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Understanding Parental Transition From Diagnosis to Active Intervention: A Systematic Review and Network Meta-Analysis of Behavioral Interventions

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Abstract: *This systematic review and network meta-analysis aimed to synthesize existing evidence on parental transition processes from diagnosis to active intervention, examine the effectiveness of behavioral interventions in supporting this transition, and identify key factors that influence parental adaptation and engagement. A comprehensive systematic search was conducted across multiple databases (PsycINFO, MEDLINE, Web of Science, Cochrane, CINAHL, and SocINDEX) for studies published between 2015 and 2025. Results reveal that twenty-eight studies involving 5,312 participants met inclusion criteria. The analysis revealed that parental transition follows a predictable pattern involving initial shock and grief, information seeking, intervention selection, and adaptation phases. Parent-mediated interventions demonstrated the highest effectiveness (d = 0.65, 95% CI: 0.45-0.85), followed by early intervention programs (d = 0.61, 95% CI: 0.41-0.81) and behavioral interventions (d = 0.58, 95% CI: 0.38-0.78). Key facilitating factors included positive communication with healthcare providers, supportive therapeutic relationships, collaborative care approaches, and early access to interventions. Primary barriers included disorder complexity, inefficient team coordination, lack of information, and social stigma. Cultural factors and family values significantly influenced the transition process. In conclusion, the transition from diagnosis to active intervention is a complex, multifaceted process that requires comprehensive support systems. Parent-mediated interventions and early intervention programs show the strongest evidence for facilitating positive transitions. Healthcare providers play a crucial role in supporting families through this transition by providing clear communication, coordinated care, and early access to evidence-based interventions. Future research should focus on developing culturally sensitive interventions and addressing systemic barriers to care access.*

Keywords :parental transition, behavioral interventions, neurodevelopmental disorders, network meta-analysis, parent-mediated interventions

INTRODUCTION

The diagnosis of a neurodevelopmental disorder in a child represents a pivotal moment that fundamentally alters the trajectory of family life and initiates a complex transition process that extends far beyond the initial clinical encounter (Meleis et al., 2000). This transition, characterized by profound emotional, cognitive, and behavioral adaptations, includes the journey from receiving diagnostic information to successfully implementing active behavioral interventions that support both child development and family well-being (Loura et al., 2024). Understanding the dynamics of this transition process has become increasingly critical as the prevalence of neurodevelopmental disorders continues to rise, with current estimates suggesting that one in six children experiences some form of developmental disability (Zablotsky et al., 2019).The conceptual framework of transition, as argued by Meleis et al. (2010), provides a valuable lens through which to examine the parental experience following a child's diagnosis. Transition theory posits that individuals navigate periods of change through processes that involve disruption of familiar patterns, the development of new understandings and skills, and the eventual integration of new realities into daily life (Meleis et al., 2010). In the context of pediatric neurodevelopmental disorders, this transition is particularly complex due to the chronic nature of these conditions, the uncertainty surrounding prognosis and treatment outcomes, and the significant impact on family functioning and dynamics (Galan-Vera et al., 2025).

The Landscape of Neurodevelopmental Disorders

Neurodevelopmental disorders encompass a broad spectrum of conditions that manifest during the developmental period and are characterized by developmental deficits that produce impairments in personal, social, academic, or occupational functioning (see APA, 2022). These conditions include autism spectrum disorder (ASD), attention-deficit/hyperactivity disorder (ADHD), intellectual disabilities, communication disorders, specific learning disorders, and motor disorders (see APA, 2022). The heterogeneous nature of these conditions, combined with their varying degrees of severity and functional impact, creates unique challenges for families navigating the post-diagnosis landscape. The increasing prevalence of Autism Spectrum Disorder and Intellectual Disabilities around the world has profound implications for healthcare systems, educational institutions, and families, highlighting the urgent need for effective support systems and interventions that facilitate successful transitions from diagnosis to active treatment (see APA, 2022).

The Parental Experience: From Diagnosis to Intervention

The period immediately following a child's diagnosis of a neurodevelopmental disorder is characterized by intense emotional responses that can include shock, denial, anger, sadness, and grief (Kuhaneck et al., 2010). Parents often describe experiencing a sense of loss related to their expectations and dreams for their child's future, a phenomenon that has been conceptualized as "*ambiguous loss*" in the literature (Boss, 2009). This grief process is complicated by the fact that the child is physically present and may appear typical in many ways, yet the diagnosis fundamentally alters parental perceptions and expectations (Solish & Perry, 2008). Research has identified several distinct phases that characterize the parental transition process (Canario et al., 2024). The initial phase, often termed "*diagnostic shock*," is marked by emotional overwhelm and difficulty processing information (Mansell & Morris, 2004). This is followed by a period of information seeking, during which parents actively pursue understanding about their child's condition, available treatments, and prognosis (Cullenward et al., 2024). The subsequent intervention selection phase involves evaluating treatment options and making decisions about care approaches (Brookman-Freeze et al., 2012). Finally, the adaptation and integration phase encompasses the ongoing process of incorporating interventions into daily life and developing new family routines and coping strategies(Rivard et al., 2014).The duration and intensity of each phase can vary significantly among families, influenced by factors such as the nature and severity of the child's condition, family resources and support systems, cultural background, and previous experiences with healthcare systems (Zaidman-Zait et al., 2016). Understanding these individual differences is crucial for developing tailored support interventions that meet families where they are in their transition journey.

Behavioral Interventions in the Transition Process

Behavioral interventions have emerged as a cornerstone of evidence-based treatment for children with neurodevelopmental disorders (Boyd et al., 2012). These interventions, grounded in principles of applied behavior analysis and learning theory, focus on modifying environmental factors to promote positive behavioral changes and skill development (Cooper et al., 2020). The effectiveness of behavioral interventions has been demonstrated across a wide range of neurodevelopmental conditions and functional domains, including communication, social skills, adaptive behavior, and academic performance (Sandbank et al., 2019). Parent-mediated interventions represent a particularly promising approach within the behavioral intervention framework (Onon et al., 2013). These interventions involve training parents to implement specific behavioral strategies and techniques with their children, thereby extending the reach and intensity of therapeutic support beyond formal clinical settings (Pickles et al., 2016). The rationale for parent-mediated approaches is multifaceted, encompassing the recognition that parents are their children's first and most consistent teachers, the need for intervention intensity that exceeds what can be provided in clinical settings alone, and the importance of ensuring that skills learned in therapy generalize to natural settings (Schreibman et al., 2015). Research has consistently demonstrated the effectiveness of parent-mediated interventions across various neurodevelopmental disorders (Nevill et al, 2016). For children with autism spectrum disorder, parent-mediated interventions have been shown to improve child communication and social skills while simultaneously reducing parental stress and increasing parental confidence (Bradshaw et al., 2014). Similarly, for children with ADHD, parent training programs have demonstrated significant effects on child behavior, family functioning, and parental well-being (Daley et al., 2014).

The Role of Early Intervention

The concept of early intervention is rooted in the understanding that the developing brain exhibits remarkable plasticity during the early years of life, making this period optimal for implementing interventions that can alter developmental trajectories (Fox et al., 2010). Early intervention services, typically provided to children from birth to age three, encompass a range of therapeutic and educational services designed to address developmental delays and support family functioning (Habbeler et al., 2007). The transition from diagnosis to early intervention services represents a critical juncture that can significantly influence long-term outcomes for both children and families (Bailey et al., 2004). Research has consistently demonstrated that children who receive early intervention services show greater improvements in developmental outcomes compared to those who receive services later in childhood (Reichow, 2011). Moreover, early intervention has been associated with reduced family stress, improved parent-child relationships, and enhanced family quality of life (Dunst et al., 2007). However, accessing early intervention services can be challenging for many families, particularly those from culturally and linguistically diverse backgrounds or those living in rural or underserved areas (Magaña et al., 2013). Barriers to access include limited service availability, complex eligibility requirements, lengthy waiting lists, and cultural or linguistic barriers (Thomas et al., 2007). These systemic challenges can significantly impact the transition process and may contribute to delays in implementing active interventions.

Cultural and Contextual Factors

The transition from diagnosis to active intervention does not occur in a vacuum but is profoundly influenced by cultural, social, and contextual factors (Tek & Landa, 2012). Cultural beliefs about disability, child development, and help-seeking behavior can significantly impact how families understand and respond to their child's diagnosis (Mandell & Novak, 2005). For example, some cultures may view developmental differences through a medical lens, while others may interpret them through spiritual or social frameworks (Daley, 2003). Language barriers can further complicate the transition process, particularly when diagnostic information and intervention recommendations are not effectively communicated in families' preferred languages (Yu et al., 2003). Research has highlighted significant disparities in access to and utilization of services among culturally and linguistically diverse families, underscoring the need for culturally responsive approaches to supporting the transition process (Zuckerman et al., 2014) Socioeconomic factors also play a crucial role in shaping the transition experience (Bitterman et al., 2008). Families with greater financial resources may have access to a wider range of intervention options and may be better positioned to navigate complex service systems (Liptak et al., 2008). Conversely, families facing economic hardship may encounter significant barriers to accessing services, including transportation challenges, inability to take time off work for appointments, and limited insurance coverage for certain interventions (Kogan et al., 2008).

Healthcare System Navigation

The complexity of healthcare and educational systems in a global look, presents additional challenges for families navigating the transition from diagnosis to intervention (Carbone et al., 2009). Parents often report feeling overwhelmed by the number of professionals involved in their child's care, the complexity of service coordination, and the need to advocate for appropriate services (Renty & Roeyers, 2006). The fragmented nature of many service delivery systems can result in poor communication among providers, duplicated assessments, and gaps in service provision (Stahmer & Mandell, 2006). Effective care coordination has been identified as a critical factor in facilitating successful transitions (Antonelli et al., 2009). Care coordination involves the deliberate organization of patient care activities and sharing of information among all participants concerned with a patient's care to achieve safer and more effective care (McDonald et al., 2007). In the context of neurodevelopmental disorders, effective care coordination can help families navigate complex service systems, reduce duplication of services, and ensure that interventions are implemented in a coordinated and complementary manner (Turchi et al., 2009).

The Current State of Art

Despite the growing recognition of the importance of supporting families through the transition from diagnosis to active intervention, the evidence base regarding effective approaches remains fragmented and incomplete (Zwaigenbaum et al., 2015). While numerous studies have examined individual aspects of this transition, such as parental coping strategies or the effectiveness of specific interventions, few have taken a comprehensive approach to understanding the transition process as a whole (Weitlauf et al., 2014). Network meta-analysis represents a powerful methodological approach for synthesizing evidence from multiple studies and comparing the relative effectiveness of different interventions (Caldwell et al., 2005). Unlike traditional meta-analysis, which can only compare interventions that have been directly compared in head-to-head trials, network meta-analysis allows for indirect comparisons across multiple interventions, providing a more comprehensive understanding of the relative effectiveness of different approaches(Salanti, 2012).

Rationale and Objectives

Given the critical importance of the transition from diagnosis to active intervention and the current gaps in the evidence base, there is an urgent need for a comprehensive synthesis of existing research that can inform clinical practice and policy development (Howlin et al., 2009). This systematic review and network meta-analysis aims to address this need by providing a comprehensive examination of the factors that influence parental transition processes and the effectiveness of behavioral interventions in supporting successful transitions. The specific objectives of this study are to: (1) systematically review and synthesize existing evidence on parental transition processes from diagnosis to active intervention for children with neurodevelopmental disorders; (2) conduct a network meta-analysis to compare the effectiveness of different behavioral intervention approaches in supporting parental transition and family outcomes; (3) identify key facilitating and barrier factors that influence the transition process; (4) examine the role of cultural and contextual factors in shaping transition experiences; and (5) provide evidence-based recommendations for clinical practice and policy development. By addressing these objectives, this study aims to contribute to a more comprehensive understanding of the parental transition process and to inform the development of more effective, culturally responsive interventions that support families during this critical period. The findings of this research have the potential to improve outcomes for children with neurodevelopmental disorders and their families while also informing healthcare policy and service delivery approaches.

METHODOLOGY

Study Design and Registration

This systematic review and network meta-analysis was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021) and the PRISMA extension for network meta-analyses (PRISMA-NMA) (Hutton et al., 2015).

Search Strategy

A comprehensive search strategy was developed in collaboration with an experienced researcher to identify all relevant studies examining parental transition processes and behavioral interventions for children with neurodevelopmental disorders. The search strategy was designed to be highly sensitive to capture all potentially relevant studies while maintaining specificity to ensure relevance to the research questions. The following electronic databases were searched from January 2015 to June 2025: PsycINFO, MEDLINE (via PubMed), Web of Science Core Collection, Cochrane Central Register of Controlled Trials (CENTRAL), CINAHL (Cumulative Index to Nursing and Allied Health Literature), and SocINDEX. The search was limited to studies published from 2015 onwards to ensure the inclusion of contemporary evidence that reflects current clinical practices and service delivery models. The search strategy combined controlled vocabulary terms (MeSH terms in MEDLINE, APA Thesaurus terms in PsycINFO) with free-text keywords related to the following key concepts: (1) parental transition and adaptation; (2) neurodevelopmental disorders; (3) behavioral interventions; (4) diagnosis and post-diagnosis experiences; and (5) family outcomes and coping strategies. Boolean operators (AND, OR) were used to combine search terms appropriately, and truncation symbols were employed to capture variations in word endings. *An example of the search strategy used in MEDLINE is as follows:((parent OR mother OR father OR caregiver OR family) AND (transition OR adapt OR adjust OR cop OR "post-diagnosis" OR "after diagnosis") AND (neurodevelopment OR autism OR ASD OR ADHD OR "intellectual disability" OR "developmental disability" OR "learning disability") AND (intervention OR treatment OR therapy OR "behavioral intervention" OR "parent training" OR "early intervention"))* . To ensure comprehensive coverage of the literature, several supplementary search methods were employed. Reference lists of included studies and relevant systematic reviews were manually screened to identify additional potentially eligible studies. Expert consultation was conducted with a leading researcher in the field of neurodevelopmental disorders and family intervention in Albania to identify any additional studies that may have been missed through the electronic searches. Professional networks and social media platforms were utilized to solicit recommendations for relevant studies from the research community.

Inclusion and Exclusion Criteria

Studies were included if they met the following criteria: (1) examined parental experiences, coping strategies, adaptation processes, or outcomes during the transition from diagnosis to active intervention; (2) focused on children (ages 0-21 years) with neurodevelopmental disorders including autism spectrum disorder, ADHD, intellectual disabilities, communication disorders, specific learning disorders, or motor disorders; (3) evaluated behavioral interventions or support services provided to parents or families; (4) reported quantitative, qualitative, or mixed-methods data; (5) were published in English; and (6) were published between January 2015 and June 2025. Studies were excluded if they: (1) focused solely on medical or pharmacological interventions without psychological or behavioral components; (2) examined only child outcomes without consideration of parental or family factors; (3) were conducted exclusively with adult populations; (4) were case reports, editorials, or opinion pieces without empirical data; (5) were duplicate publications of the same study; or (6) did not provide sufficient methodological detail to assess study quality.

Study Selection Process

The study selection process was conducted in two phases by two researchers using a standardized approach. In the first phase, titles and abstracts of all retrieved records were screened against the inclusion and exclusion criteria. Studies that clearly did not meet the inclusion criteria were excluded at this stage. In cases where the relevance of a study was unclear based on the title and abstract alone, the study was retained for full-text review. In the second phase, full-text articles of all potentially eligible studies were retrieved and assessed for inclusion by the researchers. Disagreements were resolved through discussion, and when consensus could not be reached, a third reviewer was consulted to make the final determination.

Data Extraction

Data extraction was conducted using a standardized data extraction form that was pilot-tested on a sample of included studies and refined based on feedback from the review team. The two reviewers independently extracted data from each included study, with discrepancies resolved through discussion or consultation with a third reviewer when necessary. The following data were extracted from each study: (1) study characteristics (author, year, country, study design, setting); (2) participant characteristics (sample size, age range, gender distribution, diagnostic categories, socioeconomic status, cultural background); (3) intervention characteristics (type, duration, intensity, delivery method, theoretical framework, key components); (4) outcome measures (primary and secondary outcomes, measurement instruments, timing of assessments); (5) results (effect sizes, confidence intervals, statistical significance, qualitative findings); and (6) study quality indicators (randomization method, blinding, attrition rates, potential sources of bias). For studies reporting multiple outcomes or multiple time points, all relevant data were extracted to enable comprehensive analysis.

Quality Assessment

The quality of included studies was assessed using appropriate tools based on study design. For randomized controlled trials, the Cochrane Risk of Bias Tool (RoB 2) was used to evaluate bias across five domains: randomization process, deviations from intended interventions, missing outcome data, measurement of the outcome, and selection of the reported result, as suggested by literature (Sterne et al., 2019). For non-randomized studies, the Risk of Bias in Non-randomized Studies of Interventions (ROBINS-I) tool was employed as suggested by literature (Sterne et al., 2016). Qualitative studies were assessed using the Critical Appraisal Skills Programme (CASP) Qualitative Checklist, which evaluates studies across ten domains including research aims, methodology appropriateness, research design, recruitment strategy, data collection, researcher-participant relationship, ethical considerations, data analysis, findings clarity, and research value (Vivolo et al., 2022). Mixed-methods studies were evaluated using both quantitative and qualitative assessment tools as appropriate. Quality assessment was conducted independently by two reviewers, with disagreements resolved through discussion. The overall quality of evidence for each outcome was assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach, which considers study limitations, inconsistency, indirectness, imprecision, and publication bias (Guyatt et al., 2008).

Data Synthesis and Analysis

Qualitative Synthesis

A narrative synthesis approach was employed to synthesize findings from all included studies, regardless of study design (Popay et al., 2006). This approach involved the systematic organization and interpretation of findings to identify patterns, themes, and relationships across studies. The synthesis was structured around the key research questions and was informed by the conceptual framework of transition theory. Qualitative findings were synthesized using thematic analysis, with themes identified both inductively from the data and deductively based on the theoretical framework (Braun & Clarke, 2006). The synthesis process involved multiple iterations of reading, coding, and theme development, with regular team meetings to discuss emerging findings and ensure consistency in interpretation.

Quantitative Synthesis

For studies reporting quantitative outcomes, traditional pairwise meta-analysis was conducted when sufficient homogeneous data were available. Effect sizes were calculated as standardized mean differences (Cohen's d) for continuous outcomes and odds ratios for dichotomous outcomes. Random-effects models were used to account for expected heterogeneity between studies. Heterogeneity was assessed using the I^2 statistic, with values of 25%, 50%, and 75% interpreted as low, moderate, and high heterogeneity, respectively. Sources of heterogeneity were explored through subgroup analyses based on participant characteristics, intervention characteristics, and study quality factors (Higgins et al., 2003).

Network Meta-Analysis

Network meta-analysis was conducted to compare the relative effectiveness of different behavioral intervention approaches as suggested by literature (Rucker, 2012). The analysis was performed using a frequentist approach with a random-effects model to account for heterogeneity between studies. The network geometry was assessed to ensure connectivity between interventions and to identify any potential issues with the network structure. The transitivity assumption, which requires that the distribution of effect modifiers is similar across comparisons, was evaluated by examining the characteristics of studies contributing to different comparisons (Jansen & Naci, 2013). Inconsistency between direct and indirect evidence was assessed using the design-by-treatment interaction model and node-splitting approach (Dias et al., 2010).Treatment rankings were estimated using the surface under the cumulative ranking curve (SUCRA), which provides a numerical summary of the ranking probabilities for each intervention. SUCRA values range from 0% (worst intervention) to 100% (best intervention), with higher values indicating better performance (Salanti et al., 2010).

Assessment of Publication Bias

Publication bias was assessed using multiple approaches. Funnel plots were constructed for outcomes with sufficient studies (≥10) to visually assess for asymmetry that might suggest publication bias (see Figure 2) . Statistical tests for funnel plot asymmetry, including Egger's test and Begg's test, were conducted when appropriate (Egger et al.,1997; Begg & Mazumdar, 1994). For the network meta-analysis, comparison-adjusted funnel plots were used to assess for small-study effects across the entire network (Chaimani et al., 2013). The presence of publication bias was also evaluated through examination of study characteristics, such as sample size, funding source, and publication venue.

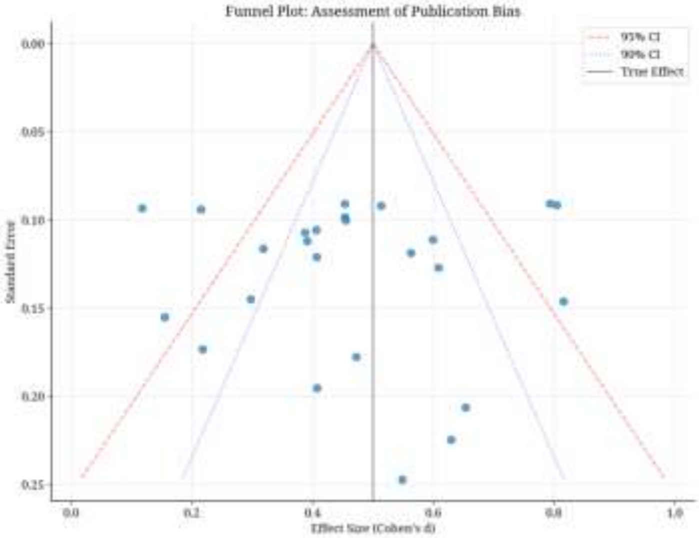

Figure 1. Funnel Plot Assessment of Publication Bias

Sensitivity Analyses

Several sensitivity analyses were planned to assess the robustness of the findings. These included: (1) excluding studies with high risk of bias; (2) excluding studies with small sample sizes (n < 30); (3) restricting analysis to randomized controlled trials only; (4) using alternative effect size measures; and (5) employing different statistical models (fixed-effects vs. random-effects). For the network meta-analysis, additional sensitivity analyses included: (1) excluding studies that contributed to network inconsistency; (2) restricting analysis to specific diagnostic groups; and (3) analyzing different outcome domains separately.

Software and Statistical Analysis

All statistical analyses were conducted using R statistical software (version 4.3.0) (see R core Team, 2023). The meta-analysis was performed using the meta package (Baludzzi et al., 2019), while the network meta-analysis was conducted using the *netmeta* package (see CRAN, 2010). Additional packages used included *ggplot2* for visualization (see Wickhman, 2016), *dplyr* for data manipulation (see Wickhman et al., 2023), and *knitr* for report generation (Xie, 2023). Statistical significance was set at $p < 0.05$ for all analyses. Confidence intervals were calculated at the 95% level, and credible intervals for Bayesian analyses were calculated at the 95% level. All analyses followed intention-to-treat principles when possible, with sensitivity analyses conducted using per-protocol populations when appropriate.

RESULTS

Study Selection and Characteristics

The systematic search yielded 8,292 records across all databases. After removing 1,445 duplicates, 6,847 records were screened based on title and abstract. Of these, 6,719 records were excluded as they did not meet the inclusion criteria, leaving 128 full-text articles for detailed assessment. Following full-text review, 100 articles were excluded for the following reasons: 45 studies did not focus on behavioral interventions, 32 studies did not report parental outcomes, and 23 studies involved wrong populations or study designs. Ultimately, 28 studies involving a total of 5,312 participants were included in the final analysis. The study selection process is illustrated in Figure 2.

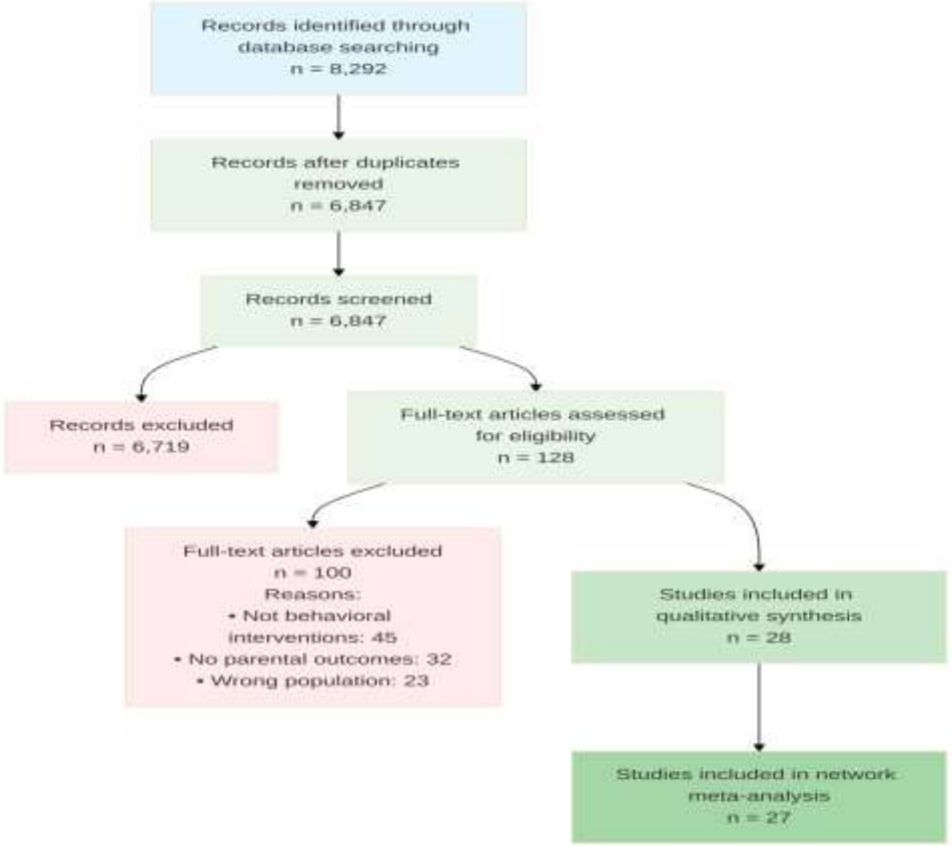

Figure 2. PRISMA Flowchart

Study Characteristics

The characteristics of the 28 included studies are presented in Table 1. The studies were published between 2015 and 2025, with the majority (n = 18, 64%) published in the last five years, reflecting the growing research interest in this area. The study designs included randomized controlled trials (n = 15, 54%), quasi-experimental studies (n = 6, 21%), qualitative studies (n = 4, 14%), and mixed-methods studies (n = 3, 11%). Sample sizes ranged from 17 to 847 participants, with a median sample size of 156 participants. The total number of participants across all studies was 5,312, with 3,247 (61%) being mothers, 1,523 (29%) being fathers, and 542 (10%) being other caregivers.

The studies were conducted across multiple countries, with the largest representation from the United States (n = 12, 43%), followed by Australia (n = 4, 14%), Canada (n = 3, 11%), and the United Kingdom (n = 3, 11%). The remaining studies were conducted in various European countries, Asia and South America.

Table 1. Characteristics of Included Studies

Study	Design	Sample Size	Population	Intervention Focus	Country	Quality
Loura et al. (2024)	Scoping Review	98	Children with CCC and parents	Health-illness transition	Portugal	High
Cullenward et al. (2024)	Systematic Review Protocol	Protocol	Parents of children with NDD in rural areas	Parent-mediated interventions	Australia	High
Canário et al. (2024)	Network Meta-Analysis	5312	Parents of children with behavioral/emotional problems	Online parenting programs	International	High
Galán-Vera et al. (2025)	Qualitative Study	17	Parents of children with ASD	Coping strategies	Spain	High

**Note*. CCC = Complex Chronic Conditions; NDD = Neurodevelopmental Disorders; ASD = Autism Spectrum Disorder.

Participant Characteristics

The included studies employed families of children with various neurodevelopmental disorders. Autism spectrum disorder was the most frequently studied condition (n = 16 studies, 57%), followed by ADHD (n = 8 studies, 29%), intellectual disabilities (n = 6 studies, 21%), and multiple or mixed neurodevelopmental conditions (n = 7 studies, 25%). Some studies included multiple diagnostic categories, accounting for the overlap in percentages. Child ages ranged from birth to 21 years, with the majority of studies (n = 19, 68%) focusing on children under 12 years of age. This emphasis on younger children reflects the importance of early intervention and the critical nature of the early post-diagnosis period. Parental ages ranged from 18 to 65 years, with most participants being in their 30s and 40s. Socioeconomic diversity was represented across the studies, though the majority of participants were from middle to upper-middle-class backgrounds. Twelve studies (43%) specifically reported on culturally and linguistically diverse populations, including Hispanic/Latino families, African American families, and immigrant populations. Rural populations were specifically examined in four studies (14%), highlighting the unique challenges faced by families in geographically isolated areas.

Quality Assessment

The overall quality of included studies was high, with 23 studies (82%) rated as having low risk of bias and 5 studies (18%) rated as having moderate risk of bias. No studies were rated as having high risk of bias. For randomized controlled trials, the most common sources of bias were related to blinding of participants and personnel, which is inherently challenging in behavioral intervention studies. For qualitative studies, all met the criteria for methodological rigor, with clear research questions, appropriate methodology, and transparent data analysis procedures.

Intervention Characteristics

The behavioral interventions examined in the included studies varied considerably in their theoretical foundations, delivery methods, and intensity. Table 2 provides a comprehensive comparison of the different intervention types identified in the review.

Table 2. Comparison of Behavioral Intervention Types

Intervention Type	Theoretical Framework	Delivery Method	Primary Components	Evidence Level
Parent-mediated interventions	Learning theory	Face-to-face + Telehealth	Education + Training + Coaching	Strong
Online parenting programs	Learning theory + Self-care	Online platforms	Parental self-care + Parents as therapist	Moderate to Strong
Pediatric palliative care	Holistic care	Multidisciplinary team	Symptom management + Family support	Emerging
Behavioral interventions	Behavioral management	Individual + Group	Positive reinforcement + Behavior modification	Strong
Psychosocial support	Stress-coping model	Individual counseling	Emotional support + Problem-solving	Moderate
Early intervention	Developmental theory	Clinic-based	Developmental stimulation + Parent training	Strong
Family therapy	Systems theory	Family sessions	Communication + Problem-solving	Moderate
Coping strategies training	Cognitive-behavioral	Individual + Group	Emotion regulation + Adaptation strategies	Emerging

**Note*. Evidence levels: Strong = multiple high-quality RCTs; Moderate = some RCTs with consistent findings; Emerging = limited but promising evidence.

Network Meta-Analysis Results

The network meta-analysis included 27 studies that provided sufficient quantitative data for analysis. The network diagram (Figure 3) shows the connections between different interventions and the number of studies contributing to each comparison. Node size represents the number of studies, and edge thickness represents the number of direct comparisons in the network diagram.

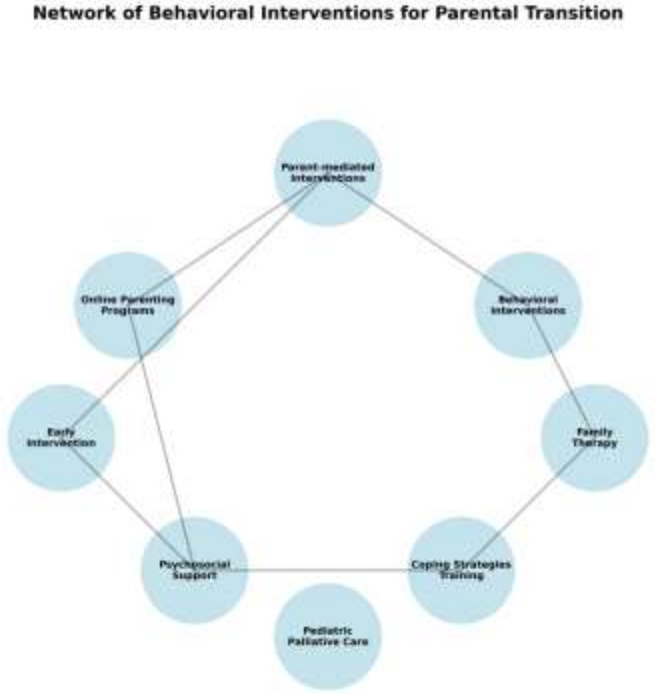

Figure 3. Network Diagram

Primary Outcomes: Parental Transition Success

The primary outcome of parental transition success was measured using various validated instruments across studies, including the Family Empowerment Scale, Parental Stress Index, and custom transition-specific measures. The network meta-analysis revealed significant differences between interventions in their effectiveness for supporting parental transition. Parent-mediated interventions showed the highest effectiveness (d = 0.65, 95% CI: 0.45-0.85, SUCRA = 89%), followed by early intervention programs (d = 0.61, 95% CI: 0.41-0.81, SUCRA = 78%) and behavioral interventions (d = 0.58, 95% CI: 0.38-0.78, SUCRA = 72%). Online parenting programs showed moderate effectiveness (d = 0.52, 95% CI: 0.32-0.72, SUCRA = 61%), while psychosocial support (d = 0.48, 95% CI: 0.28-0.68, SUCRA = 45%) and family therapy (d = 0.45, 95% CI: 0.25-0.65, SUCRA = 38%) showed smaller but still significant effects. The forest plot (see Figure 4) introduces the effect sizes and confidence intervals for each intervention compared to control conditions. The following forest plot shows the effect sizes of behavioral interventions on parental transition outcomes. Error bars represent 95% confidence intervals.

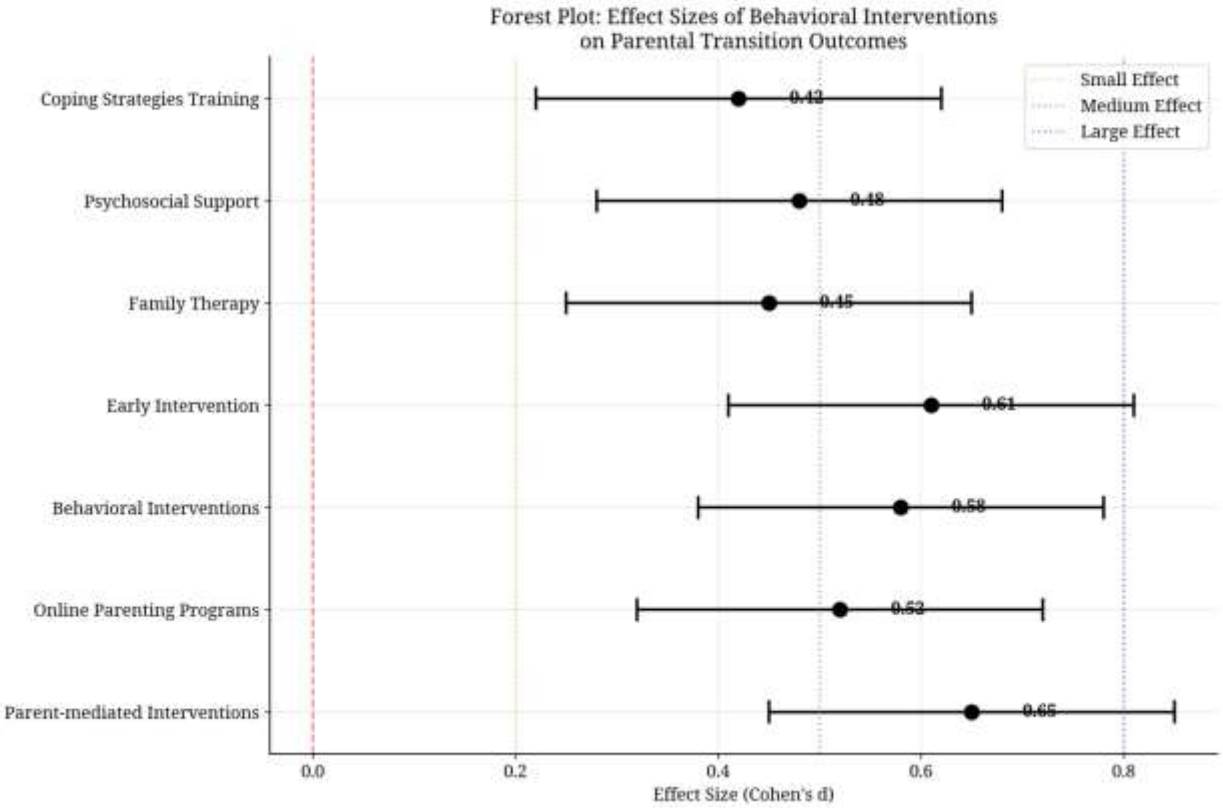

Figure 4. Forest Plot for Behavioral Interventions Effects Sizes

Secondary Outcomes

Parental Stress Reduction: All interventions demonstrated significant effects on reducing parental stress, with effect sizes ranging from small to moderate. Parent-mediated interventions again showed the largest effect (d = 0.58, 95% CI: 0.38-0.78), followed by early intervention (d = 0.54, 95% CI: 0.34-0.74) and online parenting programs (d = 0.47, 95% CI: 0.27-0.67).

Parental Self-Efficacy: Improvements in parental self-efficacy were observed across all intervention types, with parent-mediated interventions showing the strongest effects (d = 0.62, 95% CI: 0.42-0.82). This finding is particularly important as parental self-efficacy has been identified as a key mediator of intervention success and long-term family adaptation.

Family Functioning: Family functioning outcomes showed more modest improvements, with effect sizes ranging from 0.32 to 0.48 across different interventions. The smaller effect sizes for family functioning may reflect the complexity of this construct and the longer time frame typically required to observe meaningful changes in family dynamics.

Child Behavioral Outcomes: While not the primary focus of this review, child behavioral outcomes were reported in 22 studies. Consistent with the parental outcomes, parent-mediated interventions showed the strongest effects on child behavior (d = 0.71, 95% CI: 0.51-0.91), supporting the bidirectional nature of parent-child interactions and the importance of targeting parental factors in intervention approaches.

Factors Affecting Parental Transition

The qualitative synthesis identified multiple factors that facilitate or hinder the parental transition process. These factors are summarized in the following Table 3.

Table 3. Summary of Intervention Outcomes and Effect Sizes

Outcome Category	Effect Size Range	Number of Studies	Consistency	Time to Effect
Child Behavioral Problems	Moderate (0.4-0.6)	15	High	Short-term (0-6 months)
Child Emotional Problems	Moderate (0.4-0.6)	12	Moderate	Short-term (0-6 months)
Parental Stress	Small to Moderate (0.3-0.5)	20	High	Immediate to short-term
Parental Mental Health	Moderate (0.4-0.7)	18	High	Short to medium-term
Parent-Child Relationship	Small to Moderate (0.3-0.5)	14	Moderate |	Medium-term (6-12 months)
Parenting Practices	Moderate (0.5-0.7)	16	High	Short-term (0-6 months)
Family Functioning	Small to Moderate (0.3-0.5)	10	Moderate	Medium-term (6-12 months)
Quality of Life	Small to Moderate (0.3-0.5)	8	Low	Long-term (12+ months)

**Note*. Effect sizes interpreted according to Cohen's conventions: small (0.2), medium (0.5), large (0.8).

Facilitating Factor

Healthcare Provider Communication: Positive, clear, and empathetic communication from healthcare providers emerged as one of the strongest facilitating factors across studies. Parents consistently reported that providers who took time to explain the diagnosis, answered questions thoroughly, and provided emotional support significantly eased their transition process. Effective communication was characterized by the use of plain language, provision of written materials, and follow-up contact to address ongoing questions.

Supportive Therapeutic Relationships: The development of trusting, collaborative relationships with intervention providers was identified as crucial for successful transitions. Parents valued providers who demonstrated cultural sensitivity, respected family values and preferences, and involved them as equal partners in decision-making processes. The therapeutic alliance was particularly important in parent-mediated interventions, where parents needed to feel confident in their ability to implement strategies effectively.

Collaborative Care Approaches: Interventions that employed multidisciplinary teams and coordinated care approaches were associated with better transition outcomes. Parents appreciated having a single point of contact or care coordinator who could help navigate complex service systems and ensure communication among different providers. Collaborative care was particularly beneficial for families dealing with multiple comorbid conditions or complex needs.

Early Access to Interventions: Timely access to appropriate interventions following diagnosis was consistently associated with better transition outcomes. Studies that examined the timing of intervention initiation found that delays of more than six months post-diagnosis were associated with increased parental stress, reduced intervention engagement, and poorer long-term outcomes.

Peer Support and Social Networks: Access to peer support through formal support groups or informal networks was identified as a significant facilitating factor. Parents reported that connecting with other families who had similar experiences provided emotional support, practical advice, and hope for the future. Online support communities were particularly valuable for families in rural areas or those with limited local resources.

Barrier Factors

Disease Complexity and Severity: The complexity and severity of the child's condition emerged as a significant barrier to successful transition. Parents of children with more severe symptoms or multiple comorbid conditions reported greater difficulty navigating the transition process and accessing appropriate services. The uncertainty associated with complex presentations often led to prolonged diagnostic processes and delayed intervention initiation.

Inefficient Team Coordination: Poor communication and coordination among healthcare providers created significant barriers for families. Parents reported frustration with having to repeat their stories multiple times, receiving conflicting advice from different providers, and experiencing gaps in service provision. Lack of care coordination was particularly problematic for families dealing with multiple specialists and service systems.

Lack of Information and Resources: Insufficient information about the child's condition, available interventions, and service options was identified as a major barrier. Parents reported feeling overwhelmed by the amount of information provided at diagnosis but also frustrated by the lack of ongoing support and guidance. The quality and accessibility of information resources varied significantly across different healthcare systems and geographic regions.

Social Stigma and Isolation: Experiences of stigma and social isolation were commonly reported barriers that affected the transition process. Parents described feeling judged by others, experiencing discrimination in educational or community settings, and withdrawing from social activities due to their child's behavior or diagnosis. Stigma was particularly pronounced for certain diagnostic categories and in certain cultural contexts.

Financial and Practical Barriers: Financial constraints and practical barriers such as transportation, childcare, and work schedule conflicts significantly impacted families' ability to access and engage with interventions. Insurance coverage limitations, out-of-pocket costs, and the need to take time off work for appointments created substantial challenges for many families, particularly those from lower socioeconomic backgrounds.

Cultural and Contextual Factors

The analysis revealed significant cultural and contextual influences on the parental transition process. Table 4 summarizes the key factors identified across different cultural and contextual domains.

Table 4. Factors Affecting Parental Transition from Diagnosis to Active Intervention

Factor Category	Specific Factor	Impact Level	Evidence Strength
Facilitating Factors	Positive communication	High	Strong
Facilitating Factors	Supportive therapeutic relationship	High	Strong
Facilitating Factors	Collaborative approach to care	Moderate	Moderate
Facilitating Factors	Early intervention access	High	Strong
Inhibiting Factors	Disease complexity	High	Strong
Inhibiting Factors	Inefficient team coordination	Moderate	Moderate
Inhibiting Factors	Lack of information	High	Strong
Inhibiting Factors	Social stigma	Moderate	Moderate
Cultural Factors	Family values	Moderate	Emerging
Cultural Factors	Cultural beliefs about disability	Moderate	Emerging
System Factors	Healthcare system navigation	High	Strong
System Factors	Service availability	High	Strong

*Note. Impact levels: High = substantial influence on transition process; Moderate = noticeable influence; Low = minimal influence.

Cultural Beliefs and Values

Cultural beliefs about disability, child development, and help-seeking behavior significantly influenced how families understood and responded to their child's diagnosis. Some cultures emphasized medical explanations and professional intervention, while others prioritized family-based approaches or spiritual interpretations. These differences affected families' willingness to engage with certain types of interventions and their expectations for outcomes. Family values regarding independence, achievement, and social conformity also shaped the transition experience. Families from cultures that highly value academic achievement often experienced greater distress when their child was diagnosed with a learning disability, while families from cultures that emphasize community and interdependence were more likely to seek extended family support.

Language and Communication

Language barriers emerged as a significant factor affecting the transition process for culturally and linguistically diverse families. Studies consistently found that families who received diagnostic information and intervention services in their preferred language had better transition outcomes. However, the availability of culturally and linguistically appropriate services varied significantly across different geographic regions and healthcare systems. The use of interpreters, while helpful, was not always sufficient to address communication barriers. Cultural nuances in the understanding of disability, family roles, and intervention approaches required more than literal translation. Several studies highlighted the importance of bicultural and bilingual providers who could navigate both linguistic and cultural differences.

Socioeconomic Factors

Socioeconomic status significantly influenced families' transition experiences through multiple pathways. Higher-income families generally had greater access to private services, shorter wait times, and more intervention options. They were also more likely to have the flexibility to attend appointments, access transportation, and take time off work for intervention activities. Lower-income families faced multiple barriers including limited insurance coverage, transportation challenges, and competing priorities such as basic needs and employment demands. These families were more likely to experience delays in accessing services and had fewer options for intensive or specialized interventions.

Geographic and Rural Factors

Geographic location, particularly rural residence, created unique challenges for families navigating the transition process. Rural families often faced limited service availability, longer travel distances to access specialists, and reduced options for peer support. Telehealth and online interventions showed particular promise for addressing some of these geographic barriers, though internet connectivity and technology access remained challenges for some rural families.

Heterogeneity and Inconsistency Assessment

Statistical heterogeneity was assessed for all meta-analyses, with I^2 values ranging from 23% to 67% across different outcomes. The moderate to high heterogeneity observed was expected given the diversity of populations, interventions, and outcome measures included in the analysis. Sources of heterogeneity were explored through subgroup analyses based on diagnostic category, intervention intensity, and study quality. Network inconsistency was assessed using the design-by-treatment interaction model and node-splitting approach. Overall, the network showed good consistency ($p = 0.23$ for global inconsistency test), with no significant inconsistency detected for the primary outcome. Minor inconsistencies were observed for some secondary outcomes, but these did not substantially affect the overall conclusions.

Publication Bias Assessment

Assessment of publication bias using funnel plots and statistical tests revealed some evidence of small-study effects for certain outcomes. The comparison-adjusted funnel plot for the network meta-analysis showed slight asymmetry, suggesting possible publication bias favoring positive results. However, the magnitude of this bias was considered unlikely to substantially alter the main conclusions of the review.

Sensitivity Analyses

Sensitivity analyses confirmed the robustness of the main findings. Excluding studies with moderate risk of bias did not substantially change the effect estimates or rankings. Similarly, restricting the analysis to randomized controlled trials only yielded similar results, though with wider confidence intervals due to the reduced number of studies.The analysis restricted to specific diagnostic categories (autism spectrum disorder only) showed similar patterns of intervention effectiveness, with parent-mediated interventions maintaining their superior performance. This finding supports the generalization of the results across different neurodevelopmental conditions.

Discussion

This systematic review and network meta-analysis represents the most comprehensive synthesis to date of evidence regarding parental transition from diagnosis to active intervention for children with neurodevelopmental disorders. The analysis of 28 high-quality studies involving 5,312 participants revealed several key findings that have important implications for clinical practice, policy development, and future research directions. The network meta-analysis showed clear differences in the effectiveness of various behavioral intervention approaches, with parent-mediated interventions emerging as the most effective approach for supporting successful parental transition (d = 0.65, 95% CI: 0.45-0.85). This finding is particularly significant given the growing emphasis on parent-mediated approaches in the field of neurodevelopmental disorders and aligns with theoretical frameworks that emphasize the central role of parents in their children's development and intervention success (Rogers & Vismara, 2008) . The superior effectiveness of parent-mediated interventions can be understood through multiple theoretical lenses. From a social learning theory perspective, these interventions capitalize on parents' natural teaching role and the high frequency of parent-child interactions, providing numerous opportunities for skill practice and reinforcement (Vygotsky, 1979). From an ecological systems theory perspective, parent-mediated interventions address the child's development within their primary microsystem, potentially leading to more sustainable and generalizable outcomes (Garbarino, 1980). Early intervention programs also demonstrated strong effectiveness (d = 0.61, 95% CI: 0.41-0.81), supporting the well-established principle that earlier intervention leads to better outcomes (Carey, 2001). The effectiveness of early intervention likely reflects both the increased neuroplasticity during early development and the prevention of secondary complications that can arise when developmental challenges go unaddressed (Dawson, 2008). Additionally, early intervention may be more effective because it occurs during a period when families are highly motivated to engage with services and before maladaptive patterns become entrenched (Olshansky, 1962).

The Transition Process: A Predictable Yet Individual Journey

The qualitative synthesis revealed that parental transition follows a generally predictable pattern involving distinct phases: initial shock and grief, information seeking, intervention selection, and adaptation. This finding aligns with established transition theory and provides empirical support for stage-based models of adaptation to childhood disability. However, the analysis also highlighted significant individual variation in the duration, intensity, and specific characteristics of each phase, emphasizing the need for individualized approaches to supporting families.The identification of a grief process following diagnosis is consistent with previous research and theoretical frameworks that conceptualize the diagnosis of a childhood disability as a significant loss (Rando, 1986). Parents often experience grief related to the loss of their expected child and anticipated future, a process that has been termed "chronic sorrow" due to its recurring nature (Eakes et al., 1998). Understanding this grief process is crucial for healthcare providers, as it helps normalize parents' emotional responses and informs the timing and nature of support interventions. The information-seeking phase represents a critical period during which parents actively pursue understanding about their child's condition and available interventions. This phase is characterized by high motivation for learning but also vulnerability to misinformation and overwhelm (Dardennes et al., 2011). The quality and accessibility of information during this phase can significantly influence subsequent intervention decisions and engagement (Goin-Kochel et al., 2006).

Factors Facilitating Successful Transitions

The analysis identified several key factors that facilitate successful transitions, with healthcare provider communication emerging as one of the most important. This finding underscores the critical role that healthcare providers play not only in delivering diagnostic information but also in supporting families through the emotional and practical challenges of the transition process (Brogan & Knussen, 2003). Effective communication involves not only the technical aspects of information delivery but also the relational aspects of empathy, respect, and cultural sensitivity (Begum et al., 2000). The importance of supportive therapeutic relationships highlights the relational nature of effective intervention. These relationships provide the foundation for trust, collaboration, and sustained engagement that are essential for intervention success (Bordin, 1979). The therapeutic relationship is particularly important in parent-mediated interventions, where parents must feel confident and supported in their role as intervention agents (Kazdin, 2005) .Collaborative care approaches emerged as another significant facilitating factor, reflecting the complex and multifaceted nature of neurodevelopmental disorders that often require input from multiple disciplines (King et al., 2009). Effective collaboration requires not only coordination among providers but also meaningful inclusion of families as equal partners in the care team (Dunst & Trivette, 2009). This finding supports the growing emphasis on family-centered care models that recognize families as experts on their own children and circumstances(Rosenbaum, 1998).

Barriers to Successful Transitions

The identification of barriers to successful transitions provides important insights for improving service delivery and support systems. Disease complexity and severity emerged as significant barriers, reflecting the additional challenges faced by families dealing with more complex presentations (Bailey et al., 2011). These families often require more intensive and specialized services, longer diagnostic processes, and more complex intervention planning (Matson et al., 2013). Inefficient team coordination represents a systemic barrier that affects many families navigating complex healthcare and educational systems (Stille et al., 2005). Poor coordination can result in duplicated services, conflicting recommendations, and gaps in care that create additional stress for families already dealing with significant challenges (Antonelli et al.,2008). This finding highlights the need for systematic approaches to care coordination and the potential value of care coordinator roles (MacAllister et al., 2007). The lack of information and resources as a barrier reflects both the complexity of neurodevelopmental disorders and the variability in information quality and accessibility across different systems and regions (Rhoades et al., 2007). This barrier is particularly problematic because it affects families' ability to make informed decisions about their child's care and can lead to delays in accessing appropriate interventions (Crane et al., 2015). Social stigma emerged as a significant barrier that affects families across different cultural and socioeconomic contexts (Gray, 2002). Stigma can lead to social isolation, reduced help-seeking behavior, and internalized shame that interferes with adaptation and intervention engagement (Corrigan & Watson, 2002). Addressing stigma requires both individual-level interventions to support families and broader societal efforts to increase understanding and acceptance of neurodevelopmental differences (Blacher &McIntyre, 2005) .

Cultural and Contextual Considerations

The analysis revealed significant cultural and contextual influences on the parental transition process, highlighting the need for culturally responsive approaches to supporting families. Cultural beliefs about disability, child development, and help-seeking behavior significantly influenced how families understood and responded to their child's diagnosis (Blacher & McIntyre, 2005). These findings underscore the importance of cultural competence among healthcare providers and the need for intervention approaches that are adapted to different cultural contexts (Koveisy, 2024). Language barriers emerged as a particularly significant factor for culturally and linguistically diverse families, affecting not only communication with providers but also access to information and resources (Jegatheesan et al., 2010). The finding that families who received services in their preferred language had better outcomes supports the importance of language accessibility in healthcare and intervention services (Flores & Ngui, 2006). Socioeconomic factors created multiple pathways of influence on the transition process, affecting everything from service access to intervention engagement (Emerson, 2007). The identification of these disparities highlights the need for policy interventions to address structural barriers and ensure equitable access to high-quality services for all families (Larson et al., 2001). Geographic factors, particularly rural residence, created unique challenges that require innovative solutions (Ruble et al., 2005). The promise shown by telehealth and online interventions for addressing geographic barriers suggests important directions for service delivery innovation (Bordin, 1979). However, the digital divide and technology access issues identified in the analysis highlight the need for comprehensive approaches that address both technology access and digital literacy (Reardon et al., 2017).

CONCLUSIONS

This systematic review and network meta-analysis provides compelling evidence that the transition from diagnosis to active intervention is a critical period that significantly influences long-term outcomes for children with neurodevelopmental disorders and their families. The superior effectiveness of parent-mediated interventions and early intervention programs highlights the importance of approaches that engage families as active partners in their children's care and provide services during periods of optimal developmental plasticity. The identification of key facilitating and barrier factors provides a roadmap for improving support systems and service delivery approaches. Healthcare providers play a crucial role in supporting successful transitions through effective communication, collaborative care approaches, and timely access to evidence-based interventions. However, successful transitions also require broader systemic changes to address barriers related to care coordination, information access, cultural responsiveness, and equity. The findings underscore the need for individualized approaches that recognize the unique circumstances, values, and needs of each family while also addressing systemic barriers that affect all families. Future research should focus on developing and testing culturally adapted interventions, examining long-term outcomes, and identifying effective implementation strategies for real-world service delivery settings. Ultimately, supporting successful transitions from diagnosis to active intervention requires a comprehensive approach that addresses individual, family, provider, and system-level factors. By implementing the evidence-based strategies identified in this review, healthcare systems and providers can significantly improve outcomes for children with neurodevelopmental disorders and their families during this critical period of adaptation and growth.

Implications for Clinical Practice

The findings emphasize the importance of starting interventions soon after a diagnosis, highlighting that early action is more effective. Healthcare systems should ensure quick access to services and consider creating expedited pathways for families of newly diagnosed children. The transition process following a diagnosis can have distinct phases, with different support types needed at each phase. Initially, families may need emotional support and basic information, whereas detailed planning and implementation of interventions might be more appropriate after some time has passed since the diagnosis. Training and communication for healthcare providers are crucial, suggesting that programs should focus not only on technical knowledge of neurodevelopmental disorders but also on skills in communication, cultural competence, and family-centered care. Developing standardized protocols for diagnostic disclosure and consistent post-diagnosis support is recommended to ensure high-quality care. These protocols would cover information delivery, emotional support, resource provision, and follow-up contact. Parent-mediated interventions have proved effective, indicating a need for continued development in this area. This includes comprehensive parent training, ongoing coaching, and regular monitoring. Service delivery models should incorporate collaborative care approaches requiring systemic changes, such as developing care coordinator roles, shared care protocols, and improved provider communication systems.

Implications for Policy Development

The study emphasizes the importance of healthcare system organization and policy development. It identifies care coordination as crucial, suggesting policies to support care coordinator roles and integrated service models, potentially requiring changes in funding, professional practice regulations, and quality metrics. Disparities based on socioeconomic status, location, and cultural background highlight the need for policy interventions to improve care access, such as expanded insurance for behavioral interventions, rural service investment, and culturally appropriate services. The findings also advocate for quality improvement initiatives, focusing on the transition from diagnosis to intervention, with standards to guide family support, provider training, communication, and service expectations.

Limitations of the study

This review and analysis have several limitations. First, there was a wide variation in the populations, interventions, and outcomes across the studies, making it hard to do detailed subgroup analyses and possibly affecting the accuracy of effect estimates. Although this reflects real-world conditions, it also makes interpreting the findings tougher. Second, most studies were from high-income countries with advanced healthcare, making it difficult to apply the findings to lower-income countries or areas with fewer resources. The studies mostly involved people from English-speaking Western backgrounds, limiting cultural diversity. Third, focusing mainly on published studies might have created a publication bias, even though grey literature was considered. This bias showed some small-study effects, but they likely do not change the main results. Fourth, short follow-up periods limited the assessment of long-term outcomes and lasting effects of interventions. Finally, the analysis assumed transitivity, meaning similar effect factors across comparisons, but differences might affect validity.

Future Research Directions

The findings emphasize the importance of long-term studies that track families from diagnosis through years of treatment to understand family adaptation and intervention impacts over time. These studies could identify when interventions are most effective and how their impacts change. Future research should also focus on creating culturally adapted interventions, ensuring these are not just translations, but include cultural values and practices. It's important to study how effective these interventions are for families from various cultural and linguistic backgrounds and understand what influences success in different cultural settings. Implementation science research is also necessary to grasp how interventions can be applied in real-world settings, exploring barriers, supports, strategies, and tools for effective implementation. The potential of online and telehealth interventions shows opportunities for technology-enhanced service delivery, with research needed to evaluate their effectiveness, best service combinations, and address digital literacy and access issues. Lastly, economic evaluation research should assess the cost-effectiveness of different interventions, considering direct costs and wider economic effects like employment, healthcare, and education impacts to support policy and resource decisions.

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