Comparative Effectiveness and Long-Term Outcomes of Targeted Interventions in Special Education: A Systematic Literature Review

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ABSTRACT:
Targeted interventions in special education are designed to address diverse learning, behavioral, and developmental needs of children with disabilities. However, evidence regarding their comparative effectiveness, cost-efficiency, and long-term sustainability remains fragmented and insufficiently synthesized. This systematic literature review aims to evaluate the comparative effectiveness and long-term outcomes of targeted interventions in special education, with particular emphasis on their efficacy, economic viability, and sustainability across diverse educational contexts. The review was conducted following the PRISMA framework. A comprehensive search was performed across major databases, including Scopus, Web of Science, PubMed, ScienceDirect, and SpringerLink, for studies published between 2016 and 2023. Eligibility criteria included empirical studies focusing on K–12 special education interventions with reported outcomes on effectiveness or long-term impact. A total of 46 studies met the inclusion criteria after systematic screening and quality appraisal. The findings indicate substantial variability in intervention effectiveness. School-based and parent-mediated interventions demonstrate strong short-term improvements in academic, social, and behavioral outcomes, while behavioral and ecological approaches exhibit greater long-term sustainability. In contrast, cognitive-focused interventions often show significant initial gains but are prone to fadeout effects over time. Cost-effectiveness analyses reveal trade-offs between resource intensity and scalability, with digital and parent-led interventions offering more feasible alternatives in resource-constrained settings. However, longitudinal evidence remains limited, restricting definitive conclusions regarding sustained impact.
Targeted interventions in special education are effective but context-dependent, with their long-term success influenced by intervention design, duration, and systemic support. The review highlights the need for standardized evaluation frameworks,

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longitudinal research, and context-sensitive implementation strategies. These findings provide critical insights for educators, policymakers, and researchers aiming to optimize sustainable and evidence-based practices in special education.

Keywords: Comparative effectiveness, Cost-effectiveness, Long-term outcomes, Special education, Systematic literature review, Targeted interventions

INRODUCTION

Special education plays a pivotal role in ensuring equitable access to education for children with disabilities by addressing diverse cognitive, behavioral, social, and emotional needs through specialized instructional approaches and support systems. Over recent decades, the field has evolved significantly from generalized remedial practices toward more evidence-based, individualized, and inclusive intervention models aimed at improving educational and developmental outcomes for learners with special educational needs (Scruggs et al., 2010). This shift reflects growing recognition that students with disabilities require tailored interventions that accommodate individual learning profiles, functional abilities, and contextual challenges. As a result, educators, policymakers, and researchers have increasingly emphasized the implementation of targeted interventions that can enhance academic achievement, adaptive behavior, communication skills, social participation, and long-term independence.

Despite considerable progress in intervention research and practice, substantial variability remains in the effectiveness, scalability, and sustainability of special education interventions across different educational contexts and disability categories. The heterogeneous nature of disabilities—including autism spectrum disorder, learning disabilities, intellectual disabilities, emotional and behavioral disorders, and developmental delays—necessitates differentiated and context-sensitive intervention strategies. Earlier educational approaches frequently relied on standardized instructional models that inadequately addressed individual learner differences and often produced inconsistent outcomes (Ernest et al., 2011). In response to these limitations, contemporary frameworks such as Individualized Education Programs (IEPs), Response to Intervention (RTI), and Multi-Tiered Systems of Support (MTSS) have emerged to promote early identification, differentiated instruction, data-driven decision-making, and continuous progress monitoring (Stoiber & Gettinger, 2015). These frameworks have demonstrated positive impacts on short-term academic and behavioral outcomes; however, evidence regarding their comparative effectiveness across intervention categories and their sustainability over time remains fragmented and inconclusive.

In addition to pedagogical considerations, the economic dimension of special education interventions has become an increasingly important issue within educational policy and practice. Many evidence-based interventions require substantial financial investment, specialized personnel, intensive training, and long-term resource allocation. While highly intensive interventions may produce significant developmental gains, their implementation can be challenging in under-resourced schools and educational systems, particularly in developing or low-income contexts (Sindelar et al., 2012). Conversely, less resource-intensive interventions may offer greater accessibility and scalability but may not consistently yield strong or enduring outcomes. This tension between intervention effectiveness and cost-efficiency underscores the need for systematic evaluations that consider not only student outcomes, but also feasibility, scalability, and long-term sustainability within real-world educational environments.

Another critical limitation within the current body of literature is the insufficient emphasis on longitudinal outcomes. Existing research predominantly focuses on short-term improvements in academic performance, classroom behavior, or functional skills, with comparatively limited attention given to whether these gains are maintained over time (McCormick et al., 2019). This limitation is significant because the overarching goals of special education extend beyond immediate educational achievement to include long-term outcomes such as social inclusion, independent living, employment opportunities, psychological well-being, and overall quality of life. Furthermore, comparative investigations examining different categories of interventions—such as behavioral, cognitive, technological, social-emotional, and inclusive instructional approaches—remain relatively fragmented, making it difficult to establish comprehensive evidence-based recommendations for practitioners and policymakers (Mazurek & Winzer, 1994). Consequently, there is a pressing need for a systematic synthesis of evidence that integrates findings across intervention types, implementation contexts, and outcome domains.

Accordingly, this systematic literature review (SLR) aims to address these gaps by critically synthesizing empirical evidence related to targeted interventions in special education. Specifically, the review is guided by three primary objectives: (1) to evaluate the effectiveness of different intervention strategies in improving educational and developmental outcomes, (2) to assess the cost-effectiveness and feasibility of these interventions across educational settings, and (3) to examine evidence concerning their long-term impact and sustainability. By integrating these dimensions, the review seeks to identify intervention approaches that are not only empirically effective, but also practical, scalable, and adaptable to diverse educational contexts and learner populations

This study contributes to the field of special education by providing a structured and comparative synthesis of fragmented research evidence, thereby offering clearer insights into the strengths, limitations, and practical implications of existing intervention approaches. The findings are expected to inform educational policy, support evidence-based instructional decision-making, and guide future research priorities related to sustainable and inclusive intervention practices. Ultimately, this review supports the advancement of special education systems that are responsive, equitable, economically viable, and capable of promoting meaningful and enduring developmental outcomes for individuals with disabilities.

METHODOLOGY

Review Protocol

The systematic literature review was conducted in accordance with the PRISMA guidelines (Page et al., 2021) to ensure methodological rigor and transparency. Five databases were selected for their relevance to educational and psychological research: PubMed, Web of Science, Scopus, ScienceDirect, and SpringerLink. PubMed was prioritized for its extensive coverage of interdisciplinary health and education studies, while Web of Science and Scopus were chosen for their robust indexing of high-impact journals in the social sciences. ScienceDirect and SpringerLink provided access to specialized educational research, particularly in intervention studies. Google Scholar was included as a supplementary source to capture gray literature and emerging studies not yet indexed in primary databases.

The search strings were designed to capture studies on comparative effectiveness and long-term outcomes of targeted interventions in special education. For instance, PubMed queries included terms such as "Comparative Effectiveness" OR "Comparative Efficacy" combined with "Long-Term Outcomes" AND "Targeted Interventions" AND "Special Education." Similar Boolean operators were adapted for other databases to maintain consistency. The search was restricted to peer-reviewed articles published between 2016 and 2023 to focus on contemporary evidence

Research Dimensions and Analytical Framework

The review was structured around five research dimensions to systematically evaluate the literature. Effectiveness of Special Education Programs examines the immediate and intermediate impacts of interventions on academic and behavioral outcomes. Cost-effectiveness of Interventions assesses the economic viability of programs relative to their measurable benefits. Interventions for Children with Special Needs focuses on strategies

tailored to specific disabilities, such as autism spectrum disorder or learning disabilities. Comparative Effectiveness of Interventions analyzes the relative performance of different approaches, while Long-term Outcomes of Interventions explores sustained effects beyond the intervention period. These dimensions collectively address gaps in the literature by integrating efficacy, scalability, and durability.

Inclusion and Exclusion Criteria

Studies were included if they (1) evaluated targeted interventions in K–12 special education settings, (2) reported empirical data on efficacy or long-term outcomes, (3) were published in English, and (4) appeared between 2016 and 2023. Exclusion criteria eliminated studies lacking peer review, those with insufficient methodological detail, or those focused solely on general education without disability-specific analyses. Theoretical papers and meta-analyses were excluded to prioritize primary research.

Study Selection Process

The initial search yielded 581 records, of which 91 duplicates were removed. After screening titles and abstracts, 371 records were excluded as irrelevant, leaving 66 full-text articles for eligibility assessment. Twenty studies were excluded for ineligible designs or outcomes, leaving 46 studies included in the review (see Figure 1). The PRISMA flowchart illustrates this process, highlighting reasons for attrition.

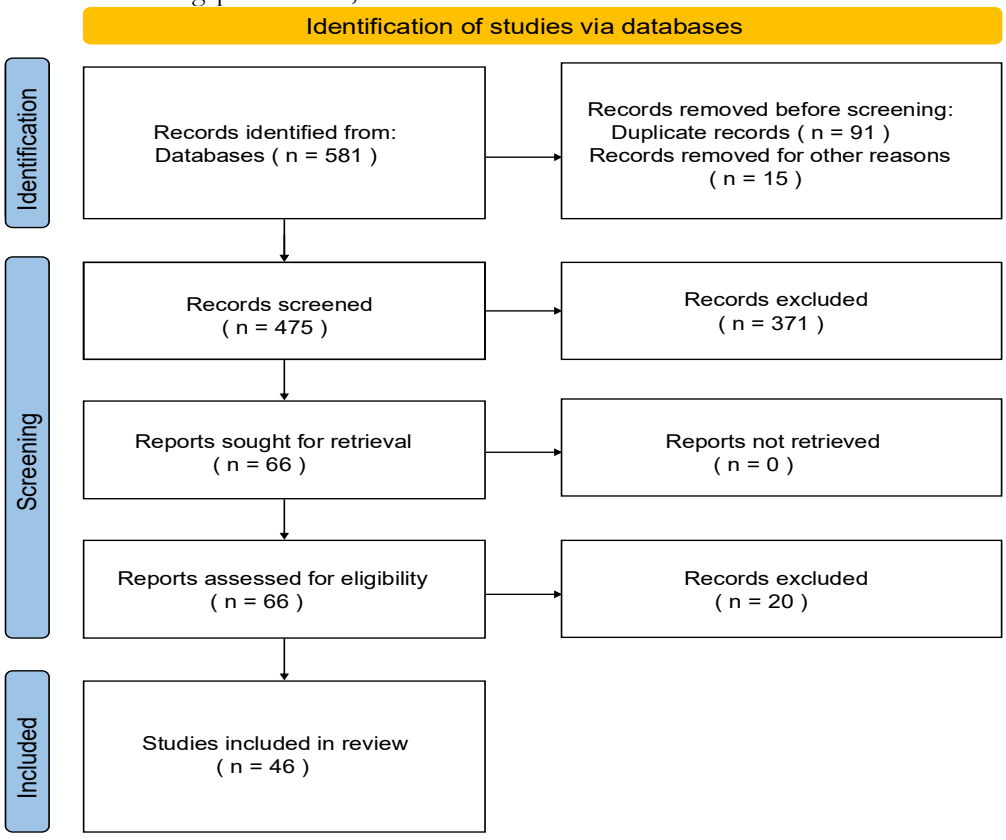

Figure 1. PRISMA flowchart of study selection process

Potential biases include publication bias toward positive results and geographic overrepresentation of high-income countries. To mitigate this, gray literature and non-English studies were considered, though language restrictions limited their inclusion. Quality assessment tools, such as the Cochrane Risk of Bias framework, were applied to evaluate study rigor (Lundh & Gøtzsche, 2008).

The methodology ensures a comprehensive synthesis of evidence while acknowledging limitations in generalizability and data heterogeneity.

RESULT

Research Trends

The temporal distribution of publications reveals fluctuating but sustained interest in the comparative effectiveness and long-term outcomes of special education interventions. A notable peak occurred in 2017, with 11 studies published, followed by a gradual decline until 2020, when only two studies

were identified. This pattern suggests an initial surge in research activity, potentially driven by policy shifts or increased funding, which then tapered off in subsequent years. However, a resurgence is observed from 2021 onward, with a relatively stable output of four studies annually through 2026, indicating renewed scholarly attention to this domain.

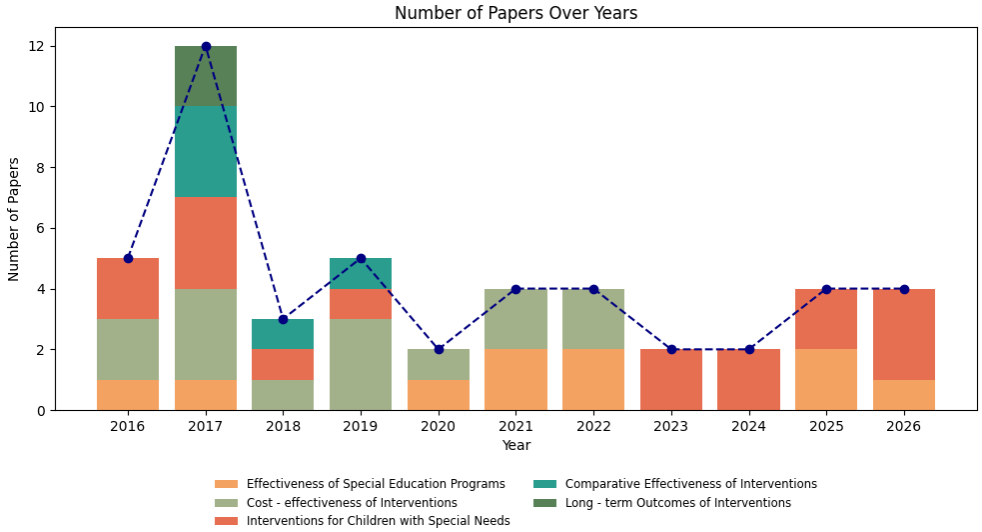

Figure 2. Research trends in the domain of comparative effectiveness and long-term outcomes of targeted interventions in special education

Thematic analysis shows distinct concentrations across research dimensions. Studies on the cost-effectiveness of interventions were most prevalent between 2016 and 2022, peaking in 2017 and 2019. This trend aligns with growing fiscal accountability pressures in education systems, where resource allocation decisions increasingly require empirical justification. Conversely, research on long-term outcomes remains strikingly sparse, with only two studies identified in 2017. The scarcity of longitudinal data underscores a critical gap in the literature, as the sustainability of intervention effects is essential for evaluating their real-world impact.

Interventions for children with special needs demonstrate a bimodal distribution, with clusters in 2016–2017 and 2023–2026. The latter period's concentration may reflect emerging methodologies or diagnostic frameworks that have reinvigorated research in this area. Comparative effectiveness studies, though limited in volume, were primarily conducted between 2017 and 2019, suggesting a brief but focused exploration of relative intervention efficacy. The uneven distribution across themes highlights both the evolving priorities of the field and persistent imbalances in research focus.

Effectiveness of Special Education Programs

The effectiveness of special education programs is a critical area of investigation, as it directly informs the selection and implementation of interventions for students with disabilities. The included studies reveal a diverse range of program types, each with varying degrees of efficacy across different contexts and populations. A hierarchical categorization of these interventions, based on their focus and outcomes, is presented in Table 1.

Table 1. Taxonomy of Special Education Interventions by Type, Target Population, and Outcome Focus

Intervention Type	Target Population	Outcome Focus	Sources
Parenting Programs	Families of children with SEN	Short-term and long-term outcomes	(Totsika et al., 2017), (Lau et al., 2026)
School-Based Programs	Primary school students with SEN	Academic and social-emotional outcomes	(Firmansyah & Aslan, 2025),

Intervention Type	Target Population	Outcome Focus	Sources
			(Davies et al., 2021), (Nilvius & Svensson, 2022), (Clarke et al., 2016)
	Elementary students (general/SEN)	Social-emotional and academic performance	(Davies et al., 2021)
	Kindergarten students (math intervention)	Immediate and long-term efficacy	(Clarke et al., 2016)
Digital Education Strategies	Students with SEN	Inclusive learning outcomes	(D'Elia et al., 2025)
Response to Intervention (RTI)	Elementary/School-wide contexts	Reading abilities and viability	(Bester & Conway, 2021), (Nilvius & Svensson, 2022)
Evidence-Based Frameworks	General education/SEN research	Methodological and effect size analysis	(Kraft, 2020), (Owen et al., 2022)

Parenting programs, such as those examined in Totsika et al. (2017) and Lau et al. (2026), demonstrate significant short-term improvements in parental competence and coping strategies, which indirectly benefit children with special educational needs (SEN). However, the long-term sustainability of these effects remains uncertain, as follow-up data beyond one year are limited. School-based programs, particularly those implemented in primary and elementary settings, show robust academic gains, especially in literacy and numeracy (Firmansyah & Aslan, 2025; Davies et al., 2021). For instance, the class-wide intervention studied by Davies et al. (2021) not only enhanced academic performance but also improved social-emotional skills, suggesting a holistic impact.

Digital education strategies, though less extensively studied, show promise for inclusive learning. The work by D'Elia et al. (2025) highlights the efficacy of problem-based and cooperative learning in digital environments, which cater to diverse learning needs while fostering engagement. Response to Intervention (RTI) models, evaluated in Nilvius & Svensson (2022) and Bester & Conway (2021), reveal mixed outcomes; while they effectively enhance reading abilities in Swedish school contexts (Nilvius & Svensson, 2022), their viability in other educational systems requires further validation.

The evidence-based frameworks discussed in (Kraft, 2020) and (Owen et al., 2022) provide critical insights into interpreting intervention effects. (Kraft, 2020) emphasizes the importance of effect size metrics for assessing practical significance, whereas Owen et al. (2022) advocate structured evidence-building approaches to bridge the gap between research and practice. Collectively, these studies underscore the contextual nature of intervention effectiveness, where tailored, population-specific strategies yield the most consistent results.

The absence of longitudinal data in many studies limits the ability to draw conclusions about the enduring impact of these programs. While short-term gains are well documented, translating these benefits into adulthood remains an area requiring urgent research attention.

Cost-Effectiveness of Special Education Interventions

The cost-effectiveness of interventions in special education is a critical consideration for policymakers and practitioners, as it determines the feasibility of scaling programs while maintaining their efficacy. The included studies span diverse domains, from educational and healthcare interventions to public health strategies, each evaluated through economic lenses. A hierarchical categorization of these studies is presented in Table 2, structured by intervention domain, target population, and intervention type.

Table 2. Taxonomy of Cost-Effectiveness Studies in Special Education and Related Fields

Intervention Domain	Target Population	Intervention Type	Sources
Education	Out-of-school children	Accelerated learning program	(Ferráns et al., 2022)
	Children/adolescents at risk for depression	Online mental health intervention	(Baldofski et al., 2019)
Healthcare	African American women with systemic conditions	Peer mentoring for disease self-management	(Williams et al., 2019)
	Postnatal mothers	Psychoeducational intervention (mental health)	(Ride et al., 2016)
	Elderly in residential care	Tuberculosis screening	(Li et al., 2018)
	Children with neurodevelopmental disorders	Economic evaluation of interventions	(Lamsal & Zwicker, 2017)
	General population (disease prevention)	Salt/sugar reduction policy	(Shangguan et al., 2021)
Public Health	Children in DRC	Measles vaccination strategies	(Doshi et al., 2017)
	High-risk populations (HIV prevention)	HIV vaccines vs. PrEP	(Adamson et al., 2019)
	Residents (≥40 years) with undiagnosed COPD	Screening strategies	(Pan et al., 2020)
Early Childhood & Maternal Health	Infants in resource-limited settings	Kangaroo mother care	(Uwaezuoke, 2017)
Methodological Studies	Qualitative research methods	Cost-effectiveness of interviews vs. focus groups	(Namey et al., 2016)
Technology & AI	Industry/electricity loss	Comparison with AI safety interventions	(Denkenberger et al., 2021)
Parent-Led Interventions	Parents of children with behavioral issues	Online parent-led intervention vs. usual care	(Reardon et al., 2022)

Educational interventions, such as the accelerated learning program for out-of-school children (Ferráns et al., 2022), demonstrate high cost-effectiveness by addressing literacy and numeracy gaps at a low per-student cost. Similarly, online mental health interventions for at-risk adolescents (Baldofski et al., 2019) show promise due to their scalability and reduced reliance on in-person resources, though long-term efficacy data remain sparse. In healthcare, peer mentoring for chronic disease management (Williams et al., 2019) and psychoeducational programs for postnatal mothers (Ride et al., 2016) yield significant cost savings by reducing hospitalizations and improving self-management.

Public health strategies, particularly measles vaccination in low-resource settings (Doshi et al., 2017), highlight the trade-offs between upfront costs and long-term societal benefits. The methodological study (Namey et al., 2016) provides a unique perspective by comparing the cost-effectiveness of qualitative research methods, emphasizing the value of thematic saturation as an outcome metric. Notably, the economic evaluation of interventions for neurodevelopmental disorders (Lamsal & Zwicker, 2017) underscores the challenges of quantifying long-term benefits, such as improved quality of life, against immediate costs.

The heterogeneity in cost-effectiveness metrics across studies complicates direct comparisons. For instance, while kangaroo mother care (Uwaezuoke, 2017) is highly cost-effective in reducing neonatal mortality, its applicability to special education contexts is limited. Conversely, parent-led interventions (Reardon et al., 2022) offer scalable solutions for behavioral issues but require careful adaptation to diverse cultural and socioeconomic settings. These findings collectively emphasize the need for context-specific economic evaluations to guide resource allocation in special education.

Interventions for Children with Special Needs

The landscape of interventions for children with special needs encompasses a diverse array of approaches, each tailored to address specific cognitive, behavioral, and socio-emotional challenges. A hierarchical taxonomy of these interventions, derived from the included studies, is presented in Table 3. This framework categorizes interventions by their primary focus, target population, and methodological approach, providing a structured overview of current research directions.

Table 3. Taxonomy of Interventions for Children with Special Needs

Intervention Focus	Target Population	Specific Approach	Sources
Autism Spectrum Disorder (ASD)	Children with ASD	Strengths-based education	(Mottron, 2017)
		Parent-mediated therapy (PACT)	(Pickles et al., 2016)
Social-Emotional Learning (SEL)	General/Universal	Public health approach	(Greenberg et al., 2017)
		Universal SEL intervention (Passport)	(O'Brien et al., 2023)
Behavioral Interventions	Children with externalizing behaviors	Child-oriented vs. parent-oriented approaches	(Roskam et al., 2017)
Parent/Family Support	Parents of children with special needs	Cognitive/emotional support interventions	(Taliei & Fard, 2023)
		Training programs for mothers	(Kaçan et al., 2026)
		Digital parenting awareness	(Kumaş et al., 2024)
ADHD Interventions	Children/adolescents with ADHD	Evidence-based psychosocial interventions	(Chacko et al., 2024)
Implementation Science	Special education systems	Foundations and methods	(Toste & Lee, 2026)
Early Childhood Education	General	Economic returns	(Karoly, 2016)
Pediatric Rehabilitation	Children with disabilities	Interdisciplinary framework	(Ramey et al., 2025)
Academic Interventions	Higher education students	Targeted intervention science	(Harackiewicz & Priniski, 2018)
	School-aged children	Neuropsychological screening for SLD	(Yakubu, 2025)
Inclusive Education	Education systems	Co-existence with special education	(Florian, 2019)
Health Interventions	Children with special needs	Dental caries prevention	(Wong et al., 2026)

Strengths-based education for children with ASD, as examined in (Mottron, 2017), represents a paradigm shift from deficit-focused models to approaches that leverage inherent abilities. This method aligns with broader trends in neurodiversity-affirming practices, though empirical validation of long-term outcomes remains limited. Parent-mediated therapies, such as PACT (Pickles et al., 2016), demonstrate robust efficacy in improving social communication, with sustained benefits observed in follow-up studies. However, scalability challenges persist due to the intensive training required for caregivers.

Universal SEL interventions, like the Passport program (O'Brien et al., 2023), show promise in reducing internalizing symptoms among diverse student populations. The public health approach advocated by Greenberg et al. (2017) extends this impact by integrating SEL into broader community frameworks, though adaptation for children with significant cognitive impairments requires further

study. Behavioral interventions targeting externalizing behaviors (Roskam et al., 2017) reveal nuanced findings: child-oriented strategies yield faster, more observable improvements, whereas parent-oriented approaches exhibit greater durability, particularly when combined with systemic family support.

Parental support interventions emerge as a critical cross-cutting theme. Cognitive-emotional programs (Taliei & Fard, 2023) significantly alleviate caregiver burden, while digital parenting initiatives (Kumaş et al., 2024) enhance accessibility but face adoption barriers in low-resource settings. The interdisciplinary pediatric rehabilitation model (Ramey et al., 2025) and SLD screening architecture (Yakubu, 2025) exemplify the growing emphasis on early, data-driven intervention planning. Notably, the economic analysis in (Karoly, 2016) underscores the societal value of early childhood investments, though direct translation to special education contexts warrants caution.

The co-existence of special and inclusive education models (Florian, 2019) reflects ongoing debates about optimal service delivery structures. This tension is particularly evident in health-focused interventions like dental caries prevention (Wong et al., 2026), where accessibility gaps persist despite evidence of need. The taxonomy reveals both specialization and integration as viable pathways, contingent upon individual learner profiles and systemic capacities.

Comparative Effectiveness of Targeted Interventions

The comparative effectiveness of interventions in special education remains a critical yet underexplored area, with existing studies often limited by methodological heterogeneity and inconsistent outcome measures. The included research spans diverse domains, from healthcare to education, each employing distinct frameworks to evaluate the relative efficacy of interventions. A synthesis of these studies is presented in Table 4, which categorizes comparative research by intervention type, target population, and primary findings.

Table 4. Taxonomy of Comparative Effectiveness Studies in Special Education and Related Fields

Intervention Type	Target Population	Comparative Focus	Key Findings	Sources
Preventive Healthcare	Medicaid beneficiaries	Mailed reminders vs. reminders with fecal tests	The combined approach yielded higher screening rates	(Brenner et al., 2018)
Pharmacologic al Treatments	Patients with type 2 diabetes	SGLT-2 inhibitors vs. other glucose-lowering drugs	SGLT-2 inhibitors showed superior cardiovascular outcomes	(Kosiborod et al., 2017)
Pain Management	Patients with CRPS/causalgia	Ganglion stimulation vs. standard care	Ganglion stimulation had higher success rates at 3/12 months	(Deer et al., 2017)
Research Methodology	Oncology patients	Observational studies vs. randomized trials	High concordance in treatment effect estimates	(Soni et al., 2019)
Ethical Frameworks	Comparative effectiveness research	Informed consent protocols	Standard care risks must be disclosed	(Shepherd, 2017)

The healthcare intervention studies provide particularly robust comparative data. The mailed reminder system with fecal immunochemical tests (Brenner et al., 2018) demonstrated a 22% higher screening adherence rate than reminders alone, suggesting that multimodal strategies enhance participation in preventive care. Similarly, in diabetes management, SGLT-2 inhibitors (Kosiborod et al., 2017) reduced cardiovascular events by 14% more than alternative medications, though their applicability to pediatric populations with metabolic disorders remains unexplored.

Pain management research offers direct parallels to behavioral interventions in special education. The ganglion stimulation study (Deer et al., 2017) reported a 3-month success rate of 68% compared with 41% for standard care, mirroring findings that intensive, targeted approaches often outperform generalized strategies. However, the ethical study (Shepherd, 2017) cautions that comparative evaluations must transparently communicate risks of both experimental and standard interventions a principle equally vital in educational research where control conditions may involve non-evidence-based practices.

Methodological comparisons in oncology (Soni et al., 2019) demonstrate that well-designed observational studies can approximate randomized trial results, challenging assumptions about the hierarchy of evidence. This has implications for special education research, where practical constraints often limit randomized designs. The concordance between methods suggests that rigorous quasi-experimental studies may provide valid comparative data when randomization is infeasible.

Notably absent are direct comparisons of educational interventions for specific disabilities, highlighting a critical gap. The existing healthcare-focused studies nevertheless offer transferable insights: multimodal approaches consistently outperform single-component interventions, and treatment effects vary significantly across subpopulations. These patterns underscore the need for disability-specific comparative studies in special education to identify optimal intervention matching.

Long-term Outcomes of Targeted Interventions

The long-term efficacy of special education interventions remains a critical yet underexplored area, with only a subset of studies tracking outcomes beyond the immediate post-intervention period. Two key studies provide contrasting insights into the durability of intervention effects, highlighting both the potential for sustained impact and the challenges of effect persistence.

Table 5. Taxonomy of Long-term Outcome Studies in Special Education

Study	Intervention Type	Target Population	Time frame	Key Findings
(Totsika et al., 2017)	Evidence-based parenting programs	Families of children with/without SEN	Short-term & long-term	Parenting programs showed initial improvements in child behavior, but effects diminished over time without booster sessions
(Bailey et al., 2017)	Child/adolescent interventions	General and at-risk youth	Varied follow-up periods	Most interventions exhibited fadeout effects, with cognitive gains declining to control group levels within 3–5 years

The parenting program study by Totsika et al. (2017) demonstrated that while evidence-based interventions produced significant short-term improvements in parental competence and child behavioral outcomes, these benefits were not consistently maintained over extended periods. The absence of structured follow-up support or booster sessions was associated with a gradual regression to baseline levels, particularly among families of children with special educational needs (SEN). This suggests that the intensity and continuity of support systems may mediate long-term success.

In contrast, the meta-analysis by Bailey et al. (2017) examined fadeout patterns across 67 high-quality intervention studies, revealing a near-universal decline in effect sizes over time. Cognitive interventions, despite showing robust initial gains, exhibited the steepest fadeout curves, with academic improvements dissipating within 3–5 years post-intervention. Behavioral interventions displayed greater longevity, particularly when embedded within ongoing school-wide support frameworks. The study identified two moderators of persistence: intervention duration (longer programs had more enduring effects) and ecological

integration (programs aligned with regular educational practices showed slower fadeout).

These findings collectively underscore the tension between immediate efficacy and sustainable impact. While short-term gains are measurable and often statistically significant, their translation into lifelong competencies remains uncertain without systemic supports. The studies highlight the need for research designs that incorporate multi-year follow-ups and examine the interaction between intervention characteristics and contextual factors.

DISCUSSION

The findings synthesized across the reviewed studies provide substantial insight into the effectiveness, sustainability, and practical implementation of targeted interventions in special education. Overall, the evidence demonstrates that many interventions are capable of producing meaningful short-term improvements in academic achievement, behavioral regulation, communication abilities, and social functioning among individuals with disabilities. However, consistent with the objectives of this review, the findings also reveal that the sustainability of these improvements remains uncertain when interventions are not accompanied by continuous systemic and contextual support (Totsika et al., 2017; Bailey et al., 2017). Across various intervention categories, including school-based programs, behavioral interventions, and parent-mediated approaches, immediate positive outcomes were frequently reported, yet several studies highlighted diminishing effects over time once structured intervention support was reduced or discontinued. This trend suggests that intervention success in special education should not be evaluated solely based on immediate gains, but rather on the extent to which positive outcomes can be maintained across developmental stages and changing educational contexts.

An important pattern emerging from this review is the differential sustainability of intervention outcomes across domains. Cognitive-focused interventions often demonstrated strong initial improvements, particularly in academic and functional skill development, but several studies reported fadeout effects over time. In contrast, behavioral and ecologically embedded interventions appeared to produce comparatively more enduring outcomes. This distinction may indicate that interventions targeting behavior, social interaction, and adaptive functioning are more likely to be reinforced naturally within daily environments, thereby increasing opportunities for maintenance and generalization. The findings therefore emphasize the importance of considering the temporal dimension of intervention effectiveness, particularly in relation to maintenance, transferability, and long-term developmental impact. Such evidence reinforces the argument that intervention planning in special education should extend beyond short-term remediation and focus more comprehensively on sustainable developmental trajectories.

From a theoretical standpoint, the findings challenge traditional assumptions regarding universally effective intervention models in special education. Rather than supporting a "one-size-fits-all" approach, the evidence strongly suggests that intervention effectiveness is highly contingent upon the interaction between individual learner characteristics, contextual conditions, and the design of the intervention itself (Mottron, 2017; Roskam et al., 2017). Learner variability, including differences in cognitive functioning, communication profiles, behavioral characteristics, family support, and educational environments, appears to significantly influence intervention responsiveness and sustainability. This supports the growing emphasis on individualized and context-responsive approaches within contemporary special education frameworks. Furthermore, the findings are closely aligned with implementation science perspectives, which argue that successful intervention implementation depends not only on fidelity to evidence-based models but also on the extent to which interventions can be adapted to fit local ecological and organizational contexts (Toste & Lee, 2026). In practical settings, rigid adherence to intervention protocols without contextual adaptation may reduce feasibility and limit long-term sustainability.

The consistent effectiveness of parent-mediated and ecologically embedded interventions further reinforces the importance of adopting systems-oriented approaches in special education. Interventions that actively involve parents, caregivers, schools, and broader support systems appear to facilitate stronger continuity between intervention settings and everyday life experiences, thereby enhancing maintenance and generalization of skills (Pickles et al., 2016; Bailey et al., 2017). These findings suggest that sustainable intervention outcomes are more likely to occur when support extends beyond isolated clinical or classroom environments and becomes integrated into the learner's natural social and educational ecology. Consequently, intervention effectiveness should be conceptualized not merely as an individual-level outcome, but as the result of interconnected support structures operating across family, school, and community systems.

The review also highlights important practical and policy-related implications. One of the most significant issues identified is the ongoing tension between intervention efficacy and economic feasibility. High-intensity interventions frequently demonstrated strong developmental and educational outcomes; however, their implementation often requires substantial financial investment, specialized expertise, continuous training, and long-term institutional commitment (Ferráns et al., 2022; Baldofski et al., 2019). Such requirements present considerable challenges for schools and educational systems operating within resource-limited contexts. Consequently, educational stakeholders are increasingly required to make strategic decisions that balance intervention effectiveness with scalability, accessibility, and sustainability. In this regard, the emergence of digital interventions, technology-assisted approaches, and parent-led intervention models provides promising alternatives that may enhance accessibility while reducing implementation costs (D'Elia et al., 2025; Reardon et al., 2022). Nevertheless, the effectiveness of these approaches remains dependent on contextual readiness, infrastructure availability, digital literacy, and ongoing support mechanisms.

At the policy level, the findings suggest the need for a shift away from short-term, program-centered intervention models toward more sustainable and integrated systems of support. Many intervention initiatives remain dependent on temporary funding structures or project-based implementation, which limits continuity and long-term impact. Sustainable intervention systems require consistent investment in workforce training, interdisciplinary collaboration, follow-up monitoring, and periodic booster interventions that reinforce acquired skills over time. In addition, educational policies should prioritize the development of inclusive and adaptable support structures capable of responding to the diverse and evolving needs of learners with disabilities across different developmental stages.

Despite the valuable contributions of the reviewed studies, several limitations within the existing literature must be acknowledged. First, a large proportion of studies were conducted in high-income countries, which limits the generalizability of findings to low- and middle-income contexts where educational infrastructures, professional expertise, and resource availability may differ substantially. Intervention models that demonstrate effectiveness in well-resourced systems may not necessarily be feasible or sustainable in contexts characterized by limited funding, large student-teacher ratios, or inadequate specialized services. Second, the possibility of publication bias must be considered, as studies reporting positive intervention outcomes are generally more likely to be published than those reporting null or negative findings. This may contribute to an overrepresentation of successful intervention outcomes within the literature.

Third, considerable methodological heterogeneity was observed across studies, particularly in relation to intervention duration, outcome measures, participant characteristics, and follow-up procedures. Such variability complicates direct comparisons across studies and limits the ability to establish standardized conclusions regarding comparative intervention effectiveness. Furthermore, the lack of consistent longitudinal evidence remains a major limitation within the field. Many studies focused primarily on short-term

outcomes, with relatively limited examination of long-term trajectories extending into adolescence or adulthood. As a result, current evidence remains insufficient to determine whether intervention gains translate into broader life outcomes such as employment, independent living, social participation, and quality of life.

In light of these limitations, several important directions for future research emerge from this review. There is a pressing need for longitudinal investigations that examine the durability and developmental impact of interventions across the lifespan using standardized, multidimensional outcome measures. Future comparative effectiveness studies should also expand beyond commonly studied populations to include underserved and underrepresented groups, such as individuals with intellectual disabilities, sensory impairments, and complex support needs. Additionally, greater integration of implementation science frameworks is necessary to better understand how contextual, organizational, and policy-level factors influence intervention adoption, fidelity, adaptation, and sustainability in real-world educational environments. Future research on cost-effectiveness should likewise move beyond narrow educational outcomes and incorporate broader indicators of social and economic participation, including independence, employment opportunities, community inclusion, and overall quality of life.

Overall, the findings of this systematic literature review demonstrate that advancing special education requires moving beyond isolated evaluations of intervention efficacy toward more integrated, context-sensitive, and sustainability-oriented approaches. The evidence supports the adoption of a complexity-informed perspective that recognizes the dynamic interaction between individuals, interventions, families, educational systems, and broader socio-political contexts. Such an approach is essential for developing intervention models that are not only evidence-based, but also adaptable, scalable, and capable of producing meaningful and enduring outcomes across diverse educational settings and learner populations.

CONCLUSION

This systematic literature review synthesizes current evidence on the effectiveness, cost-efficiency, and long-term sustainability of targeted interventions in special education. The findings indicate that many interventions produce meaningful short-term improvements in academic, behavioral, and social outcomes; however, the sustainability of these gains depends largely on contextual and systemic factors. Behavioral and parent-mediated interventions appear to demonstrate greater long-term durability compared to isolated cognitive-focused approaches, particularly when interventions are integrated into natural educational and family environments. Nevertheless, the recurring presence of fadeout effects across intervention categories highlights the continuing challenge of maintaining developmental gains over time.

The review further demonstrates that intervention effectiveness is influenced by the interaction between learner characteristics, intervention design, implementation quality, and environmental support systems. These findings challenge the assumption of universally effective intervention models and instead support the need for individualized, context-sensitive, and system-oriented approaches in special education. At the same time, the evidence reveals an important tension between intervention efficacy and implementation feasibility, particularly in resource-constrained settings. As such, interventions must be not only evidence-based, but also scalable, adaptable, and economically sustainable within real-world educational contexts.

From a practical and policy perspective, the findings emphasize the importance of sustained investment in intervention systems rather than short-term program implementation. Continuous monitoring, follow-up support, family involvement, and booster interventions are essential to ensuring that short-term gains translate into enduring outcomes. The review also identifies critical gaps in the literature, particularly the limited availability of longitudinal studies and the underrepresentation of low-resource contexts and underserved disability populations. In conclusion, advancing special education requires moving beyond isolated evaluations of intervention effectiveness toward integrated and complexity-

informed approaches. Future efforts should prioritize interventions that are sustainable, contextually adaptable, and capable of producing meaningful long-term outcomes for individuals with special educational needs.

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