27, equivalent to 6 months progress), Mathematical Difficulties (g = 0.68; n = 139, equivalent to 8 months progress), and mixed SEND (g = 0.51; n = 69, equivalent to 6 months progress). For Dyslexia and Reading Difficulties, and for Moderate Learning Difficulties, the current evidence is inconclusive. Yet, a meta-regression analysis shows that there are no differences by types of SEND[11] in terms of average effect sizes (p =. 29), which is probably caused by the overlap between the confidence intervals. This shows that there is only evidence that targeted interventions can improve mathematical outcomes among students with a few types of SEND, but for these groups the interventions improve mathematical outcomes to a similar extent.

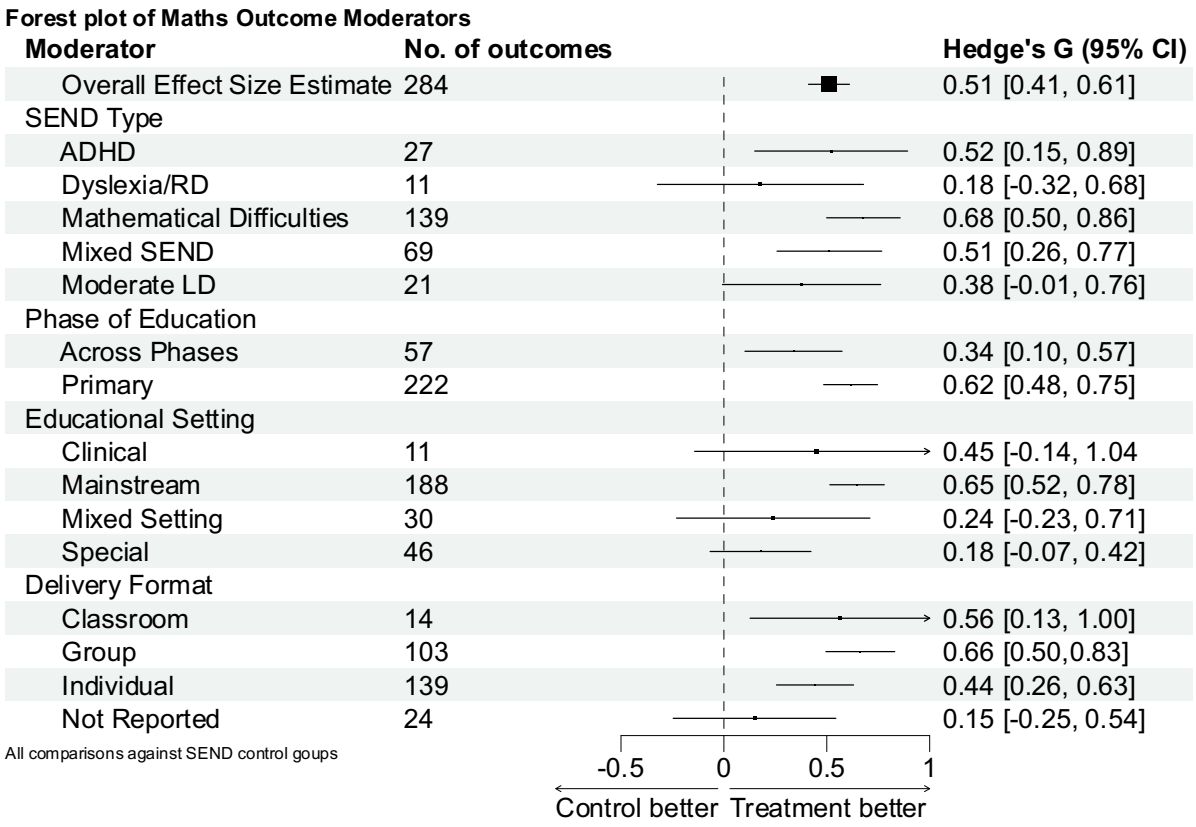
A meta-regression was used to examine the differences between the phases of education (Figure 8). As there were only five mathematical outcomes for secondary school, this category was excluded from the meta-regression. There was a significant difference (p = .04) between the effect sizes for those interventions implemented only in the primary phase (g = 0.62, range: 0.48-0.75, n = 222, equivalent to 8 months of progress) and those implemented across different phases (g = 0.34, range: 0.10-0.57, n = 57, equivalent to 4 months of progress). This finding suggests that interventions during primary school generate larger effect sizes than interventions across different phases which might suggest that early interventions may be of greater benefit to students who show Mathematical Learning Difficulties.

As can be seen from Figure 8, whilst the effect sizes for interventions delivered in mainstream classes are positive (g = 0.65, n = 188, equivalent to 8 months of progress), the evidence for special schools (n = 46), mixed settings (n = 30) and clinical settings (n = 11) is inconclusive as some effect sizes drop below zero. For a small number of outcomes (n = 9), the type of setting the intervention was implemented in was unclear or not reported. Closer inspection of this finding shows that whilst most interventions in mainstream classrooms

[11] This analysis includes all types of SEND reported in Figure 9.

are conducted with students with Mathematical Learning Difficulties (*n* = 113), some of those delivered in special schools were delivered to students with Down syndrome (*n* = 7) or Severe Learning Difficulties (*n* = 4), for whom it might be more difficult to improve mathematical outcomes, or the impact of the intervention might be more variable depending on the type of skill and how this skill is targeted within the intervention. So, the fact that students with different types of SEND are more or less likely to attend special schools might explain why only those delivered in mainstream classrooms showed clear positive effect sizes.

Figure 8. Forest plot for effect sizes by type of SEND, Phase of education, Education setting and Delivery format for mathematics outcomes



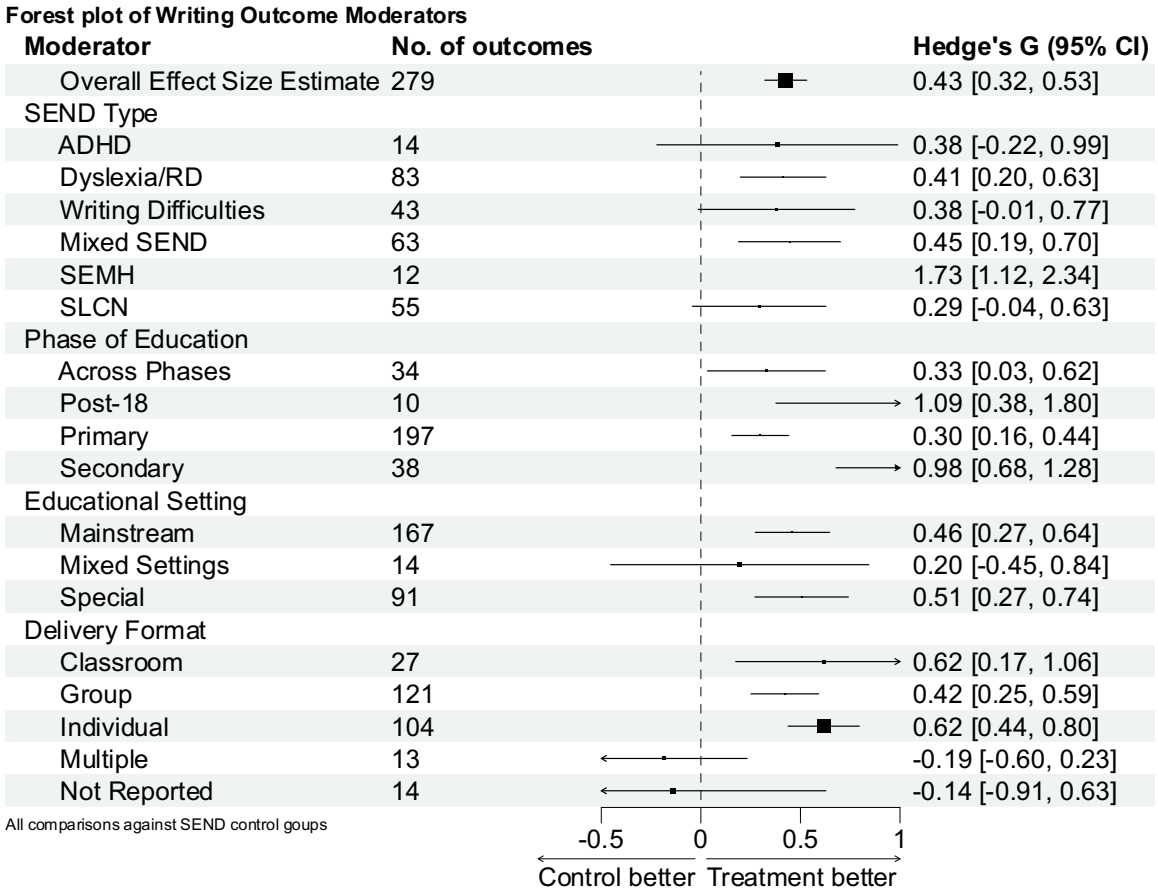
There were no significant differences in effect sizes on mathematics outcomes (*p* = .07) depending on whether an intervention was delivered to small groups (g = 0.66, range: 0.50-0.83, *n* = 103, equivalent to 8 months of progress), individually (g = 0.44, range: 0.26-0.63, *n* = 139, equivalent to 5 months of progress), or to a whole classroom (g = 0.56, range: 0.13-1.00, *n* = 14, equivalent to 7 months of progress). However, all categories showed wide variation, suggesting that a component analysis is required.

4.2.4.4. Improving writing outcomes for students with SEND

There were 279 writing outcomes available for analysis. When examining effect sizes on writing outcomes for students with different types of SEND, many groups had to be excluded (see Table 7) as they had fewer than 10 outcomes. Interventions showed positive effects on writing outcomes for students with Dyslexia and Reading Difficulties (g = 0.41; *n* = 83, equivalent to 5 months of progress), Mixed SEND (g = 0.43; *n* = 63, equivalent to 5

months of progress), and SEMH (g = 1.37; *n* = 14, equivalent to more than 12 months of progress). However, there was no conclusive evidence that interventions can provide a positive effect for writing outcomes for those students with Writing Difficulties (g = 0.37; *n* = 43) or ADHD (g = 0.40, *n* = 14). See Forest plot in Figure 9. This finding is quite striking and will be further discussed in the Discussion section below.

Figure 9. Forest plot of effect size by type of SEND, Phase of education, Education setting and Delivery format for writing outcomes



The positive effect on writing outcomes for students with SEMH difficulties was very large. Further examination showed that these effects all came from two studies (Mastropieri et al. 2015 and Rogevich et al., 2008), both of which focused on providing students with a strategy to make an essay plan and organise their writing. As these effects came from just two studies, we removed this type of SEND from further analysis. After removing the SEMH group from the moderator analysis, there was no significant difference (*p* = .97) between the different types of SEND in terms of the size of intervention effects on writing outcomes.

Meta-regression analysis showed that there was a significant difference (*p* < .001) in the effect sizes of interventions implemented in the different phases of education. Interventions implemented in the post-18 (g = 1.09, range: 0.38-1.80, *n* = 10, equivalent to more than 12 months of progress) and secondary phases (g = 0.98, range, 0.68- 1.28, *n* = 38, equivalent to more than 12 months of progress) reported significantly larger effect sizes (*p* = < .05 and *p* < .001 respectively) than those implemented in the primary phase (g = 0.30, range: 0.16-0.44, *n* = 197, equivalent to 4 months of progress). There were no differences

between those implemented in primary school and those implemented across different phases (g = 0.33, range: 0.03-0.62, *n* = 34, equivalent to 4 months of progress).

There were no significant differences (*p* = .71) in the effects of interventions on writing outcomes according to the type of education setting in which they were delivered. As can be seen from Figure 9, the evidence for writing outcomes in mixed settings was inconclusive.

Finally, there was a significant difference (*p* = .03) between small group (g = 0.42, *n* = 121, equivalent to 5 months of progress) and individual delivery (g = 0.62, *n* = 104, equivalent to 8 months of progress), with interventions delivered one-to-one showing larger effects on writing outcomes. There was no difference between interventions delivered to small groups and those delivered to whole classrooms (g = 0.62, *n* = 27, equivalent to 8 months of progress) and no difference between whole classroom and individual delivery. (See Figure 9). However, when low-quality studies were excluded (*n* = 40), small group delivery was associated with higher positive outcomes (g = 0.61, *n* = 106, equivalent to 8 months of progress) than individual delivery (g = 0.34, *n* = 88, equivalent to 4 months of progress). As the outcomes of interventions that included multiple formats had large negative estimates, we re-ran the analyses without them. This resulted in a borderline significant effect for delivery format (*p* = .06). This suggests that delivery method probably does not matter for improving writing outcomes. However, further high-–quality studies are required, as well as a component analysis, to confirm this.

4.2.4.5. Improving general attainment

There were only 53 outcomes across all studies that examined the impacts of targeted interventions on general attainment outcomes. It was not possible to examine how these outcomes differed between students with different types of SEND or by the different settings in which the interventions were delivered, due to a lack of statistical power.

4.2.4.6. Sensitivity analyses

Quality of the studies

With regards to the quality of the study, sensitivity analyses showed that there was no significant impact of study quality (*p* = .15) when all outcome domains were combined as similar effects were reported for studies of high quality (*n* = 485; average effect size = 0.39; range: 0.30-0.49), moderate quality (*n* = 1,162, average effect size = 0.39; range: 0.33-0.45) and low quality (*n* = 111; average effect size = 0.60; range: 0.40-0.81) (See Figure 10).

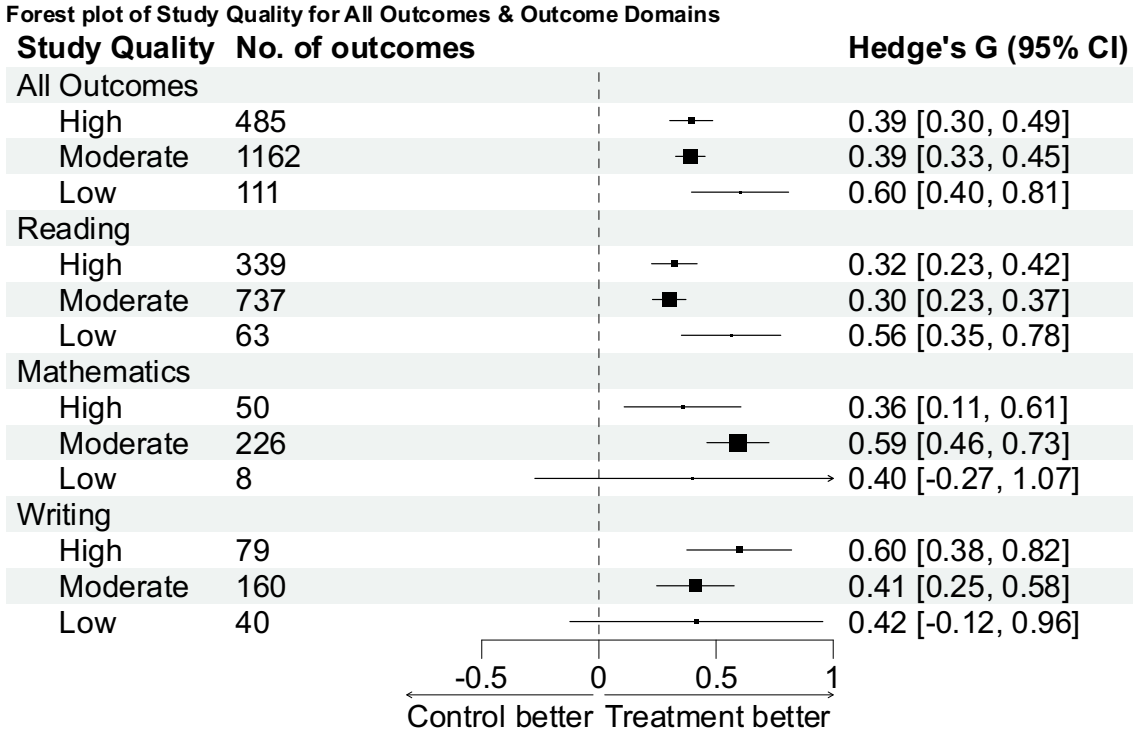
There were borderline significant differences in effect sizes for reading outcomes based on the quality rating of the study (*p* = .06). However, significant differences were found when directly comparing the higher average effect sizes reported in low-quality studies (n = 63; g = 0.56) to high-quality studies (*n* = 339; g = 0.32; p < .05) and moderate quality studies (*n* = 737; g = 0.30; p < .05) (See Figure 10). As a result of this we re-ran analyses for reading outcomes with low-quality studies omitted to examine how these studies impacted the results (See section 4.2.4.2.). Given the small number of low-quality

studies (*n* = 63), we did not expect this difference to bias estimates when these were distributed across different SEND and moderator categories, and indeed, excluding the low-quality studies did not change any of the analytical findings.

For mathematics outcomes no significant impact was found for study quality (p > .05) and only 8 out of 284 outcomes, less than 1%, were coded as low quality. Subsequently we did not explore the impact of low quality on our findings for mathematics further.

Sensitivity analysis showed that there were no differences in effect sizes on writing outcomes based on the quality of the study (p = .33). However, there were 40 low-quality studies (containing 14% of total writing outcomes, all of which used individual or group-based intervention delivery) which, as can be seen from Figure 10, produced a wide range of effects. We re-ran all main analyses with these studies excluded, which resulted in no change in the significance of findings and only marginal changes in reported effect sizes for all moderators (see section 4.2.4.4.), with the exception of intervention delivery format. As noted in section 4.2.4.4 above, when low-quality studies were removed the results for intervention delivery and writing outcomes changed from favouring individual delivery (g = 0.62) over small group delivery (g = 0.42) to favouring small group delivery (g = 0.61) over individual delivery (0.34). This suggests that the findings for this analysis are sensitive to study quality and in turn reduces the confidence we have in this result.

Figure 10. Forest plot of effect sizes by study quality for all outcomes and each outcome domain.

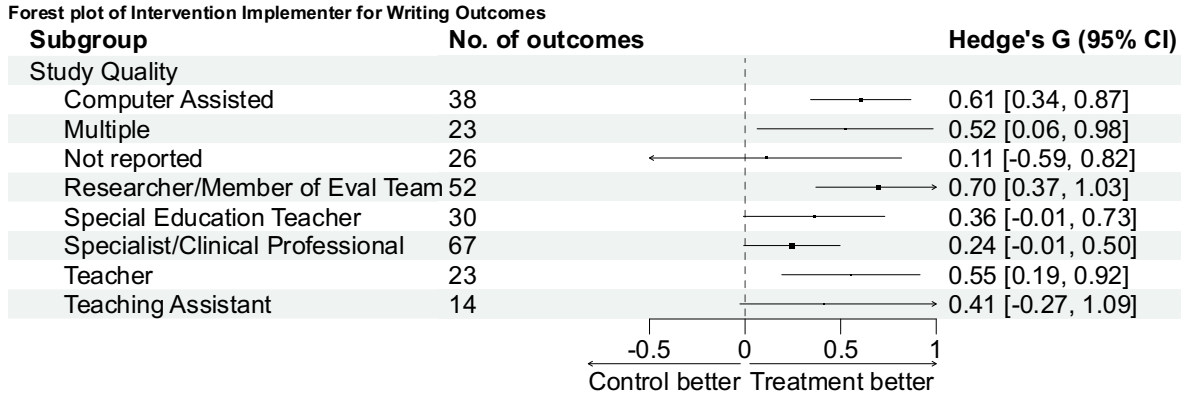


Intervention implementer

Further sensitivity analyses were run with regards to the implementer of the intervention. There was no significant effect for reading outcomes (p = .20) or mathematics outcomes (p = .49). However, the effect sizes on writing outcomes differed depending on the implementer of the intervention (p = .004), with a smaller average effect reported for

interventions delivered by specialists/clinical professionals (g = 0.24) compared to a significantly larger average effect for computerised interventions (g = 0.61) – see the Discussion section below for some reflections on why this might be. There were no reliable results for interventions delivered by teaching assistants or for those studies that did not report who delivered the intervention. See Figure 11.

Figure 11. Forest plot for writing outcomes by implementer



Type of control group

There was no significant moderating effect of the type of control group used in the study on mean effect size estimates for reading (*p* = .98), mathematics s (*p* = .92), or writing (*p* = .12). This finding may be explained in part by the variable quality of reporting of treatment and control conditions in studies, which made it difficult to determine exactly what learning content the control group were receiving. Additionally, the focus of this review on students with SEND likely means most comparison groups were receiving varied levels of additional support that blurred the distinctions between the business-as-usual and Tier 1 coded control groups.

Outcome measure used

The type of outcome measure used in studies measuring reading outcomes had a significant effect on the effect sizes reported (*p* < .001), with outcomes that were measured using researcher-created experimental measures (*n* = 168) reporting higher effect sizes (g = 0.54; range: 0.42-0.65) compared to outcomes that were measured using standardised measures (*n* = 507, g = 0.27; range: 0.19-0.34) or referenced measures (*n* = 408, g = 0.30 ; range: 0.22-0.38). There was no such difference with unreferenced measures (*n* = 49), and the type of measure was unclear for seven outcomes, which were excluded from the analysis.

As with reading outcomes, there was a significant effect for the type of outcome measure (*p* < .001) with mathematics outcomes that were measured using researcher-created experimental measures (g = 0.76, range, 0.55-0.98, *n* = 56) resulting in higher effect sizes compared to referenced measures (g = 0.52, range: 0.36-0.68, *n* = 120), standardised measures (g = 0.40, range: 0.23-0.57, *n* = 86), and unreferenced measures (g = 0.70, range: 0.37-1.04, *n* = 21).

There was no significant difference for the type of measurement used to measure the impact on writing outcomes (p = .19). It was unclear for two outcomes what kind of measure was used and only eight writing outcomes used unreferenced measures. These 10 outcomes were excluded from the analysis.

5. How do educational practitioners use evidence?

To answer research question 3, we conducted individual interviews with educational professionals who occupied different roles across various educational settings. In addition to identifying how these professionals select and use current evidence-based interventions and what the barriers to implementation might be, the interview data informed our assessment of the resources and training needs of practitioners and our subsequent guidance for local authorities and educational psychologists, as well as the toolkit we developed.

5.1. Methods

Semi-structured interviews were conducted one-to-one with 33 practitioners working in primary and secondary schools, including teachers, SENCOs, headteachers and deputy headteachers working in mainstream and specialist schools, as well as specialist teachers/advisors and educational psychologists working for local authorities across England.

Interviews took place online using Microsoft Teams and lasted 30-45 minutes. Interviews were audio-recorded and transcribed verbatim. The interviews covered:

- What specific intervention approaches educational professionals use/support
- How they decide on these approaches
- What facilitators and barriers they have experienced in implementing interventions
- How (if at all) they connect with research evidence and assess its quality/utility.

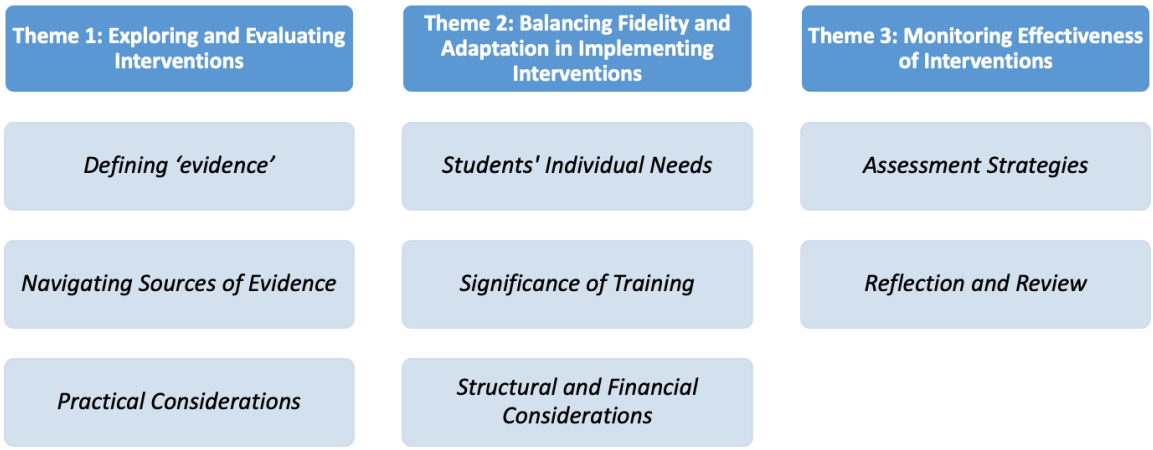
We discussed the evidence base and findings from Phase 1 of the current study with interviewees, asking them how aware they were of the particular approaches identified in Phase 1 and what factors might affect their use of these. We also gathered interviewees' input on the database to be developed in terms of its content and functionality. Follow-up questions and probes were used to generate further explanation from participants.

Interview transcripts were analysed inductively, using Braun and Clarke's (2022) six-phase reflexive thematic approach. A predominantly inductive approach was adopted for this analysis, meaning data was open-coded and respondent/data-based meanings were emphasised. A degree of deductive analysis was, however, employed to ensure that the open-coding contributed to producing themes that were meaningful to the research questions, and to ensure that the respondent/ data-based meanings that were emphasised were relevant to the research questions. Initial line-by-line coding across the whole data set was completed first and then initial codes were collated into potential themes. Themes were developed and refined through frequent discussions within the research team.

5.2. Key themes and findings of the interviews

Three overarching themes, each consisting of multiple sub-themes, were identified in the interview data. The first theme, 'exploring and evaluating evidence for interventions', relates to the typical strategies, reliable sources, and main obstacles encountered in the process of discovering, evaluating, and selecting interventions. The second theme, 'balancing fidelity and adaptation in implementing interventions', pertains to the delicate balance between adhering strictly to an intervention programme from a top-down perspective and customising interventions to accommodate teachers' expertise, students' individual requirements, and various school contexts. The third theme, 'monitoring effectiveness of interventions', focuses on the methodologies practitioners employ to assess intervention effectiveness, along with the difficulties encountered in tracking progress and determining effectiveness. Figure 12 illustrates these themes and sub-themes, each of which will be further explored below.[12]

Figure 12. Overview of the three main themes and sub-themes from the practitioner interviews



5.2.1. Theme one: Exploring and evaluating research evidence for interventions

This theme centres on the definition and utilisation of 'evidence' by participants within the decision-making processes of evaluating and selecting interventions. Within this theme, three sub-themes emerged: (i) Defining 'evidence', (ii) Navigating sources of evidence, and (iii) Evaluating evidence against practical considerations. Key findings on this theme were:

- While most practitioners acknowledged the importance of employing evidence-based interventions, there was inconsistency in their understanding of what constitutes 'evidence' and approaches to identifying the best sources of evidence.

[12] Due to space limitations, the discussion in this report focuses on the main themes and key findings. A complete discussion of all themes and sub-themes can be found in (Antalek et al., preprint).

For instance, while some participants recognised that an evidence-base for a given intervention comes from peer-reviewed empirical research and theoretical foundations, others defined 'evidence' simply as the success of an intervention programme in comparable contexts or settings.

- Overall, it was evident that there was only a limited awareness of randomised control trials, the need for control groups, comparisons of interventions, or what kind of research designs can provide the most reliable evidence.
- Participants also highlighted the challenges they faced when searching for evidence. For example, they lacked the time to devote to reading relevant research articles and lacked access to academic journals which limited where they could search. These challenges also contributed to their reliance on their informal networks and word of mouth.
- Participants' knowledge of 'evidence' and 'research', and the approaches they took to sourcing suitable interventions, were reflected in their roles and qualifications. Those who held a level 7 qualification or higher seemed to have a better understanding of how to find evidence and read peer-reviewed research articles and were more likely to research intervention programmes themselves. These participants also had a better foundation of knowledge around how interventions are developed and how research may be used to support interventions.
- Despite variations in how they defined and sourced evidence, participants recognised the need to evaluate the impact of each intervention alongside factors like the teacher training required to adopt the intervention, accessibility of the intervention, and adapting international research to the UK context and to the students in their classrooms.

5.2.2. Theme two: Balancing fidelity and adaptation in implementing interventions

This theme reflects how practitioners implement interventions and their efforts in navigating the tension between manualised, fidelity-focused approaches and individualised, adaptable strategies. Within this theme, three sub-themes were identified: (i) considering students' individual needs, (ii) significance of training, and (iii) financial and structural constraints. Key findings from this theme are:

- It was common among practitioners, especially those working in special schools and more experienced participants, to have adapted interventions to suit their specific educational contexts and the individual needs of their students. Often, this involved integrating elements from various interventions to create a bespoke approach.
- Manualised interventions requiring minimal training were often prioritised.
- Adapting interventions to fit teachers' existing knowledge was also valued, as it saved time and resources, but this flexibility often compromised fidelity to the original intervention.
- Training on intervention implementation was delivered in various ways. Some participants reported that it had been conducted by specialists such as speech and language therapists, educational psychologists, or occupational therapists. However, others reported that training had been conducted by the school's SENCOs or SEN team, who had undergone the specialist training previously. This cascade training approach could reduce fidelity and dilute the implementation quality and effectiveness of interventions. Moreover, high staff turnover means a frequent need

for re-training, which added another layer of challenge and increased the risk of reduced fidelity.

- Whilst the financial costs of interventions and training impacted the selection of the interventions across all settings, participants in primary schools and special schools reported having the flexibility to try out different intervention strategies, whereas participants in secondary schools felt more constrained and preferred programmes that are off the shelf and easy to use, and where the training is straightforward.

5.2.3. Theme three: Monitoring effectiveness of interventions

This theme highlights the cycle of evaluating whether a given intervention is working, through continuous monitoring of student progress and/or attainment after implementation. This theme included two sub-themes related to i) assessment strategies, and ii) reflection and review. Main findings that emerged from these themes included:

- Practitioners frequently considered observed success within their settings as evidence of an intervention's effectiveness, although the assessment methods used differed among participants and settings. Practitioners who used interventions that included assessments for tracking progress had used these. Where interventions did not contain such assessments, it was not always clear what methods had been used, and some practitioners had only used observations or anecdotal evidence to ascertain improvements as a result of the intervention, giving rise to questions about validity and reliability. This shows that practitioners are not always clear about what makes an effective assessment of impact in classrooms or what kind of assessment tools should be used.
- Often, the monitoring and evaluation process was not systematic, relying instead on informal methods for gauging the impact of interventions.
- Although participants noted that interventions were frequently adapted, it was unclear whether these adaptations were consistently tracked and monitored. In addition, the assessment of the intervention's effectiveness did not take into account any adaptations made.

In sum, whilst all professionals in the interviews used targeted interventions, there was great variability in how they engaged with research evidence to select the interventions, how they implemented these interventions, and how they evaluated what worked for students in their settings. Barriers to using evidence-based practice included access to research but also training to understand this evidence. All practitioners mentioned the need for a trusted source of research evidence. In terms of intervention approaches, they welcomed approaches that could be implemented flexibly and adapted to the needs of the individual students, as well as those that require less training. Overall, there were few differences between the educational practitioners but the ability for flexibility was greater for primary than for secondary school staff. Those developing policies and training as well as those designing interventions should consider these structural differences between primary and secondary educational settings.

It was clear that although all practitioners tracked the impact of the interventions they used for the students, they did not track the changes in implementation they made to the targeted approach and the impact of these changes. It is therefore possible that after

some time the targeted approach becomes too far removed from its intended purpose and therefore becomes less effective. Overall, the interviews showed that educational professionals would benefit from further guidance in how to find and select evidence-based practices, how to evaluate what works in their classrooms, and how and when to review and replace the intervention approaches that are being used within their settings.

5.3. Toolkit for educational professionals working with SEND

A toolkit was created as part of this study. It includes a searchable database of the targeted intervention approaches that we have reviewed. This database was developed in collaboration with the educational professionals who participated in the interviews, incorporating their input on the information and features to be included. In addition to the database, the toolkit includes some blogs about the current research evidence, an infographic that summarises the results of this study, and a short video about how to interpret effect sizes and evaluate the research evidence. The toolkit aims to help educational practitioners select targeted interventions based on the current research evidence.

The teachers we interviewed mentioned using approaches that differed greatly from those ones we identified for the systematic review and meta-analysis. This shows that the targeted interventions evaluated in the research literature are not necessarily those that are being used by practitioners. Interviewees also made it clear that they wanted to see interventions included in the database that can be accessed by practitioners. As such the current database currently only includes targeted intervention approaches that are commercially or freely available to teachers through downloadable links (n = 180). Interestingly, these intervention approaches were evaluated by 249 studies. This indicates that most interventions are only evaluated by one study in one specific setting and country.

Interviewees provided input on the search criteria and the information about the intervention approaches they would want to see in the database. In terms of the search functions, they agreed that, whilst some practitioners might only be interested in interventions that are available in English or those evaluated in the UK, others could see the benefit of knowing what works in other countries and languages, as these could potentially be translated or adapted to be used in UK settings. Some interviewees suggested that the database should only include those approaches that have demonstrated positive outcomes, whilst others also wanted to know which approaches have been less successful. As such, the searchable database allows practitioners to search for approaches by: age group (Key Stages), academic outcome (i.e., reading, writing, mathematics, science, general attainment), type of SEND, whether or not the outcomes are positive, whether the intervention materials are provided in English, and whether the study has been evaluated in the UK. Finally, there is a search function that allows practitioners to search for specific targeted intervention approaches or by specific words.

The database includes an overview of each named targeted intervention. It contains information about the approach and how it is implemented, an overview of the studies that have examined the impact of the approach, and an evidence quality rating that is based on the GRADE framework (Guyatt et al., 2008), examining the key quality indicators of: study

design, study limitations, inconsistency across studies, overall effect, and risk of publication bias.

The database does not currently include the costs of purchasing, being trained to use, or implementing the intervention approaches. This information needs to be obtained directly from the commercial providers and obtaining this information would require additional funding. However, we hope to include this information in the future.

The toolkit and MetaSENse searchable database can be accessed through this link and QR code:

http://www.educationalneuroscience.org.uk/metasense/

6. Overall discussion

In the UK, the focus on improving educational outcomes has been a priority since the Warnock Committee's report in 1978. Although since then various studies and reports have looked at what works for students with SEND, none thus far had conducted a systematic review of all Tier 2 and 3 approaches evaluated across different groups with SEND. The systematic review and meta-analysis presented in this report were the first to evaluate the existing literature related to manualised targeted interventions across different students with SEND, different outcome domains, and different settings, drawing on research from across the world. By consolidating this evidence base for the first time, we are able to highlight the breadth of the types of SEND targeted, judge the quality of the existing research, and identify where the gaps and methodological issues are.

Understanding this current evidence base is an important first step that will open up opportunities for future research to examine what works for which students with which types of SEND in which contexts and why. We combined this evidence base with insights from a variety of educational professionals in England, which granted us further insight into what kinds of intervention approaches have been used by practitioners in England, and what steps are required to implement those approaches evaluated as most effective into educational practice. This extends previous studies that have mostly either examined what works or barriers to implementation separately (but see Pegram et al., 2022). It enabled us to produce a toolkit that aims to be the first step towards closing the research-practice gap.

6.1. Current state of the evidence base on enhancing academic outcomes for students with SEND

Overall, the data indicated that manualised interventions targeting specific difficulties can raise the educational outcomes of students with SEND, delivering an average of five months of additional progress compared to participants with SEND who received business-as-usual or an active control intervention. However, this evidence was not consistent across all groups with SEND, as for many groups there was no or limited data available and thus, not all groups with SEND could be included in the analysis. Overall, this finding demonstrates the positive impact of targeted interventions and provides a basis for power calculations in future studies. Across all outcome measures and different types of interventions, there were positive effects for those with Dyslexia/Reading Difficulties, Dyscalculia/Mathematical Difficulties, ADHD, SCLN, Mixed SEND, and SEMH. Importantly, these findings were not impacted by the quality of the studies.

Reading outcomes had been improved for those with Reading Difficulties and SCLN, as well as mixed SEND groups. Mathematical outcomes had been improved for those with Mathematical Learning Difficulties, ADHD, and Mixed SEND. Interestingly, however, whilst writing outcomes had been enhanced for those with Dyslexia or Reading Difficulties as well as Mixed SEND, there is no evidence that interventions positively impacted the writing outcomes of students with Writing Difficulties.

There is little or inconsistent evidence on the effectiveness of targeted interventions for improving academic outcomes among students with other types of SEND, including specific conditions (Autism, Down syndrome, DCD) and sensory needs (Hearing impairment and Vision impairment). There are also very few studies that have included outcomes related to science or general attainment.

The findings of our review are in line with previous studies that have examined what works for Specific Learning Difficulties and specific learning outcomes. For example, in terms of mathematical outcomes, the current results align with a meta-analysis by Jitendra et al. (2021), who found that Tier 2 interventions improve mathematical outcomes for those with Mathematical Learning Difficulties by a moderate, positive effect size of 0.41 (equivalent to about 5 months of progress), which is slightly lower compared to the results reported here (effect size of 0.51, equivalent to 6 months of progress). However, as Jitendra and colleagues only included students with Mathematical Difficulties in their meta-analysis, they were not able to show that mathematical outcomes can be improved for students with some other types of SEND as well, such as those with ADHD and Mixed SEND, or that there is currently no reliable evidence for other groups (i.e., those with Down syndrome).

Similarly, our results for reading outcomes align with a previous review by Hall et al. (2023) that examined reading outcomes for those at risk for Reading Difficulties using a wide range of interventions (not just targeted ones) across a wide age range, and found an overall effect size of 0.33, which is comparable to the effect size of 0.36 we have identified. However, by including a wide range of SEND categories, the current study was able to show

that reading outcomes can be improved not only for those with Reading Difficulties but also for those with Mixed SEND and SCLN to a similar extent.

Writing abilities are a mediating factor for academic outcomes and associated life chances, and therefore of strategic importance to those with (and without) SEND. Students with Reading Difficulties usually also demonstrate difficulties with writing, and although there is a perception that these can be more difficult to resolve than reading difficulties (Carroll et al., 2017), our findings show that Tier 2 and Tier 3 interventions can improve writing outcomes for those with Reading Difficulties and, again, Mixed SEND. However, there was not clear evidence of this for students with Writing Difficulties. The identification of specific Writing Difficulties can be challenging, as there is a lack of reliable measures suitable for students under the age of nine, and a very wide variety of approaches available for use with older students (Dockrell & Connelly, 2021). The fact that targeted interventions have failed to show a positive effect for students with identified Writing difficulties may reflect these challenges, as well as the different ways in which writing difficulties manifest themselves across the course of a child's development.

Effect sizes varied greatly for all the outcome domains we investigated. Therefore, we examined what factors impacted on this variability, including the phase of education, type of setting, and delivery format. We also ran further sensitivity analyses within each outcome domain for type of control group, quality of study, implementer and type of outcome measure used.

Studies of interventions that targeted students across different phases of education showed lower effect sizes than those that focused on specific phases of education. Further examination of the different outcomes showed that interventions in primary school settings generate larger effect sizes for mathematical outcomes than those delivered across different phases, but that for writing outcomes, those implemented in the secondary or post-18 phases of education have larger effect sizes than those delivered in primary school settings. For reading outcomes, there were no differences in effect sizes by phase of education. This contrasts with previous reviews which have shown that interventions for primary school age children have larger effects on reading outcomes (Hall et al., 2023); this might be explained by the fact that we incorporated students with many more types of SEND, and thus more variability, compared to previous studies.

The fact that writing abilities can be improved with greater effect in secondary schools compared to primary schools is perhaps to be expected. The initial stages of learning to write are underpinned by the development of transcription skills (handwriting and spelling); it is only once these basic skills are mastered that interventions targeting the quality of written text and writing across genres are likely to be effective (Graham & Perin, 2007). However, for all outcome domains there were fewer studies for secondary school and post-18 students compared to primary school children, which may have influenced these findings, and the mean effect estimates for this review might have been lower had all phases of education been represented to a similar degree within included studies. Although a component analysis is required to understand more about what works for which age groups of students with SEND, the current findings suggest that age differences need to be considered when evaluating these kinds of interventions. This is especially important given the findings from our interviews that practitioners in secondary schools might implement

interventions that are off-the-shelf without making changes, which might result in higher fidelity compared to primary school teachers.

One of the most interesting findings from our meta-analysis was that there were no differences in outcomes overall, or for reading and writing outcomes specifically, based on the type of setting in which the intervention was delivered. On the one hand, this finding is not surprising, as targeted interventions should be implemented in similar ways regardless of the type of setting. On the other hand, evidence from the interviews suggested that educational practitioners in special schools are more likely than those in mainstream schools to adapt intervention approaches to bring them more in line with their students' needs, because students in special schools often have more complex needs and diverse learning profiles that require more bespoke interventions. However, the findings for mathematical outcomes were different: while there was a clear positive effect for mainstream schools, the evidence for special schools, mixed settings and clinical settings was mixed. This finding might potentially relate to the types of SEND found among students who attend special schools and the fact that they often have more complex needs (Pinney, 2017), which might make it harder to improve mathematical abilities. In addition, there is a lack of research about how mathematical abilities (which are complex and incorporate a variety of abilities and skills, see Gillmore, 2023) for those with complex needs can be addressed (Cristescu et al., 2024).

Delivery format, i.e., one-to-one, small group, whole classroom, or multiple formats, was only found to have a significant effect for writing outcomes, and when low-quality studies and studies with multiple formats were excluded, these differences disappeared. Previous studies have often reported conflicting results when it comes to one-to-one delivery versus small group delivery in relation to improving reading outcomes (see Bus & Van IJzendoorn, 1999 or Slavin, 2011). The current study combined a much larger sample of studies across different educational outcomes and confirms the results from Al Otaiba et al. (2023), who only examined the impact of reading interventions for students with Reading Difficulties, that different delivery formats seem to have similar impacts. Similarly, there was no effect of implementer for the reading and mathematical outcomes. However, for writing outcomes the sensitivity analysis suggested that computer-assisted interventions deliver larger effect sizes than those delivered by specialists/clinical professionals. It has been suggested that computer-assisted interventions might have a higher buy-in from schools ensuring students are timetabled to complete sessions consistently across the week (McWilliams et al., 2022) and thus the computerised interventions might be implemented more often (as they are not dependent on a trained teacher being present) and more consistently. However, a component analysis is required to explore further the impact of delivery method and implementer, and how these relate to other features of interventions, including content, dosage, and outcome measures.

Whilst most studies compared a particular approach and a 'no-treatment' or 'business as usual' control, about a quarter of the studies did include an active control group and analysis showed no differences for any of the outcomes by type of control group. This finding highlights a critical issue in the design of many studies: the frequent reliance on 'no-treatment' or 'business as usual' control groups. While this approach can demonstrate whether an intervention has an effect compared to maintaining current practices, it falls short in providing comparative effectiveness data between different active interventions

(see also Carroll et al., 2017 for similar findings). This limitation is significant because it means that, although we might know that an intervention is better than not intervening, we lack the nuanced understanding necessary to determine which intervention among several is the most effective for which types of difficulty. This is a crucial gap, especially in fields like education, where practitioners must choose between multiple potentially beneficial interventions. However, the finding that about a quarter of the studies did include an active control group is promising. An active control group, where participants receive a different form of intervention rather than no intervention, allows for direct comparison between the effectiveness of different approaches. The fact that our analysis showed no difference in outcomes based on the type of control group used might therefore be counterintuitive. However, previous studies have shown that students with SEND are likely to receive a wide range of support in schools and at home in addition to the support received or not received in research studies (Van Herwegen et al., 2018) and thus, the difference between the treatment and active control might have been muddied by the additional support being provided that was not captured by the evaluation studies. In addition, whilst we have tried to carefully categorise the different control groups, studies did not always provide explicit information about the type of control activities used, so this had to be inferred from the text and may not therefore be perfectly accurate. These two caveats need to be considered when interpreting the apparent lack of by type of control group.

In sum, the data suggest that, when choosing a targeted intervention to address needs of students with SEND, teachers may be able to increase the chances of the intervention being effective (especially for raising mathematics and writing outcomes) by checking that it is a good fit for their context in terms of both phase of education and setting, in addition to ensuring its appropriateness for the student's type of SEND. This finding resonates with the findings from Cullen et al. (2020) who examined the moderators in 27 systematic reviews that included targeted interventions for students with SEND and also found that context and phase of education are important moderators for targeted interventions. However, Cullen and colleagues included all types of study designs and outcomes, including single case studies and behavioural interventions and measures, while the current study identified similar moderators despite using more restrictive inclusion criteria.

Our newly produced database in the toolkit allows educators to identify what kind of manualised interventions work for what groups, and what the available evidence base is. Although further analysis and research for certain types of SEND is required to understand more precisely what works for whom, the fact that there was positive evidence of intervention effectiveness for raising attainment among students with mixed types of SEND in reading, writing and mathematics provides further evidence that type of need, rather than the label of a specific SEND, is an important factor to consider when choosing which intervention to use (Astle et al., 2022; Dockrell et al., 2019), as interventions seems to be effective across different types of SEND but not all of types of SEND.

6.2. Gaps in the research

As our review combined data across various educational outcomes and types of SEND for the first time, we were able to highlight specific gaps in the research that had not

been identified before. Overall, the review shows that available data are skewed towards students with Dyscalculia or Mathematical Difficulties and those with Dyslexia or Reading Difficulties, and that for several types of SEND there were not enough data to see whether the interventions had impacted on the outcomes. Similar to Carroll et al. (2017), our systematic review highlights that the research evidence for supporting Physical and Sensory needs is much less extensive than for other types of SEND. Additionally, consistent with Bond et al. (2016) and Cristscu et al. (2024), very few studies concentrate on improving educational outcomes for Autistic students or those with genetic conditions such as Down syndrome, even though these groups have been reported to have lower educational attainment (Daunhauer et al., 2020; Keen et al., 2016). This lack of research restricts our understanding of how the specific needs of students versus SEND categories can explain outcomes. Without these studies, it is impossible to determine whether interventions are effective across different types of need.

While more evaluations measured reading outcomes than mathematics outcomes, the latter had marginally larger effect sizes. This finding is similar to Dietrichson et al.'s (2020) finding that for students at risk of learning difficulties intervention effect sizes for mathematical outcomes were larger than for reading outcomes. This suggests that targeting mathematical abilities may be a better investment than targeted interventions for other key academic skills.

It was notable that very few studies measured general attainment or science outcomes. Whilst reading, writing, and mathematical abilities form the fundamental components of education (as they provide essential skills necessary for functioning effectively in society and for further learning, see Bynner, 2004), improving science knowledge allows for the development of critical thinking skills (Tolmie et al., 2016) and an understanding of scientific principles allows students with SEND to navigate and contribute to a rapidly changing world. In addition, as science and general attainment are part of providing a comprehensive education, examining what interventions improve science and general attainment outcomes for those with SEND will allow for a better understanding of how students with SEND can be fully included in education and society.

The review also highlights that most targeted interventions have been evaluated with primary school aged students. This finding echoes previous reviews, such as Carroll et al. (2017), which also found that most existing high-quality research is based on work in primary schools. However, secondary school environments may be very different from primary school environments, in terms of their physical aspects (e.g., overall size, class sizes, number of teachers), but also the academic demands and social demands placed on students. As such, interventions that show large effect sizes in primary school may not translate to secondary education. Without specific research including secondary and post-18 students, it is unclear if and how interventions that worked successfully for primary school students with SEND should be adapted for older students.

Finally, there was a gap between the approaches that interviewees mentioned they were using in their practice and those that have been evaluated in the literature. This might not be surprising given that only 21 studies have evaluated a particular approach in the UK. However, a study by Pegram et al. (2022) identified through a survey of educational practitioners 242 intervention approaches in use. Following screening, they examined the

evidence base for 138 of these approaches through a rapid review and found that for 67% of these approaches there was no existing evidence base. The findings from the current study further underscore the challenge educators face in accessing and implementing evidence-based interventions. Moreover, while we have created a searchable database to assist schools in identifying effective interventions, many of the interventions evaluated in our meta-analysis are researcher-developed and not readily accessible or practical for use in educational settings. This situation calls for greater alignment between research and practice, ensuring that effective, evidence-based interventions are both developed with practitioner input and made available for practical application in schools.

6.3. Methodological issues

Although the majority of the studies reached a moderate quality assessment, most included small sample sizes (fewer than 50 participants overall). It has been established that small sample studies can include type 1 errors (i.e., a false positive conclusion) and may create unreliable and non-representative results (Jitendra et al., 2021). That said, for all outcomes there was clear evidence for positive results. Still, future intervention studies with larger sample sizes are required to see if the results reported thus far can be replicated.

In addition, low-quality studies did indeed generate larger or more variable effect sizes, for writing outcomes especially, suggesting that they do not deliver reliable results. Studies that were of low quality often failed to report a number of study details that are required for replication. Most intervention approaches have only been evaluated once or a handful of times and further replication studies are required.

Despite the finding that most interventions yielded positive effect sizes, the evaluations were typically implemented for short periods. Therefore, it remains unclear what the long-term effects of these interventions would be or whether the effects identified would be maintained over time. It is also possible that they may have impacts on other outcomes if they were implemented for longer durations. This might be of particular importance for SEND students with delayed cognitive development, who may take longer to learn new skills, such as those with Down syndrome (Pulina et al., 2019) or Severe Learning Difficulties (Stadskleiv, 2020), for whom the current evidence was often found to be inconclusive.

There is also a lack of detail in the reported studies regarding implementation fidelity. However, the teachers we interviewed mentioned that they frequently adjust interventions to meet students' needs, which might suggest that the gap between research and practice is smaller than expected as teachers' practice seems likely to vary in terms of implementation fidelity both in practice as well as in research studies.

Sensitivity analyses revealed that studies using researcher-created experimental measures had larger effect sizes than those using standardised or referenced measures. This finding is consistent with other meta-analyses evaluating intervention effectiveness (see discussion in Hall, 2023). It has been argued that researcher-created experimental measures are often more closely related to the intervention and may not capture far transfer effects, which are better measured by standardised assessments (Dietrichson et al., 2020; Slavin et

al., 2011). However, it is also important to note that standardised assessments should not be repeated within six months and, given the short time span between evaluation points in most interventions, might not be sensitive enough to detect any changes.

Regarding individual differences, we were unable to examine variations in responsiveness to interventions (e.g., by level of intellectual disabilities, gender or English as an additional language). While it is well-known that certain approaches work better for some children than others (Carroll et al., 2017), many studies did not report participant characteristics such as ethnicity or EAL status. This is definitely a gap in the literature, as teachers identified in the interviews that they would like to know what works for children with different characteristics in their specific settings and contexts.

In summary, our review highlights significant methodological issues related to the reporting as well as the design of studies evaluating targeted interventions for students with SEND. Larger sample sizes, longer implementation periods, and comprehensive reporting should all be prioritised in future research to enhance the evidence base.

6.4. Barriers to implementation

Implementation is the critical link between research and practice (Cook & Odom, 2013, p. 138) and thus, in addition to highlighting what research evidence is available and the gaps in the evidence base, the current study also included interviews with practitioners to explore how they use the research evidence and what the barriers to using the evidence mined in this review might be.

The main barrier experienced by teachers was their currently limited understanding either of what research evidence entails, or of how to access research evidence, or both. However, those who did access research evidence referred to using clearing houses, like the toolkit provided by the Education Endowment Foundation (EEF, 2018), and were very enthusiastic about the searchable database to be produced as an output of this study.

The fact that the meta-analysis results indicate that very few moderating factors impacted on overall effect sizes, yet there was still large variation in the effect sizes, suggests that other factors, such as the way the intervention is implemented, matter for outcomes. This makes it especially important that studies include information about implementation – which, as noted above, few currently do. In addition, the fact that practitioners often adapt interventions to fit their students' unique needs again highlights the need for a deeper understanding of the active ingredients or key components in any intervention for improving academic outcomes for students with different types of SEND.

6.5. Limitations

At the beginning of this research, being unclear what the size of the evidence base was, we focused on peer-reviewed studies. As we identified a large number of these, it was not possible to include unpublished studies (i.e., grey literature) or to include a backwards and forwards citation search. Grey literature is often sparse, difficult to retrieve, contains missing data, or is of questionable quality. However, excluding the grey literature runs the

risk of introducing publication bias into the sample. Publication bias in education research has been documented to overestimate the size of treatment effects in the population (Polanin et al., 2016). Our publication bias analysis showed a slight skewing towards positive findings but this was not significant (See Appendix C). Moreover, our results align strongly with those reported in previous reviews in the field, which suggests that they are robust. Still, future reviews should include grey literature as well to reduce publication bias and increase the accuracy of the meta-analytical results.

For our review, we only focused on RCTs and QEDs and did not include single case study designs, which are common approaches for evaluating what works for students with SEND. We excluded single case study designs because these approaches present issues of validity (i.e., no control group) and generalisability. Yet, by excluding them, the current study may have missed key insights into what outcomes and types of SEND have been researched using smaller designs (Thomas, 2021). Future studies should expand search procedures to include single-case design studies to further validate results.

We originally aimed to code for secondary outcomes of the studies and include outcomes such as student behaviour or student attendance, or social and behavioural outcomes should these measures be reported. However, given the vast number of studies and outcomes we identified, we had to restrict ourselves to coding primary outcomes in order to stay within the timeline and funding constraints for our study. However, now that we have identified the studies, coding for the secondary outcomes should not require extensive resources and we aim to make our dataset openly available to other researchers for this purpose among others.

The present meta-analysis primarily examined the immediate outcomes of targeted interventions. However, certain studies have also explored the potential long-term effects of these interventions. While the meta-analysis results indicate positive outcomes across all domains, it remains uncertain whether these effects are sustained over time. Therefore, further research is needed to investigate the long-term impacts of these interventions.

During the interviews, teachers noted that decisions regarding interventions are influenced by various factors, including the time and financial investments required for training. However, the costs associated with interventions were not accessible from the reviewed literature. Obtaining information about intervention costs would involve contacting the creators or distributors, which was not feasible due to the funding and time limitations for this study. Therefore, information regarding intervention costs could not be included in the analysis. It would be beneficial to incorporate this information in future.

6.6. Future steps

The current project has brought together, for the first-time, data on targeted interventions for students with SEND from across the globe. The data gathered have established an evidence base that can now be further explored and built upon in various ways:

1) **Component framework and analysis**: The data obtained will allow the development of a framework using a data-driven approach to understand what components are included in the current targeted interventions across the different outcome domains and types of SEND. Such a framework will allow for further analyses in terms of what makes for a successful targeted intervention for students with different types of SEND.
2) **Expand and further mine the existing database**: As the search terms and data will be made openly accessible, it will be possible to update the database in the next few years to include new studies. It could also be expanded to include, for example, information on secondary outcomes and intervention costs. The existing data could also be further mined to explore how the students' needs, rather than their SEND labels, might impact on outcomes by examining the baseline data in greater detail.
3) **Review and examine the uptake of the existing toolkit**: It will be important to examine how our database is being used and to use this information to determine how it can be further adapted so it remains most useful to practitioners, as well as to identify what is missing.
4) **Improve and explore new ways we can evaluate what works for whom**: Systematic reviews and meta-analyses rely on the quality of the published research (Sotola, 2022) which, as shown in the current study, is often variable. In addition, there is a gap between what is being evaluated by researchers and the targeted intervention approaches that are being used by practitioners. As such, improved and new ways of evaluating what works are required to close the research-practice gap. These new ways of working should be established through co-production processes, such as workshops involving both practitioners and researchers.

6.7. Recommendations

This study was the first to bring together evidence around targeted interventions for different groups with SEND across various educational outcome domains. By examining how outcomes differed for students with different types of SEND, and by academic outcome domain and context (phase and type of education as well as delivery format and implementer), we now have a clearer understanding of what has been evaluated for whom, and what kind of research and training provision is required in the future. Based on this evidence, we make the following four recommendations:

1. Invest in a more balanced evidence base

Across the various outcomes, it is evident that the evidence base is skewed towards certain types of SEND, with notable gaps that warrant attention. Specifically, there is a need for more research targeting students with physical disabilities, sensory needs, and intellectual disabilities. Additionally, there is a need for more studies involving secondary school and post-18 students, and focusing on science and general attainment outcomes. There is also a lack of UK-based evidence. As such, funders and academics should invest in a more diverse evidence base.

2. Establish a new national database on the outcomes of SEND interventions

The findings show that there is a need to enhance the quality of the research on SEND interventions, particularly by facilitating access to larger sample sizes and longer-term outcome measurements across diverse schools. Our research has shown that teachers often do track the outcomes of the interventions they use with their students, but this data is often stored locally, and the assessments may not always be reliable. Together with researchers, teachers could agree on the best measures to be used (see Outhwaite et al., 2024), and the data collected could then be stored in a newly developed national database. This database, containing information about each student and the type of practice or intervention implemented, along with baseline, post-intervention and even follow-up evaluation data, would enable researchers to conduct more robust studies, yielding findings that were representative and generalisable, and ultimately advancing our understanding of effective educational practices. This recommendation is relevant to policy makers.

3. Increase collaboration between researchers and educational practitioners

Priority should be placed on aligning interventions evaluated by researchers with those being implemented by practitioners, ensuring a seamless integration of evidence-based practices into educational settings. Additionally, there is a need to consider ways to make research evidence more readily accessible to teachers, empowering them with the knowledge and resources needed to effectively support student learning and development. These objectives can be achieved by academics working more closely with educational practitioners and by producing materials with practitioners, such as the database created through this study, so that these materials are accessible to them. We expect this recommendation to be of relevance to academics and funders.

4. Offer practitioners training in evaluating evidence related to interventions and what works in their classrooms

It is essential that teachers receive training on understanding evidence related to interventions (from research as well as from practice) and how to evaluate its credibility. This training will enable them to effectively apply robust research findings in classroom settings, particularly for students with SEND, as well as helping them evaluate their own practices effectively. We have included a video and other materials in our toolkit to start addressing this need but policy makers and Higher Education providers should consider including additional training in Initial Teacher Training courses as well as SENCO training.

7. References

Al Otaiba, S., McMaster, K., Wanzek, J., & Zaru, M. W. (2023). What we know and need to know about literacy interventions for elementary students with reading difficulties and disabilities, including dyslexia. *Reading Research Quarterly*, *58*(2), 313-332. Doi:10.1002/rrq.458

Astle, D. E., Holmes, J., Kievit, R., & Gathercole, S. E. (2022). Annual Research Review: The transdiagnostic revolution in neurodevelopmental disorders. *Journal of Child Psychology and Psychiatry*, *63*(4), 397-417. Doi: 10.1111/jcpp.13589

Barker, T. H., Stone, J. C., Sears, K., Klugar, M., Tufanaru, C., Leonardi-Bee, J., ... & Munn, Z. (2023). The revised JBI critical appraisal tool for the assessment of risk of bias for randomized controlled trials. *JBI evidence synthesis*, *21*(3), 494-506.

Barker, T. H., Habibi, N., Aromataris, E., Stone, J. C., Leonardi-Bee, J., Sears, K., ... & Munn, Z. (2024). The revised JBI critical appraisal tool for the assessment of risk of bias for quasi-experimental studies. *JBI Evidence Synthesis*, *22*(3), 378-388.

Bond, C., Symes, W., Hebron, J., Humphrey, N., Morewood, G., & Woods, K. (2016). Educational interventions for children with ASD: A systematic literature review 2008–2013. School Psychology International, 37(3), 303-320. Doi:10.1177/01430343166396

Braun, V., & Clarke, V. (2022). Conceptual and design thinking for thematic analysis. *Qualitative psychology*, *9*(1), 3-26. Doi:10.1037/qup0000196

Bus, A. G., & Van IJzendoorn, M. H. (1999). Phonological awareness and early reading: A meta-analysis of experimental training studies. *Journal of Educational Psychology,* 91(3), 403

Bynner, J. (2004). Literacy, numeracy and employability: evidence form the British birth cohort studies. *Literacy and numeracy studies*, *13*(1), 31-48.

Carroll, J., Bradley, L., Crawford, H., Hannant, P., Johnson, H., & Thompson, A. (2017). SEN support: A rapid evidence assessment. Department for Education. https://www.gov.uk/government/publications/special-educational-needs-support-in-schools-and-colleges

Cook, B. G., & Odom, S. L. (2013). Evidence-based practices and implementation science in special education. *Exceptional children*, *79*(2), 135-144. Doi:10.1177/0014402913079002

Coldwell, M., Greany, T., Higgins, S., Brown, C., Maxwell, B., Stiell, B., ... & Burns, H. (2017). *Evidence-informed teaching: an evaluation of progress in England. Research Report*. Department for Education. Research Report. Project Report. London, UK, Department for Education.

Coldwell, M. (2022). Evidence-informed teaching in England. In C Brown & J.R Malin (Eds): *The Emerald Handbook of Evidence-Informed Practice in Education* (pp. 59-68). Emerald Publishing Limited. Doi: 10.1108/9781800431416

Cristescu, L., Scerif, G., Pellicano, E., Van Herwegen, J., Farran, E.K. (2024). Shape Research, Change Lives: Setting priorities in genetic syndrome research. https://osf.io/db6cg/

Cullen, M. A et al. (2020). *Special Educational Needs in Mainstream Schools: Evidence Review*. London: Education Endowment Foundation. The report is available from: https://educationendowmentfoundation.org.uk/public/files/Publications/Send/EEF_SEND_Evidence_Review.pdf

Daunhauer, L. A., Will, E., Schworer, E., & Fidler, D. J. (2020). Young students with Down syndrome: Early longitudinal academic achievement and neuropsychological

predictors. *Journal of Intellectual & Developmental Disability*, *45*(3), 211–221. Doi: 10.3109/13668250.2020.1726016

Davis, P. & Florian, L. (2004). *Teaching Strategies and Approaches for Pupils with Special Educational Needs: A Scoping Study*. Brief No RB516 (London: DfES). Available online at: www.dfes.gov.uk/research/data/uploadfiles/RB516.doc.

Dietrichson, J., Filges, T., Klokker, R. H., Viinholt, B. C. A., Bøg, M., & Jensen, U. H. (2020). Targeted school based interventions for improving reading and mathematics for students with, or at risk of, academic difficulties in Grades 7–12: A systematic review. *Campbell Systematic Reviews*, *16*(2). Doi:10.1002/cl2.1081

Dockrell, J. E., Ricketts, J., Palikara, O., Charman, T., & Lindsay, G. A. (2019). What Drives Educational Support for Children With Developmental Language Disorder or Autism Spectrum Disorder: Needs, or Diagnostic Category? *Frontiers in Education, 4*. doi:10.3389/feduc.2019.00029

Dockrell, J. E., & Connelly, V. (2021). Capturing the challenges in assessing writing: Development and writing dimensions. In T. Limpo & T. Olive (Eds.), *Executive functions and writing* (pp. 103–135). Oxford University Press. Doi:10.1093/oso/9780198863564.003.0005

Duval, S., & Tweedie, R. (2000). Trim and fill: a simple funnel-plot–based method of testing and adjusting for publication bias in meta—analysis. *Biometrics, 56*(2), 455-463. Doi: 10.1111/j.0006-341X.2000.00455.x

Ebbels, S. H., McCartney, E., Slonims, V., Dockrell, J. E., & Norbury, C. F. (2019). Evidence-based pathways to intervention for children with language disorders. International journal of language & communication disorders, 54(1), 3-19. Doi:10.1111/1460-6984.12387

Education Endowment Foundation (EEF), corp creator. (2018). *Teaching and learning toolkit*. https://educationendowmentfoundation.org.uk/education-evidence/teaching-learning-toolkit [last accessed 10/06/2024].

Egger, M., Smith, G. D., Schneider, M., & Minder, C. (1997). Bias in meta-analysis detected by a simple, graphical test. *bmj*, 315(7109), 629-634.

Fuchs, D., & Fuchs, L. S. (2006). Introduction to response to intervention: What, why, and how valid is it? *Reading Research Quarterly*, 41(1), 93–99.

Gilmore, C. (2023). Understanding the complexities of mathematical cognition: A multi-level framework. *Quarterly Journal of Experimental Psychology*, *76*(9), 1953-1972. Doi:10.1177/17470218231175325

Graham, S., & Perin, D. (2007). What we know, what we still need to know: Teaching adolescents to write. *Scientific studies of reading*, *11*(4), 313-335. Doi:10.1080/10888430701530664

Guldberg, K. (2017) Evidence-based practice in autism educational research: can we bridge the research and practice gap?, Oxford Review of Education, 43(2), 149-161, DOI: 10.1080/03054985.2016.1248818

Guyatt, G. H., Oxman, A. D., Vist, G. E., Kunz, R., Falck-Ytter, Y., Alonso-Coello, P., & Schünemann, H. J. (2008). GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *British Medical Journal*, *336*(7650), 924-926.

Harlacher, J. E, Sanford, A. K., & Nelson, N. (2014). Distinguishing Between Tier 2 and Tier 3 Instruction in Order to Support Implementation of RTI. *Education Faculty Publications*

and Presentations. 132. https://archives.pdx.edu/ds/psu/25582 [last accessed 12/08/2024].

Hall, C., Dahl-Leonard, K., Cho, E., Solari, E. J., Capin, P., Conner, C. L., ... & Kehoe, K. F. (2023). Forty years of reading intervention research for elementary students with or at risk for dyslexia: A systematic review and meta-analysis. *Reading Research Quarterly*, *58*(2), 285-312. Doi:10.1002/rrq.477

Higgins, J.P.T., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M.J., & Welch, V.A. (2023). *Cochrane Handbook for Systematic Reviews of Interventions version 6.4* (updated August 2023). Available from www.training.cochrane.org/handbook.

Hirsh-Pasek, K., Zosh, J. M., Golinkoff, R. M., Gray, J. H., Robb, M. B., & Kaufman, J. (2015). Putting Education in "Educational" Apps: Lessons from the Science of Learning. *Psychological Science, 16*(1), 3-34. Doi:10.1177/1529100615569721

Jitendra, A. K., Alghamdi, A., Edmunds, R., McKevett, N. M., Mouanoutoua, J., & Roesslein, R. (2021). The effects of tier 2 mathematics interventions for students with mathematics difficulties: A meta-analysis. *Exceptional Children*, *87*(3), 307-325. Doi:10.1177/0014402920969187

Keen, D., Webster, A., & Ridley, G. (2016). How well are children with autism spectrum disorder doing academically at school? An overview of the literature. *Autism*, *20*(3), 276-294. Doi:10.1177/1362361315580962

Lee, I. O., Wolstencroft, J., Housby, H., van den Bree, M. B. M., Chawner, S. J. R. A., Hall, J., ... & Skuse, D. H. (2024). The inequity of education, health and care plan provision for children and young people with intellectual and developmental disabilities. *Journal of Intellectual Disability Research*. Doi:10.1111/jir.13139

Mastropieri, M. A., Scruggs, T. E., Irby Cerar, N., Guckert, M., Thompson, C., Bronaugh, D. A., ... & Cuenca-Carlino, Y. (2015). Strategic persuasive writing instruction for students with emotional and behavioral disabilities. *Exceptionality*, *23*(3), 147-169. Doi:10.1080/09362835.2014.986605

McWilliams, G., Leslie, J. C., & McDowell, C. (2022). Evaluation of a School-Based Headsprout *Intervention for Improving Literacy. Journal of Behavioural Education, 19,* 1-9. Doi:10.1007/s10864-022-09489-y

Mintz, J., Hick, P., Solomon, Y., Matziari, A., Ó'Murchú, F., Hall, K., ... & Margariti, D. (2020). The reality of reality shock for inclusion: How does teacher attitude, perceived knowledge and self-efficacy in relation to effective inclusion in the classroom change from the pre-service to novice teacher year?. *Teaching and Teacher Education*, 91, 103042. Doi:10.1016/j.tate.2020.103042

Mintz, J. & Roberts, A. (2023). Prospects for applying a theory of change model to the use of research evidence in autism education. *Frontiers in Education* 8,987688. Doi: 10.3389/feduc.2023.987688

Morsanyi, K., van Bers, B. M., McCormack, T., & McGourty, J. (2018). The prevalence of specific learning disorder in mathematics and comorbidity with other developmental disorders in primary school-age children. *British Journal of Psychology*, 109(4), 917-940. Doi:10.1111/bjop.12322

Office for National Statistics (2023). Office for national statistics, https://explore-education-statistics.service.gov.uk/find-statistics/special-educational-needs-in-england

Outhwaite, L. A., Aunio, P., Leung, J. K. Y., & Van Herwegen, J. (2024, March 9). Measuring Mathematical Skills in Early Childhood: A Systematic Review of the Psychometric Properties of Early Maths Assessments and Screeners. Doi:10.31234/osf.io/hk37b

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). Updating guidance for reporting systematic reviews: development of the PRISMA 2020 statement. *Journal of Clinical Epidemiology*, 134, 103-112. Doi:10.1016/j.jclinepi.2021.02.003

Pegram, J., Watkins, R. C., Hoerger, M., & Hughes, J. C. (2022). Assessing the range and evidence-base of interventions in a cluster of schools. *Review of Education*, *10*(1), e3336. Doi:10.1002/rev3.3336

Pinney, A. (2017). *Understanding the needs of disabled children with complex needs or life-limiting conditions.* Council for Disabled Children. UK https://councilfordisabledchildren.org.uk/sites/default/files/uploads/attachments/Data%20Report.pdf [last accessed 2nd of June 2024]

Polanin, J. R., Tanner-Smith, E. E., & Hennessy, E. (2016). Estimating the difference between published and unpublished effect sizes: A meta-review. *Review of Educational Research*, *86*, 207–236. Doi.org:10.3102/0034

Pulina, F., Vianello, R., & Lanfranchi, S. (2019). Cognitive profiles in individuals with Down syndrome. In *International review of research in developmental disabilities* (Vol. 56, pp. 67-92). Academic Press.

Reynolds, G. A., & Perin, D. (2009). A comparison of text structure and self-regulated writing strategies for composing from sources by middle school students. *Reading Psychology*, *30*(3), 265-300. Doi:10.1080/02702710802411547

Shawn Green, C., Bavelier, D., Kramer, A. F., Vinogradov, S., Ansorge, U., Ball, K. K., ... & Witt, C. M. (2019). Improving methodological standards in behavioral interventions for cognitive enhancement. *Journal of Cognitive Enhancement*, *3*, 2-29. Doi:10.1007/s41465-018-0115-y

Slavin, R. E., Lake, C., Davis, S., & Madden, N.A. (2011). Effective programs for struggling readers: A best-evidence synthesis. *Educational Research Review* 6 (1), 1-26. Doi:10.1016/j.edurev.2010.07.002.

Stadskleiv, K. (2020). Cognitive functioning in children with cerebral palsy. *Developmental Medicine & Child Neurology*, *62*(3), 283-289. Doi:10.1111/dmcn.14463

Sotola, L. K. (2022). Garbage in, garbage out? Evaluating the evidentiary value of published meta-analyses using z-curve analysis. *Collabra: Psychology, 8*(1), Article 32571. Doi:10.1525/collabra.32571

Thomas, G. (2021). Experiment's persistent failure in education inquiry, and why it keeps failing. *British Educational Research Journal*, *47*(3), 501-519. Doi: 10.1002/berj.3660

Thomas, J., Graziosi, S., Brunton, J., Ghouze, Z., O'Driscoll, P., Bond, M., & Koryakina, A. (2022). *EPPI-Reviewer: advanced software for systematic reviews, maps and evidence synthesis*. EPPI Centre, UCL Social Research Institute, University College London

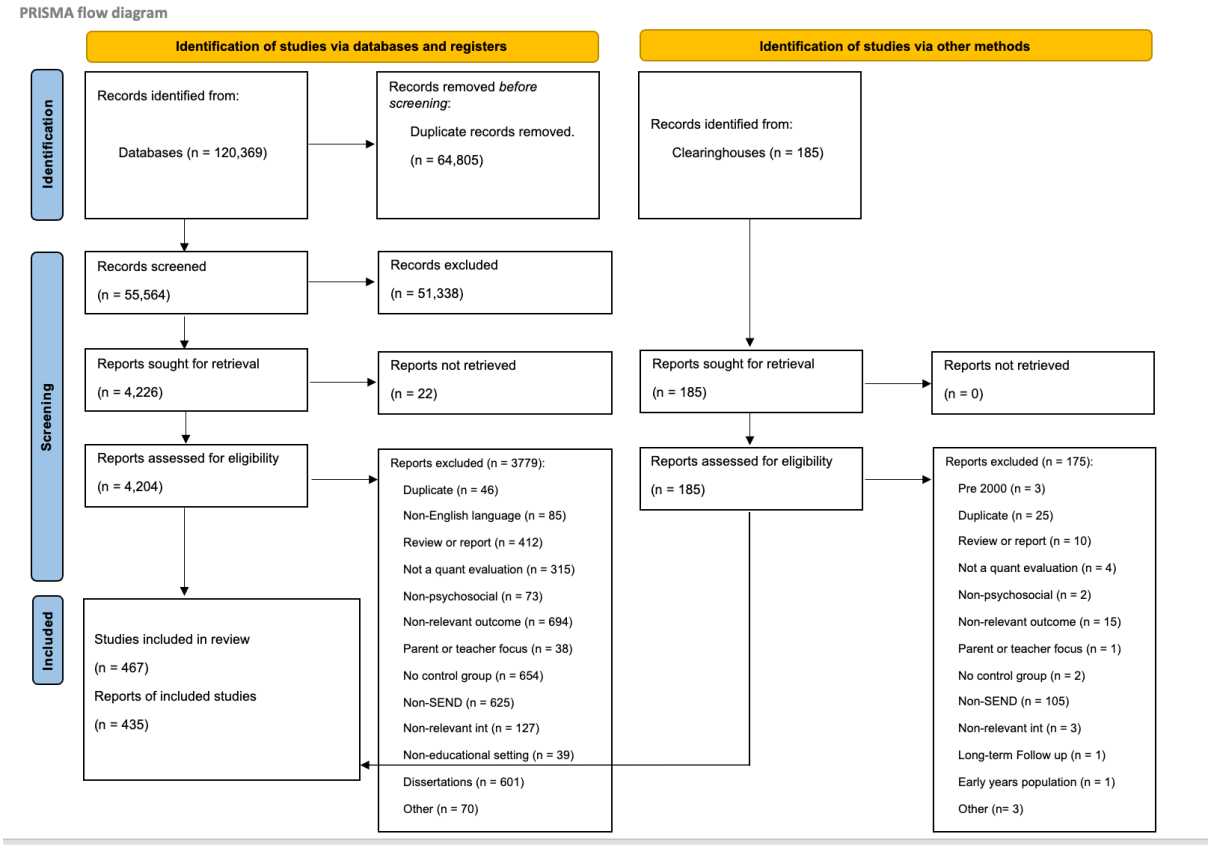
Tolmie, A., Ghazali, Z. & Morris, S. (2016). Children's science learning: a core skills approach. *British Journal of Educational Psychology*, 86(3), 481–497. doi: 10.1111/bjep.12119

Tuckett, S., Robinson, D., & Bunting, F. (2021). Measuring the Disadvantage Gap in 16-19 Education. Education Policy Institute.

https://epi.org.uk/wpcontent/uploads/2021/02/Measuring-the-16-19-disadvantage-attainment-gap_EPI-2021.pdf.
Van Herwegen, J., Ashworth, A., & Palikara, O. (2018). Parental views on special educational needs provision: cross-syndrome comparisons in Williams Syndrome, Down Syndrome, and Autism Spectrum Disorders. *Research in Developmental Disability, 80,* 102-111. Doi:10.1016/j.ridd.2018.06.014.
Warnock, H.M.H. (1978). *Special Educational Needs: Report for the Committee of Enquiry into the Education of Handicapped Children and Young People*. London. HMSO.

Appendices

Appendix A. PRISMA Flow Diagram



Appendix B. Study quality assessment questions

These assessment questions were adapted from the Joanna Briggs Institute

Questions to assess RCTs
Q1. Was true randomization used for assignment of participants to treatment groups?
Q2. Was allocation to treatment groups concealed?
Q3. Were treatment groups similar at the baseline?
Q4. Were treatment groups treated identically other than the intervention of interest?
Q5. Were outcome assessors blind to treatment assignment?
Q6. Were outcomes measured in the same way for treatment groups?
Q7. Were outcomes measured in a reliable way?
Q8. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed?
Q9. Were participants analysed in the groups to which they were randomised?
Q10. Was appropriate statistical analysis used?
Q11. Was the trial design appropriate and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?
Q12. Was the implementation of the study described, and if so, was an acceptable level of fidelity achieved in the delivery of the intervention?

Assessment questions for QEDs
Q1. Is it clear in the study what is the 'cause' and what is the 'effect' (i.e., there is no confusion about which variable comes first)?
Q2. Were participants included in any comparisons similar?
Q3. Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?
Q4. Was there a control group?
Q5. Were there multiple measurements of the outcome both pre and post the intervention/exposure?
Q6 Were the outcomes of participants included in any comparisons measured in the same way?
Q7 Were outcomes measured in a reliable way?
Q8 Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed?
Q9 Was appropriate statistical analysis used?
Q10. Was the implementation of the study described, and if so, was an acceptable level of fidelity achieved in the delivery of the intervention?

Appendix C. Publication bias analyses

For reading

Publication bias analysis indicated funnel plot asymmetry and an Egger's regression test showed a possible reporting bias in favour of negative findings. This would suggest that there are studies missing that provide positive evidence, which would be unlikely in the event of significant publication bias. Trim and Fill analyses undertaken using the 'metafor' packing in R only added studies with positive effect sizes (i.e., on the righthand side of the funnel plot) which led to higher effect sizes once hypothetically missing studies had been imputed. This finding runs counter to a scenario in which publication bias leading to a inflated effect size would be encountered (i.e., where negative studies are expected to be missing) and suggests that the reported effect sizes might be conservative.

For mathematics

Publication bias analyses showed no significant funnel plot asymmetry for mathematical outcomes, and thus we did not interrogate possible publication bias further for this outcome domain. In terms of sensitivity analyses, there was no effect for the quality of the study (p = .24), suggesting that high (n = 50), moderate (n = 226) and low (n = 8) studies resulted in similar effect sizes (See Figure 10). However, low-quality studies reported effect sizes ranging from below zero (-0.27) to 1.07, suggesting that these studies did not deliver reliable results. However, as only eight outcomes of such studies were included in the sample, it is unlikely that these would have biased any results reported.

For writing

A Funnel plot and Egger's test suggested asymmetry in the distribution of positive and negative findings in favour of positive findings, indicating that there could be publication bias, resulting in missing studies that find negative or null outcomes. The Fill and Trim analyses imputed two hypothetical studies in favour of null or negative findings which reduced the estimated effect size equivalent only slightly to g = 0.4 (from g = 0.36 using aggregated effect sizes within studies to g = 0.32 using aggregated effects within studies including imputed hypothetical studies). This finding remains significant, indicating that even assuming publication bias these findings remain robust.

Summary table for included studies

For a summary of the table with the included studies please see:
CDLD lab webpage and the Centre for Educational Neuroscience MetaSENse

References for included studies

Included studies reference list (all studies included in narrative review – studies included in meta-analysis denoted by *)

Acosta Rodríguez, V. M., Ramírez Santana, G. M., Del Valle Hernández, N., & de Castro Bermúdez, L. (2016). Intervention in reading processes in pupils with Specific Language Impairment (SLI). *Psicothema,* 28(1), 40–46. https://doi.org/10.7334/psicothema2015.144

Adibsereshki, N., Abkenar, S. J., Ashoori, M., & Mirzamani, M. (2015). The effectiveness of using reinforcements in the classroom on the academic achievement of students with intellectual disabilities. *Journal of Intellectual Disabilities*, 19(1), 83–93. https://doi.org/10.1177/1744629514559313

*Adnams, C. M., Sorour, P., Kalberg, W. O., Kodituwakku, P., Perold, M. D., Kotze, A., September, S., Castle, B., Gossage, J., & May, P. A. (2007). Language and literacy outcomes from a pilot intervention study for children with fetal alcohol spectrum disorders in South Africa. *Alcohol*, 41(6), 403–414. https://doi.org/10.1016/j.alcohol.2007.07.005

*Agaliotis, I., & Teli, A. (2016). Teaching Arithmetic Combinations of Multiplication and Division to Students with Learning Disabilities or Mild Intellectual Disability: The Impact of Alternative Fact Grouping and the Role of Cognitive and Learning Factors. *Journal of Education and Learning*, 5(4), 90. https://doi.org/10.5539/jel.v5n4p90

*Ahmed, Y., Miciak, J., Taylor, W. P., & Francis, D. J. (2022). Structure Altering Effects of a Multicomponent Reading Intervention: An Application of the Direct and Inferential Mediation (DIME) Model of Reading Comprehension in Upper Elementary Grades. *Journal of Learning Disabilities*, 55(1), 002221942199590. https://doi.org/10.1177/0022219421995904

*Akbari, E., Soltani–Kouhbanani, S., & Khosrorad, R. (2019). The effectiveness of working memory computer assisted program on executive functions and reading progress of students with reading disability disorder. *Electronic Journal of General Medicine*, 16(2), em123. https://doi.org/10.29333/ejgm/94044

*Al Otaiba, S., Petscher, Y., Wanzek, J., Lan, P., & Rivas, B. (2018). I'm Not Throwing Away My Shot: What Alexander Hamilton Can Tell Us about Standard Reading Interventions. *Learning Disabilities Research & Practice*, 33(3), 156–167. https://doi.org/10.1111/ldrp.12179

*Allor, J. H., Mathes, P. G., J. Kyle Roberts, Jones, F. G., & Champlin, T. M. (2010a). Teaching Students with Moderate Intellectual Disabilities to Read: An Experimental Examination of a Comprehensive Reading Intervention. *Education and Training in Autism and Developmental Disabilities*, 45(1), 3–22.

Allor, J. H., Mathes, P. G., Roberts, J. K., Cheatham, J. P., & Champlin, T. M. (2010b). Comprehensive reading instruction for students with intellectual disabilities: Findings from the first three years of a longitudinal study. *Psychology in the Schools*, 47(5), 445–466. https://doi.org/10.1002/pits.20482

Allor, J. H., Mathes, P. G., Roberts, J. K., Cheatham, J. P., & Otaiba, S. A. (2014). Is Scientifically Based Reading Instruction Effective for Students With Below-Average IQs? *Exceptional Children*, 80(3), 287–306. https://doi.org/10.1177/0014402914522208

Alloway, T. (2012). Can interactive working memory training improving learning? Journal of Interactive Learning Research*, 23(3), 197-207.
*Alloway, T. P., & Warner, C. (2008). Task-Specific Training, Learning, and Memory for Children with Developmental Coordination Disorder: A Pilot Study. *Perceptual and Motor Skills*, 107(2), 473–480. https://doi.org/10.2466/pms.107.2.473-480
*Al-Zoubi, S.M., & Al-Adawi, F. A. (2019). Effects of Instructional Activities Based on Multiple Intelligences Theory on Academic Achievement of Omani Students with Dyscalculia. *Journal for the Education of Gifted Young Scientists*, 7(1), 1–14. https://doi.org/10.17478/jegys.515102
*Ang, S. Y., Lee, K., Cheam, F., Poon, K., & Koh, J. (2015). Updating and working memory training: Immediate improvement, long-term maintenance, and generalisability to non-trained tasks. *Journal of Applied Research in Memory and Cognition*, 4(2), 121–128. https://doi.org/10.1016/j.jarmac.2015.03.001
Antarasena, S. (2011). Color Schemata Designed for Delayed-language Students. The International Journal of the Humanities: *Annual Review*, 8(11), 1–8. https://doi.org/10.18848/1447-9508/cgp/v08i11/43064
*Antoniou, F., & Elmar Souvignier. (2007). Strategy Instruction in Reading Comprehension: An Intervention Study for Students with Learning Disabilities. *Learning Disabilities: A Contemporary Journal*, 5(1), 41–57.
*Archambault, C., Tullo, D., Clark, E., Faubert, J., & Bertone, A. (2021). Assessing the feasibility of a classroom-based visual attention training program targeting academics for students with extremely low IQ. *Pilot and Feasibility Studies,* 7(1). https://doi.org/10.1186/s40814-021-00879-z
*Arciuli, J., & Bailey, B. (2019). Efficacy of ABRACADABRA literacy instruction in a school setting for children with autism spectrum disorders. *Research in developmental disabilities*, 85, 104–115. https://doi.org/10.1016/j.ridd.2018.11.003
*Arfé, B., Cona, E., & Merella, A. (2018). Training Implicit Learning of Spelling in Italian Children With Developmental Dyslexia. *Topics in Language Disorders*, 38(4), 299–315.
*Aro, T., Viholainen, H., Koponen, T., Peura, P., Räikkönen, E., Salmi, P., Sorvo, R., & Aro, M. (2018). Can reading fluency and self-efficacy of reading fluency be enhanced with an intervention targeting the sources of self-efficacy? *Learning and Individual Differences*, 67, 53–66. https://doi.org/10.1016/j.lindif.2018.06.009
*Asaro-Saddler, K., Muir-Knox, H., & Meredith, H. (2018). The Effects of a Summary Writing Strategy on the Literacy Skills of Adolescents with Disabilities. *Exceptionality*, 26(2), 106–118. https://doi.org/10.1080/09362835.2017.1283626
*Atmaca, F., & Yıldız-Demirtaş, V. (2022). Does Cognitive Training Affect Reading and Writing Skills of Students With Specific Learning Disabilities? *Learning Disability Quarterly*, 073194872210859. https://doi.org/10.1177/07319487221085994
Axpe, Á., Acosta, V., & Moreno, A. (2012). Intervention strategies in preschool students with specific language impairments. *Revista de Psicodidáctica*, 17(2), 271-289. https://doi.org/10.1387/Rev.Psicodidact.4496
*Badami, R., Mahmoudi, S., & Baluch, B. (2016). Effect of sports vision exercise on visual perception and reading performance in 7- to 10-year-old developmental dyslexic children. *Journal of Exercise Rehabilitation*, 12(6), 604–609. https://doi.org/10.12965/jer.1632728.364
*Bakker, M., van den Heuvel-Panhuizen, M., & Robitzsch, A. (2016). Effects of mathematics computer games on special education students' multiplicative reasoning ability. British

Journal of Educational Technology, 47(4), 633–648. https://doi.org/10.1111/bjet.12249

Barker, M. D., & Hicks, C. B. (2020). Treating Deficits in Auditory Processing Abilities. *Language, Speech, and Hearing Services in Schools*, 51(2), 416–427. https://doi.org/10.1044/2019_lshss-19-00001

*Bar-Kochva, I., Korinth, S. P., & Hasselhorn, M. (2020). Effects of a morpheme-based training procedure on the literacy skills of readers with a reading disability. *Applied Psycholinguistics*, 41(5), 1061–1082. https://doi.org/10.1017/s0142716420000120

*Barquero, L. A., Sefcik, A. M., Cutting, L. E., & Rimrodt, S. L. (2015). Teaching reading to children with neurofibromatosis type 1: a clinical trial with random assignment to different approaches. *Developmental Medicine & Child Neurology*, 57(12), 1150–1158. https://doi.org/10.1111/dmcn.12769

*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. https://doi.org/10.1044/2016_lshss-16-0041

*Beam, M., & Faddis, B. (2012). Evaluation of "System 44." Final Report [2012]. RMC Research Corporation. https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,shib&db=eric&AN=ED613692&site=ehost-live&scope=site&custid=s8454451

Beers, S. F., Berninger, V., Mickail, T., & Abbott, R. (2018). Online Writing Processes in Translating Cognition into Language and Transcribing Written Language by Stylus and Keyboard in Upper Elementary and Middle School Students With Persisting Dysgraphia or Dyslexia. *Learning Disabilities: A Multidisciplinary Journal*, 23(2), 70–86. https://doi.org/10.18666/ldmj-2018-v23-i2-9008

Benner, G. J., Michael, E., Ralston, N. C., & Lee, E. O. (2022). The Impact of Supplemental Word Recognition Strategies on Students with Reading Difficulties*. International Journal of Instruction*, 15(1), 837–856. https://doi.org/10.29333/iji.2022.15148a

*Benso, F., Moretti, S., Bellazzini, V., Benso, E., Ardu, E., & Gazzellini, S. (2021). Principles of Integrated Cognitive Training for Executive Attention: Application to an Instrumental Skill. *Frontiers in Psychology*, 12. https://doi.org/10.3389/fpsyg.2021.647749

Bergey, B. W., Parrila, R. K., Laroche, A., & Deacon, S. H. (2019). Effects of peer-led training on academic self-efficacy, study strategies, and academic performance for first-year university students with and without reading difficulties*. Contemporary Educational Psychology*, 56, 25–39. https://doi.org/10.1016/j.cedpsych.2018.11.001

*Berninger, V. W., Lee, Y.-L., Abbott, R. D., & Breznitz, Z. (2013). Teaching children with dyslexia to spell in a reading-writers' workshop. *Annals of Dyslexia*, 63(1), 1–24. https://doi.org/10.1007/s11881-011-0054-0

*Berninger, V. W., Winn, W. D., Stock, P., Abbott, R. D., Eschen, K., Lin, S.-J. (Cindy), Garcia, N., Anderson-Youngstrom, M., Murphy, H., Lovitt, D., Trivedi, P., Jones, J., Amtmann, D., & Nagy, W. (2008). Tier 3 specialized writing instruction for students with dyslexia. *Reading and Writing*, 21(1-2), 95–129.

*Berninger, V.W., Vaughan, K., Abbott, R.D., Begay, K., Coleman, K.B., Curtin, G., Hawkins, J.M., & Graham, S. (2002). Teaching spelling and composition alone and together: Implications for the simple view of writing. *Journal of Educational Psychology*, 94(2), 291–304. https://doi.org/10.1037//0022-0663.94.2.291

*Bhat, P., Griffin, C. C., & Sindelar, P. T. (2003). Phonological Awareness Instruction for Middle School Students with Learning Disabilities. *Learning Disability Quarterly*, 26(2), 73. https://doi.org/10.2307/1593591

*Bishop, D., Adams, C., Lehtonen, A., & Rosen, S. (2005). Effectiveness of computerised spelling training in children with language impairments: a comparison of modified and unmodified speech input. *Journal of Research in Reading*, 28(2), 144–157.

Björn, P. M., & Leppänen, P. H. T. (2013). Accelerating decoding-related skills in poor readers learning a foreign language: a computer-based intervention. *Educational Psychology*, 33(6), 671–689. https://doi.org/10.1080/01443410.2013.797336

*Bonacina, S., Cancer, A., Lanzi, P. L., Lorusso, M. L., & Antonietti, A. (2015). Improving reading skills in students with dyslexia: the efficacy of a sublexical training with rhythmic background. *Frontiers in Psychology*, 6. https://doi.org/10.3389/fpsyg.2015.01510

*Bottge, B. A., Ma, X., Gassaway, L. J., Jones, M., & Gravil, M. (2021). Effects of Formative Assessment Strategies on the Fractions Computation Skills of Students With Disabilities. *Remedial and Special Education*, 42(5), 074193252094295. https://doi.org/10.1177/0741932520942954

*Bottge, B. A., Ma, X., Gassaway, L., Toland, M. D., Butler, M., & Cho, S.-J. (2014). Effects of Blended Instructional Models on Math Performance. *Exceptional Children*, 80(4), 423–437. https://doi.org/10.1177/0014402914527240

*Bottge, B. A., Rueda, E., LaRoque, P. T., Serlin, R. C., & Kwon, J. (2007). Integrating Reform-Oriented Math Instruction in Special Education Settings. *Learning Disabilities Research & Practice*, 22(2), 96–109. https://doi.org/10.1111/j.1540-5826.2007.00234.x

*Boyle, J. R. (2010). Strategic Note-Taking for Middle-School Students with Learning Disabilities in Science Classes. *Learning Disability Quarterly*, 33(2), 93–109. https://doi.org/10.1177/073194871003300203

*Brankaer, C., Ghesquière, P., & De Smedt, B. (2015). The Effect of a Numerical Domino Game on Numerical Magnitude Processing in Children With Mild Intellectual Disabilities. *Mind, Brain, and Education*, 9(1), 29–39. https://doi.org/10.1111/mbe.12065

*Brasseur-Hock, I. F., Miller, W., Washburn, J., Christ, A. J., & Hock, M. F. (2021). The effects of a comprehensive and supplemental middle school reading program. *International Journal for Research in Learning Disabilities*, 5(1), 25–41. https://doi.org/10.28987/5.1.25

*Brimo, D. (2016). Evaluating the Effectiveness of a Morphological Awareness Intervention. *Communication Disorders Quarterly*, 38(1), 35–45. https://doi.org/10.1177/1525740115604592

*Browder, D. M., Ahlgrim-Delzell, L., Courtade, G., Gibbs, S. L., & Flowers, C. (2008). Evaluation of the Effectiveness of an Early Literacy Program for Students with Significant Developmental Disabilities. *Exceptional Children*, 75(1), 33–52. https://doi.org/10.1177/001440290807500102

*Browder, D., Ahlgrim-Delzell, L., Flowers, C., & Baker, J. (2012). An Evaluation of a Multicomponent Early Literacy Program for Students With Severe Developmental Disabilities. *Remedial and Special Education*, 33(4), 237–246. https://doi.org/10.1177/0741932510387305

*Bryant, D. P., Bryant, B. R., Gersten, R. M., Scammacca, N. N., Funk, C., Winter, A., Shih, M., & Pool, C. (2008a). The Effects of Tier 2 Intervention on the Mathematics Performance of First-Grade Students who are at Risk for Mathematics Difficulties. *Learning Disability Quarterly*, 31(2), 47–63. https://doi.org/10.2307/20528817

Bryant, D. P., Bryant, B. R., Gersten, R., Scammacca, N., & Chavez, M. M. (2008b). Mathematics Intervention for First- and Second-Grade Students With Mathematics

Difficulties. *Remedial and Special Education*, 29(1), 20–32. https://doi.org/10.1177/0741932507309712

*Burgoyne, K., Duff, F. J., Clarke, P. J., Buckley, S., Snowling, M. J., & Hulme, C. (2012). Efficacy of a reading and language intervention for children with Down syndrome: a randomized controlled trial. *Journal of Child Psychology and Psychiatry*, 53(10), 1044–1053.

*Burns, M. K. (2007). Reading at the instructional level with children identified as learning disabled: Potential implications for response-to-intervention. *School Psychology Quarterly*, 22(3), 297–313. https://doi.org/10.1037/1045-3830.22.3.297

*Burns, M. K., Maki, K. E., Brann, K. L., McComas, J. J., & Helman, L. A. (2020). Comparison of Reading Growth Among Students With Severe Reading Deficits Who Received Intervention to Typically Achieving Students and Students Receiving Special Education. *Journal of Learning Disabilities*, 53(6), 444–453. https://doi.org/10.1177/0022219420918840

Caldani, S., Gerard, C.-L., Peyre, H., & Bucci, M. P. (2020). Visual Attentional Training Improves Reading Capabilities in Children with Dyslexia: An Eye Tracker Study During a Reading Task. *Brain Sciences*, 10(8), 558. https://doi.org/10.3390/brainsci10080558

*Calhoon, M. B. (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(5), 424–433. https://doi.org/10.1177/00222194050380050501

*Calhoon, M. B., Sandow, A., & Hunter, C. V. (2010). Reorganizing the instructional reading components: could there be a better way to design remedial reading programs to maximize middle school students with reading disabilities' response to treatment? *Annals of Dyslexia*, 60(1), 57–85. https://doi.org/10.1007/s11881-009-0033-x

*Cancer, A., Bonacina, S., Antonietti, A., Salandi, A., Molteni, M., & Lorusso, M. L. (2020). The Effectiveness of Interventions for Developmental Dyslexia: Rhythmic Reading Training Compared With Hemisphere-Specific Stimulation and Action Video Games. *Frontiers in Psychology*, 11. https://doi.org/10.3389/fpsyg.2020.01158

*Cancer, A., De Salvatore, M., Granocchio, E., Andreoli, L., Antonietti, A., & Sarti, D. (2022a). The Role of Auditory and Visual Components in Reading Training: No Additional Effect of Synchronized Visual Cue in a Rhythm-Based Intervention for Dyslexia. *Applied Sciences*, 12(7), 3360. https://doi.org/10.3390/app12073360

Cancer, A., Stievano, G., Pace, G., Colombo, A., Brembati, F., Donini, R., & Antonietti, A. (2022b). Remedial interventions for developmental dyslexia: Comparing the rhythmic reading training to the "Abilmente" approach. *Psychology of Music*, 030573562211233. https://doi.org/10.1177/03057356221123374

*Cannon, J. E., Hubley, A. M., O'Loughlin, J. I., Phelan, L., Norman, N., & Finley, A. (2020). A Technology-based Intervention to Increase Reading Comprehension of Morphosyntax Structures. *The Journal of Deaf Studies and Deaf Education*, 25(1), 126–139. https://doi.org/10.1093/deafed/enz029

Celo, P., & Vian, N. (2016). Teaching reading and writing with the intramorphic method to deaf children. *RIVISTA DI PSICOLINGUISTICA APPLICATA-JOURNAL of APPLIED PSYCHOLINGUISTICS*, 16(2), 85–99. https://doi.org/10.19272/201607702006

Chan, A. S., Lee, T.-L., Sze, S. L., Yang, N. S., & Han, Y. M. Y. (2022). Eye-tracking training improves the learning and memory of children with learning difficulty. *Scientific Reports*, 12(1). https://doi.org/10.1038/s41598-022-18286-6

*Chang, S.-H., & Yu, N.-Y. (2014). The effect of computer-assisted therapeutic practice for children with handwriting deficit: A comparison with the effect of the traditional sensorimotor approach. *Research in developmental disabilities*, 35(7), 1648–1657. https://doi.org/10.1016/j.ridd.2014.03.024

*Chang, S.-H., & Yu, N.-Y. (2017). Visual and Haptic Perception Training to Improve Handwriting Skills in Children With Dysgraphia. *American Journal of Occupational Therapy*, 71(2), 7102220030p1. https://doi.org/10.5014/ajot.2017.021311

*Chang, S.-H., Shie, J.-J., & Yu, N.-Y. (2022). Enhancing Executive Functions and Handwriting with a Concentrative Coordination Exercise in Children with ADHD: A Randomized Clinical Trial. *Perceptual and Motor Skills*, 129(4), 003151252210983. https://doi.org/10.1177/00315125221098324

Chen, X., Ye, M., Chang, L., Chen, W., & Zhou, R. (2018). Effect of Working Memory Updating Training on Retrieving Symptoms of Children With Learning Disabilities. *Journal of Learning Disabilities*, 51(5), 507–519. https://doi.org/10.1177/0022219417712015

*Chen, Y.-H. (2014). Effects of Phonological Awareness Training on Early Chinese Reading of Children Who Are Deaf and Hard of Hearing. *The Volta Review*, 114(1), 85–100.

Chenault, B., Thomson, J., Abbott, R. D., & Berninger, V. W. (2006). Effects of Prior Attention Training on Child Dyslexics' Response to Composition Instruction. *Developmental Neuropsychology*, 29(1), 243–260. https://doi.org/10.1207/s15326942dn2901_12

Cheng, D., Xiao, Q., Cui, J., Chen, C., Zeng, J., Chen, Q., & Zhou, X. (2020). Short-term numerosity training promotes symbolic arithmetic in children with developmental dyscalculia: The mediating role of visual form perception. *Developmental Science*, 23(4). https://doi.org/10.1111/desc.12910

Chong, W. H., Moore, D. W., Nonis, K. P., Tang, H. N., Koh, P., & Wee, S. (2014). Mission I'm Possible: Effects of a community-based project on the basic literacy skills of at-risk kindergarteners. *Infants & Young Children*, 27(1), 60-73.

*Christodoulou, J. A., Cyr, A., Murtagh, J., Chang, P., Lin, J., Guarino, A. J., Hook, P., & Gabrieli, J. D. E. (2017). Impact of Intensive Summer Reading Intervention for Children With Reading Disabilities and Difficulties in Early Elementary School. *Journal of Learning Disabilities*, 50(2), 115–127. https://doi.org/10.1177/0022219415617163

*Clarke, B., Doabler, C. T., Kosty, D., Kurtz Nelson, E., Smolkowski, K., Fien, H., & Turtura, J. (2017a). Testing the Efficacy of a Kindergarten Mathematics Intervention by Small Group Size. *AERA Open*, 3(2), 233285841770689. https://doi.org/10.1177/2332858417706899

*Clarke, B., Doabler, C. T., Smolkowski, K., Baker, S. K., Fien, H., & Mari Strand Cary. (2016). Examining the Efficacy of a Tier 2 Kindergarten Mathematics Intervention. *Grantee Submission*, 49(2), 152–165.

*Clarke, P. J., Paul, S.-A. S., Smith, G., Snowling, M. J., & Hulme, C. (2017b). Reading Intervention for Poor Readers at the Transition to Secondary School. *Scientific Studies of Reading*, 21(5), 408–427. https://doi.org/10.1080/10888438.2017.1318393

*Clarke, P. J., Snowling, M. J., Truelove, E., & Hulme, C. (2010). Ameliorating Children's Reading-Comprehension Difficulties. *Psychological Science*, 21(8), 1106–1116. https://doi.org/10.1177/0956797610375449

Collet, G., Colin, C., W Serniclaes, I Hoonhorst, E Markessis, P Deltenre, & J Leybaert. (2012). Effect of phonological training in French children with SLI: Perspectives on voicing identification, discrimination and categorical perception. *Research in developmental disabilities*, 33(6), 1805–1818. https://doi.org/10.1016/j.ridd.2012.05.003

Conners, F. A., Rosenquist, C. J., Sligh, A. C., Atwell, J. A., & Kiser, T. (2006). Phonological reading skills acquisition by children with mental retardation. *Research in developmental disabilities*, 27(2), 121–137. https://doi.org/10.1016/j.ridd.2004.11.015

*Contesse, V. A., Campese, T., Kaplan, R., Mullen, D., Pico, D. L., Gage, N. A., & Lane, H. B. (2021). The Effects of an Intensive Summer Literacy Intervention on Reader Development. *Reading & Writing Quarterly*, 37(3), 221–239. https://doi.org/10.1080/10573569.2020.1765441

*Cook, L. G., Chapman, S. B., Elliott, A. C., Evenson, N. N., & Vinton, K. (2014). Cognitive Gains from Gist Reasoning Training in Adolescents with Chronic-Stage Traumatic Brain Injury. *Frontiers in Neurology*, 5. https://doi.org/10.3389/fneur.2014.00087

*Coyne, M. D., Simmons, D. C., Hagan-Burke, S., Simmons, L. E., Kwok, O.-M., Kim, M., Fogarty, M., Oslund, E. L., Taylor, A. B., Capozzoli-Oldham, A., Ware, S., Little, M. E., & Rawlinson, D. M. (2013). Adjusting Beginning Reading Intervention Based on Student Performance: An Experimental Evaluation. *Exceptional Children*, 80(1), 25–44. https://doi.org/10.1177/001440291308000101

*Curcic, S. (2011). Addressing the needs of students with learning disabilities during their interaction with the web. *Multicultural Education & Technology Journal*, 5(2), 151–170.

*Curcic, S., & Johnstone, R. S. (2016). The Effects of an Intervention in Writing with Digital Interactive Books. *Computers in the Schools*, 33(2), 71–88.

*D'Agostino, J. V., Rodgers, E., & Konstantopoulos, S. (2021). The effects of HEROES on the achievement levels of beginning readers with individualized education programs. *Journal of Educational Research*, 114(5), 433–444. https://doi.org/10.1080/00220671.2021.1965077

*Dahlin, K. I. E. (2011). Effects of working memory training on reading in children with special needs. *Reading and Writing*, 24(4), 479–491.

*Dahlin, K. I. E. (2013). Working Memory Training and the Effect on Mathematical Achievement in Children with Attention Deficits and Special Needs. *Journal of Education and Learning*, 2(1), 118–133.

*Dai, L., Zhang, C., & Liu, X. (2016). A Special Chinese Reading Acceleration Training Paradigm: To Enhance the Reading Fluency and Comprehension of Chinese Children with Reading Disabilities. *Frontiers in Psychology*, 7(DEC). https://doi.org/10.3389/fpsyg.2016.01937

*Daki, J., & Savage, R. S. (2010). Solution-Focused Brief Therapy: Impacts on Academic and Emotional Difficulties. *The Journal of Educational Research*, 103(5), 309–326. https://doi.org/10.1080/00220670903383127

*Daza Gonzalez, M. T., Phillips-Silver, J., Maurno, N. G., García, L. F., & Ruiz-Castañeda, P. (2023). Improving phonological skills and reading comprehension in deaf children: A new multisensory approach. *Scientific Studies of Reading*, 27(2), 1–17. https://doi.org/10.1080/10888438.2022.2095280

*De La Paz, S., & Wissinger, D. R. (2017). Improving the Historical Knowledge and Writing of Students With or At Risk for LD. *Journal of Learning Disabilities*, 50(6), 658–671.

*Deaño, M. D., Alfonso, S., & Das, J. P. (2015). Program of arithmetic improvement by means of cognitive enhancement: An intervention in children with special educational needs. *Research in developmental disabilities*, 38, 352–361. https://doi.org/10.1016/j.ridd.2014.12.032

*Demir, Ü. (2022). An Examination of the Impact of Game-Based Geometric Shapes Education Software Usage on the Education of Students With Intellectual Disabilities.

ECNU Review of Education, 5(4), 209653112094072. https://doi.org/10.1177/2096531120940721

*Denton, C. A., Cirino, P. T., Barth, A. E., Romain, M., Vaughn, S., Wexler, J., Francis, D. J., & Fletcher, J. M. (2011). An Experimental Study of Scheduling and Duration of "Tier 2" First-Grade Reading Intervention. *Journal of Research on Educational Effectiveness*, 4(3), 208–230. https://doi.org/10.1080/19345747.2010.530127

Denton, C. A., Montroy, J. J., Zucker, T. A., & Cannon, G. (2020). Designing an Intervention in Reading and Self-Regulation for Students With Significant Reading Difficulties, Including Dyslexia. *Learning Disability Quarterly*, 44(3), 073194871989947. https://doi.org/10.1177/0731948719899479

*Denton, C. A., Nimon, K., Mathes, P. G., Swanson, E. A., Kethley, C., Kurz, T. B., & Shih, M. (2010). Effectiveness of a Supplemental Early Reading Intervention Scaled up in Multiple Schools. *Exceptional Children*, 76(4), 394–416.

*Denton, C. A., Tamm, L., Schatschneider, C., & Epstein, J. N. (2020). The Effects of ADHD Treatment and Reading Intervention on the Fluency and Comprehension of Children with ADHD and Word Reading Difficulties: A Randomized Clinical Trial. *Scientific Studies of Reading*, 24(1), 72–89. https://doi.org/10.1080/10888438.2019.1640704

*Denton, C. A., Tolar, T. D., Fletcher, J. M., Barth, A. E., Vaughn, S., & Francis, D. J. (2013). Effects of tier 3 intervention for students with persistent reading difficulties and characteristics of inadequate responders. *Journal of Educational Psychology*, 105(3), 633–648. https://doi.org/10.1037/a0032581

*Denton, C. A., Wexler, J., Vaughn, S., & Bryan, D. (2008). Intervention Provided to Linguistically Diverse Middle School Students with Severe Reading Difficulties. *Learning Disabilities Research & Practice*, 23(2), 79–89. https://doi.org/10.1111/j.1540-5826.2008.00266.x

*Denton, P. L., Cope, S., & Moser, C. (2006). The Effects of Sensorimotor-Based Intervention Versus Therapeutic Practice on Improving Handwriting Performance in 6- to 11-Year-Old Children. *American Journal of Occupational Therapy*, 60(1), 16–27. https://doi.org/10.5014/ajot.60.1.16

*Dhingra, K., Aggarwal, R., Garg, A., Pujari, J., & Yadav, D. (2022). Mathlete: an adaptive assistive technology tool for children with dyscalculia. *Disability and Rehabilitation: Assistive Technology*, 1–7. https://doi.org/10.1080/17483107.2022.2134473

*Didion, L., & Toste, J. R. (2022). Data mountain: Self-Monitoring, goal setting, and positive attributions to enhance the oral reading fluency of elementary students with or at-risk for reading disabilities. *Journal of Learning Disabilities*, 55(5), 002221942110434. https://doi.org/10.1177/00222194211043482

*Diliberto, J. A., Beattie, J. R., Flowers, C. P., & Algozzine, R. F. (2009). Effects of Teaching Syllable Skills Instruction on Reading Achievement in Struggling Middle School Readers. *Literacy Research and Instruction*, 48(1), 14–27. https://doi.org/10.1080/19388070802226253

*Donegan, R. E., Wanzek, J., & Al Otaiba, S. (2020). Effects of a Reading Intervention Implemented at Differing Intensities for Upper Elementary Students. *Learning Disabilities Research & Practice*, 35(2), 62–71. https://doi.org/10.1111/ldrp.12218

*Donnelly, P. M., Huber, E., & Yeatman, J. D. (2019). Intensive Summer Intervention Drives Linear Growth of Reading Skill in Struggling Readers. *Frontiers in Psychology*, 10(AUG). https://doi.org/10.3389/fpsyg.2019.01900

*DuPaul, G. J., Evans, S. W., Owens, J. S., Cleminshaw, C. L., Kipperman, K., Fu, Q., & Benson, K. (2021). School-based intervention for adolescents with attention-

deficit/hyperactivity disorder: Effects on academic functioning. *Journal of School Psychology*, 87, 48–63. https://doi.org/10.1016/j.jsp.2021.07.001

*Ebbels, S. H., Nicoll, H., Clark, B., Eachus, B., Gallagher, A. L., Horniman, K., Jennings, M., McEvoy, K., Nimmo, L., & Turner, G. (2012). Effectiveness of semantic therapy for word-finding difficulties in pupils with persistent language impairments: a randomized control trial. *International Journal of Language & Communication Disorders*, 47(1), 35–51.

Ecalle, J., Kleinsz, N., & Magnan, A. (2013). Computer-assisted learning in young poor readers: The effect of grapho-syllabic training on the development of word reading and reading comprehension. *Computers in Human Behavior*, 29(4), 1368–1376. https://doi.org/10.1016/j.chb.2013.01.041

*Egeland, J., Aarlien, A. K., & Saunes, B.-K. (2013). Few Effects of Far Transfer of Working Memory Training in ADHD: A Randomized Controlled Trial. *PLoS ONE*, 8(10), e75660. https://doi.org/10.1371/journal.pone.0075660

*Ehlert, A., & Fritz, A. (2013). Evaluation of maths training programme for children with learning difficulties. *South African Journal of Childhood Education*, 3(1). https://doi.org/10.4102/sajce.v3i1.34

Eissa, M. A. (2009). The effectiveness of a program based on self-regulated strategy development on the writing skills of writing-disabled secondary school students. *Electronic Journal of Research in Education Psychology*, 7(17), 5-24.

Englert, C. S., Zhao, Y., Dunsmore, K., Collings, N. Y., & Wolbers, K. (2007). Scaffolding the Writing of Students with Disabilities Through Procedural Facilitation: Using an Internet-Based Technology to Improve Performance*. Learning Disability Quarterly*, 30(1), 9. https://doi.org/10.2307/30035513

Esfandbod, A., Rokhi, Z., Meghdari, A. F., Taheri, A., Alemi, M., & Karimi, M. (2022). Utilizing an Emotional Robot Capable of Lip-Syncing in Robot-Assisted Speech Therapy Sessions for Children with Language Disorders. *International Journal of Social Robotics*. https://doi.org/10.1007/s12369-022-00946-2

*Evans, S. W., Langberg, J. M., Schultz, B. K., Vaughn, A., Altaye, M., Marshall, S. A., & Zoromski, A. K. (2016). Evaluation of a school-based treatment program for young adolescents with ADHD. *Journal of Consulting and Clinical Psychology*, 84(1), 15–30. https://doi.org/10.1037/ccp0000057

*Evans, S. W., Schultz, B. K., & DeMars, C. E. (2014). High School–Based Treatment for Adolescents With Attention-Deficit/Hyperactivity Disorder: Results From a Pilot Study Examining Outcomes and Dosage. *School Psychology Review*, 43(2), 185–202. https://doi.org/10.1080/02796015.2014.12087444

*Evans, S. W., Schultz, B. K., DeMars, C. E., & Davis, H. (2011). Effectiveness of the Challenging Horizons After-School Program for Young Adolescents With ADHD. *Behavior Therapy*, 42(3), 462–474. https://doi.org/10.1016/j.beth.2010.11.008

Everatt, J., Al-Sharhan , A., Al-Azmi, Y., Al-Menaye, N., & Elbeheri, G. (2011). Behavioural/attentional problems and literacy learning difficulties in children from non-English language/cultural backgrounds. *Support for Learning*, 26(3), 127–133.

*Faramarzi, S., Moradi, M., & Abedi, A. (2018). Comparing the Effect of Thinking Maps Training Package Developed by the Thinking Maps Method on the Reading Performance of Dyslexic Students. *Journal of Psycholinguistic Research*, 47(3), 627–640. https://doi.org/10.1007/s10936-017-9545-4

*Farhat, F., Hsairi, I., Baati, H., Smits-Engelsman, B. C. M., Masmoudi, K., Mchirgui, R., Triki, C., & Moalla, W. (2016). The effect of a motor skills training program in the

improvement of practiced and non-practiced tasks performance in children with developmental coordination disorder (DCD). *Human Movement Science*, 46, 10–22. https://doi.org/10.1016/j.humov.2015.12.001

*Ferraz, E., Gonçalves, T., Freire, T., Mattar, T., Lamônica, D., Maximino, L., & Abreu Pinheiro Crenitte, P. (2018). Effects of a Phonological Reading and Writing Remediation Program in Students with Dyslexia: Intervention for Specific Learning Disabilities. *Folia Phoniatrica et Logopaedica*, 70(2), 59–73. https://doi.org/10.1159/000489091

*Filderman, M. J., & Toste, J. R. (2022). Effects of Varying Levels of Data Use to Intensify a Multisyllabic Word Reading Intervention for Upper Elementary Students With or At Risk for Reading Disabilities. *Journal of Learning Disabilities*, 55(5), 002221942110484. https://doi.org/10.1177/00222194211048405

*Firuz Akhundi Yamchi, Haniyeh Davatgar Asl, & Nader Asadi Aidinloo. (2021). The Effectiveness of Using Multimedia in Smart Classes on Improving Reading Disorders, Word Chain, and Word Comprehension in Late Learning Students. *Research in English Language Pedagogy (RELP)*, 9(2), 469.

*Flaugnacco, E., Lopez, L., Terribili, C., Montico, M., Zoia, S., & Schön, D. (2015). Music Training Increases Phonological Awareness and Reading Skills in Developmental Dyslexia: A Randomized Control Trial. *PLOS ONE*, 10(9), e0138715. https://doi.org/10.1371/journal.pone.0138715

Fleury, V. P., & Towson, J. A. (2021). Early Lessons Learned in Designing an Adaptive Shared Reading Intervention for Preschoolers With Autism. *Exceptional Children*, 88(1), 45–64.

*Flores, M. M., Nelson, C. D., Hinton, V., Franklin, T. M., Strozier, S. D., Terry, L., & Franklin, S. (2013). Teaching Reading Comprehension and Language Skills to Students with Autism Spectrum Disorders and Developmental Disabilities Using Direct Instruction. *Education and Training in Autism and Developmental Disabilities*, 48(1), 41–48.

Fraga González, G., Žarić, G., Tijms, J., Bonte, M., Blomert, L., & van der Molen, M. W. (2015). A Randomized Controlled Trial on The Beneficial Effects of Training Letter-Speech Sound Integration on Reading Fluency in Children with Dyslexia. *PLOS ONE*, 10(12), e0143914. https://doi.org/10.1371/journal.pone.0143914

*Fraga González, G., Žarić, G., Tijms, J., Bonte, M., Blomert, L., Leppänen, P., & van der Molen, M. W. (2016). Responsivity to dyslexia training indexed by the N170 amplitude of the brain potential elicited by word reading. *Brain and Cognition*, 106, 42–54. https://doi.org/10.1016/j.bandc.2016.05.001

*Fragkouli, K., Antoniou, F., Mouzaki, A., Ralli, A. M., Kokkali, V., & Alexoudi, K. (2022). Evaluation of a Spelling Intervention Program for Third Graders at Risk for Learning Disabilities. *Reading & Writing Quarterly*, 38(6), 544–563. https://doi.org/10.1080/10573569.2021.1987362

*Freilich, R., & Shechtman, Z. (2010). The contribution of art therapy to the social, emotional, and academic adjustment of children with learning disabilities. *The Arts in Psychotherapy*, 37(2), 97–105. https://doi.org/10.1016/j.aip.2010.02.003

*Fuchs, L. S., Fuchs, D., & Karns, K. (2001). Enhancing Kindergartners' Mathematical Development: Effects of Peer-Assisted Learning Strategies. *The Elementary School Journal*, 101(5), 495–510. https://doi.org/10.1086/499684

*Fuchs, L. S., Fuchs, D., Compton, D. L., Wehby, J., Schumacher, R. F., Gersten, R., & Jordan, N. C. (2015). Inclusion Versus Specialized Intervention for Very-Low-Performing Students. *Exceptional Children*, 81(2), 134–157.

Fuchs, L. S., Powell, S. R., Seethaler, P. M., Cirino, P. T., Fletcher, J. M., Fuchs, D., & Hamlett, C. L. (2010). The effects of strategic counting instruction, with and without deliberate practice, on number combination skill among students with mathematics difficulties. *Learning and Individual Differences*, 20(2), 89–100. https://doi.org/10.1016/j.lindif.2009.09.003

*Fuchs, L. S., Powell, S. R., Seethaler, P. M., Cirino, P. T., Fletcher, J. M., Fuchs, D., Hamlett, C. L., & Zumeta, R. O. (2009). Remediating number combination and word problem deficits among students with mathematics difficulties: A randomized control trial. *Journal of Educational Psychology*, 101(3), 561–576. https://doi.org/10.1037/a0014701

*Fuchs, L. S., Seethaler, P. M., Powell, S. R., Fuchs, D., Hamlett, C. L., & Fletcher, J. M. (2008). Effects of Preventative Tutoring on the Mathematical Problem Solving of Third-Grade Students with Math and Reading Difficulties. *Exceptional Children,* 74(2), 155–173. https://doi.org/10.1177/001440290807400202

*Furey, W. M., Marcotte, A. M., Wells, C. S., & Hintze, J. M. (2017). The effects of supplemental sentence-level instruction for fourth-grade students identified as struggling writers. *Reading & Writing Quarterly*, 33(6), 563–578. https://doi.org/10.1080/10573569.2017.1288591

*Gebauer, D., Fink, A., Kargl, R., Reishofer, G., Koschutnig, K., Purgstaller, C., Fazekas, F., & Enzinger, C. (2012). Differences in Brain Function and Changes with Intervention in Children with Poor Spelling and Reading Abilities. *PLoS ONE*, 7(5), e38201. https://doi.org/10.1371/journal.pone.0038201

*Gharaibeh, M., & Dukmak, S. (2021). Effect of computer-based multisensory program on English reading skills of students with Dyslexia and reading difficulties. *Applied Neuropsychology*: *Child*, 11(3), 1–14. https://doi.org/10.1080/21622965.2021.1898395

Gilbert, J. K., Compton, D. L., Fuchs, D., Fuchs, L. S., Bouton, B., Barquero, L. A., & Cho, E. (2013). Efficacy of a First-Grade Responsiveness-to-Intervention Prevention Model for Struggling Readers. *Reading Research Quarterly*, 48(2), 135–154. https://doi.org/10.1002/rrq.45

*Gillam, R. B., Loeb, D. F., Hoffman, L. M., Bohman, T., Champlin, C. A., Thibodeau, L., Widen, J., Brandel, J., & Friel-Patti, S. (2008). The efficacy of fast forword language intervention in school-age children with language impairment: A randomized controlled trial. *Journal of Speech, Language, and Hearing Research*, 51(1), 97–119. https://doi.org/10.1044/1092-4388(2008/007)

Gillon, G. T. (2000). The Efficacy of Phonological Awareness Intervention for Children With Spoken Language Impairment. Language Speech and Hearing Services in Schools*, 31(2), 126. https://doi.org/10.1044/0161-1461.3102.126

*Goetz, K., Hulme, C., Brigstocke, S., Carroll, J. M., Nasir, L., & Snowling, M. (2008). Training reading and phoneme awareness skills in children with Down syndrome. *Reading and Writing*, 21(4), 395–412. https://doi.org/10.1007/s11145-007-9089-3

González, M. D. R. O., Garcia Espinel, A. I., & Guzman Rosquete, R. (2002). Remedial Interventions for Children with Reading Disabilities. *Journal of Learning Disabilities*, 35(4), 334–342. https://doi.org/10.1177/00222194020350040401

*González-Castro, P., Cueli, M., Areces, D., Rodríguez, C., & Sideridis, G. (2016). Improvement of Word Problem Solving and Basic Mathematics Competencies in Students with Attention Deficit/Hyperactivity Disorder and Mathematical Learning Difficulties. *Learning Disabilities Research & Practice*, 31(3), 142–155.

*Gorard, S., Beng, H, S., Siddiqui, N. (2014). *Switch-on Reading: Evaluation Report and Executive Summary*. Education Endowment Foundation. https://educationendowmentfoundation.org.uk/projects-and-evaluation/projects/switch-on-reading

*Graham, G. (2021). Teacher and Parent Perceptions of Training, Supports, and Learning Gains among HISD Students with Dyslexia, 2020-2021. *Research Educational Program Report*. https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,shib&db=eric&AN=ED617810&site=ehost-live&scope=site&custid=s8454451

*Gray, S. A., Chaban, P., Martinussen, R., Goldberg, R., Gotlieb, H., Kronitz, R., Hockenberry, M., & Tannock, R. (2012). Effects of a computerized working memory training program on working memory, attention, and academics in adolescents with severe LD and comorbid ADHD: a randomized controlled trial. *Journal of Child Psychology and Psychiatry*, 53(12), 1277–1284.

*Green, K. B., Gallagher, P. A., & Hart, L. (2018). Integrating mathematics and children's literature for young children with disabilities. *Journal of Early Intervention*, 40(1), 3–19.

*Grindle, C. F., Murray, C., Hastings, R. P., Bailey, T., Forster, H., Taj, S., Paris, A., Lovell, M., Jackson Brown, F., & Hughes, J. C. (2021). Headsprout® Early Reading for children with severe intellectual disabilities: a single blind randomised controlled trial. *Journal of Research in Special Educational Needs*, 21(4), 334–344.

Grossen, B., Hagen-Burke, S., & Burke, M. D. (2002). *An Experimental Study of the Effects of Considerate Curricula in Language Arts on Reading Comprehension and Writing*. Research Report. https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,shib&db=eric&AN=ED469291&site=ehost-live&scope=site&custid=s8454451

*Guan, C. Q., & Wang, Y. (2017). The Effect of Handwriting Training on Language Learning Among Deaf Children and Their Matched Hearing Peers in China. *American Annals of the Deaf*, 162(3), 265–276. https://doi.org/10.1353/aad.2017.0025

Guo, Y., Dynia, J. M., Logan, J. A. R., Justice, L. M., Breit-Smith, A., & Kaderavek, J. N. (2016). Fidelity of implementation for an early-literacy intervention: Dimensionality and contribution to children's intervention outcomes. *Early Childhood Research Quarterly*, 37, 165–174. https://doi.org/10.1016/j.ecresq.2016.06.001

Hacker, D. J., Kiuhara, S. A., & Levin, J. R. (2019). A metacognitive intervention for teaching fractions to students with or at-risk for learning disabilities in mathematics. *ZDM*, 51(4), 601–612.

*Harn, B. A., Linan-Thompson, S., & Roberts, G. (2008). Intensifying instruction: Does additional instructional time make a difference for the most at-risk first graders? *Journal of Learning Disabilities*, 41(2), 115–125. https://doi.org/10.1177/0022219407313586

*Hart, K. C., Graziano, P. A., Kent, K. M., Kuriyan, A., Garcia, A., Rodriguez, M., & Pelham, W. E. (2016). Early Intervention for Children With Behavior Problems in Summer Settings. *Journal of Early Intervention*, 38(2), 92–117. https://doi.org/10.1177/1053815116645923

*Hart, K. C., Maharaj, A. V., & Graziano, P. A. (2019). Does dose of early intervention matter for preschoolers with externalizing behavior problems? A pilot randomized trial comparing intensive summer programming to school consultation. *Journal of School Psychology*, 72, 112–133. https://doi.org/10.1016/j.jsp.2018.12.007

*Hatcher, P. J. (2000). Sound links in reading and spelling with discrepancy-defined dyslexics and children with moderate learning difficulties. *Reading and Writing*, 13(3-4), 257–272. https://doi.org/10.1023/a:1026486500271

*Hattabi, S., Forte, P., Kukic, F., Bouden, A., Have, M., Chtourou, H., & Sortwell, A. (2022). A Randomized Trial of a Swimming-Based Alternative Treatment for Children with Attention Deficit Hyperactivity Disorder. *International Journal of Environmental Research and Public Health*, 19(23), 16238. https://doi.org/10.3390/ijerph192316238

*Hautala, J., Ronimus, M., & Junttila, E. (2022). Readers' Theater Projects for Special Education: A Randomized Controlled Study. *Scandinavian Journal of Educational Research*, 1–16. https://doi.org/10.1080/00313831.2022.2042846

*Hayes, E. A., Warrier, C. M., Nicol, T. G., Zecker, S. G., & Kraus, N. (2003). Neural plasticity following auditory training in children with learning problems. *Clinical Neurophysiology*, 114(4), 673–684. https://doi.org/10.1016/s1388-2457(02)00414-5

*Hebert, M., Bohaty, J., Nelson, J. R., Roehling, J., & Christensen, K. (2018). Taking Notes on Informational Source Text Using Text Structures: An Intervention for Fourth Grade Students with Learning Difficulties. Learning Disabilities: *A Multidisciplinary Journal*, 23(2), 34–55. https://doi.org/10.18666/ldmj-2018-v23-i2-9048

*Hechtman, L., Abikoff, H., Klein, R. G., Weiss, G., Respitz, C., Kouri, J., Blum, C., Greenfield, B., Etcovitch, J., Fleiss, K., & Pollack, S. (2004). Academic Achievement and Emotional Status of Children With ADHD Treated With Long-Term Methylphenidate and Multimodal Psychosocial Treatment. *Journal of the American Academy of Child & Adolescent Psychiatry*, 43(7), 812–819. https://doi.org/10.1097/01.chi.0000128796.84202.eb

*Heikkilä, J., Lonka, E., Meronen, A., Tuovinen, S., Eronen, R., Leppänen, P. H., Richardson, U., Ahonen, T., & Tiippana, K. (2018). The effect of audiovisual speech training on the phonological skills of children with specific language impairment (SLI). *Child Language Teaching and Therapy*, 34(3), 269–287. https://doi.org/10.1177/0265659018793697

Helland, T., Tjus, T., Hovden, M., Ofte, S., & Heimann, M. (2011). Effects of Bottom-Up and Top-Down Intervention Principles in Emergent Literacy in Children at Risk of Developmental Dyslexia: A Longitudinal Study. *Journal of Learning Disabilities*, 44(2), 105–122. https://doi.org/10.1177/0022219410391188

Higgins, E. L., & Raskind, M. H. (2000). Speaking to Read: The Effects of Continuous vs. Discrete Speech Recognition Systems on the Reading and Spelling of Children with Learning Disabilities. *Journal of Special Education Technology*, 15(1), 19–30. https://doi.org/10.1177/016264340001500102

*Hintikka, S., Landerl, K., Aro, M., & Lyytinen, H. (2008). Training reading fluency: is it important to practice reading aloud and is generalization possible? *Annals of Dyslexia*, 58(1), 59–79. https://doi.org/10.1007/s11881-008-0012-7

*Hirschman, M. (2000). Language repair via metalinguistic means. *International Journal of Language & Communication Disorders*, 35(2), 251–268. https://doi.org/10.1080/136828200247179

*Hock, M. F., Brasseur-Hock, I. F., Hock, A. J., & Duvel, B. (2017). The Effects of a Comprehensive Reading Program on Reading Outcomes for Middle School Students With Disabilities. *Journal of Learning Disabilities*, 50(2), 195–212.

*Hodgins, H., & Harrison, G. L. (2021). Improving phonological awareness with Talking Tables in at-risk kindergarten readers. *Research in developmental disabilities*, 115, 103996. https://doi.org/10.1016/j.ridd.2021.103996

Holmer, E., Heimann, M., & Rudner, M. (2017). Computerized Sign Language-Based Literacy Training for Deaf and Hard-of-Hearing Children. *The Journal of Deaf Studies and Deaf Educatio*n, 22(4), 404–421.

*Hook, P. E., Macaruso, P., & Jones, S. (2001). Efficacy of Fast ForWord training on facilitating acquisition of reading skills by children with reading difficulties—A longitudinal study. *Annals of Dyslexia*, 51(1), 73–96. https://doi.org/10.1007/s11881-001-0006-1

Hua, Y., Benjamin, S.T.M., Kaldenberg, E. R., & Goo, M. (2012). Cognitive Strategy Instruction for Functional Mathematical Skill: Effects for Young Adults with Intellectual Disability. *Education and Training in Autism and Developmental Disabilities*, 47(3), 345–358.

Hua, Y., Woods-Groves, S., Ford, J. W., & Nobles, K. A. (2014). Effects of the Paraphrasing Strategy on Expository Reading Comprehension of Young Adults with Intellectual Disability. *Education and Training in Autism and Developmental Disabilities*, 49(3), 429–439.

*Hudson, R. F., Sanders, E. A., Greenway, R., Xie, S., Smith, M., Gasamis, C., Martini, J., Schwartz, I., & Hackett, J. (2017). Effects of Emergent Literacy Interventions for Preschoolers With Autism Spectrum Disorder. *Exceptional Children*, 84(1), 55–75. https://doi.org/10.1177/0014402917705855

*Hume, K., Odom, S. L., Steinbrenner, J. R., Smith DaWalt, L., Hall, L. J., Kraemer, B., Tomaszewski, B., Brum, C., Szidon, K., & Bolt, D. M. (2022). Efficacy of a School-Based Comprehensive Intervention Program for Adolescents With Autism. *Exceptional Children*, 88(2), 223–240. https://doi.org/10.1177/00144029211062589

*Hund-Reid, C., & Schneider, P. (2013). Effectiveness of Phonological Awareness Intervention for Kindergarten Children With Language Impairment. *Canadian Journal of Speech-Language Pathology & Audiology*, 37(1).

*Hunt, P., Kozleski, E., Lee, J., Mortier, K., Fleming, D., Hicks, T., Balasubramanian, L., Leu, G., Bross, L. A., Munandar, V., Dunlap, K., Stepaniuk, I., Aramburo, C., & Oh, Y. (2019). Implementing Comprehensive Literacy Instruction for Students With Severe Disabilities in General Education Classrooms. *Exceptional Children*, 86(3), 330–347. https://doi.org/10.1177/0014402919880156

*Hurwitz, L., B., & Vanacore, K., P. (2022). Educational Technology in Support of Elementary Students With Reading or Language-Based Disabilities: A Cluster Randomized Control Trial. *Journal of Learning Disabilities*. https://doi.org/10.1177/00222194221141093

*Ise, E., & Schulte-Körne, G. (2010). Spelling deficits in dyslexia: evaluation of an orthographic spelling training. *Annals of Dyslexia*, 60(1), 18–39. https://doi.org/10.1007/s11881-010-0035-8

*Iseman, J. S., & Naglieri, J. A. (2011). A Cognitive Strategy Instruction to Improve Math Calculation for Children With ADHD and LD: A Randomized Controlled Study. *Journal of Learning Disabilities*, 44(2), 184–195. https://doi.org/10.1177/0022219410391190

*Isikdogan, N., & Kargin, T. (Eds.). (2010). Investigation of the Effectiveness of the Story-Map Method on Reading Comprehension Skills among Students with Mental Retardation. *KURAM ve UYGULAMADA EGITIM BILIMLERI*, 10(3), 1509–1527.

Jacob, U. S., & Pillay, J. (2021). Effectiveness of music therapy on reading skills of pupils with intellectual disability. *Cypriot Journal of Educational Sciences*, 16(1), 251–265. https://doi.org/10.18844/cjes.v16i1.5526

Jansen, B. R. J., De Lange, E., & Van der Molen, M. J. (2013). Math practice and its influence on math skills and executive functions in adolescents with mild to borderline

intellectual disability. *Research in developmental disabilities*, 34(5), 1815–1824. https://doi.org/10.1016/j.ridd.2013.02.022

*Jepsen, R., & VonThaden, K. (2002). The effect of cognitive education on the performance of students with neurological developmental disabilities. *NeuroRehabilitation*, 17(3), 201–209.

*Jiménez, J. E., de León, S. C., & Gutiérrez, N. (2021). Piloting the Response to Intervention Model in the Canary Islands: Prevention of Reading and Math Learning Disabilities. *The Spanish Journal of Psychology*, 24. https://doi.org/10.1017/sjp.2021.25

*Jiménez, J. E., de León, S. C., García, E., & Seoane, R. C. (2022). Assessing the efficacy of a Tier 2 early intervention for transcription skills in Spanish elementary school students. *Reading and Writing*, 36(5), 1227–1259. https://doi.org/10.1007/s11145-022-10329-8

*Jimenez, J. E., del Rosario Ortiz, M., Rodrigo, M., Hernandez-Valle, I., Ramirez, G., Estevez, A., O'Shanahan, I., & de la Luz Trabaue, M. (2003). Do the Effects of Computer-Assisted Practice Differ for Children with Reading Disabilities With and Without IQ—Achievement Discrepancy? *Journal of Learning Disabilities*, 36(1), 34–47. https://doi.org/10.1177/00222194030360010501

*Jiménez, J. E., Gutiérrez, N., & de León, S. C. (2021). Analyzing the role of fidelity of RTI Tier 2 reading intervention in Spanish kindergarten and first grade students. *Annals of Dyslexia*, 71(1), 28–49. https://doi.org/10.1007/s11881-021-00221-5

*Jiménez, J. E., Hernández-Valle, I., Ramírez, G., Ortiz, M. del R., Rodrigo, M., Estévez, A., O'Shanahan, I., García, E., & Trabaue, M. de la L. (2007). Computer Speech-Based Remediation for Reading Disabilities: The Size of Spelling-to-Sound Unit in a Transparent Orthography. *The Spanish Journal of Psychology*, 10(1), 52–67. https://doi.org/10.1017/s1138741600006314

*Jitendra, A. K., Dupuis, D. N., Rodriguez, M. C., Zaslofsky, A. F., Slater, S., Cozine-Corroy, K., & Church, C. (2013). A Randomized Controlled Trial of the Impact of Schema-Based Instruction on Mathematical Outcomes for Third-Grade Students with Mathematics Difficulties. *The Elementary School Journal*, 114(2), 252–276. https://doi.org/10.1086/673199

*Joly-Pottuz, B., Mercier, M., Leynaud, A., & Habib, M. (2008). Combined auditory and articulatory training improves phonological deficit in children with dyslexia. *Neuropsychological Rehabilitation*, 18(4), 402–429. https://doi.org/10.1080/09602010701529341

*Jongmans, M. J., Linthorst-Bakker, E., Westenberg, Y., & Smits-Engelsman, B. C. M. (2003). Use of a task-oriented self-instruction method to support children in primary school with poor handwriting quality and speed. *Human Movement Scienc*e, 22(4-5), 549–566. https://doi.org/10.1016/j.humov.2003.09.009

Jucla, M., Nenert, R., Chaix, Y., & Démonet, J. (2010). Remediation effects on N170 and P300 in children with developmental dyslexia. *PubMed*, 22(3-4), 121–129. https://doi.org/10.3233/ben-2009-0257

*Judica, A., Luca, M. D., Spinelli, D., & Zoccolotti, P. (2002). Training of developmental surface dyslexia improves reading performance and shortens eye fixation duration in reading. *Neuropsychological Rehabilitation*, 12(3), 177–197.

*Jung, P.-G., McMaster, K. L., & delMas, R. C. (2017). Effects of Early Writing Intervention Delivered Within a Data-Based Instruction Framework. *Exceptional Children*, 83(3), 281–297.

*Jurbergs, N., Palcic, J. L., & Kelley, M. L. (2010). Daily Behavior Report Cards with and without Home-Based Consequences: Improving Classroom Behavior in Low Income,

African American Children with ADHD. *Child & Family Behavior Therapy*, 32(3), 177–195. https://doi.org/10.1080/07317107.2010.500501

*Justice, L. M., Logan, J. A. R., Kaderavek, J. N., & Dynia, J. M. (2015). Print-Focused Read-Alouds in Early Childhood Special Education Programs. *Exceptional Children*, 81(3), 292–311. https://doi.org/10.1177/0014402914563693

*Kable, J. A., Coles, C. D., & Taddeo, E. (2007). Socio-cognitive Habilitation Using the Math Interactive Learning Experience Program for Alcohol-Affected Children. *Alcoholism: Clinical and Experimental Research*, 31(8), 1425–1434. https://doi.org/10.1111/j.1530-0277.2007.00431.x

*Kamps, D., Heitzman-Powell, L., Rosenberg, N., Mason, R., Schwartz, I., & Romine, R. S. (2016). Effects of Reading Mastery as a Small Group Intervention for Young Children with ASD. *Journal of Developmental and Physical Disabilities*, 28(5), 703–722. https://doi.org/10.1007/s10882-016-9503-3

*Kanive, R., Nelson, P. M., Burns, M. K., & Ysseldyke, J. (2014). Comparison of the Effects of Computer-Based Practice and Conceptual Understanding Interventions on Mathematics Fact Retention and Generalization. *The Journal of Educational Research*, 107(2), 83–89. https://doi.org/10.1080/00220671.2012.759405

*Keller, J., Ruthruff, E., & Keller, P. (2019). Mindfulness and Speed Testing for Children With Learning Disabilities: Oil and Water? *Reading & Writing Quarterly*, 35(2), 154–178. https://doi.org/10.1080/10573569.2018.1524803

Kemper, M. J., Verhoeven, L., & Bosman, A. M. T. (2012). Implicit and explicit instruction of spelling rules. *Learning and Individual Differences*, 22(6), 639–649. https://doi.org/10.1016/j.lindif.2012.06.008

*Kim, A.-H., Vaughn, S., Klingner, J. K., Woodruff, A. L., Klein Reutebuch, C., & Kouzekanani, K. (2006). Improving the Reading Comprehension of Middle School Students With Disabilities Through Computer-Assisted Collaborative Strategic Reading. *Remedial and Special Education*, 27(4), 235–249. https://doi.org/10.1177/07419325060270040401

*King, B., & Kasim, A. (2015). Rapid Phonics: Evaluation Report and Executive Summary. Education Endowment Foundation. https://educationendowmentfoundation.org.uk/projects-and-evaluation/projects/rapid-phonics

*Koen, B. J., Hawkins, J., Zhu, X., Jansen, B., Fan, W., & Johnson, S. (2018). The Location and Effects of Visual Hemisphere-Specific Stimulation on Reading Fluency in Children With the Characteristics of Dyslexia. *Journal of Learning Disabilities*, 51(4), 399–415.

*Kohn, J., Rauscher, L., Kucian, K., Käser, T., Wyschkon, A., Esser, G., & von Aster, M. (2020). Efficacy of a Computer-Based Learning Program in Children With Developmental Dyscalculia. What Influences Individual Responsiveness? *Frontiers in Psychology*, 11. https://doi.org/10.3389/fpsyg.2020.01115

Kozulin, A., & Kazaz, S. (2017). Developing the concept of perimeter and area in students with learning disabilities (LD). *European Journal of Psychology of Education*, 32(3), 353–366. https://doi.org/10.1007/s10212-016-0304-y

*Kroesbergen, E. H., & van Luit, J. E. H. (2002). Teaching multiplication to low math performers: Guided versus structured instruction. *Instructional Science*, 30(5), 361–378. https://doi.org/10.1023/a:1019880913714

Laing, S. P., & Espeland, W. (2005). Low intensity phonological awareness training in a preschool classroom for children with communication impairments. *Journal of Communication Disorders*, 38(1), 65–82.

*Lambert, K., & Spinath, B. (2014). Do we need a special intervention program for children with mathematical learning disabilities or is private tutoring sufficient. *Journal for Educational Research Online*, 6(1), 68–93.

*Landis, T. D., Hart, K. C., & Graziano, P. A. (2019). Targeting self-regulation and academic functioning among preschoolers with behavior problems: Are there incremental benefits to including cognitive training as part of a classroom curriculum? *Child Neuropsychology*, 25(5), 688–704. https://doi.org/10.1080/09297049.2018.1526271

*Lane, K. L., Harris, K., Graham, S., Driscoll, S., Sandmel, K., Morphy, P., Hebert, M., House, E., & Schatschneider, C. (2011). Self-Regulated Strategy Development at Tier 2 for Second-Grade Students With Writing and Behavioral Difficulties: A Randomized Controlled Trial. *Journal of Research on Educational Effectiveness*, 4(4), 322–353. https://doi.org/10.1080/19345747.2011.558987

*Lanfranchi, S., Aventaggiato, F., Jerman, O., & Vianello, R. (2015). Numerical skills in children with Down syndrome. Can they be improved? *Research in developmental disabilities*, 45-46, 129–135. https://doi.org/10.1016/j.ridd.2015.07.006

Langberg, J. M., Epstein, J. N., Becker, S. P., Girio-Herrera, E., & Vaughn, A. J. (2012). Evaluation of the Homework, Organization, and Planning Skills (HOPS) Intervention for Middle School Students with Attention Deficit Hyperactivity Disorder as Implemented by School Mental Health Providers. *School Psychology Review*, 41(3), 342–364.

*Langberg, J. M., Epstein, J. N., Urbanowicz, C. M., Simon, J. O., & Graham, A. J. (2008). Efficacy of an organization skills intervention to improve the academic functioning of students with attention-deficit/hyperactivity disorder. *School Psychology Quarterly*, 23(3), 407–417. https://doi.org/10.1037/1045-3830.23.3.407

*Lauchlan, F., & Elliott, J. (2001). The psychological assessment of learning potential. British *Journal of Educational Psychology*, 71(4), 647–665. https://doi.org/10.1348/000709901158712

Lawton, T. (2016). Improving Dorsal Stream Function in Dyslexics by Training Figure/Ground Motion Discrimination Improves Attention, Reading Fluency, and Working Memory. *Frontiers in Human Neuroscience*, 10, 16. https://doi.org/10.3389/fnhum.2016.00397

Lawton, T., & Shelley-Tremblay, J. (2017). Training on Movement Figure-Ground Discrimination Remediates Low-Level Visual Timing Deficits in the Dorsal Stream, Improving High-Level Cognitive Functioning, Including Attention, Reading Fluency, and Working Memory. *Frontiers in Human Neuroscience*, 11. https://doi.org/10.3389/fnhum.2017.00236

*Layes, S., Guendouz, M., Lalonde, R., & Rebai, M. (2022). Combined Phonological Awareness and Print Knowledge Training Improves Reading Accuracy and Comprehension in Children with Reading Disabilities. *International Journal of Disability, Development and Education*, 69(4), 1185–1199.

*le Roux, M. C., Swartz, L., & Swart, E. (2014). The Effect of an Animal-Assisted Reading Program on the Reading Rate, Accuracy and Comprehension of Grade 3 Students: A Randomized Control Study. *Child & Youth Care Forum*, 43(6), 655–673. https://doi.org/10.1007/s10566-014-9262-1

*Lederberg, A. R., Miller, E. M., Easterbrooks, S. R., & Connor, C. M. (2014). Foundations for Literacy: An Early Literacy Intervention for Deaf and Hard-of-Hearing Children. *Journal of Deaf Studies and Deaf Education*, 19(4), 438–455. https://doi.org/10.1093/deafed/enu022

*Lim, L., Arciuli, J., Munro, N., & Cupples, L. (2019). Using the MULTILIT literacy instruction program with children who have Down syndrome. *Reading and Writing*, 32(9), 2179–2200. https://doi.org/10.1007/s11145-019-09945-8

*Loeb, D. F., Gillam, R. B., Hoffman, L., Brandel, J., & Marquis, J. (2009). The Effects of Fast ForWord Language on the Phonemic Awareness and Reading Skills of School-Age Children With Language Impairments and Poor Reading Skills. *American Journal of Speech-Language Patholo*gy, 18(4), 376–387. https://doi.org/10.1044/1058-0360(2009/08-0067)

*Lombardi, A., Rifenbark, G. G., Monahan, J., Tarconish, E., & Rhoads, C. (2020). Aided by Extant Data: The Effect of Peer Mentoring on Achievement for College Students with Disabilities. *The Journal of Postsecondary Education and Disability*, 33(2), 143–154.

*Lonigan, C. J., & Phillips, B. M. (2016). Response to instruction in preschool: Results of two randomized studies with children at significant risk of reading difficulties. *Journal of Educational Psychology*, 108(1), 114–129. https://doi.org/10.1037/edu0000054

Lorusso, M. L., Facoetti, A., & Bakker, D. J. (2011). Neuropsychological Treatment of Dyslexia: Does Type of Treatment Matter? *Journal of Learning Disabilities*, 44(2), 136–149. https://doi.org/10.1177/0022219410391186

Lotfi, S., Rostami, R., Shokoohi-Yekta, M., Ward, R. T., Motamed-Yeganeh, N., Mathew, A. S., & Lee, H.-J. (2020). Effects of computerized cognitive training for children with dyslexia: An ERP study. *Journal of Neurolinguistics*, 55. https://doi.org/10.1016/j.jneuroling.2020.100904

Lovett, M. W., De Palma, M., Frijters, J., Steinbach, K., Temple, M., Benson, N., & Lacerenza, L. (2008). Interventions for reading difficulties: a comparison of response to intervention by ELL and EFL struggling readers. *Journal of Learning Disabilities*, 41(4), 333–352.

*Lovett, M. W., Frijters, J. C., Steinbach, K. A., Sevcik, R. A., & Morris, R. D. (2021). Effective intervention for adolescents with reading disabilities: Combining reading and motivational remediation to improve outcomes. *Journal of Educational Psychology*, 113(4).

Lovett, M. W., Frijters, J. C., Wolf, M., Steinbach, K. A., Sevcik, R. A., & Morris, R. D. (2017). Early intervention for children at risk for reading disabilities: The impact of grade at intervention and individual differences on intervention outcomes. *Journal of Educational Psychology*, 109(7), 889–914.

*Lucangeli, D., Fastame, M. C., Pedron, M., Porru, A., Duca, V., Hitchcott, P. K., & Penna, M. P. (2019). Metacognition and errors: the impact of self-regulatory trainings in children with specific learning disabilities. ZDM: *The International Journal on Mathematics Education*, 51(4), 577–585.

Lundberg, I., & Reichenberg, M. (2013). Developing Reading Comprehension Among Students With Mild Intellectual Disabilities: An Intervention Study. *Scandinavian Journal of Educational Research*, 57(1), 89–100.

*Łuniewska, M., Chyl, K., Dębska, A., Kacprzak, A., Plewko, J., Szczerbiński, M., Szewczyk, J., Grabowska, A., & Jednoróg, K. (2018). Neither action nor phonological video games make dyslexic children read better. *Scientific Reports*, 8(1), 549. https://doi.org/10.1038/s41598-017-18878-7

Luo, Y., Wang, J., Wu, H., Zhu, D., & Zhang, Y. (2013). Working-memory training improves developmental dyslexia in Chinese children. *Neural Regeneration Research*, 8(5), 452–460. https://doi.org/10.3969/j.issn.1673-5374.2013.05.009

Magnan, A., Ecalle, J., Veuillet, E., & Collet, L. (2004). The effects of an audio-visual training program in dyslexic children. *Dyslexia*, 10(2), 131–140.

*Malekpour, M., & Aghababaei, S. (2013). The effect of executive functions training on the rate of executive functions and academic performance of students with learning disability. *International Journal of Developmental Disabilities*, 59(3), 145–155. https://doi.org/10.1179/2047387712y.0000000004

*Malliakas, E., Jiménez-Fanjul, N., & Marín-Díaz, V. (2021). Educational Intervention through a Board Game for the Teaching of Mathematics to Dyslexic Greek Students. *Social Sciences*, 10(10). https://doi.org/10.3390/socsci10100370

*Marschark, M. (2006). Benefits of Sign Language Interpreting and Text Alternatives for Deaf Students' Classroom Learning. *Journal of Deaf Studies and Deaf Education*, 11(4), 421–437. https://doi.org/10.1093/deafed/enl013

Martínez, C., Maurits, N., & Maassen, B. (2022). Graphogame intervention as a tool for early diagnosis of reading difficulties in Spanish-speaking children with developmental language disorder. *Child Language Teaching and Therapy*, 026565902211392. https://doi.org/10.1177/02656590221139232

*Martinez-Lincoln, A., Barnes, M. A., & Clemens, N. H. (2021). The influence of student engagement on the effects of an inferential reading comprehension intervention for struggling middle school readers. *Annals of Dyslexia*, 71(2), 322–345.

Mastropieri, M. A., Scruggs, T. E., & Uberti, H. Z. (2004). Check it off: Individualizing a math algorithm for students with usabilities via self-monitoring checklists. *Intervention in School and Clinic*, 39(5), 269–275.

*Mastropieri, M. A., Scruggs, T. E., Irby Cerar, N., Guckert, M., Thompson, C., Bronaugh, D. A., Jakulski, J., Abdulalim, L., Mills, S., Evmenova, A., Regan, K., & Cuenca-Carlino, Y. (2015). Strategic Persuasive Writing Instruction for Students with Emotional and Behavioral Disabilities. *Exceptionality,* 23(3), 147–169.

*Maximo, J. O., Murdaugh, D. L., O'Kelley, S., & Kana, R. K. (2017). Changes in intrinsic local connectivity after reading intervention in children with autism. *Brain and Language*, 175, 11–17. https://doi.org/10.1016/j.bandl.2017.08.008

*McLeod, S., Baker, E., McCormack, J., Wren, Y., Roulstone, S., Crowe, K., Masso, S., White, P., & Howland, C. (2017). Cluster-Randomized Controlled Trial Evaluating the Effectiveness of Computer-Assisted Intervention Delivered by Educators for Children With Speech Sound Disorders. *Journal of Speech, Language, and Hearing Research*, 60(7), 1891–1910.

*McMaster, K. L., van den Broek, P., Espin, C. A., Pinto, V., Janda, B., Lam, E., Hsu, H.-C., Jung, P.-G., Leinen, A. B., & van Boekel, M. (2015). Developing a reading comprehension intervention: Translating cognitive theory to educational practice. Contemporary *Educational Psychology*, 40, 28–40. https://doi.org/10.1016/j.cedpsych.2014.04.001

*Mercer, C. D., Campbell, K. U., Miller, M. D., Mercer, K. D., & Lane, H. B. (2000). Effects of a Reading Fluency Intervention for Middle Schoolers With Specific Learning Disabilities. *Learning Disabilities Research and Practice*, 15(4), 179–189.

*Mihandoost, Z., & Elias, H. (2011). The Effectiveness of the Barton's Intervention Program on Reading Comprehension and Reading Attitude of Students with Dyslexia. *Iranian journal of psychiatry and behavioral sciences*, 5(2), 43–52.

*Mills, C. J., Chapparo, C., & Hinitt, J. (2020). The impact of sensory activity schedule (SAS) intervention on classroom task performance in students with autism – a pilot

randomised controlled trial. *Advances in Autism*, 6(3), 179–193. https://doi.org/10.1108/aia-05-2019-0015

*Mioduser, D., Tur-Kaspa, H., & Leitner, I. (2000). The learning value of computer-based instruction of early reading skills. *Journal of Computer Assisted Learning*, 16(1), 54–63. https://doi.org/10.1046/j.1365-2729.2000.00115.x

Mononen, R., Aunio, P., & Koponen, T. (2014). A pilot study of the effects of RightStart instruction on early numeracy skills of children with specific language impairment. *Research in developmental disabilities*, 35(5), 999–1014. https://doi.org/10.1016/j.ridd.2014.02.004

Monroe, B. W., & Troia, G. A. (2006). Teaching Writing Strategies to Middle School Students With Disabilities. *The Journal of Educational Research*, 100(1), 21–33. https://doi.org/10.3200/joer.100.1.21-33

*Moran, A. S., Swanson, H. L., Gerber, M. M., & Fung, W. (2014). The Effects of Paraphrasing Interventions on Problem-Solving Accuracy for Children at Risk for Math Disabilities. *Learning Disabilities Research & Practice*, 29(3), 97–105. https://doi.org/10.1111/ldrp.12035

Morano, S., Flores, M. M., Hinton, V., & Meyer, J. (2020). A Comparison of Concrete-Representational-Abstract and Concrete-Representational-Abstract-Integrated Fraction Interventions for Students with Disabilities. *Exceptionality*, 28(2), 77–91.

Morocco, C. C., Hindin, A., Mata-Aguilar, C., & Clark-Chiarelli, N. (2001). Building a Deep Understanding of Literature with Middle-Grade Students with Learning Disabilities. *Learning Disability Quarterly*, 24(1), 47–58. https://doi.org/10.2307/1511295

*Morris, R. D., Lovett, M. W., Wolf, M., Sevcik, R. A., Steinbach, K. A., Frijters, J. C., & Shapiro, M. B. (2012). Multiple-Component Remediation for Developmental Reading Disabilities. *Journal of Learning Disabilities*, 45(2), 99–127. https://doi.org/10.1177/0022219409355472

Morrison, J. Q., Hawkins, R. O., & Collins, T. A. (2020). Evaluating the cost-effectiveness of the Dyslexia Pilot Project: A multitiered system of supports for early literacy. *Psychology in the Schools*, 57(4), 522–539.

*Moser Opitz, E., Freesemann, O., Prediger, S., Grob, U., Matull, I., & Hußmann, S. (2016). Remediation for Students With Mathematics Difficulties: An Intervention Study in Middle Schools. *Journal of Learning Disabilities*, 50(6), 724–736. https://doi.org/10.1177/0022219416668323

*Mun, E. J., Kim, Y. T., Kang, M. K., & Yeon, S. J. (2017). Effect of Robot-Assisted Phonological Awareness Training on Invented Spelling for Children with Reading Disabilities. *Communication Sciences & Disorders*, 22(1), 76–89. https://doi.org/10.12963/csd.17368

*Muñez, D., Lee, K., Bull, R., Khng, K. H., Cheam, F., & Rahim, R. A. (2022). Working memory and numeracy training for children with math learning difficulties: Evidence from a large-scale implementation in the classroom. *Journal of Educational Psychology*, 114(8), 1866–1880. https://doi.org/10.1037/edu0000732

*Nagler, T., Zarić, J., Kachisi, F., Lindberg, S., & Ehm, J.-H. (2021). Reading-impaired children improve through text-fading training: analyses of comprehension, orthographic knowledge, and RAN. *Annals of Dyslexia*, 71(3), 458–482.

*Nakeva von Mentzer, C., Kalnak, N., & Jennische, M. (2021). Intensive computer-based phonics training in the educational setting of children with Down syndrome: An explorative study. *Journal of Intellectual Disabilities*, 25(4), 636–660.

Nakeva von Mentzer, C., Lyxell, B., Sahlén, B., Dahlström, Ö., Lindgren, M., Ors, M., Kallioinen, P., & Uhlén, I. (2014). Computer-assisted reading intervention with a phonics approach for children using cochlear implants or hearing aids. *Scandinavian Journal of Psychology*, 55(5), 448–455. https://doi.org/10.1111/sjop.12149

*Namkung, J. M., & Bricko, N. (2020). The Effects of Algebraic Equation Solving Intervention for Students With Mathematics Learning Difficulties. *Journal of Learning Disabilities*, 54(2), 111–123.

*Nazari, S., Hakiminejad, F., & Hassanzadeh, S. (2022). Effectiveness of a process-based executive function intervention on arithmetic knowledge of children with Developmental Dyscalculia. *Research in developmental disabilities*, 127, 104260. https://doi.org/10.1016/j.ridd.2022.104260

*Nazir, M., & Nabeel, T. (2019). Effects of Training of Eye Fixation Skills on the Reading Fluency of Children with Oculomotor Dysfunction. *Pakistan Journal of Education*, 36(1).

*Nunes, T. (2002). An Intervention Program for Promoting Deaf Pupils' Achievement in Mathematics. *Journal of Deaf Studies and Deaf Education*, 7(2), 120–133.

*Nusser, L., & Weinert, S. (2017). Appropriate Test-Taking Instructions for Students With Special Educational Needs. *Journal of Cognitive Education and Psychology*, 16(3), 227–240.

O'Connor, R. E., Beach, K. D., Sanchez, V. M., Bocian, K. M., & Flynn, L. J. (2015). Building BRIDGES: A Design Experiment to Improve Reading and United States History Knowledge of Poor Readers in Eighth Grade. *Exceptional Children*, 81(4), 399–425.

*O'Connor, R. E., Harty, K. R., & Fulmer, D. (2005). Tiers of Intervention in Kindergarten Through Third Grade. *Journal of Learning Disabilities*, 38(6), 532–538.

*O'Connor, R. E., Sanchez, V. M., Jones, B., Suchilt, L., Youkhana, V., & Beach, K. D. (2022). Continuing CHAAOS: Vocabulary Intervention for Students With Disabilities in Eighth Grade Who Are Also English Learners. *Learning Disability Quarterly*, 42(2), 108–120. https://doi.org/10.1177/0731948720922818

*O'Shaughnessy, T. E., & Lee Swanson, H. (2000). A Comparison of Two Reading Interventions for Children with Reading Disabilities. *Journal of Learning Disabilities*, 33(3), 257–277. https://doi.org/10.1177/002221940003300304

Odegard, T. N., Ring, J., Smith, S., Biggan, J., & Black, J. (2008). Differentiating the neural response to intervention in children with developmental dyslexia. *Annals of Dyslexia*, 58(1), 1–14.

Odom, S. L., Butera, G., Diamond, K. E., Hanson, M. J., Horn, E., Lieber, J., Palmer, S., Fleming, K., & Marquis, J. (2019). Efficacy of a Comprehensive Early Childhood Curriculum to Enhance Children's Success. *Topics in Early Childhood Special Education*, 39(1), 19–31. https://doi.org/10.1177/0271121419827654

Öğülmüş, K., & Melekoğlu, M. A. (2021). The Impact of POW + C-SPACE Strategy on Story Writing Skills of Turkish Students with Specific Learning Disabilities. *Educational Policy Analysis and Strategic Research*, 16(1), 287–305.

Olad-Ghobad, T., Abbaspoor-Azar, Z., Khalatbari, J., & Afkari, F. (2022). Comparing the Effectiveness of Fernald's And Rossner's Multisensory Teaching Methods in Reducing the Spelling Disorder of Elementary Students. Int J Pediatr*, 10(10), 16825–16836. https://doi.org/10.22038/IJP.2021.55542.4372

*Orkin, M., Pott, M., Wolf, M., May, S., & Brand, E. (2017). Beyond Gold Stars: Improving the Skills and Engagement of Struggling Readers through Intrinsic Motivation. *Reading & Writing Quarterly*, 34(3), 203–217. https://doi.org/10.1080/10573569.2017.1387834

*Pannim, P., Suwannatthachote, P., Manowan, P., & Numprasertchai, S. (2022). Improving Reading Comprehension Skills Using Multimedia Storytelling with Mind Maps for Students with Learning Disabilities in Thailand. *International Journal of Emerging Technologies in Learning (IJET)*, 17(8), 97–111. https://doi.org/10.3991/ijet.v17i08.10931

*Papadopoulou, M. T., Karageorgiou, E., Kechayas, P., Geronikola, N., Lytridis, C., Bazinas, C., Kourampa, E., Avramidou, E., Kaburlasos, V. G., & Evangeliou, A. E. (2022). Efficacy of a Robot-Assisted Intervention in Improving Learning Performance of Elementary School Children with Specific Learning Disorders. *Children*, 9(8). https://doi.org/10.3390/children9081155

*Pape-Neumann, J., Muna van Ermingen-Marbach, Grande, M., Willmes, K., & Heim, S. (2015). The role of phonological awareness in treatments of dyslexic primary school children. *Acta Neurobiologiae Experimentalis*, 75(1), 80–106.

*Parveen, Z. (2017). Educational effectiveness of the 5E model for scientific achievement of students with hearing impairment. *Journal of Baltic Science Education*, 16(5), 723–732.

*Pears, K. C., Kim, H. K., Fisher, P. A., & Yoerger, K. (2016). Increasing pre-kindergarten early literacy skills in children with developmental disabilities and delays. *Journal of School Psychology*, 57, 15–27. https://doi.org/10.1016/j.jsp.2016.05.004

Peters, J. L., Crewther, S. G., Murphy, M. J., & Bavin, E. L. (2021). Action video game training improves text reading accuracy, rate and comprehension in children with dyslexia: a randomized controlled trial. *Scientific Reports*, 11(1), 18584. https://doi.org/10.1038/s41598-021-98146-x

Petscher, Y., Zumeta Edmonds, R., Arden, S., & Weingarten, Z. (2020). Using Intensive Intervention to Improve Mathematics Skills of Students with Disabilities: Project Evaluation Repor*t. American Institutes for Research.

*Pires, M. M., & Schochat, E. (2019). The effectiveness of an auditory temporal training program in children who present voiceless/voiced-based orthographic errors. *PloS One*, 14(5), e0216782. https://doi.org/10.1371/journal.pone.0216782

*Pokorni, J. L., Worthington, C. K., & Jamison, P. J. (2004). Phonological Awareness Intervention: Comparison of Fast ForWord, Earobics, and LiPS. *The Journal of Educational Research*, 97(3), 147–158. https://doi.org/10.3200/joer.97.3.147-158

Pourmohamadreza-Tajrishi, M., Ashori, M., & Jalil-Abkenar, S. S. (2015). The effectiveness of verbal self-instruction training on math problem-solving of intellectually disabled students*. Iranian Rehabilitation Journal*. 13(4), 58–62.

*Powell, S. R., & Driver, M. K. (2015). The Influence of Mathematics Vocabulary Instruction Embedded Within Addition Tutoring for First-Grade Students With Mathematics Difficulty. *Learning Disability Quarterly*, 38(4), 221–233. https://doi.org/10.1177/0731948714564574

Powell, S. R., Berry, K. A., & Barnes, M. A. (2019). The role of pre-algebraic reasoning within a word-problem intervention for third-grade students with mathematics difficulty. *ZDM,* 52(1), 151–163. https://doi.org/10.1007/s11858-019-01093-1

Powell, S. R., Berry, K. A., & Benz, S. A. (2020). Analyzing the word-problem performance and strategies of students experiencing mathematics difficulty. *The Journal of Mathematical Behavior*, 58, 100759. https://doi.org/10.1016/j.jmathb.2020.100759

*Powell, S. R., Berry, K. A., Acunto, A. N., Fall, A.-M., & Roberts, G. (2022). Applying an Individual Word-Problem Intervention to a Small-Group Setting: A Pilot Study's Evidence of Improved Word-Problem Performance for Students Experiencing

Mathematics Difficulty. *Journal of Learning Disabilities*, 002221942110476. https://doi.org/10.1177/00222194211047635

*Powell, S. R., Berry, K. A., Fall, A.-M., Roberts, G., Fuchs, L. S., & Barnes, M. A. (2021). Alternative paths to improved word-problem performance: An advantage for embedding prealgebraic reasoning instruction within word-problem intervention. *Journal of Educational Psychology*, 113(5), 898–910. https://doi.org/10.1037/edu0000513

*Praet, M., & Desoete, A. (2019). A Pilot Study about the Effect and Sustainability of Early Interventions for Children with Early Mathematical Difficulties in Kindergarten. *Learning Disabilities*, 17(1), 29–40.

*Qian, Y., & Bi, H.-Y. (2015). The effect of magnocellular-based visual-motor intervention on Chinese children with developmental dyslexia. *Frontiers in Psychology*, 6. https://doi.org/10.3389/fpsyg.2015.01529

*Rabiner, D. L., Murray, D. W., Skinner, A. T., & Malone, P. S. (2010). A Randomized Trial of Two Promising Computer-Based Interventions for Students with Attention Difficulties. *Journal of Abnormal Child Psychology*, 38(1), 131–142. https://doi.org/10.1007/s10802-009-9353-x

*Rafdal, B. H., Mcmaster, K. L., Mcconnell, S. R., Fuchs, D., & Fuchs, L. S. (2011). The Effectiveness of Kindergarten Peer-Assisted Learning Strategies for Students with Disabilities. *Exceptional Children*, 77(3), 299–316.

Rajender, G., Malhotra, S., Bhatia, M. S., Singh, T. B., & Kanwal, K. (2011). Efficacy of cognitive retraining techniques in children with attention deficit hyperactivity disorder. *German Journal of Psychiatry*, 14(2), 55–60.

*Ramer, J. D., Santiago-Rodríguez, M. E., Davis, C. L., Marquez, D. X., Frazier, S. L., & Bustamante, E. E. (2020). Exercise and Academic Performance Among Children With Attention-Deficit Hyperactivity Disorder and Disruptive Behavior Disorders: A Randomized Controlled Trial. *Pediatric Exercise Science*, 32(3), 140–149. https://doi.org/10.1123/pes.2019-0224

*Ramezani, M., Behzadipour, S., Pourghayoomi, E., Joghataei, M. T., Shirazi, E., & Fawcett, A. J. (2021). Evaluating a new verbal working memory-balance program: a double-blind, randomized controlled trial study on Iranian children with dyslexia. *BMC Neuroscience*, 22(1), 55. https://doi.org/10.1186/s12868-021-00660-1

Ramírez-Santana, G. M., Acosta-Rodríguez, V. M., Moreno-Santana, A. M., Nayarit del Valle-Hernández, & Ángeles Axpe-Caballero. (2018). Use of Oral Narrative and Morphosyntactic Activities to Improve Grammar Skills in Pupils with Specific Language Impairment (SLI). *Revista de Psicodidáctica,* 23(1). https://doi.org/10.1016/j.psicoe.2017.07.004

*Rashotte, C. A., MacPhee, K., & Torgesen, J. K. (2001). The Effectiveness of a Group Reading Instruction Program with Poor Readers in Multiple Grades. *Learning Disability Quarterly*, 24(2), 119–134. https://doi.org/10.2307/1511068

*Ray, A. B., & Graham, S. (2021). A College Entrance Essay Exam Intervention for Students With High-Incidence Disabilities and Struggling Writers. *Learning Disability Quarterly*, 44(4), 275–287.

*Re, A. M., Pedron, M., Tressoldi, P. E., & Lucangeli, D. (2014). Response to Specific Training for Students With Different Levels of Mathematical Difficulties. *Exceptional Children*, 80(3), 337–352.

*Reed, D. K., & Lynn, D. (2016). The Effects of an Inference-Making Strategy Taught With and Without Goal Setting. *Learning Disability Quarterly*, 39(3), 133–145.

Reichenberg, M. (2014). The Importance of Structured Text Talks for Students' Reading Comprehension. *Journal of Special Education and Rehabilitation*, 15(3-4), 77–94. https://doi.org/10.2478/jser-2014-0012

Ribeiro, F. S., & Santos, F. H. (2020). Persistent Effects of Musical Training on Mathematical Skills of Children With Developmental Dyscalculia. *Frontiers in Psychology*, 10. https://doi.org/10.3389/fpsyg.2019.02888

*Ritter, M. J., Park, J., Saxon, T. F., & Colson, K. A. (2013). A Phonologically Based Intervention for School-Age Children With Language Impairment. *Journal of Literacy Research*, 45(4), 356–385. https://journals.sagepub.com/doi/full/10.1177/1086296X13504156

*Ritter, M., Colson, K. A., & Park, J. (2013). Reading Intervention Using Interactive Metronome in Children With Language and Reading Impairment. *Communication Disorders Quarterly*, 34(2), 106–119.

*Roberts, G. J., Capin, P., Roberts, G., Miciak, J., Quinn, J. M., & Vaughn, S. (2018). Examining the Effects of Afterschool Reading Interventions for Upper Elementary Struggling Readers. *Remedial and Special Education*, 39(3), 131–143. https://doi.org/10.1177/0741932517750818

Roberts, G., Quach, J., Spencer-Smith, M., Anderson, P. J., Gathercole, S., Gold, L., Sia, K.-L., Mensah, F., Rickards, F., Ainley, J., & Wake, M. (2016). Academic Outcomes 2 Years After Working Memory Training for Children With Low Working Memory. *JAMA Pediatrics*, 170(5), e154568. https://doi.org/10.1001/jamapediatrics.2015.4568

Roden, I., Früchtenicht, K., Kreutz, G., Linderkamp, F., & Grube, D. (2019). Auditory Stimulation Training With Technically Manipulated Musical Material in Preschool Children With Specific Language Impairments: An Explorative Study. *Frontiers in Psychology*, 10. https://doi.org/10.3389/fpsyg.2019.02026

*Rogevich, M. E., & Perin, D. (2008). Effects on Science Summarization of a Reading Comprehension Intervention for Adolescents with Behavior and Attention Disorders. *Exceptional Children*, 74(2), 135–154. https://doi.org/001440290807400201

*Roux, C., Dion, E., & Barrette, A. (2015). Enhancing Reading Comprehension Among Students With High-Functioning Autism Spectrum Disorder: A Randomized Pilot Study. *Canadian Journal of Education*, 38(1), 1–19.

*Rvachew, S., Nowak, M., & Cloutier, G. (2004). Effect of Phonemic Perception Training on the Speech Production and Phonological Awareness Skills of Children With Expressive Phonological Delay. *American Journal of Speech-Language Pathology*, 13(3), 250–263. https://doi.org/10.1044/1058-0360(2004/026)

Saint-Georges, C., Pagnier, M., Ghattassi, Z., Hubert-Barthelemy, A., Tanet, A., Clément, M.-N., Soumille, F., Crespin, G. C., Pellerin, H., & Cohen, D. (2020). A developmental and sequenced one-to-one educational intervention (DS1-EI) for autism spectrum disorder and intellectual disability: A three-year randomized, single-blind controlled trial. *EClinicalMedicine*, 26, 100537. https://doi.org/10.1016/j.eclinm.2020.100537

Saleh, E. A. A. (2018). The Effect of Using the Guided Discovery Method on Enabling the Students with Intellectual Disability to Acquire some Pre-Academic Mathematical Concepts in the Kingdom of Saudi Arabia. *International Journal of English Linguistics*, 8(3), 108. https://doi.org/10.5539/ijel.v8n3p108

Salgado, C. A., & Capellini, S. A. (2008). Programa de remediação fonológica em escolares com dislexia do desenvolvimento. *Pró-Fono Revista de Atualização Científica*, 20(1), 31–36. https://doi.org/10.1590/s0104-56872008000100006

*Salminen, J., Koponen, T., Räsänen, P., & Aro, M. (2015). Preventive Support for Kindergarteners Most At-Risk for Mathematics Difficulties: Computer-Assisted Intervention. *Mathematical Thinking and Learning*, 17(4), 273–295. https://doi.org/10.1080/10986065.2015.1083837

*Sanders, S., Losinski, M., Ennis, R. P., Lane, J., White, W., & Teagarden, J. (2020). Use of Self-Regulated Strategy Development to Improve Comprehension of Elementary Students with and At-Risk for E/BD. *Education and Treatment of Children*, 43(1), 21–33. https://doi.org/10.1007/s43494-020-00003-5

Sanford, A. K., Park, Y., & Baker, S. K. (2013). Reading Growth of Students With Disabilities in the Context of a Large-Scale Statewide Reading Reform Effort. *The Journal of Special Education*, 47(2), 83–95. https://doi.org/10.1177/0022466911430350

Santos, A., Joly-Pottuz, B., Moreno, S., Habib, M., & Besson, M. (2007). Behavioural and event-related potentials evidence for pitch discrimination deficits in dyslexic children: Improvement after intensive phonic intervention. *Neuropsychologia*, 45(5), 1080–1090. https://doi.org/10.1016/j.neuropsychologia.2006.09.010

Satsangi, R., & Bofferding, L. (2017). Improving the Numerical Knowledge of Children with Autism Spectrum Disorder: The Benefits of Linear Board Games. *Journal of Research in Special Educational Needs*, 17(3), 218–226.

*Scanlon, D. M., Gelzheiser, L. M., Vellutino, F. R., Schatschneider, C., & Sweeney, J. M. (2008). Reducing the incidence of early reading difficulties: Professional Development for classroom teachers versus direct interventions for children. *Learning and Individual Differences*, 18(3), 346–359.

Schäffler, T., Sonntag, J., Hartnegg, K., & Fischer, B. (2004). The effect of practice on low-level auditory discrimination, phonological skills, and spelling in dyslexia. *Dyslexia*, 10(2), 119–130. https://doi.org/10.1002/dys.267

Schiavo, G., Mana, N., Mich, O., Zancanaro, M., & Job, R. (2021). Attention-driven read-aloud technology increases reading comprehension in children with reading disabilities. *Journal of Computer Assisted Learning*, 37(3), 875–886.

Schiff, R., Nuri Ben-Shushan, Y., & Ben-Artzi, E. (2016). Metacognitive Strategies. *Journal of Learning Disabilities*, 50(2), 143–157. https://doi.org/10.1177/0022219415589847

Schirmer, B. R., Schaffer, L., Therrien, W. J., & Schirmer, T. N. (2016). Effect of the Reread-Adapt and Answer-Comprehend Intervention on the Reading Achievement of Middle and High School Readers Who are Deaf. *Reading Psychology*, 37(4), 650–663.

Schneider, W., Roth, E., & Ennemoser, M. (2000). Training phonological skills and letter knowledge in children at risk for dyslexia: A comparison of three kindergarten intervention programs. *Journal of Educational Psychology*, 92(2), 284–295.

*Schultz, B. K., Evans, S. W., Langberg, J. M., & Schoemann, A. M. (2017). Outcomes for adolescents who comply with long-term psychosocial treatment for ADHD. *Journal of Consulting and Clinical Psychology*, 85(3), 250–261. https://doi.org/10.1037/ccp0000172

*Schumaker, J. B., Walsh, L. D., & Fisher, J. B. (2021). Effects of Computerized Instruction on Mastery and Generalized Use of Commas Strategies by Students With LD. *Journal of Special Education Technology*, 36(1), 29–43.

Schwartzberg, E. T., & Silverman, M. J. (2016). Effects of a music-based short story on short- and long-term reading comprehension of individuals with Autism Spectrum Disorder: A cluster randomized study. *The Arts in Psychotherapy*, 48, 54–61. https://doi.org/10.1016/j.aip.2016.01.001

*Segal-Drori, O., Kalmanovich, L. B. H., & Shamir, A. (2019). Electronic Book for Promoting Emergent Math: A Comparison Between Kindergarteners at Risk for Learning Disabilities and With Typical Development. *Journal of Educational Computing Research*, 57(4), 954–977.

*Segers, E., & Verhoeven, L. (2004). Computer-Supported Phonological Awareness Intervention for Kindergarten Children With Specific Language Impairment. *Language Speech and Hearing Services in Schools*, 35(3), 229–239.

*Seifert, K., & Espin, C. (2012). Improving Reading of Science Text for Secondary Students With Learning Disabilities. *Learning Disability Quarterly*, 35(4), 236–247.

*Sella, F., Onnivello, S., Lunardon, M., Lanfranchi, S., & Zorzi, M. (2021). Training basic numerical skills in children with Down syndrome using the computerized game "The Number Race." *Scientific Reports*, 11(1), 2087. https://doi.org/10.1038/s41598-020-78801-5

*Sermier Dessemontet, R., de Chambrier, A.-F., Martinet, C., Meuli, N., & Linder, A.-L. (2021). Effects of a phonics-based intervention on the reading skills of students with intellectual disability. *Research in developmental disabilities*, 111. https://doi.org/10.1016/j.ridd.2021.103883

Serret, S., Hun, S., Thümmler, S., Pierron, P., Santos, A., Bourgeois, J., & Askenazy, F. (2017). Teaching Literacy Skills to French Minimally Verbal School-Aged Children with Autism Spectrum Disorders with the Serious Game SEMA-TIC: An Exploratory Study. *Frontiers in Psychology*, 8(SEP). https://doi.org/10.3389/fpsyg.2017.01523

Shaffer, R. J., Jacokes, L. E., Cassily, J. F., Greenspan, S. I., Tuchman, R. F., & Stemmer, P. J. (2001). Effect of Interactive Metronome(R) Training on Children With ADHD. *American Journal of Occupational Therapy*, 55(2), 155–162. https://doi.org/10.5014/ajot.55.2.155

Shamir, A., & Lifshitz, I. (2013). E-Books for supporting the emergent literacy and emergent math of children at risk for learning disabilities: can metacognitive guidance make a difference? *European Journal of Special Needs Education*, 28(1), 33–48.

Shamir, A., & Shlafer, I. (2011). E-books effectiveness in promoting phonological awareness and concept about print: A comparison between children at risk for learning disabilities and typically developing kindergarteners. *Computers & Education*, 57(3), 1989–1997.

*Shamir, A., Korat, O., & Fellah, R. (2012). Promoting vocabulary, phonological awareness and concept about print among children at risk for learning disability: can e-books help? *Reading and Writing*, 25(1), 45–69.

*Shamir, A., Korat, O., & Shlafer, I. (2011). The effect of activity with e-book on vocabulary and story comprehension: a comparison between kindergarteners at risk of learning disabilities and typically developing kindergarteners. *European Journal of Special Needs Education*, 26(3), 311–322.

Shaywitz, B. A., Shaywitz, S. E., Blachman, B. A., Pugh, K. R., Fulbright, R. K., Skudlarski, P., Mencl, W. Einar., Constable, R. Todd., Holahan, J. M., Marchione, K. E., Fletcher, J. M., Lyon, G. Reid., & Gore, J. C. (2004). Development of left occipitotemporal systems for skilled reading in children after a phonologically- based intervention. *Biological Psychiatry*, 55(9), 926–933. https://doi.org/10.1016/j.biopsych.2003.12.019

Shogren, K. A., Palmer, S. B., Wehmeyer, M. L., Williams-Diehm, K., & Little, T. D. (2012). Effect of Intervention With the Self-Determined Learning Model of Instruction on Access and Goal Attainment. *Remedial and Special Education*, 33(5), 320–330.

Sibieta., L. (2016). *REACH: Evaluation report and executive summary*. Education Endowment Foundation. https://educationendowmentfoundation.org.uk/projects-and-evaluation/projects/reach

Simmons, D. C., Kame'enui, E. J., Harn, B., Coyne, M. D., Stoolmiller, M., Edwards Santoro, L., Smith, S. B., Beck, C. T., & Kaufman, N. K. (2007). Attributes of Effective and Efficient Kindergarten Reading Intervention. *Journal of Learning Disabilities*, 40(4), 331–347.

Simos, P. G., Fletcher, J. M., Bergman, E., Breier, J. I., Foorman, B. R., Castillo, E. M., Davis, R. N., Fitzgerald, M., & Papanicolaou, A. C. (2002). Dyslexia-specific brain activation profile becomes normal following successful remedial training. *Neurology*, 58(8), 1203–1213. https://doi.org/10.1212/wnl.58.8.1203

*Sirinides, P., Gray, A., & May, H. (2018). The Impacts of Reading Recovery at Scale: Results From the 4-Year i3 External Evaluation. *Educational Evaluation and Policy Analysis*, 40(3), 316–335. https://doi.org/10.3102/0162373718764828

*Smit, A. B., Brumbaugh, K. M., Weltsch, B., & Hilgers, M. (2018). Treatment of Phonological Disorder: A Feasibility Study With Focus on Outcome Measures. *American Journal of Speech-Language Pathology (Online)*, 27(2), 536–552. https://doi.org/10.1044/2017_ajslp-16-0225

Smith, T. M., Cobb, P., Farran, D. C., Cordray, D. S., & Munter, C. (2013). Evaluating Math Recovery. *American Educational Research Journal*, 50(2), 397–428. https://doi.org/10.3102/0002831212469045

*Snellings, P., van der Leij, A., de Jong, P. F., & Blok, H. (2009). Enhancing the Reading Fluency and Comprehension of Children With Reading Disabilities in an Orthographically Transparent Language. *Journal of Learning Disabilities*, 42(4), 291–305. https://doi.org/10.1177/0022219408331038

*Solan, H. A., Shelley-Tremblay, J., Ficarra, A., Silverman, M., & Larson, S. (2003). Effect of Attention Therapy on Reading Comprehension. *Journal of Learning Disabilities*, 36(6), 556–563.

Soliman, M. S., & Al-Madani, F. M. (2017). The Effects of a Multisensory based Instruction Combined with Brain Compatible Environment Techniques on Reading Fluency and Reading Comprehension of Fourth-Grade Students with Dyslexia. *Croatian Journal of Education - Hrvatski Časopis Za Odgoj I Obrazovanje*, 19(2). https://doi.org/10.15516/cje.v19i2.2190

*Solis, M., Kulesz, P., & Williams, K. (2023). A Two-Study Conceptual Replication Investigating the Role of Initial Word-Reading Skills with Response to Intervention for High School Students. *Learning Disabilities Research & Practice*, 38(1), 26–39. https://doi.org/10.1111/ldrp.12297

*Solis, M., Reutebuch, C., Vaughn, S., & Jimenez, Z. (2022). Reading enhancements for students with autism spectrum disorder: A matched randomized pilot experimental study. *Research in Autism Spectrum Disorders*, 93. https://doi.org/10.1016/j.rasd.2022.101937

Somers, M.-A., Corrin, W., Sepanik, S., Salinger, T., Levin, J., & Zmach, C. (2010). *The Enhanced Reading Opportunities Study Final Report: The Impact of Supplemental Literacy Courses for Struggling Ninth-Grade Readers*. NCEE 2010-4021. National Center for Education Evaluation and Regional Assistance.

*Soriano, M., Miranda, A., Soriano, E., Nievas, F., & Félix, V. (2011). Examining the Efficacy of an Intervention to Improve Fluency and Reading Comprehension in Spanish Children with Reading Disabilities. International Journal of Disability, *Development and Education*, 58(1), 47–59.

Spaniol, M. M., Mevorach, C., Shalev, L., Teixeira, M. C. T. V., Lowenthal, R., & Paula, C. S. (2021). Attention training in children with autism spectrum disorder improves academic performance: A double-blind pilot application of the computerized progressive attentional training program. *Autism Research*, 14(8), 1769–1776. https://doi.org/10.1002/aur.2566

*Sperafico, Y. L., Pisacco, N. M., Corso, L., Rohde, L. A., & Dorneles, B. (2021). Combined Intervention of Working Memory and Arithmetic Reasoning in Students with ADHD. *International Journal of Disability, Development and Education*, 68(4), 566–582.

*Sprague, K., Zaller, C., Kite, A., Hussar, K. (2012). *Springfield-Chicopee School Districts Striving Readers (SR) Program: Final Report Years 1-5: Evaluation of Implementation and Impact*. Research & Evaluation Division: The Education Alliance at Brown University. https://eric.ed.gov/?id=ED600926

*Starling, A., Lo, Y. Y., & Rivera, C. J. (2015). Improving Science Scores of Middle School Students with Learning Disabilities through Engineering Problem Solving Activities. *Journal of the American Academy of Special Education Professionals*, 98-113.

Steacy, L. M., Elleman, A. M., Lovett, M. W., & Compton, D. L. (2016). Exploring Differential Effects Across Two Decoding Treatments on Item-Level Transfer in Children With Significant Word Reading Difficulties: A New Approach for Testing Intervention Elements. *Scientific Studies of Reading*, 20(4), 283–295.

*Stebbings, J. A., & Kline, E. (2020). Academic and Cognitive Remediation for Students with Learning Disabilities: A Comparison between Orton Gillingham and NILD Educational Therapy. *International Journal for Research in Learning Disabilities*, 4(2), 15–34.

*Steele, S. C., Willoughby, L. M., & Mills, M. T. (2013). Learning word meanings during reading: Effects of phonological and semantic cues on children with language impairment. *International Journal of Speech-Language Pathology*, 15(2), 184–197. https://doi.org/10.3109/17549507.2012.700322

*Struiksma, C., van der Leij, A., & Stoel, R. (2009). Response to fluency-oriented intervention of Dutch poor readers. *Learning and Individual Differences*, 19(4), 541–548. https://doi.org/10.1016/j.lindif.2009.07.005

*Subramaniam, H., Nawi, H. S. A., & Kathan, R. M. (2022). Assessing the Virtual Early Intervention for Children with Learning Disabilities. *International Journal of Early Childhood Special Education*, 14(1), 1161–1168. https://doi.org/10.9756/int-jecse/v14i1.221132

*Sumi, W. C., Woodbridge, M. W., Javitz, H. S., Thornton, S. P., Wagner, M., Rouspil, K., Yu, J. W., Seeley, J. R., Walker, H. M., Golly, A., Small, J. W., Feil, E. G., & Severson, H. H. (2013). Assessing the Effectiveness of First Step to Success. *Journal of Emotional and Behavioral Disorders*, 21(1), 66–78. https://doi.org/10.1177/1063426611429571

*Svensson, I., Nordström, T., Lindeblad, E., Gustafson, S., Björn, M., Sand, C., Almgren/Bäck, G., & Nilsson, S. (2021). Effects of assistive technology for students with reading and writing disabilities. *Disability and Rehabilitation: Assistive Technolog*y, 16(2), 196–208. https://doi.org/10.1080/17483107.2019.1646821

Swanlund, A., Dahlke, K., Tucker, N., Kleidon, B., Kregor, J., Davidson-Gibbs, D., & Hallberg, K. (2012). *Striving Readers: Impact Study and Project Evaluation Report*. American Institutes for Research.

Swanson, H. L., Lussier, C. M., & Orosco, M. J. (2013). Cognitive Strategies, Working Memory, and Growth in Word Problem Solving in Children With Math Difficulties.

Journal of Learning Disabilities, 48(4), 339–358. https://doi.org/10.1177/0022219413498771

Szczytko, R., Carrier, S. J., & Stevenson, K. T. (2018). Impacts of Outdoor Environmental Education on Teacher Reports of Attention, Behavior, and Learning Outcomes for Students With Emotional, Cognitive, and Behavioral Disabilities. *Frontiers in Education*, 3. https://doi.org/10.3389/feduc.2018.00046

*Tam, I. O. L., & Leung, C. (2019). Evaluation of the effectiveness of a literacy intervention programme on enhancing learning outcomes for secondary students with dyslexia in Hong Kong. *Dyslexia*, 25(3), 296–317. https://doi.org/10.1002/dys.1626

*Tannock, R., Frijters, J. C., Martinussen, R., White, E. J., Ickowicz, A., Benson, N. J., & Lovett, M. W. (2018). Combined Modality Intervention for ADHD With Comorbid Reading Disorders: A Proof of Concept Study. *Journal of Learning Disabilities*, 51(1), 55–72.

Therrien, W. J., Hughes, C., Kapelski, C., & Mokhtari, K. (2008). Effectiveness of a Test-Taking Strategy on Achievement in Essay Tests for Students With Learning Disabilities. *Journal of Learning Disabilities*, 42(1), 14–23.

*Therrien, W. J., Kirk, J. F., & Woods-Groves, S. (2012). Comparison of a Reading Fluency Intervention With and Without Passage Repetition on Reading Achievement. *Remedial and Special Education*, 33(5), 309–319. https://doi.org/10.1177/0741932511410360

*Thomson, J. M., Leong, V., & Goswami, U. (2013). Auditory processing interventions and developmental dyslexia: a comparison of phonemic and rhythmic approaches. *Reading and Writing*, 26(2), 139–161.

*Tijms, J. (2007). The Development of Reading Accuracy and Reading Rate during Treatment of Dyslexia. *Educational Psychology*, 27(2), 273–294. https://doi.org/10.1080/01443410601066800

Tilanus, E. A. T., Segers, E., & Verhoeven, L. (2016). Responsiveness to Intervention in Children with Dyslexia. *Dyslexia*, 22(3), 214–232.

Tilanus, E. A. T., Segers, E., & Verhoeven, L. (2019). Predicting responsiveness to a sustained reading and spelling intervention in children with dyslexia. *Dyslexia*, 25(2), 190–206. https://doi.org/10.1002/dys.1614

Tilanus, E. A. T., Segers, E., & Verhoeven, L. (2020). Responsiveness to Intervention after Second versus Third Grade Diagnosis of Dyslexia. *Reading & Writing Quarterly*, 521–541.

*Toll, S. W. M., & Van Luit, J. E. H. (2013). Accelerating the early numeracy development of kindergartners with limited working memory skills through remedial education. *Research in developmental disabilities*, 34(2), 745–755. https://doi.org/10.1016/j.ridd.2012.09.003

*Toste, J. R., Capin, P., Williams, K. J., Cho, E., & Vaughn, S. (2019). Replication of an Experimental Study Investigating the Efficacy of a Multisyllabic Word Reading Intervention With and Without Motivational Beliefs Training for Struggling Readers. *Journal of Learning Disabilities*, 52(1), 45–58.

*Tosto, C., Hasegawa, T., Mangina, E., Chifari, A., Treacy, R., Merlo, G., & Chiazzese, G. (2021). Exploring the effect of an augmented reality literacy programme for reading and spelling difficulties for children diagnosed with ADHD. *Virtual Reality*, 25(3), 879–894. https://doi.org/10.1007/s10055-020-00485-z

*Tournaki, N. (2003). The Differential Effects of Teaching Addition Through Strategy Instruction Versus Drill and Practice to Students With and Without Learning Disabilities. *Journal of Learning Disabilities*, 36(5), 449–458. https://doi.org/10.1177/00222194030360050601

Travers, J. C., Higgins, K., Pierce, T., Boone, R., Miller, S., & Tandy, R. (2011). Emergent Literacy Skills of Preschool Students with Autism: A Comparison of Teacher-Led and Computer-Assisted Instruction. *Education and Training in Autism and Developmental Disabilities*, 46(3), 326–338.

*Tribushinina, E., Berg, Z. op ten, & Karman, S. (2022). Facilitating positive L1 transfer through explicit spelling instruction for EFL learners with dyslexia: an intervention study. *Language Awareness*, 31(3), 351–370. https://doi.org/10.1080/09658416.2021.1949332

Trout, A. L., Epstein, M. H., Mickelson, W. T., Nelson, J. R., & Lewis, L. M. (2003). Effects of a Reading Intervention for Kindergarten Students at Risk for Emotional Disturbance and Reading Deficits. *Behavioral Disorders*, 28(3), 313–326. https://doi.org/10.1177/019874290302800315

*Turner, H., Remington, A., & Hill, V. (2017). Developing an intervention to improve reading comprehension for children and young people with autism spectrum disorders. *Educational and Child Psychology*, 34(2), 13–26.

*Twyman, T., & Tindal, G. (2006). Using a Computer-Adapted, Conceptually Based History Text to Increase Comprehension and Problem-Solving Skills of Students with Disabilities. *Journal of Special Education Technology*, 21(2), 5–16.

*Tzanakaki, P., Hastings, R. P., Grindle, C. F., Hughes, J. C., & Hoare, Z. (2014). An Individualized Numeracy Curriculum for Children with Intellectual Disabilities: A Single Blind Pilot Randomized Controlled Trial. *Journal of Developmental and Physical Disabilities*, 26(5), 615–632. https://doi.org/10.1007/s10882-014-9387-z

*Uccheddu, S., Albertini, M., Pierantoni, L., Fantino, S., & Pirrone, F. (2019). The Impacts of a Reading-to-Dog Programme on Attending and Reading of Nine Children with Autism Spectrum Disorders. *Animals*, 9(8), 491. https://doi.org/10.3390/ani9080491

*Ukrainetz, T. A. (2019). Sketch and Speak: An Expository Intervention Using Note-Taking and Oral Practice for Children With Language-Related Learning Disabilities. *Language, Speech, and Hearing Services in Schools*, 50(1), 53–70. https://doi.org/10.1044/2018_lshss-18-0047

*Ukrainetz, T. A., Ross, C. L., & Harm, H. M. (2009). An Investigation of Treatment Scheduling for Phonemic Awareness With Kindergartners Who Are at Risk for Reading Difficulties. *Language, Speech, and Hearing Services in Schools*, 40(1), 86–100. https://doi.org/10.1044/0161-1461(2008/07-0077)

*Vadasy, P. F., & Sanders, E. A. (2008a). Benefits of Repeated Reading Intervention for Low-Achieving Fourth- and Fifth-Grade Students. *Remedial and Special Education*, 29(4), 235–249. https://doi.org/10.1177/0741932507312013

*Vadasy, P. F., & Sanders, E. A. (2008b). Code-oriented instruction for kindergarten students at risk for reading difficulties: a replication and comparison of instructional groupings. *Reading and Writing*, 21(9), 929–963. https://doi.org/10.1007/s11145-008-9119-9

*Vadasy, P. F., Sanders, E. A., & Peyton, J. A. (2005). Relative Effectiveness of Reading Practice or Word-Level Instruction in Supplemental Tutoring. *Journal of Learning Disabilities*, 38(4), 364–380. https://doi.org/10.1177/00222194050380041401

*Vadasy, P. F., Sanders, E. A., & Peyton, J. A. (2006). Code-Oriented Instruction for Kindergarten Students At Risk for Reading Difficulties: A Randomized Field Trial With Paraeducator Implementers. *Journal of Educational Psychology*, 98(3), 508–528. https://doi.org/10.1037/0022-0663.98.3.508

Vaden-Kiernan, M., Caverly, S., Bell, N., Sullivan, K., Fong, C., Atwood, E., Borman, G., So Jung Park, & Debra Hughes Jones. (2012). Louisiana Striving Readers: Final Evaluation Report*.

*Van der Bijl, C., Alant, E., & Lloyd, L. (2006). A comparison of two strategies of sight word instruction in children with mental disability. *Research in developmental disabilities*, 27(1), 43–55.

*van der Donk, M., Hiemstra-Beernink, A.-C., Tjeenk-Kalff, A., van der Leij, A., & Lindauer, R. (2015). Cognitive training for children with ADHD: a randomized controlled trial of cogmed working memory training and "paying attention in class." *Frontiers in Psychology*, 6. https://doi.org/10.3389/fpsyg.2015.01081

*Van der Molen, M. J., Van Luit, J. E. H., Van der Molen, M. W., Klugkist, I., & Jongmans, M. J. (2010). Effectiveness of a computerised working memory training in adolescents with mild to borderline intellectual disabilities. *Journal of Intellectual Disability Research*, 54(5), 433–447.

Van Herwegen, J., Costa, H.M., Nicholson, B., & Donlan, C. (2018). Improving number abilities in low performing pre-schoolers: symbolic versus non-symbolic training programmes. *Research in Developmental Disorders, 77,* 1-11.

*Van Horne, A. J. O., Fey, M., & Curran, M. (2017). Do the Hard Things First: A Randomized Controlled Trial Testing the Effects of Exemplar Selection on Generalization Following Therapy for Grammatical Morphology. *Journal of Speech, Language, and Hearing Research*, 60(9), 2569–2588. https://doi.org/10.1044/2017_jslhr-l-17-0001

*Van Luit, J. E. H., & Schopman, E. A. M. (2000). Improving Early Numeracy of Young Children with Special Educational Needs. *Remedial and Special Education*, 21(1), 27–40. https://doi.org/10.1177/074193250002100105

*Van Luit, J. E. H., & Toll, S. W. M. (2015). Remedial early numeracy education: can children identified as having a language deficiency benefit? *International Journal of Language & Communication Disorders*, 50(5), 593–603. https://doi.org/10.1111/1460-6984.12159

van Staden, A. (2013). An evaluation of an intervention using sign language and multi-sensory coding to support word learning and reading comprehension of deaf signing children. *Child Language Teaching and Therapy*, 29(3), 305–318.

Vander Stappen, C., Dricot, L., & Van Reybroeck, M. (2020). RAN training in dyslexia: Behavioral and brain correlates. *Neuropsychologia*, 146, 107566. https://doi.org/10.1016/j.neuropsychologia.2020.107566

Vaughn, S., Linan-Thompson, S., Mathes, P. G., Cirino, P. T., Carlson, C. D., Pollard-Durodola, S. D., Cardenas-Hagan, E., & Francis, D. J. (2006a). Effectiveness of Spanish Intervention for First-Grade English Language Learners at Risk for Reading Difficulties. *Journal of Learning Disabilities*, 39(1), 56–73.

*Vaughn, S., Martinez, L. R., Williams, K. J., Miciak, J., Fall, A.-M., & Roberts, G. (2019). Efficacy of a high school extensive reading intervention for English learners with reading difficulties. *Journal of Educational Psychology*, 111(3), 373–386.

*Vaughn, S., Mathes, P., Linan-Thompson, S., Cirino, P., Carlson, C., Pollard-Durodola, S., Cardenas-Hagan, E., & Francis, D. (2006b). Effectiveness of an English Intervention for First-Grade English Language Learners at Risk for Reading Problems. *The Elementary School Journal*, 107(2), 153–181.

Vaughn, S., Roberts, G., Schnakenberg, J. B., Fall, A.-M., Vaughn, M. G., & Wexler, J. (2015). Improving Reading Comprehension for High School Students With Disabilities. *Exceptional Children*, 82(1), 117–131. https://doi.org/10.1177/0014402915585478

Wang, A. Y., Fuchs, L. S., Fuchs, D., Gilbert, J. K., Krowka, S., & Abramson, R. (2019). Embedding Self-Regulation Instruction Within Fractions Intervention for Third Graders With Mathematics Difficulties. *Journal of Learning Disabilities*, 52(4), 337–348. https://doi.org/10.1177/0022219419851750

*Wang, J., Wu, K. C., Mo, J., Wong, W. L., Siu, T. S. C., McBride, C., Chung, K. K. H., Wong, P. C. M., & Maurer, U. (2021). Remediation of a Phonological Representation Deficit in Chinese Children with Dyslexia: A Comparison between Metalinguistic Training and Working Memory Training. *Developmental Science*, 24(3). https://doi.org/10.1111/desc.13065

Wang, L.-C. (2017). Effects of Phonological Training on the Reading and Reading-Related Abilities of Hong Kong Children with Dyslexia. *Frontiers in Psychology*, 8. https://doi.org/10.3389/fpsyg.2017.01904

Wang, L.-C., Liu, D., & Xu, Z. (2019). Distinct effects of visual and auditory temporal processing training on reading and reading-related abilities in Chinese children with dyslexia. *Annals of Dyslexia*, 69(2), 166–185. https://doi.org/10.1007/s11881-019-00176-8

Wang, L.-C., Yang, H.-M., Tasi, H.-J., & Chan, S.-Y. (2013). Learner-generated drawing for phonological and orthographic dyslexic readers. *Research in developmental disabilities*, 34(1), 228–233.

*Wanzek, J., & Roberts, G. (2012). Reading Interventions With Varying Instructional Emphases for Fourth Graders With Reading Difficulties. *Learning Disability Quarterly*, 35(2), 90–101.

*Wanzek, J., Otaiba, S. A., Schatschneider, C., Donegan, R. E., Rivas, B., Jones, F., & Petscher, Y. (2020). Intensive Intervention for Upper Elementary Students With Severe Reading Comprehension Difficulties. *Journal of Research on Educational Effectiveness*, 13(3), 1–22. https://doi.org/10.1080/19345747.2019.1710886

*Wanzek, J., Vaughn, S., Roberts, G., & Fletcher, J. M. (2011). Efficacy of a Reading Intervention for Middle School Students with Learning Disabilities. *Exceptional Children*, 78(1), 73–87.

*Washington, K. N., & Warr-Leeper, G. A. (2013). Visual Support in Intervention for Preschoolers With Specific Language Impairment. *Topics in Language Disorders*, 33(4), 347–365.

*Williams, K. J., & Vaughn, S. (2020). Effects of an Intensive Reading Intervention for Ninth-Grade English Learners With Learning Disabilities. *Learning Disability Quarterly*, 43(3), 154–166.

*Wolbers, K. (2009). Using ASL and print-based sign to build fluency and greater independence with written English among deaf students. *L1 Educational Studies in Language and Literature,* 10, Running Issue(1, Special Issue), 99–125. https://doi.org/10.17239/l1esll-2010.10.01.05

*Woods-Groves, S., Hua, Y., Therrien, W. J., Kaldenberg, E. R., Hendrickson, J. M., Lucas, K. G., & McAninch, M. J. (2014). An Investigation of Strategic Writing Instruction for Post-Secondary Students with Developmental Disabilities. *Education and Training in Autism and Developmental Disabilities*, 49(2), 248–262.

*Woods-Groves, S., Hua, Y., Therrien, W. J., Kaldenberg, E. R., Kihura, R. W., & Hendrickson, J. M. (2015). An Investigation of the Efficacy of an Editing Strategy with Postsecondary Individuals with Developmental Disabilities. *Education and Training in Autism and Developmental Disabilities*, 50(1), 95–108.

*Woodward, J., & Brown, C. (2006). Meeting the Curricular Needs of Academically Low-Achieving Students in Middle Grade Mathematics. *The Journal of Special Education*, 40(3), 151–159. https://doi.org/10.1177/00224669060400030301

*Wright, J., & Jacobs, B. (2003). Teaching Phonological Awareness and Metacognitive Strategies to Children with Reading Difficulties: A comparison of two instructional methods. Educational Psychology: *An International Journal of Experimental Educational Psychology*, 23(1), 17–47.

*Xin, Y. P., Tzur, R., Hord, C., Liu, J., Park, J. Y., & Si, L. (2017). An Intelligent Tutor-Assisted Mathematics Intervention Program for Students With Learning Difficulties. *Learning Disability Quarterly*, 40(1), 4–16. https://doi.org/10.1177/0731948716648740

*Zafiropoulou, M., & Chryssoula Karmba-Schina. (2005). Applying Cognitive-Behavioral Interventions in Greek Mainstream School Settings: The Case of Learning Difficulties. *Learning Disabilities: A Contemporary Journal*, 3(2), 29–48.

Zare, M., Amani, M., & Sadoughi, M. (2020). The role of Persian-language word exercise games in improving spelling of students with dyslexia: Word exercise games in improving spelling. *Journal of Computer Assisted Learning*, 36(3), 315–322.

Zens, N. K., Gillon, G. T., & Moran, C. (2009). Effects of phonological awareness and semantic intervention on word-learning in children with SLI. *International Journal of Speech-Language Pathology*, 11(6), 509–524. https://doi.org/10.3109/17549500902926881

Zhang, H., Chang, L., Chen, X., Ma, L., & Zhou, R. (2018a). Working Memory Updating Training Improves Mathematics Performance in Middle School Students With Learning Difficulties. *Frontiers in Human Neuroscience*, 12. https://doi.org/10.3389/fnhum.2018.00154

*Zhang, M., Xie, W., Xu, Y., & Meng, X. (2018b). Auditory temporal perceptual learning and transfer in Chinese-speaking children with developmental dyslexia. *Research in developmental disabilities*, 74, 146–159. https://doi.org/10.1016/j.ridd.2018.01.005

Zhao, J., Liu, H., Li, J., Sun, H., Liu, Z., Gao, J., Liu, Y., & Huang, C. (2019). Improving sentence reading performance in Chinese children with developmental dyslexia by training based on visual attention span. *Scientific Reports*, 9(1), 18964. https://doi.org/10.1038/s41598-019-55624-7

*Zheng, H., Dong, Y., Sun, Y., Yang, J., Yuan, C., Wang, J., & Dong, W. (2021). Effectiveness of Metacognitive Regulation Intervention on Attention-Deficit–Hyperactivity Disorder Students' Scientific Ability and Motivation. *Frontiers in Psychology*, 12. https://doi.org/10.3389/fpsyg.2021.747961

*Zhu, N. (2015). Cognitive Strategy Instruction for Mathematical Word Problem-solving of Students with Mathematics Disabilities in China. *International Journal of Disability, Development and Education*, 62(6), 608–627.

*Zijlstra, H., van Bergen, E., Regtvoort, A., de Jong, P. F., & van der Leij, A. (2021). Prevention of reading difficulties in children with and without familial risk: Short- and long-term effects of an early intervention. *Journal of Educational Psychology*, 113(2), 248–267.

*Ziolkowski, R. A., & McDowell, K. D. (2015). Effectiveness of a Collaborative, Multi-Component Intervention for Adolescent Students with Severe Reading Disabilities. *The Open Communication Journal*, 9(1), 44–55. https://doi.org/10.2174/1874916x01509010044