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MSc in Psychology, Neuroscience and Human Sciences

**LIGHTS, CAMERA, INTERACTION! A SYSTEMATIC REVIEW ON THE
EFFECTIVENESS OF VIDEO-FEEDBACK INTERVENTIONS IN SUPPORTING
PARENTS OF CHILDREN WITH DEVELOPMENTAL DISABILITIES**

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Academic year 2023-2024

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Abstract

Developmental disabilities include a wide range of clinical conditions with varying levels of impairment. Previous studies have shown that the most effective early rehabilitation interventions engage parents through a family-centred approach, supporting both parenting skills and the child's outcomes. Parent-child interaction is essential to promote adaptive emotional, cognitive, and social development. Video-feedback interventions (VFI) involve recording and reviewing parent-child interactions to improve parental competencies and support child development. VFI are valued for their utility, feasibility, and effectiveness in clinical settings for children with neurodevelopmental, behavioural, and socio-emotional issues. To accurately evaluate the effectiveness of VFIs, it is essential to gather scientific studies focusing on how these interventions engage parents and children. This study aims to systematically review research on VFI programs worldwide, specifically targeting young children with neurodevelopmental disorders or developmental risks and their interactions with healthy parents.

Keywords: developmental disabilities, video-feedback intervention, parent-child interaction

**Lights, Camera, Interaction! A Systematic Review on the Effectiveness of
Video-Feedback Interventions on Supporting Parents of Children with Developmental
Disabilities**

Parenting a child with developmental disabilities presents unique challenges that can affect the well-being of both the child and the family. These disabilities, which include conditions such as autism spectrum disorder (ASD), Down syndrome, and cerebral palsy, often require specialized support strategies to enhance the developmental outcomes of the child and to alleviate the stress experienced by the parents. Traditional interventions have focused on direct therapy for the child; however, recent advancements have highlighted the importance of involving parents more actively in the therapeutic process.

One promising approach is the video-feedback, which involves recording parent-child interactions and later reviewing these videos with a trained therapist. This technique allows parents to observe their behaviours and their children's responses, providing a powerful tool for enhancing parenting skills, improving parent-child interactions, and ultimately supporting the child's development.

Despite the growing interest in video-feedback interventions, there remains a lack of comprehensive synthesis of the evidence on their effectiveness, particularly in the context of supporting parents of children with developmental disabilities. Multiple studies have reported various outcomes, from improvements in parental sensitivity and responsiveness to enhancements in the child's social and emotional development. However, these findings are scattered across different populations, settings, and methodologies, making it difficult to draw general conclusions.

Given the critical role that parents play in children's development, even in the presence of disabilities, and the potential of video feedback interventions to support this role, a systematic review is necessary to consolidate the existing evidence. This review will provide a clearer understanding of the effectiveness of these interventions, identify gaps in the current literature, and offer recommendations for future research and practice. The thesis is divided into three parts. The first chapter reviews the existing literature on neurodevelopmental disorders, examining their effects on child development and their impact on parenting. The second chapter presents key findings on the use of video feedback interventions and explores how positive parenting can support child development. The final chapter provides a systematic review of existing studies that have investigated the impact of video-feedback interventions in supporting parents of children with neurodevelopmental disorders.

CHAPTER 1

1.1 Neurodevelopmental disabilities

1.1.1 Theoretical Background/Framework

Neurodevelopmental disabilities (NDDs) are complex conditions that are difficult to conceptualise straightforwardly. Recent advancements in technology such as high-density diffuse optical tomography (HD-DOT) and optically pumped magnetometry (OPM), have made measuring infant brain function more efficiently attainable, revolutionising research (Collins-Jones et al., 2024; Turk-Browne & Aslin, 2024). However, while these methodological innovations are exciting, it is important to consider the role of theoretical frameworks in shaping research. Theories not only influence what researchers investigate but also how they interpret their findings, which, in turn, directly informs the development of policies, educational practices, and interventions (Collins & Stockton, 2018). Therefore, the theoretical models adopted by scientists have tangible implications for the lives of children with NDDs, their families, and the broader community (Bradshaw et al., 2022; Williams, D., 2019).

Two major theoretical approaches exist in understanding NDDs: the neuropsychological account and neuroconstructivism. The former, based on adult models, is insufficient for explaining NDDs. In contrast, neuroconstructivism which emphasises the dynamic, evolving nature of the brain, is reshaping how NDDs are investigated. Unlike static neuropsychological models that posit the impairment of specific cognitive modules (e.g., visuospatial ability in Williams syndrome) while other systems remain intact, neuroconstructivism posits that basic-level deficits can have cascading effects across multiple domains throughout development.

The neuroconstructivist approach encourages researchers to embrace the complexity of NDDs by promoting the establishment of large research consortia that integrate findings across multiple levels of analysis (e.g., genetic, neural, cognitive, and environmental) throughout developmental time. This integrative approach deepens our understanding of NDDs and enhances the design of more effective developmental interventions (D'Souza & Karmiloff-Smith, 2017).

In their text “A Comprehensive Guide to Intellectual and Developmental Disabilities”, Wehmeyer, Brown, Percy, Fung, and Shogren (2017) have outlined three distinct models regarding developmental disabilities (DD): the legal model, the biomedical model, and the social model, each offering a unique perspective on understanding and addressing DD, thereby shaping policies, practices, and societal attitudes. The **legal model** emphasizes the rights and protections afforded to individuals with DD under various legal frameworks, such as the Americans with Disabilities Act (ADA) and the Individuals with Disabilities Education Act (IDEA). This model is grounded in civil rights legislation, which seeks to ensure that individuals with DD have equal access to services and opportunities under the law. Legal advocacy is central to this model, with organizations working to combat discrimination and promote inclusion in education, employment, and healthcare, while also addressing issues surrounding legal capacity and aligning with international human rights standards. The **biomedical model** focuses on the medical and biological aspects of DD, prioritizing accurate diagnosis, early intervention, and therapeutic strategies, including medication and behavioural therapies. This model supports ongoing research into the causes and treatments of DD and emphasizes the importance of healthcare access, advocating for appropriate services that include preventive care, mental health services, and specialized medical treatment. In contrast, the **social model** shifts the focus from the individual to the societal context, emphasizing that disabilities are not merely the result of individual impairments but

are significantly influenced by societal attitudes, policies, and physical environments that create barriers to participation. The social model advocates for inclusive practices, accessibility in various aspects of life, and the removal of societal barriers. It also highlights the importance of self-advocacy, empowerment, and cultural change, encouraging society to recognize the value and contributions of individuals with DD, rather than viewing them through a deficit lens. Together, these models provide a comprehensive framework for understanding and addressing the complexities of DD, offering diverse insights and approaches to improve the lives of individuals with these disabilities.

1.1.2 Prevalence of Developmental Disorders

Neurodevelopmental disorders encompass several conditions, a result of atypical development of the brain, including intellectual developmental disorders, communication disorders, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorder (ASD), motor disorders, and specific learning disorders (DSM-5, American Psychiatric Association, 2013). It is one of the most frequent diagnoses in the pediatric population with a recent 2019 report indicating a significant increase in developmental disabilities' prevalence (i.e., ADHD, ASD, cerebral palsy, blindness, moderate to profound hearing loss, learning disability, intellectual disability and other developmental delays) among children aged 3-7 years in the US between 2009-2017 (Zablotsky et al., 2019). In 2019, approximately 317 million children and young people were affected by health conditions that contribute to developmental disabilities. For children under 5, the prevalence of neurodevelopmental conditions was 4.1%, with sensory disorders affecting 1.3% (WHO-UNICEF, 2023). A comprehensive review of the global prevalence of neurodevelopmental disorders (NDDs) in children under the age of 18 according to the DSM-5 (2013) criteria, found the prevalence rate to vary significantly. ADHD often being the most prevalent disorder, ranging from 5% to

9% globally while ASD, ID, and SLD showed lower prevalence but were highly comorbid (Frances et al., 2022).

1.1.3 Impact of Developmental Disorders on Children

Encompassing a heterogeneous group with various clinical diagnoses, the children usually have several deficits that emerge in early development (Ismail & Shapiro, 2019). Although the umbrella term Neurodevelopmental disorders (NDD) is used to describe these conditions, they are usually not treated as separate entities, as the impairments, though occurring in different areas, often co-occur, leading to multiple diagnoses.

The deficits infants with NDD often share are developmental impairments in physical, emotional-behavioural and cognitive domains (Boivin et al., 2015). The domains include sensory and motor deficits in physical development, internalizing and externalizing behavioural issues, and speech, language and executive functioning issues. Significant delay in two or more developmental domains exhibited by children under the age of 5 is termed global developmental delay (Micai et al., 2020; Shevell et al., 2017).

Physical Health Outcomes. Children and young people with developmental disabilities face significantly worse health outcomes and a higher risk of premature death compared to their peers, with common contributing factors including epilepsy, choking, respiratory infections, and injuries (Heslop et al., 2014). These risks are heightened by fragmented and underfunded healthcare systems that frequently fail to address the needs of individuals with developmental disabilities (Krahn, Walker, & Correa-De-Araujo, 2015).

Health disparities among the disabled compared to their peers extend well into adulthood, increasing the likelihood of conditions such as diabetes, heart disease, respiratory illnesses, and mental health disorders. A cross-sectional study by Emerson and colleagues revealed that British adults with intellectual disability had markedly poorer health on indicators including

cancer, arthritis, obesity, and lung function, in comparison to their non-disabled compatriots, with age, gender, and socio-economic disadvantage having a significant impact on the odds estimate (Emerson et al., 2016). The unmet healthcare needs of people with developmental disabilities result from systemic failures, including delayed diagnoses, lengthy waiting lists, and ineligibility for essential care services (Krahn, Hammond, & Turner, 2006).

Difficulties in Executive Function. Children with NDDs, such as ADHD and ASD, often demonstrate significant impairments in executive functioning and inhibitory control, compared to their typically developing peers. These deficits are present from early childhood and can have lasting effects on developmental trajectories and behavioural outcomes. The most comprehensive meta-analysis by Townes and colleagues (2023) indicated that children with ADHD and ASD exhibit similar impairments in executive functions, particularly in areas such as working memory, cognitive flexibility, and response inhibition. Both groups showed worse performance compared to typically developing children, with no significant differences in their executive function profiles when assessed through neuropsychological tests (Townes et al, 2023). Another meta-analysis revealed that while ADHD and ASD children displayed more difficulties than typically developing peers, significant differences in executive function profiles emerged when using questionnaires rather than performance tests. This suggests that the method of assessment can influence the perceived severity of executive function deficits (Ceruti et al, 2024). These impairments can contribute to difficulties in academic performance and social interactions throughout development. Studies have also examined the effects of comorbid conditions, noting that children with both ADHD and ASD may exhibit a more pronounced profile of executive function deficits, particularly in areas like working memory and response inhibition, compared to those with either disorder alone. A systematic review by Benallie and colleagues confirmed this as they found that children

with ASD + ADHD and ASD + ID exhibited more severe EF impairments than children with ASD (Benallie et al., 2021).

Social-emotional and Behavioural Difficulties. skills encompass a wide range of abilities, including social awareness, relationship skills, responsible decision-making, empathy, prosocial understanding, and the recognition and differentiation of emotions (Weissberg et al., 2015; Widen, 2016).

Many studies have tried to understand the socio-emotional and behavioural difficulties faced by children with NDD. One such study by Löytömäki and colleagues examined children aged 6–10 with autism spectrum disorder, ADHD, and developmental language disorder. Through evaluations by parents, teachers, and therapists, and six emotion discrimination tasks, the study found that children with these neurodevelopmental disorders had impaired emotion discrimination skills, which were linked to behavioral challenges and fewer friendships. These findings highlighted the early onset of loneliness in these children and the need for timely interventions, including emotion perception training (Löytömäki, 2022).

In a 2020 UK study, researchers found that children with neurodevelopmental disorders (NDDs) during the COVID-19 pandemic showed higher rates of emotional symptoms (42% vs. 15%) and conduct problems (28% vs. 9%) compared to neurotypical peers. Emotional symptoms worsened across all groups, with ADHD linked to more conduct issues and autism spectrum disorder (ASD) associated with fewer prosocial behaviors. Females with ASD had higher emotional symptoms than males. Overall, both NDD and non-NDD groups reported more mental health problems than pre-pandemic levels (Nonweiler et al., 2020).

Social-emotional and behavioural difficulties can often precede or occur in the absence of a formal NDD diagnosis as well. A large, multisite study by Messinger et al. (2013) reported that among high-risk siblings without an ASD diagnosis, 21% were characterized by either

elevated levels of ASD severity (but still subthreshold) and low-average developmental functioning or low levels of ASD severity in the presence of lower developmental functioning at 36 months. A high-risk sibling study done by Costanzo and colleagues revealed that children who later develop ASD often exhibit early social-emotional and behavioural differences, such as atypical social referencing and variations in emotional responses during infancy. The younger siblings of children with autism (HR-noASD), who did not develop ASD by 36 months, showed mixed joint attention (JA) skills. They had lower non-verbal cognitive abilities compared to typically developing (TD) peers but better social communication skills than children with ASD. Eye-tracking revealed that HR-noASD toddlers had visual patterns similar to both ASD and TD groups, suggesting shared characteristics in social attention between these groups (Costanzo et al., 2022). These findings underscore the importance of early detection and intervention in addressing NDDs, emphasizing the need to monitor these early signs to improve long-term outcomes for affected children.

1.1.4 **Barriers to Healthcare**

Physical and attitudinal barriers coupled with a lack of training among healthcare professionals, contribute to inequitable care. These factors lead to wide variations in care quality, with children with developmental disabilities often experiencing preventable harm during hospital stays (Troller et al., 2016). Troller's study found that adults with intellectual disabilities experienced premature mortality and that 38 % of deaths that were previously misattributed to the etiology of the disability were potentially avoidable. Moreover, stigma and limited understanding of developmental disabilities among healthcare providers further hinder access to necessary services (Brown & Percy, 2007).

Socio-economic burden. The financial burden on families is a significant contributor to inaccessibility to proper healthcare. A 2023 report from the Washington State Department of Social and Health Services estimated that the annual cost per child for services related to developmental disabilities can range from \$30,000 to \$80,000, depending on the severity of the disability and the resources available in the region (WA DSHS, 2023). Similarly, a 2022 study published in the *Pediatrics* Journal of the American Academy of Pediatrics found that the lifetime costs associated with developmental disabilities such as ASD can exceed \$2 million per individual, underscoring the substantial economic impact on families (AAP, 2022). These costs are not just financial but also encompass significant emotional and time burdens, making comprehensive, accessible support systems critical for families dealing with developmental disabilities.

Cultural Perspectives. The stigma associated with developmental disorders and their impact on help-seeking behaviours is a critical aspect that can influence the experiences of families across different cultural contexts. In some collectivistic societies, developmental disabilities might be viewed as a family issue, leading to a stigma that discourages families from seeking outside help (Szlamka et al., 2023). Conversely, while individualistic societies may offer greater access to specialized services, the absence of communal support can still result in a sense of isolation for families (Szkody et al., 2024). Latino and African American children with autism spectrum disorder (ASD) face significant disparities in diagnosis and treatment compared to their white, U.S.-born counterparts. Research indicates that these minority children are diagnosed at older ages, receive fewer treatment services, and report higher levels of unmet service needs (Burkett et al., 2015; Angell et al., 2018). Kim and Kristen (2022) further reveal that Korean communities exhibit greater stigma towards autistic characteristics and demonstrate less awareness of and support for the neurodiversity movement compared to Americans. Parents from minority backgrounds may perceive

language and social development delays as temporary and indicative of transient immaturity rather than developmental issues.

The ecocultural theory provides a valuable framework for understanding these differences. It posits that the cultural context in which a family lives profoundly shapes their experiences and coping strategies for managing a child's disability (Worthman et al., 2016). Professionals working with these families should consider cultural values, goals, and available resources when designing interventions to support both the child and the family.

Missed/Delayed Diagnoses. Several factors contribute to missed diagnoses of NDDs in children, including limited access to healthcare, misattribution of symptoms, and lack of awareness among caregivers and professionals (Zablotsky et al., 2019). Additionally, service gaps significantly impact children with NDDs, particularly those who do not meet strict eligibility criteria for government-funded services, leading to inadequate care and delayed proper diagnosis. A systematic review conducted focused on looked-after children (LAC) and found that many children with NDDs in foster care and adoption centres go undiagnosed, especially those with ADHD (Heady et al., 2022).

Missed or delayed diagnoses significantly impede the timely delivery of early interventions, which are critical for optimizing long-term outcomes in children (Boulton et al., 2023). The diagnostic process is further complicated by the overlapping symptoms of ADHD and anxiety disorders, often resulting in inappropriate treatment plans that exacerbate the child's challenges (Jerome & Jerome et al., 2020). Addressing these issues necessitates a comprehensive assessment approach that thoroughly evaluates symptom profiles and considers comorbid conditions. Furthermore, the implementation of early detection methods is imperative to identify neurodevelopmental disorders (NDDs) before symptom progression, thereby minimizing the likelihood of missed diagnoses.

Financial constraints, cultural differences, geographic isolation, and socioeconomic disparities significantly hinder access to necessary services, particularly in low-income communities.. These barriers contribute to delays in diagnosis and unmet needs for children experiencing emotional and behavioural challenges. Addressing these barriers requires targeted policy and practice changes, including increased funding for services in underserved areas, expanding telehealth options, and implementing community-based interventions. Early recognition, comprehensive assessment, and access to appropriate healthcare services are crucial for identifying and supporting children with these challenges, regardless of whether they meet the criteria for a specific neurodevelopmental disorder. It is important to note that not every child receives an NDD diagnosis at an early age, yet they may still exhibit developmental risks or issues. Different developmental disabilities may differ in terms of epidemiology, leading causes, impact on daily life, and outcomes. However, many children with these conditions share varying degrees of cognitive, behavioural, relational, and socio-emotional impairment (Giusti, Provenzi, & Montirosso, 2018). The spectrum of neurodevelopmental conditions highlights the necessity for innovative and adaptable approaches to diagnosis and intervention (Morris-Rosendahl & Crocq, 2022).

This complexity influences intervention program designs, which should focus not only on the child but also on supporting the parents to address functional impairments effectively (Lipkin & Macias, 2020; Olhaberry et al., 2017; Woolfenden et al., 2014).

1.2 Impact of Neurodevelopmental Disorders on Parenting

Parenting refers to the process of raising children and encompasses all the responsibilities and activities involved in nurturing and guiding a child's development (Darling & Steinberg, 1993). It is probably one of the most rewarding yet demanding roles and requires a good amount of time, money, energy and emotional resources. Apart from meeting the physical

needs of a child, it is essential to provide a stimulating environment that engages the child intellectually and emotionally. The parent-child relationship begins even before birth, with parents developing mental representations and expectations about their roles and the child's development. A systematic review found that positive pre-natal attachment is associated with better socioemotional and cognitive outcomes for children, emphasizing the importance of early bonding experiences (Trombetta et al., 2021).

The concept of the "dyadic dance" in parent-child interactions, as discussed by Provenzi et al. (2018), refers to the dynamic and reciprocal exchange between a parent and their child during early interactions. This "dance" involves processes of attunement where the parent is sensitive and responsive to the child's cues and needs, and synchronization, where the parent and child's behaviours and emotional states align after periods of misattunement and reparation. The dyadic management of bio-behavioural synchrony in the mother-infant dyad at birth is significantly associated with the child's socio-emotional development at various stages in their childhood (Feldman, 2012). A 2015 study by Baker and his colleagues explored parent-child physiological synchrony in autism spectrum disorder (ASD) by assessing electrodermal activity (EDA) during naturalistic play. It identified a positive correlation between EDA synchrony and observed emotional attunement. The strength of this synchrony was moderated by ASD symptom severity, with higher synchrony associated with lower levels of ASD symptoms. These findings underscore the potential benefits of maintaining physiological synchrony for enhancing parent-child interactions despite ASD-related challenges (Baker et al., 2015).

These studies highlight the multifaceted nature of parenting, emphasizing that the parent-child relationship is deeply ingrained and begins well before the child is born, shaping the child's future development in significant ways.

1.2.1 Psychological Impact on Parents

Research indicates that parenting children with neurodevelopmental disorders (NDD) is associated with heightened stress and a greater risk of mental health issues, particularly anxiety and depression, especially among parents of children with autism spectrum disorder (ASD) (Hayes & Watson, 2013; Ashworth et al., 2019; Craig et al., 2016). Depression and anxiety are more prevalent among parents of children with psychomotor delays than those with typically developing children (Barreto et al., 2020).

For example, Lach et al. (2009) found that caregivers of children with NDD experience significantly higher levels of stress, depression, and anxiety compared to those caring for typically developing children. This chronic stress is often linked to the complexities of managing a child's condition, including navigating healthcare systems and addressing challenging behaviours.

1.2.2 Behavioral Challenges and Parental Stress

The severity of behavioural challenges in children with NDD directly correlates with increased parental stress and psychological distress (Craig et al., 2016; Estes et al., 2013). Externalizing behaviours, such as aggression and defiance, exacerbate childcare demands, further heightening parental psychological strain (Hayes & Watson, 2013; Firth & Dryer, 2013). Barlow et al. (2007) reported that parents of children with cerebral palsy are four to five times more likely to experience anxiety and depression than parents of typically developing children. Those with developmental disabilities report significant emotional burden and parenting stress, leading to increased rates of affective disorders (Baird et al., 2000; Bemister et al., 2015; Cianfaglione et al., 2015; Papaeliou et al., 2012).

The relationship between child symptoms and parental distress is complex, influenced by factors such as parental concerns about the future, ongoing stress, marital conflict, and the family's economic situation (Chan et al., 2018; Vasilopoulou & Nisbet, 2016). Research by Pelentsov et al. (2016) highlights the social isolation and distress experienced by caregivers of children with rare genetic syndromes, emphasizing the widespread impact of caregiving on mental health.

1.2.3 Quality of Life and Well-Being

Parents of children with developmental disabilities frequently report significantly lower levels of overall well-being compared to parents of typically developing children. This diminished well-being is reflected in various aspects of life, including reduced life satisfaction, happiness, and health satisfaction. Research suggests that these parents face a substantially higher number of negative life events, approximately three times more than their counterparts with neurotypical children (Lučić, 2019).

The severity of the child's developmental impairments and behavioral challenges plays a critical role in influencing the parents' quality of life (QOL). Specifically, parents of children with Autism Spectrum Disorder (ASD) consistently report the highest levels of stress and the lowest quality of life compared to parents of children with other developmental disabilities. Cianfaglione et al. (2015) and Green et al. (2021) provide evidence that the intensity of a child's symptoms correlates strongly with elevated parental stress levels and a decrease in overall well-being. A study by Faden et al. (2023) indicated that parents of children with severe symptoms endure poorer QOL and higher levels of parental stress than those whose children exhibit moderate or mild symptoms. Interestingly, the data show no significant difference in the levels of QOL and parental stress between mothers and fathers, suggesting

that both parents are equally affected by their child's condition. The primary challenges contributing to diminished QOL in these parents are financial strain, familial stress, and concerns about personal well-being (Faden, Merdad, & Faden, 2023).

Increased caregiving demands can disrupt the typical "dyadic dance" between parents and children. Children with disabilities may be less responsive and exhibit more challenging behaviours, complicating emotional regulation for parents and their ability to support their child's needs (Innocenti et al., 2013; Landry et al., 2006). This can lead to more directive or intrusive parenting styles, or conversely, to distant and less responsive parenting, both of which strain the parent-child relationship (Bornstein et al., 2012; Venuti et al., 2009).

Moreover, parents often grapple with disrupted mental representations of themselves and their children due to the realities of raising a child with a disability. Initial expectations of having a healthy child can lead to feelings of inadequacy and emotional overload (Sayre et al., 2001; Pianta et al., 2001). The uncertainty surrounding their child's developmental trajectory complicates parents' ability to form new expectations and effectively support their child's growth.

1.2.4 Resilience and Support

Despite these challenges, parental resilience is crucial for coping with the demands of raising a child with NDD. Resilient parents are better equipped to manage stress and maintain positive relationships with their children (Aivalioti & Pezikianidis, 2020). Protective factors such as social support, adaptive coping strategies, and fewer stressors contribute to higher levels of parental resilience (Gavidia-Payne et al., 2015).

The experience of parenting children with developmental disabilities is marked by significant emotional and psychological challenges. The interplay between child behaviours, parental stress, and family dynamics highlights the need for targeted support systems to improve both child and parental well-being. Addressing these multifaceted challenges through community resources and mental health services is essential for fostering healthier family environments and enhancing outcomes for children with NDD.

Traditional developmental theories and interventions may not adequately address the needs of families dealing with developmental disabilities. A more flexible and tailored approach is necessary. The "porridge-like framework of parenting" proposed by Provenzi et al. (2021) serves as a decision-making tool for clinicians, emphasizing the importance of viewing families as dynamic systems and involving parents as active partners in early interventions (Levac & DeMatteo, 2009; Yoshikawa & Hsueh, 2001).

This approach encourages healthcare practitioners to adapt their interventions to the specific challenges faced by each family, considering the emotional, behavioural, and cognitive dimensions of parenting that are often disrupted when a child has a developmental disability. By doing so, practitioners can provide more sensitive and effective support, helping families navigate the complexities of parenting a child with special needs.

Social isolation and parenting-related distress are common among parents of children with rare genetic syndromes (Pelentsov et al., 2016). Psychosomatic symptoms are also prevalent and can be exacerbated by the severity of children's challenging behaviours (Gallagher & Whiteley, 2013). These findings underscore the significant emotional toll of parenting children with developmental disabilities.

In summary, the emotional, behavioural, and cognitive dimensions of parenting are profoundly affected by developmental disabilities. The complexities of caregiving necessitate appropriate assessment and support strategies to enhance the well-being of both parents and children (Giusti et al., 2018).

Another key factor that is sometimes overlooked in the development of supporting strategies is the neurodiversity of the parents. A recent study evaluated over 97,000 families, revealing a higher incidence of disorders such as autism in children whose parents both exhibited related neurodevelopmental traits (Girirajan et al, 2023). This research emphasizes the influence of assortative mating—where individuals with similar traits pair together—on the severity and prevalence of these conditions in their offspring. This finding aligns with previous research that highlights how parental traits, particularly when undiagnosed, affect parenting and child outcomes. For instance, Wood and Simpson (2020) reveal that undiagnosed parental conditions can negatively impact parenting behaviors and child development.

Similarly, Biederman and Monuteaux (2023) demonstrate that parental ADHD leads to inconsistent parenting and increased stress, which adversely affects child outcomes. Becker and Elmore (2023) further illustrate how undiagnosed conditions in parents heighten parenting stress, complicating the care of children with similar disorders. Integrating these insights with the recent study's findings suggests that recognizing and addressing parental neurodevelopmental and psychiatric traits could enhance genetic counselling and inform targeted therapeutic interventions. This comprehensive approach emphasizes the importance of considering parental traits in predicting and managing neurodevelopmental disorders, aiming for more effective support strategies for both parents and children.

While biological factors like genetics and neurodevelopment are foundational to a child's development, research (DiCorcia; Tronick, 2011) show that the social and emotional environment provided by parents is equally crucial. This includes the quality of caregiving, emotional support, and engagement that parents offer. Early in life, children's knowledge and exploration of the world take place throughout and in the relationship with the caregiver (Trevathan, 2015). So, the caregiver-infant dyad must be considered as an interactional system in which both partners coordinate each other their behaviors, communicative signals, and emotional states (Sander, 2002). Several studies have documented that specific dimensions of caregiving are significantly linked with better developmental outcomes in both children with a neurotypical development (Mills-Koonce et al., 2009) and with different kinds of disabilities (Spiker et al., 2002). In typical development, the majority of research has focused on the effects of maternal sensitivity on different domains of infants' development, including psychological regulation (Conrad Ablow, 2010; Calkins et al., 1998), secure attachment (Bakermans-Kranenburg et al., 2003), temperament (McElwain, Booth-Laforce, 2006), cognitive skills (Bernier et al., 2010), and socio-emotional development (Provenzi et al., 2017; Leerkes et al., 2009).

Similar evidence has been produced even in the context of child developmental disability. For instance, children with a developmental disability whose parents are rated high in parental sensitivity show better outcomes in emotional, cognitive, and socio-interactive developmental trajectories (Anderson et al., 2013; Innocenti et al., 2013; Totsika et al., 2020). Vilaseca et al. (2019) found significant associations between different patterns of parenting (i.e., affection, responsiveness, encouragement, and teaching) and better cognitive and language outcomes in children with an intellectual disability or autism spectrum disorders. Moreover, both maternal and paternal caregiving emerged as predictors of better cognitive development in preschoolers with developmental disabilities (Vilaseca et al., 2019).

Studies engaging infants with cerebral palsy showed that early interventions focused on parents' empowerment and the parent-infant relationship had a greater impact on later cognitive and neuromotor outcomes compared to those exclusively focused on the infant's functional impairment (Festante et al., 2019; Hadders-Algra, 2014; Morgan et al., 2013). More recently, the quality of maternal physical stimulation and touch during playful exchanges has been linked with the orienting and attentive capacities of children with disabilities (Provenzi et al., 2020). Therefore, even when children present disability conditions, parenting remains a powerful source of protection for their health and a significant factor linked with their optimal developmental trajectories in emotional, cognitive, and social domains. As such, actively engaging parents in early interventions as well as targeting parenting skills and needs should be crucial goals of rehabilitation programs aimed at promoting the long-term well-being of children with disabilities (Britto et al., 2017; Schuster & Fuentes-Afflick, 2017; Spittle, 2015).

Aldharman et al. (2023) conducted a systematic review and meta-analysis across several databases to evaluate the effects of early diagnosis and intervention for NDDs. Their findings revealed that telehealth interventions, the Early Start Denver Model (ESDM), and the LEAP (Learning Experience and Alternative Program for Preschoolers and Their Parents) model significantly improved the management of NDD and enhanced the quality of life for affected children. The study highlighted the transformative potential of technology and the crucial role of the parent-child relationship in NDD interventions. Furthermore, the integration of machine learning algorithms could advance these interventions, though additional research is necessary to optimize strategies and support for parents and guardians (Aldharman et al., 2023).

CHAPTER 2

2.1 Collaborative Approach and Video-Feedback Intervention

2.1.1 Collaborative Assessment

The fetal period and early childhood are critical stages in human development, during which the experiences and environment significantly influence a child's physical, mental, and emotional growth (Cooper et al., 2009). The presence of caring and supportive environments provided by parents, family, and community plays a pivotal role in shaping a child's development. (Buultjens et al., 2013) However, several risk factors can disrupt this growth, affecting both mother and child.

Research has underscored the importance of maternal health in determining fetal well-being (Dunst et al., 2014). Stressors such as maternal malnutrition, smoking, and substance abuse have been associated with negative outcomes for the developing fetus, potentially leading to both short- and long-term health consequences. Additionally, adverse mental states in mothers, including depression, anxiety, and stress, can have significant impacts on fetal development. These conditions can affect not only the physical development of the child but also the mother's well-being throughout the pregnancy and postpartum period. (Brown et al., 2020) Women undergoing assisted reproductive treatments face heightened stress during pregnancy, as the emotional strain of infertility and repeated treatment failures can have lasting impacts on the emotional state of parents throughout pregnancy and beyond. (Cheadle et al., 2020)

One of the most significant challenges during birth is premature delivery, which poses serious risks to both the physical health of the child and the emotional state of the parents. Premature

infants often require extended stays in neonatal intensive care units, limiting the opportunities for parental bonding and involvement in their child's care. Maternal mental health issues, such as depression and anxiety, have also been linked to poorer emotional regulation in children through less responsive and attuned relationships between mother and child.

The period following birth is a significant transition for parents, particularly mothers, as they navigate physical recovery, hormonal changes, and lifestyle adjustments (Letourneau et al., 2012). These factors can lead to confusion, disorientation, and emotional vulnerability, and new responsibilities within the family can create additional stress, especially for first-time parents. (Rossi, 1968) This period is particularly challenging if the newborn has a health condition or developmental disability, adding further emotional strain on parents and potentially affecting their interactions with the child. (Friedman et al., 2011). Poor parental mental health during this period can also disrupt parent-infant bonding, further impacting child development.

The process of becoming a parent is influenced by a myriad of past experiences and present circumstances (Law et al., 2021). Some factors are protective, while others pose risks to the mental health of the parent(s) and child dyad/triad. Collaborative consultation provides practical and applicable knowledge for the perinatal period, including the third trimester of pregnancy and the neonatal and early infancy period, which can be used to effectively assist practitioners (Gurvich, 2015). The consultant's knowledge encompasses the organization of behaviour in preterm and mature newborn infants, the facilitation of parent-infant interactions based on joint observation, and the ability to monitor changes in interaction patterns by using the technique of focusing and paying attention to one's body-felt sense. Joint observation and consultation with parents are particularly crucial when an infant with a congenital defect or developmental difference arrives in the family. One of the fundamental tenets of the

interdisciplinary field of early childhood mental health is that a mother's balanced mental state and the extent to which she is supported enable her to provide the emotionally sustaining care necessary for healthy infant development (Finkelman, 2003; Law et al., 2021).

Collaborative Consultation associated with Zack Boukydis is a systematic methodological framework that is one of the cornerstones of video-feedback intervention. It plays a crucial role in the effectiveness of video-feedback interventions for parents of children with developmental disabilities (Gill et al., 1988). This collaborative process between parents and practitioners enhances the relevance and impact of the feedback, fostering a more meaningful and empowering intervention experience.

Within video-feedback interventions, collaborative assessment enables parents and practitioners to engage in joint reflection on video recordings of parent-child interactions (Krejčová, 2015). This approach allows parents to observe their own behaviours and their child's responses, which may not have been fully apparent during the interaction itself. The practitioner's role is to guide the parent in recognizing both strengths and areas requiring improvement, encouraging a deeper understanding of the parent-child dynamic and enhancing the parent's ability to respond more effectively to their child's needs (Neuman et al., 1995).

Collaborative assessment also serves to empower parents by positioning them as active participants in the intervention process. Rather than receiving directive feedback from the practitioner, parents contribute their insights and reflections, thus fostering a sense of ownership and engagement. This participatory approach enhances parents' commitment to implementing changes based on the video feedback and reinforces their confidence in their

parenting abilities. The collaborative nature of the process increases the likelihood that parents will apply the insights gained during the intervention to real-world contexts.

A key advantage of collaborative assessment in video-feedback interventions is the ability to provide feedback that is highly tailored to the specific needs and circumstances of each family. By actively involving parents in the assessment process, practitioners can ensure that the feedback is relevant and resonates with the parents' experiences, ultimately leading to more meaningful and impactful interventions.

2.1.2 Video-feedback Intervention

Since the 1970s, research on parent-infant interactions has advanced significantly, leading to a deeper understanding of how disturbances in these interactions contribute to infant psychopathology. This knowledge has laid the foundation for the development of interventions aimed at improving the quality of the infant-parent relationship, particularly through the use of video feedback. In these interventions, video feedback is used to analyze parent-child interactions, helping parents better understand their behaviors and their effects on the child. Over time, the use of video feedback has become an essential tool in various therapeutic approaches aimed at improving family dynamics and parenting skills (Rusconi-Serpa et al., 2009; Groeneveld et al., 2011).

Multiple studies have shown that video feedback can lead to significant improvements in the quality of parent-child interactions within a relatively short period. Additionally, interventions focusing on attachment quality using video feedback have demonstrated increased maternal sensitivity, which is vital for healthy child development (Juffer, Bakermans-Kranenburg, & Van IJzendoorn, 2017; Hoffenkamp et al., 2015). Various therapeutic models have incorporated video feedback, each with its own goals and outcome measures, including behavioral change, reflective functioning, and family system

improvement. These models target different aspects of parent-infant relationships, such as parental sensitivity, family dynamics, and reflective parenting (Fukkink, 2008).

Video-feedback interventions have been adapted across various therapeutic models, each emphasizing different treatment goals and mechanisms of change. Key approaches include the attachment-based model, the psychoanalytically oriented approach, the systemic approach, and the transactional model. Each model targets specific aspects of the parent-infant relationship, ranging from enhancing parental sensitivity to improving overall family dynamics.

1. **Attachment-Based Approach:** This model primarily focuses on increasing parental sensitivity by helping parents recognize and respond appropriately to their child's cues. The feedback helps parents become more attuned to their child's emotional and behavioural needs, leading to more secure attachment relationships (Rusconi-Serpa et al., 2009).
2. **Psychoanalytically Oriented Approach:** This approach encourages parents to reflect on their internal representations and emotions during interactions with their child. Video feedback helps them process non-verbal communication and deepen their reflective functioning, which is crucial for understanding both their own and their child's emotional experiences (Bakermans-Kranenburg et al., 2003).
3. **Systemic Approach:** This model emphasizes family relationships, using video feedback to observe behavioural interactions and non-verbal communication within the family. It targets improving family dynamics and communication, helping family members understand how their interactions influence each other (Lo et al., 2018).
4. **Transactional Model:** In this approach, the social environment is viewed as the primary driver of both positive and negative child development. Video feedback helps

parents recognize patterns of behaviour that may either support or hinder their child's development, promoting more positive interactions (Solantaus et al., 2009).

2.1.3 Mechanisms of Video-Feedback Interventions

The primary mechanism through which VFIs work is by allowing parents to observe their interactions with their child and reflect on their behaviour. This self-observation promotes greater self-awareness and helps parents develop more sensitive caregiving practices. When parents watch videos of themselves, they are able to see both positive behaviours and areas where they can improve, which often leads to more effective parenting practices. The intervention also enables practitioners to provide personalized feedback, further supporting the development of positive parenting behaviours (Bakermans-Kranenburg et al., 2003).

By promoting self-confrontation, VFIs can enhance parental sensitivity, responsiveness, and engagement. These improvements in parenting have been linked to better developmental outcomes for children, including increased emotional regulation, social skills, and cognitive development (Groeneveld et al., 2011). Furthermore, video feedback helps parents improve their attunement to their child's needs, which is crucial for building secure attachment relationships.

Effectiveness of VFIs in Different Contexts. Video-feedback interventions have been shown to be effective in various clinical contexts, including for children at risk of behavioral problems, preterm infants, and children with hearing impairments or developmental disabilities. Studies have demonstrated that VFIs can reduce behavioral problems in at-risk children, improve parent-child relationships in families with preterm infants, and support positive interactions in families dealing with maternal psychopathology (Rusconi-Serpa et al., 2009; Mouton et al., 2018).

In addition to clinical contexts, VFIs have also been found to be beneficial for families from diverse ethnic backgrounds and those facing socioeconomic challenges. These interventions have been effective in improving parental sensitivity and reducing parenting stress in families that might otherwise have limited access to parenting support (Yagmur et al., 2014). Despite the growing evidence of the effectiveness of VFIs, challenges remain in making these interventions more widely available and accessible to underserved communities (Hall & Bierman, 2015).

The Role of Technology in VFIs. The integration of technology into VFIs has opened up new possibilities for delivering these interventions to a broader audience. Technology-assisted interventions, such as web-based platforms and video conferencing, have demonstrated their potential to improve access to parenting education, particularly for underserved communities. These technology-based approaches maintain the core elements of VFIs, such as self-observation and reflective feedback, while making the intervention more accessible to families who may not be able to attend in-person sessions (Nelson & Patton, 2016).

The use of technology in VFIs has proven to be feasible and acceptable, and it has the potential to enhance the reach and effectiveness of these interventions. By incorporating technology into the VFI framework, practitioners can deliver high-quality, evidence-based parenting support to a larger number of families, helping to overcome some of the barriers to access that have traditionally limited the dissemination of these programs (Hall & Bierman, 2015).

Valentine et al. (2021) conducted a systematic review of the implementation of telehealth services for assessing, monitoring, and treating neurodevelopmental disorders (NDDs) and found a significant increase in telehealth adoption, particularly in response to the COVID-19

pandemic. It provided an alternative to in-person services for families facing barriers to physical appointments. Telehealth was found to be effective for various purposes, including the assessment and treatment of conditions like autism spectrum disorder (ASD) and attention-deficit/hyperactivity disorder (ADHD), offering outcomes comparable to traditional methods. The review also noted the flexibility of telehealth, which supports both synchronous and asynchronous interactions tailored to family needs. However, barriers such as technological limitations and the need for provider training were identified. Another scoping review on behavioral telehealth services for children with neurodevelopmental disabilities (NDDs) in Europe conducted by Kingsdorf and Pančocha (2021) conducted a scoping review, found that the shortage of behavioral professionals has made telehealth a crucial alternative to in-person care, offering improved access, reduced financial barriers, and flexibility through both synchronous and asynchronous formats.

Video-feedback interventions represent a powerful tool for supporting parents of children with developmental disabilities and other challenges. These interventions have been shown to improve parenting behaviours, enhance parental sensitivity, and promote better developmental outcomes for children. By incorporating collaborative assessment and self-reflection into the intervention process, VFIs enable parents to gain greater insight into their interactions with their children and make meaningful changes in their caregiving practices.

While the evidence supporting VFIs is strong, more work is needed to expand the availability of these interventions and explore their long-term effects on child development. Additionally, the integration of technology into VFIs holds promise for increasing access to these valuable interventions, particularly for underserved families.

2.3 Positive Parenting and its Effect on Developmental Changes

Positive parenting practices have been linked to a wide range of beneficial outcomes for children. These practices, such as warmth, acceptance, belonging, and responsiveness, are correlated with healthy development and adjustment even in the face of adverse life situations. (Williams, 2021) Specifically, supportive parenting early in life has been shown to have positive effects on cognitive, behavioral, and psychological development throughout the lifespan. (Whittle et al., 2014) Moreover, attempts to enhance parenting early on, when the child's brain and biological systems that underlie mental health are rapidly taking shape, are likely to be especially effective from both a clinical and economic perspective. A growing body of research underscores the significant impact these practices have on multiple developmental domains.

Emotional Development and Self-Regulation. Positive parenting is consistently linked to enhanced emotional development in children. Parents who display nurturing behaviors, such as warmth, affection, and unconditional love, help their children develop a secure sense of self-esteem and emotional regulation (Whittle et al., 2014; Miller & Commons, 2010). These behaviors enable children to feel valued and understood, fostering a sense of emotional security that is crucial for their ability to cope with stress and regulate their own emotions. Moreover, children raised in emotionally supportive environments tend to develop better coping strategies for managing challenges and are more likely to express their emotions in constructive ways. Parental warmth and empathy also play a key role in the development of children's empathy. By observing their parents' compassionate behavior, children learn to recognize and respond appropriately to the emotions of others, laying the groundwork for prosocial behaviors such as sharing and cooperation (Morris et al., 2017).

Social Development and Prosocial Behaviors. The impact of positive parenting extends beyond emotional regulation to social development. Parents who engage in responsive, warm, and supportive interactions foster social competence in their children. Such children are more likely to exhibit prosocial behaviors, including sharing, cooperating, and helping others. These social skills are foundational for healthy peer relationships and broader societal engagement. In particular, the use of reasoning and guidance in discipline, rather than harsh punitive measures, has been shown to be crucial for encouraging positive social outcomes (Osofsky & Thompson, 2000). Children who are raised with supportive discipline tend to internalize prosocial values, such as fairness and empathy, and are more likely to engage in cooperative behavior in group settings. Additionally, positive parental involvement in early socialization processes, including modeling appropriate social behavior and guiding interactions with peers, further enhances children's social skills and peer relationships.

Cognitive Development and Academic Success. In addition to emotional and social benefits, positive parenting is strongly linked to cognitive development and academic readiness. Parents who challenge their children with tasks that push them just beyond their current abilities, while providing necessary support, contribute significantly to cognitive competence and the development of a love for learning (Williams, 2021). This concept, often referred to as scaffolding, allows children to gradually acquire new skills and fosters problem-solving abilities. Engaging children in cognitively stimulating activities, such as reading, problem-solving games, or discussions about new ideas, has been found to improve their cognitive abilities and academic performance (Bun et al., 1988; Sanders et al., 2021). A nurturing and cognitively enriching home environment, where learning is encouraged and curiosity is fostered, helps children develop the intellectual skills necessary for school

success. Research suggests that these practices contribute to better long-term educational outcomes, including higher levels of academic achievement and cognitive flexibility.

Neurodevelopmental Impacts of Positive Parenting. Recent research highlights the significant influence of positive parenting on brain development, particularly during adolescence. A longitudinal study by Whittle et al. (2014) found that higher levels of positive maternal behavior were associated with structural changes in brain development, including attenuated growth in the amygdala and accelerated thinning in the prefrontal cortex. These brain regions are crucial for emotion regulation and decision-making, suggesting that positive parenting may enhance the development of these critical cognitive and emotional functions during adolescence. The findings of this study indicate that positive parenting practices not only promote emotional and social competence but also play a role in shaping neurobiological pathways that support resilience and adaptive functioning in adolescents.

Positive parenting practices have far-reaching implications for children's emotional, social, cognitive, and neurobiological development. By fostering a nurturing, responsive, and supportive environment, parents can help their children develop the skills and capacities necessary for success in various aspects of life. The consistent association between positive parenting and improved developmental outcomes, as highlighted in numerous studies, underscores the critical role that parenting plays in shaping a child's trajectory from early childhood through adolescence. Positive parenting not only strengthens children's ability to regulate emotions and engage in prosocial behavior but also promotes cognitive development and healthy brain maturation, ultimately contributing to a child's overall well-being and success in life.

2.3.1 Impact on Neurodevelopmental Disorders

Positive parenting plays a critical role in shaping children's development, including those with neurodevelopmental disorders, offering benefits in several key areas.

Enhanced Social and Emotional Development. Positive parenting, characterized by warmth, responsiveness, and supportive communication, helps children with neurodevelopmental disorders improve their emotional regulation (Williams, 2021). These children often struggle with heightened emotional sensitivity and may have difficulty managing stress, but positive parenting can provide them with a sense of security, helping to calm their emotions and reduce anxiety. Additionally, consistent, positive parental engagement can enhance a child's social skills, promoting better peer relationships and interactions. Research suggests that children with autism benefit significantly from structured social guidance from parents, helping them understand social cues and engage more meaningfully with others (Whittle et al., 2014).

Cognitive and Behavioral Improvements. Positive parenting strategies, such as providing clear expectations, positive reinforcement, and consistent discipline, can reduce problematic behaviors commonly seen in children with neurodevelopmental disorders, including hyperactivity in ADHD, aggression, or repetitive behaviors in ASD (Powell et al., 2006)(Harpin, 2005). Furthermore, in children with ADHD, positive parenting that encourages structure, routines, and patience can improve attention and focus. Parenting strategies such as breaking tasks into smaller, manageable steps and rewarding positive behavior can foster greater concentration and task completion (Gottesman, 2003; Piffner & Haack, 2014).

Language and Communication Development. Positive parenting practices that involve responsive and engaging communication can also support language and communication development in children with neurodevelopmental disorders (Delaney &

Kaiser, 2001). By providing a nurturing and stimulating environment, parents can help these children expand their expressive and receptive language skills, which are often delayed or impaired. Through consistent interaction, modeling, and reinforcement, positive parenting can facilitate the acquisition and use of language, ultimately improving a child's ability to communicate effectively with others (Roberts et al., 2019).

The impact of positive parenting on children with neurodevelopmental disorders is well-documented. Attachment parenting techniques, characterized by warmth, responsiveness, and emotional support, have been shown to have physical and psychological benefits for these children, including reduced stress and its associated effects on brain development (Miller & Commons, 2010). Furthermore, longitudinal research has revealed that supportive parenting early in life has positive effects on cognitive, behavioral, and psychological development throughout the lifespan. (Whittle et al., 2014) Parents of children with neurodevelopmental disorders must receive the necessary support and resources to implement positive parenting strategies, as this can have a profound impact on their child's overall development and well-being.

CHAPTER 3

3.1 Systematic Review

3.1.1 Introduction

The parent-child relationship is a fundamental aspect of child development, significantly influencing various dimensions of growth, including emotional, cognitive, and social development. Recent research underscores the importance of this relationship in identifying and addressing developmental risks and neurodevelopmental disabilities in children. Programs that enhance parent-child interactions have been shown to improve both child development outcomes and parental competencies, as highlighted by studies from Jeong et al. (2021) and Britto et al. (2017).

The quality of interactions between parents and children is crucial for early detection and intervention of developmental issues. Video-feedback interventions (VFI) have emerged as effective tools for recording and reviewing these interactions, aiming to improve parental caregiving behaviours and support child development. These interventions are recognized for their practicality, cost-effectiveness, and efficacy in clinical settings, particularly for children facing neurodevelopmental, behavioural, and socio-emotional challenges (Grumi et al., 2023; Provenzi et al., 2020; Balldin et al., 2016).

Neurodevelopmental disorders (NDDs), such as ADHD, autism spectrum disorder (ASD), intellectual disabilities, and learning disabilities, can lead to significant delays in a child's development. These disorders often present in overlapping forms, complicating diagnosis and intervention strategies (Micai et al., 2020; Morris-Rosendahl & Crocq, 2022). It is essential to recognize that not all children with developmental risks receive a formal diagnosis, which necessitates intervention programs that focus on functional impairments rather than solely on diagnostic labels (Lipkin & Macias, 2020).

VFI has been shown to be particularly beneficial in addressing a wide range of developmental and behavioural issues in children with NDDs. This evidence-based approach not only fosters children's social-emotional development, language skills, and cognitive abilities but also enhances parental responsiveness and confidence (Grumi et al., 2023). Secure attachments formed through positive parent-child interactions are linked to improved self-regulation and social competence in children, reducing the likelihood of externalizing and internalizing behaviours during later developmental stages (Groh et al., 2017).

Grounded in attachment theory, VFI utilizes video feedback to promote sensitive parenting and strengthen the parent-child bond. By providing visual feedback on interactions, parents gain insights into their child's behaviour and learn to respond more effectively to their needs. This reciprocal understanding fosters a supportive environment conducive to early risk detection and timely intervention for both the child and the parent, facilitated by interdisciplinary teams of pediatric specialists and early childhood professionals.

To accurately evaluate the effectiveness of video-feedback interventions, it is crucial to gather scientific studies that specifically focus on how these interventions engage both parents and children. This study aims to systematically review research on VFI programs worldwide, specifically focusing on young children with neurodevelopmental disorders or developmental risks and their engagement with healthy parents.

3.1.2 Aims

The primary objective of this systematic review is to evaluate the effectiveness of video-feedback interventions in supporting parents of children with developmental disabilities. Specifically, the review aims to:

1. Synthesize the evidence on the impact of video-feedback interventions on parental outcomes, such as parenting skills, parental stress, and confidence.
2. Assess the effects of video-feedback interventions on child outcomes, including social, emotional, and cognitive development.
3. Identify the key characteristics of effective video-feedback interventions, such as duration, frequency, and content of feedback sessions.
4. Highlight gaps in the current research and propose directions for future studies.

3.2 Methods

3.2.1 Literature search

This review applied a literature search procedure to identify credible sources about the diagnosis and video-feedback intervention of NDD in children. The aim was to examine the implications of the video-feedback approach as intervention of NDD in children and engaging parent as subject. This study aimed at using relevant and current sources reflective of the early diagnosis and intervention management strategies in the current NDD development. The search process used keywords and Boolean operators “AND” or “OR” to diversify the scope and identify important sources in proving the aim and the objectives. A search string with an intentionally wide scope was used. The following keywords were utilized for this study (((videofeedback) OR ("video feedback")) AND ((infant) OR (child))) AND (((parent) OR (father)) OR (mother)).

The keywords were applied in the following databases Scopus and PubMed with unconstrained time limits to help identify accurate and verifiable journal articles to create table characteristics and substantiate the findings.

Manual Searches: One study was included after cross-referencing.

3.2.2 Study Selection Criteria

The review applied inclusion and exclusion criteria to determine the most accurate sources reflecting the research aims and objectives. In this respect, the inclusion criteria considered several characteristics to qualify the study for reference in this review. The first criterion was that the children had a diagnosis or were at risk for developmental disorders. The second criterion was that the parents were not diagnosed with NDs (healthy subjects). The third criterion was that the intervention involved video feedback intervention with parents. An exclusion criterion was the language of publication; this review only considered studies written in English. The second exclusion criterion was the year of publication; this study considered studies conducted from 2000 to 2023 and studies published before 2000 were excluded from this study. The third exclusion criterion was not-quantitative papers (such as theoretical papers, reviews and single case studies). Another factor considered in this review was the inclusion of studies with full text to quantify the credibility and reliability of the sources in justification of this research aim and objectives

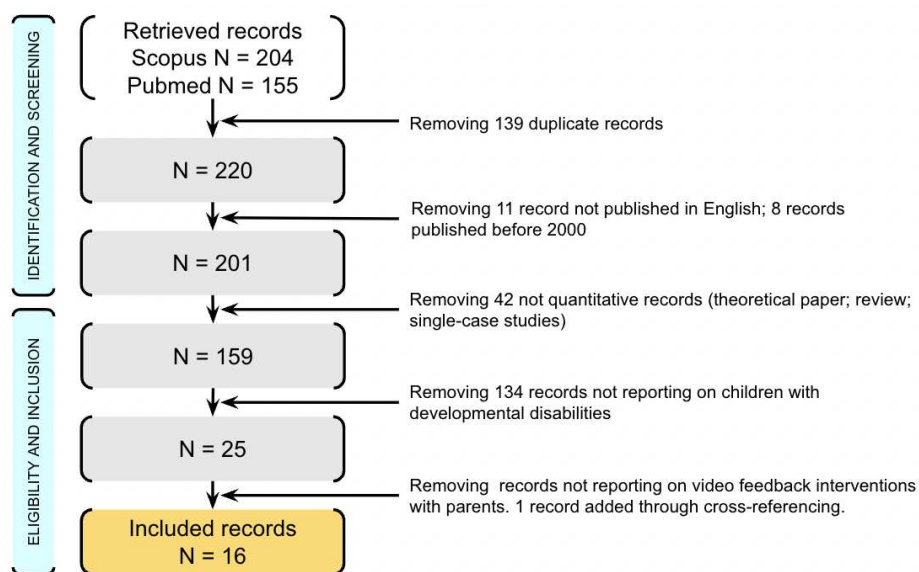
3.2.3 Study Selection Process

The inclusion criteria and keywords were crucial in accumulating important data in establishing the effectiveness of video-feedback interventions in supporting parents of children with neurodevelopmental disorders. Using the Boolean “AND” and “OR” keywords, the study retrieved 204 records from PubMed and 155 records from Scopus. The records were checked for duplicates using Endnote X5.01 (Thomson Reuters Scientific Inc., Carlsbad, CA, United States). The remaining papers were then filtered by two independent authors (i.e., TS and LR) by reading titles, abstracts, and full articles. If any disagreements arose, a third reviewer was consulted to reach a consensus. Exclusion criteria were applied, with 11 non-English articles, 8 records published before 2000, and 42 non-quantitative records (which include qualitative papers, single case studies and review articles) removed.

3 case study records were excluded, although they were not single-case studies; as they had been assessed as low quality in a previous mini-systematic review (Provenzi et al., 2020).

The presence of any neurodevelopmental risk (e.g., prematurity) or disability conditions with or without sensory impairment (e.g., hearing and visual) was checked through title/abstract screening as well as reading the full articles. 134 records that did not focus on developmental disabilities were excluded. Finally papers not focusing on the parent-child relationship with video-feedback interventions were removed leaving 15 records. An additional record was included through cross-referencing bringing the total to 16. The whole study selection process is reported as PRISMA in Figure 1. PRISMA flowchart was used to support the transparent and easy-to-understand search strategy.

Figure 1



3.2.4 Quality Assessment

Quality was of the essence in this review, which entailed systematically and carefully examining the research to identify its relevance, value, and trustworthiness. The following questions were ideal in the quality appraisal process. First, whether the study was focused on addressing the query and whether the methodology was valid to address the question, whether

the question was biased concerning the study design, and whether the entire approach was addressed. The methodological quality of the included papers was assessed using the Quality Assessment Tool for Quantitative Studies (Jackson et al., 2005). Sections A–F (A, selection bias; B, study design; C, confounders; D, blinding; E, data collection methods; F, withdrawal and dropouts) were coded as 3 (weak), 2 (moderate), or 1 (strong) according to the component rating scale criteria. A final 1–3 score is assigned to each paper according to the presence of 2 or more weak scores (3, weak), only 1 weak score (2, moderate), and no weak scores (1, strong). Quality appraisal is reported in Table 1.

Table 1

Quality appraisal of the included studies.

Study	A	B	C	D	E	F	Final
Sharry et al. (2005)	2	2	3	1	1	1	2
Kim J M et al. (2005)	2	1	1	2	1	2	1
Bakermans-Kranenbur et al. (2008)	2	1	1	1	1	1	1
Glanemann et al. (2013)	2	2	2	1	1	1	1
Poslowsky et al.	2	1	1	2	1	1	1

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(2015)

Sealy & 2 2 1 1 1 1 1

Glovinsky (2016)

Lam-Cassettari et 2 1 1 2 1 1 1

al. (2017)

Platje et al. 2 1 1 2 1 1 1

(2018)

Olhaberry et al. 2 2 2 3 1 1 2

(2019)

Whitehouse et al. 1 1 1 2 1 1 1

(2019)

Wadnerkar 2 1 1 1 1 1 1

Kamble et al.

(2020)

Costanza 1 1 1 1 1 1 1

Colombi et al.

(2021)

Aiello S et al. 3 3 3 3 2 1 3

(2022)

Salisbury et al. 2 2 2 1 1 2 1

(2022)

Cleary DB et al. (2022)	3	3	3	3	2	1	3
De Oliveira et al. (2023)	2	2	2	1	1	1	1

Labels: A, selection bias; B, study design; C, confounders; D, blinding; E, data collection methods; F, withdrawals and dropout. Quality codes: 1(strong), 2 (moderate), 3 (weak)

3.2.5 Data Extraction and Analysis

Google Sheets were used for manual data extraction due to their flexibility. Customized templates were used to manage the data. A final pool of 16 studies was selected (Table 2).

The records were systematically reviewed, and relevant data were extracted, including details such as authors, publication year, journal source, characteristics of the children, age at the commencement of the intervention, procedural aspects, intervention setting, number and frequency of sessions, outcome variables, feasibility, and key findings. Data were then analyzed according to the specific objectives of this review. Information regarding infants' characteristics related to neurodevelopmental conditions was extracted, given that previous studies suggest that the well-being of parents and/or parent-infant interactions can be influenced by the severity of the child's clinical condition (Smith et al., 2001). Furthermore, parenting quality and the impact of caregiving may differ based on the age of the infants, necessitating the abstraction of the child's age at the start of the VFI interventions (Woolfson & Grant, 2006). Additionally, the setting was examined, as parent-child interactions may vary between home and laboratory environments, highlighting the importance of documenting whether these interventions were conducted in home environments or clinical settings, such as hospitals or rehabilitation centres (McWilliam et al., 2000). Extraction was done by two

reviewers (TS, LR) and was corrected for any inconsistencies by a co-supervising researcher (SG).

Table 2

Characteristics of the studies included in the review

Study	VFI Protocol	Setting	Sample size	Session Number	Intervention Duration (months)	Children Age (M(SD))	Clinical Category
Sharry et al. (2005)	PPEY	Clinic	25	12	3	46.8 (12.24)	behavioural problems and DD
Kim J M et al. (2005)	RFI	Home & Class	16	12	3	74.4 (20.28)	DD
Bakermans-Kranenburg et al. (2008)	VIPP-SD	Home	130	6	6	28.29 (10.26)	behavioural problems
Glanemann et al. (2013)	MPP	Clinic	24	10	3	6.8 (5.2)	sensory deficit (hearing)
Poslowsky et al. (2015)	VIPP-A UTI	Home	77	5	3	43.0 (9.96)	ASD
Sealy & Glovinsky	DIR/FT	Clinic	40	24	3	52.65 (16.07)	ND

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(2016)

Lam-Cassettari et al. (2017) VIG Home 14 3 3 40 (2.6) sensory deficit (hearing)

Platje et al. (2018) VIPP-V Home 77 7 5 39.36 (13.24) sensory deficit (visual)

Olhaberry et al. (2019) VFI Home 80 7 2 25.08 (7.64) socio-emotional difficulties

Whitehouse et al. (2019) iBASIS-VIPP Home 103 10 5 12.40 (1.93) ASD risk

Wadnerkar Kamble et al. (2020) VIG Home 16 3 6 24.36 (23.28) sensory deficit (hearing)

Costanza Colombi et al. (2021) NDBI+V F Clinic 13 24 6 26.84 (5.18) ASD

Aiello S et al. (2022) ESDM+ VF Home 29 24 4 42.2 (14.2) ASD

Salisbury et al. (2022) KEEP-V Home & Clinic 153 12 3 47.70 (10.48) DD

Cleary DB et al. (2022) iBASIS-VIPP Home 13 12 8 4.02 (1.02) ASD risk

De Oliveira et al.(2023)	SB	Home & Clinic	60	7	2	36(12.4)	behavioural problems
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Note. N.A. = Not Available. VF = Video-Feedback. PPEY = Parents Plus Early Years Programme. RFI = Relationship Focussed Intervention. VIPP-SD = Video-Feedback Intervention to Promote Positive Parenting and Sensitive Discipline. MPP = Muenster Parental Programme. VIPP-AUTI = Video feedback Intervention to promote Positive Parenting adapted to Autism. DIR/FT = Developmental Individual-Difference, Relationship-based/Floortime. VIG = Video Interaction Guidance. VIPP-V = VIPP-Visual. iBASIS-VIPP = Intervention for Autism-based VIPP. NDBI+VF = Naturalistic Developmental Behavioral Interventions +VF. ESDM+VF = Early Start Denver Model +VF. KEEP-V = Keeping Foster and Kin Parents Supported and Trained (Video-Feedback). SB = Strengthening Bonds.

3.2.6 Data Synthesis

First, (a) a comprehensive account of various VFI approaches and methodologies is provided, detailing theoretical foundations, techniques, procedures, settings, and timing. Second, (b) a review of the effects of VFI on child development, parental well-being, and the quality of parent-child interaction is conducted. Lastly, (c) the feasibility of these interventions and inconsistencies in methodology are examined to guide future research and improve clinical practices. Data were synthesized into the following categories: (1) characteristics of the children, (2) VFI methodology, including procedures, settings, and session structures, and (3) outcomes related to child development, parental well-being, and parent-child interactions.

3.3 Findings

3.3.1 VFI State of the Art and Methodology

Characteristics of Participating Subjects. The included studies focused on different Developmental Disabilities (Kim and Mahoney, 2005; Sealy & Glovinsky, 2016; Salisbury et al., 2022) sensory deficits such as hearing (Glanemann et al., 2013; Lam-Cassettari et al., 2017; Wadnerkar Kamble et al., 2020) and visual (Platje et al., 2018). Most of the papers included were on ASD or ASD risk (Poslowsky et al., 2015; Whitehouse et al., 2019; Costanza Colombi et al., 2021; Aiello S et al., 2022; Cleary DB et al., 2022) and behavioural problems (Sharry et al., 2005; Bakermans-Kranenbur et al., 2008; De Oliveira et al., 2023), one paper was on socio-emotional difficulties (Olhaberry et al., 2019).

Children's age varied widely with the interventions being administered in the first few years of life (from 1 to 36 months) in 7 studies (Bakermans-Kranenburg et al., 2008, Glanemann et al., 2013, Olhaberry et al., 2019, Whitehouse et al., 2019, Wadnerkar Kamble et al., 2020, Costanza Colombi et al., 2021, Cleary DB et al., 2022); during preschool and kindergarten age in 8 studies (Sharry et al., 2005, Poslowsky et al., 2015, Sealy & Glovinsky, 2016, Lam-Cassettari et al., 2017, Platje et al., 2018, Aiello S et al., 2022, Salisbury et al., 2022, De Oliveira et al., 2023); and 1 study with up to 8 years of age (Kim J M et al., 2005).

VFI Procedures and Methodology. The Video-Feedback Intervention implemented in the studies varied in terms of the main target themes, setting (clinic/home) and duration of the intervention.

Parents Plus Early Years Programme (PPEY). is a structured, evidence-based intervention for parents of children aged 1 to 6 years, focusing on promoting positive parenting, child development, and emotional well-being (Parents Plus, 2023). Sharry et al. (2005) aimed to equip parents with strategies for fostering secure relationships, encouraging positive child behaviour, managing parental stress and goal achievement. They implemented the intervention in 12 sessions spread over 3 months. It involved synchronous recording

during individual sessions in a clinic setting, where interactions between parent and child were videotaped and immediately reviewed with a therapist. Group sessions used video input for psychoeducational sessions.

Relationship Focused Intervention (RFI) is a therapeutic approach designed to strengthen parent-child bonds by fostering emotional connections and promoting secure attachment through responsive caregiving. The intervention typically involves 8-12 weekly sessions, where parents practice strategies to enhance mutual responsiveness, address emotional needs, and support their child's developmental progress (Mahoney & Perales, 2009). Kim and Mahoney (2005), implemented RFI over 3 months, consisting of 12 sessions. The intervention was divided into four components: classroom-based instruction, home-based instruction, video feedback, and evaluation. The classroom-based instruction was delivered asynchronously, while home-based instruction and self-assessment were provided either in real-time or through recorded feedback. Video feedback was implemented in two sessions, aimed at allowing parents to reflect on their caregiving practices and make adjustments to improve their responsiveness to their child's emotional and developmental needs.

Video-Feedback Intervention to Promote Positive Parenting and Sensitive Discipline (VIPP-SD) is an evidence-based program that aims to enhance parental sensitivity and promote non-coercive discipline techniques. It focuses on fostering positive parenting practices, enhancing sensitive discipline strategies, and improving emotional attunement between parents and children. The intervention typically consists of 5 to 8 sessions, during which parents receive tailored feedback based on video recordings of their interactions with their child to improve parenting skills (Juffer et al., 2008). Bakermans-Kranenburg (2008) implemented the VIPP-SD program through 6 sessions over a 6-month period, including follow-up sessions. The intervention was delivered through home

visits, where a female intervener provided feedback based on videotaped mother-child interactions. These video recordings were reviewed asynchronously, allowing the intervener to prepare detailed feedback for the subsequent sessions aimed at helping parents reflect on and refine their parenting behaviours at home.

Muenster Parental Programme (MPP). is a structured intervention designed to enhance parent-child interactions, particularly for children with developmental challenges. It focuses on improving parental sensitivity, promoting positive communication, and encouraging appropriate discipline. The core themes include building secure attachments, fostering emotional regulation in children, improving parental responsiveness toward children's vocal and non-verbal signals and reducing parental intrusiveness (Thomeer et al., 2016). Initiative behavior another target theme, characterized by the inadequate introduction of new actions or objects that disregard the child's focus, decreased significantly, indicating improved parental responsiveness and alignment with the child's needs.

Glanemann et al. (2013) aimed to improve responsive parental behaviour in 10 sessions overall in 3 months. Parent-child interactions were recorded asynchronously at the clinic, and feedback was provided during individual sessions.

Video-feedback Intervention to Promote Positive Parenting adapted to Autism (VIPP-AUTI). is a tailored version of the VIPP program designed specifically for parents of children with autism. It focuses on improving parental sensitivity and communication to meet the unique social and emotional needs of autistic children. The intervention's main themes include fostering emotional attunement, enhancing social interaction, and promoting positive parenting strategies aligned with the child's specific behavioural characteristics. VIPP-AUTI typically involves 6 to 8 sessions, where video feedback is used to help parents refine their responses to their child's behaviours (Poslawsky et al., 2015).

Poslawsky et al. (2015), targeted key areas in the intervention such as mastery motivation and play, joint attention, daily routines and problem-solving, and managing emotions and stereotypical behaviours. Additionally, they incorporated VIPP-SD themes like positive reinforcement and, when necessary, sensitive time-out. This version was delivered over 5 sessions across 3 months, offering personalized feedback to help parents better support their child's development.

Developmental, Individual-Difference, Relationship-based/Floortime (DIR/FT) model. is designed to foster the emotional and developmental growth of children, especially those with autism and other developmental delays. It emphasizes engaging children at their current developmental level and addressing their individual differences through relationship-driven, playful interactions. Core themes include enhancing emotional and intellectual development through child-led play, improving communication, and promoting social-emotional growth. Sessions are typically tailored to each child, occurring daily or several times a week, with each session lasting 20 to 30 minutes (Greenspan & Wieder, 2006). Sealy and Glovinsky (2016) focused on parental attunement to the child's sensory processing abilities to enhance co-regulation and reduce disruptive behaviors. The intervention involved 24 clinic-based sessions over a 3-month period, using structured approaches to improve sensory responses and social interaction.

Video Interaction Guidance (VIG). is an intervention that uses video feedback to enhance communication and strengthen relationships, particularly in parent-child or teacher-student interactions. The main themes of VIG include improving attunement, responsiveness, and communication by highlighting moments of successful interaction captured on video. Participants review short clips of their interactions, guided by a facilitator, to reflect on positive behaviours and strengthen relational skills. VIG is typically delivered

over 3 to 6 sessions, each lasting about an hour (Kennedy et al., 2011). Lam-Cassettari et al. (2015), used VIG in 3 sessions to facilitate parental bonding with newborns. Sessions involved asynchronous recording of parent-child interactions at home, followed by shared review sessions where selected clips were analyzed and discussed. Wadnerkar Kamble (2020), implemented VIG in 3 goal-directed filming sessions followed by shared review sessions, all facilitated by a trained guide. These sessions were conducted in the participants' homes, ensuring a familiar environment for the intervention.

Video-Feedback Intervention to Promote Positive Parenting - Visual (VIPP-V) is a specialized parenting program designed to enhance parental sensitivity and promote effective behaviour management through the use of visual aids and video feedback. Its key themes include balancing exploration and attachment behaviour, "speaking for the child," understanding the sensitivity chain and sharing emotions. The program also focuses on safe exploration, joint attention, and improving parents' ability to recognize and respond to their child's emotional and behavioural signals. Sessions, typically conducted over 4 to 8 weeks, last between one to two hours and use video recordings of parent-child free-play interactions for reflective feedback (Juffer et al., 2008; Van Den Broek et al., 2017).

Platje et al. (2018) implemented it at home with up to seven sessions focussing on exploration vs. attachment behaviour, sensitive exchanges, joint attention and intersubjectivity during interactions, with each session tailored to predetermined themes.

Olhaberry (2019) implemented a video-feedback intervention involving weekly home visits, where parent-child interactions were video-recorded in the family's natural home environment. The intervention focused on both dyadic (parent-child) and triadic (mother-father-child) interactions, helping parents reflect on their behaviors and strengthen

relational bonds. The program was conducted over 7 sessions across 2 months, allowing for gradual progress and integration of positive parenting strategies.

iBASIS-VIPP (Intervention for Autism-based Video Interaction to Promote Positive Parenting) is an adaptation of the VIPP program aimed at helping parents of children at risk of autism. It focuses on improving parental sensitivity by guiding parents to better recognize and respond to their child's emotional and behavioural cues. Key themes include promoting joint attention, fostering emotion recognition, and balancing exploration and attachment behaviours to enhance parent-child interactions and communication. The intervention typically involves 6 to 8 sessions, during which parents receive video feedback to reflect on and improve their interactions (Green et al., 2015).

Whitehouse (2019) delivered iBASIS-VIPP through asynchronous recordings of parent-infant interactions at home, with feedback sessions conducted by therapists. The full intervention, including follow-up sessions, was conducted over 8 sessions plus additional follow-ups across 5 months, focusing on refining parent-infant communication strategies within the family home. Cleary (2022), also implemented iBASIS-VIPP, conducting 12 sessions, including 2 antenatal sessions of 90 minutes and 10 postnatal sessions of 60 minutes.

Naturalistic Developmental Behavioral Interventions (NDBIs) are evidence-based approaches designed to support young children, particularly those with autism, by integrating naturalistic teaching and behavioural techniques. NDBIs are flexible, play-based interventions that incorporate learning opportunities within natural interactions, focusing on child-initiated activities. Key themes include promoting social communication, improving language development, and encouraging adaptive behaviours through strategies such as reinforcement and modelling to support developmental progress. Sessions are typically conducted several times a week and integrated into daily routines, with each session lasting

between 30 minutes to an hour depending on the child's needs (Schreibman et al., 2015; Landa et al., 2011).

Costanza Colombi et al. (2021), implemented NDBIs through 24 sessions over 6 months in a clinic setting, using asynchronous video recording and in-person feedback. The intervention included group-based clinician-mediated sessions (6 hours/week), individual parent-coaching (3 hours/week), and additional speech and occupational therapy. Two groups were studied: one receiving standard NDBI and another receiving NDBI combined with video feedback (NDBI+VF).

Early Start Denver Model (ESDM). is an evidence-based intervention for young children with autism, typically aged 12 to 48 months, that integrates Applied Behavior Analysis (ABA) principles with developmental approaches. It aims to promote social, cognitive, and language skills in a naturalistic, play-based environment. Key themes include enhancing social communication, fostering language development, and improving cognitive abilities through positive reinforcement and relationship-building techniques. ESDM is individualized, with teaching embedded in play routines to encourage spontaneous interactions and learning. Sessions are typically conducted several times a week, lasting between 1 to 2 hours, and can be implemented in both home and clinic settings by trained therapists or caregivers (Dawson et al., 2010). Aiello et al. (2022) delivered ESDM via telehealth in 24 sessions, utilizing methods such as live streaming (52%), video feedback (29%), and parental psychoeducation (19%) to engage parents and children remotely.

KEEP-V (Keeping Foster and Kin Parents Supported and Trained - Video-Feedback). is a specialized intervention designed for foster and kinship caregivers. It combines traditional KEEP methods with video feedback to enhance parenting strategies and improve behavioural outcomes for children. The key themes include using positive

reinforcement, improving behaviour management, and strengthening communication between caregivers and children. Video feedback allows caregivers to reflect on real-life interactions and receive personalized guidance, helping them progressively refine their parenting skills. Sessions typically occur over 10 to 12 weeks, with weekly meetings lasting 1 to 2 hours (Leve et al., 2012; Chamberlain, 2003).

Salisbury (2022), integrated the KEEP-V model with traditional KEEP training, where routine parent-child interactions were filmed at home or during childcare drop-off. These videos were edited to highlight positive behaviours and reviewed in group sessions with facilitators providing strength-based coaching. The study also compared this model to KEEP-P, which applied traditional PMT methods without video feedback.

Strengthening Bonds. is a relationship-focused intervention aimed at improving emotional connection and communication between parents and children. The program emphasizes enhancing parent-child attachment, fostering emotional regulation, and improving communication skills within the family. Through guided interactions, parents are supported in understanding their child's emotional needs, responding with sensitivity, and promoting a secure, nurturing environment. The intervention typically includes practical exercises, reflective discussions, and coaching on positive parenting strategies. Strengthening Bonds usually consists of 8 to 12 weekly sessions, each lasting 1 to 2 hours, promoting progressive development of stronger family relationships (Kim et al., 2019; Gross et al., 2016).

De Oliveira (2023) implemented the intervention by initially including in-person group session, followed by remote asynchronous video feedback delivered via WhatsApp. Personalized video clips were sent weekly to mothers' smartphones over 2 months, comprising a total of 7 sessions, with no live online therapy sessions involved.

Most interventions (6 studies) were based on VIPP that focussed on exploring attachment behaviour, accurate perception of the child's non-verbal cues, parental sensitivity and sharing emotions between the parent and child, showing and encouraging parents' affective attunement to their child's positive and negative emotions.

3.3.2 Impact of VFI on Neurodevelopmental Disability

Effects on Child Behavior and Developmental Outcomes. In children with developmental disabilities and behavioural problems, a significant reduction in conduct problems and hyperactivity was found as measured by SDQ scores at time 2 and time 3 compared to time 1 after the PPEY intervention (Sharry J et al, 2005).

RFI study by Kim et al., (2005). found an 18% increase in interactive behaviours measured with Child Behavior Rating Scale (CBRS), a significant increase was observed in joint attention for the treatment group. However, the overall effect of RFI was not statistically significant compared to the control group.

VIPP-SD study by Bakermans-Kranenburg et al., (2008). on daily cortisol in children with externalizing behavioural problems found that the intervention reduced basal cortisol levels in children with the DRD4 7-repeat allele, but not in those without it. Children with the 7-repeat allele showed the largest decrease in externalizing behaviours after the intervention, and they did so even more when there was a substantial increase in the use of parental-positive discipline.

MPP study by Glanemann et al., (2013). found that the intervention led to a significant increase in vocalisations in the training group of infants with hearing loss as compared to the control group who did not go through the training.

VIPP-AUTI study by Poslawsky et al., (2015). found that compared to the Care-As-Usual group, the VIPP-AUTI group showed a significant improvement in Child-initiated joint attention skills (IJA) at 3-month follow-up for children, especially those

not attending school. However, there were no significant differences between intervention and control groups in play level, play variation, child responsiveness and involvement.

Lam-Cassettari et al. (2017) however, conducted a video interaction guidance (VIG) intervention on prelingual deaf and hard-of-hearing children and found a significant increase in child responsiveness ($F(1,12) = 20.757, p < .01$) and child involvement ($F(1,12) = 41.354, p < .01$) from preintervention to postintervention. It was measured on the Emotional Availability (EA) Scale.

Mother-father-child triad video-feedback intervention by Olhaberry et al., (2019). found a significant decrease in socio-emotional difficulties in the experimental group compared to the control group (Wilks' $\lambda=0.930, F(1,78)= 5.907, P=.017$); also improved fine motor skills and psychomotor development in communication (Wilks $\lambda=0.875, F(1,78)=11.185; P=.001$) in the experimental group.

iBASIS-VIPP study by Whitehouse et al., (2019). pre-emptive intervention for infants showing early behavioural risk signs of autism spectrum disorder found no significant differences between groups (difference estimate -0.74, 95% CI -2.47 to 0.98) after the iBASIS-VIPP intervention.

VIG study by Wadnerkar Kamble et al., (2020). after the application of the intervention on pre-linguistic deaf and hard-of-hearing children, found a significant increase in communicative autonomy post-intervention ($Z = -3.517, p < 0.0001, d = 0.62$) and a significant decrease in children's no-responses post-intervention ($Z = -3.111, p < 0.005, d = 0.55$). However, there was no significant difference between the pre-and post-intervention ABC score ($Z = -1.226, p > 0.05$), measured using the Vineland Adaptive Behavior Scales (VABS).

NDBI by Constanza et al., (2021). intervention on toddlers with Autism Spectrum Disorder (ASD) assessed for improvements in social communication and developmental skills. Social communication skills were measured using the Brief Observation of Social Communication Change (BOSCC), with significant improvements observed in both the NDBI+VF (Naturalistic Developmental Behavioral Intervention with Video Feedback) and NDBI groups, showing large effect sizes for BOSCC-Clinician Social Communication. Developmental and adaptive skills were measured using the Mullen Scales of Early Learning (MSEL) and Vineland Adaptive Behavior Scales (VABS). The NDBI+VF group showed significant gains in visual reception, fine motor, and expressive language, while the NDBI group exhibited improvements in visual reception, receptive language, and expressive language.

KEEP intervention Salisbury et al., (2022). did a comparison study between two parenting interventions. KEEP-P included Parenting Management Training (PMT), while KEEP-V included video-feedback intervention. Significant improvements were seen in behavioural (internalizing and externalizing) scales in both KEEP-P and KEEP-V groups. Improvements in executive functioning, particularly in inhibitory control, were also observed in both groups.

Strengthening Bonds study by de Oliveira et al., (2023) study the Behavioural Problem group showed a decrease in problems post-intervention, with 37% of children presenting normal behaviours.

Effects on Parent-Child Relationship and Parental Interactive Behavior. Sharry et al. (2005) observed an increase in positive parent-child interactions and a decrease in parent-child instructions. Additionally, parents achieved significant progress toward

parent-defined goals, demonstrating the effectiveness of the intervention in improving the parent-child relationship.

In Kim JM (2005), the Maternal Behavior Rating Scale (MBRS) showed significant improvements in maternal interactivity behaviors, including responsiveness, affect, and achievement orientation, for the RFI treatment group compared to the control group ($p < .001$). This indicates that the intervention effectively enhanced positive maternal behaviors.

In Bakermans-Kranenburg et al., (2008) study, the VIPP-SD intervention was found to be highly effective in promoting maternal sensitive discipline. Mothers in the intervention group demonstrated significantly improved use of sensitive discipline techniques compared to the control group.

Glanemann et al. (2013), found that the intervention led to a significant increase in responsive parental behavior, particularly in measures such as dialogic echo and responsiveness to movement/action. At the same time, a notable reduction in initiative behavior was observed in the training group ($t = 5.687$, $df = 14$, $p < .001$), but not in the control group ($t = 2.090$, $df = 13$, $p = .057$).

Poslawsky et al., (2015) reported parents in the VIPP-AUTI group showed a significant reduction in parental intrusiveness, as measured by the EAS-parental scales, when compared to the control group.

In Sealy & Glovinsky (2016), the DIR/FT intervention led to significant improvements in parental reflective functioning capacities in the treatment group compared to the wait-list group. This was confirmed by an ANOVA analysis, which showed a statistically significant interaction between the intervention and time on reflective functioning ($F(1, 38) = 13.39$, $p = .001$, partial $\eta^2 = .261$).

Lam-Cassettari et al., (2017) found that the VIG intervention showed improvements in several Emotional Availability (EA) subscales, including parental sensitivity, parental structuring, parental non-hostility compared to baseline levels.

Platje et al., (2018) examined several parenting outcomes for the VIPP-V group compared to a care-as-usual (CAU) control group. Parental sensitivity, there were no significant changes across time or between groups, indicating that the intervention had no significant effect on improving sensitivity ($F(1,75) = 0.13, p = .715, \eta^2 = .002$). Similarly, the analysis of parent-child interaction quality revealed no significant effect of the intervention, although a quadratic time effect was noted, with interaction quality improving posttest but declining by follow-up ($F(1,75) = 5.85, p = .018, \eta^2 = .072$).

In the Wadnerkar Kamble (2020) study, the VIG intervention focused on enhancing emotional availability in parents. Using the Emotional Availability (EA) scales, the findings showed a large effect indicating a significant increase in parental sensitivity and attentiveness. This suggests that the intervention successfully improved the emotional responsiveness of parents in interacting with their children.

In the study by de Oliveira R.C (2023), the primary parental outcome was the improvement in mother-child interactions, measured using the PICCOLO tool, which focuses on domains such as affection, responsiveness, encouragement, and teaching. The findings showed a significant improvement in mother-child interactions, particularly in the teaching dimension, for mothers of children with behaviour problems following the intervention.

Effects on Parental Well-Being. Sharry et al. (2005) reported a significant reduction in parental stress over time ($F(2,28) = 7.645, p < .05$), with the effects maintained at a 5-month follow-up.

A significant reduction in parental stress was observed in Kim et al. (2005) RFI study, particularly in stress related to parent-child relationships, measured by the Parenting Stress Index (PSI) ($p < .01$) with a moderate effect size ($ES = 0.35$).

Poslawsky et al., (2015) found that parents in the VIPP-AUTI group demonstrated an increase in parental self-efficacy, as measured by the Parental Efficacy Questionnaire (PEQ), while parents in the control group (CU) showed no change over time. Additionally, at the 3-month follow-up, both groups (VIPP-AUTI and CU) reported high levels of parental satisfaction with no significant difference between them ($t(69) = -0.75$, $p = 0.46$), indicating that parents in both groups were similarly satisfied with the interventions.

In Lam-Cassettari C (2017), the intervention led to a significant increase in parental self-esteem, as measured by the Rosenberg Self-Esteem Scale (RSES). Self-esteem scores rose from pre-intervention ($M = 20.42$) to post-intervention ($M = 22.71$), with the results showing statistical significance ($F(1,12) = 4.815$, $p < .05$, $\eta^2 = .29$).

Platje et al., (2018) found that parenting self-efficacy significantly increased over time for the VIPP-V group, with a notable Time \times Condition interaction indicating that the VIPP-V group demonstrated higher self-efficacy at post-test and follow-up compared to the CAU group ($F(1,75) = 5.35$, $p = .024$, $\eta^2 = .067$). In terms of parenting stress, no significant main effects were found; however, a trend toward a reduction in stress was observed for the VIPP-V group from pretest to posttest, although this effect slightly diminished at follow-up ($F(1,75) = 3.52$, $p = .065$, $\eta^2 = .045$).

In the study by Olhaberry M (2019), the Video-Feedback Intervention (VFI) triad found an improvement in parental outcomes such as increased self-efficacy, greater satisfaction, and enhanced self-esteem in the parental role. These outcomes were assessed qualitatively

through participant experiences and observations, highlighting the subjective improvements parents felt in their ability to parent effectively and confidently.

In the Whitehouse (2019) study of the iBASIS-VIPP intervention, the Parenting Sense of Competence (PSOC) scale was used to measure self-reported levels of parenting satisfaction, interest, and efficacy. The findings indicated no significant differences between the intervention and control groups on the PSOC subscales, with an estimated difference of -0.23 (95% CI -0.62 to 0.16). This suggests that the intervention did not have a measurable impact on parents' overall sense of competence in their parenting role.

In the study by Salisbury MR (2022), parenting stress was measured using the Parenting Stress Index (PSI) Short Form, revealing a significant decrease in stress levels over time ($F(1,125) = 26.81, p < .001$), indicating reduced parenting stress. Additionally, parenting sense of competence improved over time in both groups, as measured by the Parenting Sense of Competence (PSOC) scale ($F(1,122) = 10.21, p < .01$), with parents in the KEEP-P group reporting greater gains than those in the KEEP-V group ($M(SD) = 2.14 (3.39)$ vs $.30 (4.84)$, respectively). The Interpersonal Mindfulness in Parenting (IEMP) scale showed increases in awareness, non-judgment, and non-reactivity, with significant improvement over time ($F(1,126) = 5.29, p < .05$). These results suggest that the KEEP-P intervention was more effective in improving parental competence and mindfulness compared to the KEEP-V group.

Feasibility. In the study by Constanza et al., (2021), the primary parental outcome was the change in caregivers' use of NDBI strategies, measured by the Measure of NDBI Strategy Implementation-Caregiver Change (MONSI-CC). The findings indicated no significant changes in MONSI-CC scores for either the NDBI+VF or NDBI groups. However, the study highlighted the feasibility of integrating video feedback into a community-based early intervention program, with high levels of implementation and

acceptability reported by both caregivers and clinicians. The intervention did not increase attrition rates or affect service utilization, suggesting it did not impose an additional burden on participants.

In the study by Aiello et al., (2022) examining the Early Start Denver Model (ESDM), the primary parental outcome was compliance with the intervention, which was measured by the percentage of sessions attended by at least one parent out of a total of 24 sessions. The findings revealed that the video feedback modality had the highest compliance rate ($M = 0.93$), followed by live streaming ($M = 0.74$), and parental psychoeducation ($M = 0.51$). In terms of participation satisfaction, the video feedback modality had significantly higher ratings ($M = 22.33$, $SD = 2.55$) compared to both live streaming ($M = 17.81$, $SD = 5.07$) and parental psychoeducation ($M = 8.00$, $SD = 3.16$), with the latter showing the lowest compliance and highest drop-out rates.

Additionally, most participants reported being satisfied or very satisfied with the intervention, with satisfaction ratings of $M = 4.67$ ($SD = 0.70$) for video feedback, $M = 4.27$ ($SD = 1.17$) for live streaming, and $M = 3.50$ ($SD = 1.23$) for psychoeducation. However, there were no statistically significant differences in satisfaction among the modalities ($F(2,27) = 2.19$, $p = 0.13$). In terms of perceived utility, 90% of participants judged the experience useful, with no significant differences across the modalities ($F(2,27) = 0.22$, $p = 0.80$). Finally, telehealth parent training was evaluated as effective ($M = 4.07$, $SD = 1.03$), but again, there were no statistically significant differences in perceived efficacy between the different delivery methods ($F(2,27) = 0.32$, $p = 0.78$). These results suggest that the video feedback modality was most effective in engaging parents, although satisfaction and perceived utility were high across all formats.

The Cleary et al., (2022) iBASIS-VIPP study, demonstrated initial feasibility in a general population sample, showing high levels of acceptability, implementation, practicality, and integration. Participants reported benefits from the program, with high attendance rates and plans to continue using the skills learned. To improve practicality, participants suggested reducing the number of antenatal sessions. The primary parental outcome, acceptability, was measured through parent questionnaires and semi-structured interviews. Findings indicated that parents found the program beneficial, particularly in enhancing their understanding of infant communication and increasing their confidence in parenting.

3.4 Discussion

The reviewed interventions not only highlighted improvements in child behaviour and developmental outcomes post intervention but also demonstrated significant positive effects on parental outcomes, particularly in stress reduction, self-efficacy, and competence.

For children with developmental disabilities and behavioural problems, interventions like PPEY significantly reduced conduct problems and hyperactivity (Sharry et al., 2005), while the RFI study showed increased interactive behaviours such as joint attention (Kim et al., 2005). Interventions like VIPP-SD had specific neurobiological effects, reducing basal cortisol levels and externalizing behaviours in children with the DRD4 7-repeat allele, highlighting the importance of parental discipline strategies (Bakermans-Kranenburg et al., 2008). In addition, the Muenster Parental Programme showed an increase in vocalizations in infants with hearing loss, indicating positive effects on communication development (Glanemann et al., 2013).

In children with autism, VIPP-AUTI improved child-initiated joint attention skills, although other domains such as play variation and child responsiveness showed no significant differences (Poslawsky et al., 2015). Similarly, VIG interventions with prelingual deaf children increased child responsiveness and involvement (Lam-Cassettari et al., 2017; Wadnerkar Kamble et al., 2020). In terms of overall developmental progress, Constanza et al. (2021) found that the NDBI+VF group exhibited improvements in social communication, visual reception, and expressive language. Furthermore, KEEP-P and KEEP-V interventions demonstrated significant improvements in behavioural regulation and executive functioning, particularly inhibitory control, across both groups (Salisbury et al., 2022).

From a parental outcomes perspective, a common trend across interventions is the reduction of parenting stress and improvements in self-efficacy and competence. Sharry et al. (2005) reported a significant reduction in parental stress, with effects maintained at a 5-month follow-up. The RFI intervention showed reductions in stress related to parent-child relationships (Kim et al., 2005), while VIPP-AUTI increased parental self-efficacy, though both the intervention and control groups reported high satisfaction levels (Poslawsky et al., 2015). In Lam-Cassettari (2017), a significant increase in parental self-esteem was observed, further indicating the benefits of video-feedback interventions.

Interventions like KEEP-P and KEEP-V showed greater improvements in parental competence and mindfulness, with the KEEP-P group reporting more substantial gains than the KEEP-V group (Salisbury et al., 2022).

Olhaberry et al. (2019) found improvements in self-efficacy, satisfaction, and self-esteem in the VFI triad intervention, emphasizing the subjective improvements parents felt in their ability to parent effectively.

Several interventions resulted in enhanced parent-child interactions. For instance, Sharry et al. (2005) observed an increase in positive parent-child interactions and a reduction in parent-child instructions, with parents meeting significant parent-defined goals. Similarly, the RFI intervention enhanced maternal interactive behaviours, particularly in responsiveness and affect (Kim et al., 2005). VIPP-SD successfully promoted maternal sensitive discipline, significantly improving parental use of these techniques (Bakermans-Kranenburg et al., 2008). In the Muenster Parental Programme, a significant improvement in responsive parental behaviours such as dialogic echo was observed, with a reduction in initiative behaviour (Glanemann et al., 2013).

The VIPP-AUTI intervention also led to a significant reduction in parental intrusiveness (Poslawsky et al., 2015). Meanwhile, the DIR/FT intervention enhanced reflective functioning capacities in parents (Sealy & Glovinsky, 2016). Furthermore, VIG interventions have shown improvements in parental sensitivity, structuring, and non-hostility (Lam-Cassettari et al., 2017; Wadnerkar Kamble et al., 2020), and de Oliveira (2023) reported improvements in mother-child interactions, particularly in the teaching domain.

Improvements in parental well-being, such as reduced stress and enhanced self-efficacy, were consistently associated with positive child outcomes across multiple studies. For example, interventions like PPEY not only reduced parental stress but also led to significant reductions in behavioural problems and hyperactivity in children (Sharry et al., 2005). Similarly, VIPP-AUTI was effective in increasing parental self-efficacy, which was linked to improvements in joint attention skills in children with autism (Poslawsky et al., 2015). Enhanced parental self-esteem following VIG interventions was also associated with improvements in child responsiveness and involvement, emphasizing the role of parental confidence in fostering child development (Lam-Cassettari et al., 2017).

In cases where parents were reported to be more attuned to their child's emotional and developmental needs, such as in the RFI study (Kim et al., 2005), child interactive behaviours improved significantly. Similarly, the reduction in externalizing behaviours observed in children with the DRD4 7-repeat allele was directly tied to improved parental use of sensitive discipline after the VIPP-SD intervention (Bakermans-Kranenburg et al., 2008). This shows that when parents learn and apply effective strategies, such as sensitive discipline and responsiveness, children demonstrate significant behavioural and developmental improvements.

Despite the overall positive trends, some interventions failed to produce significant results. For example, Platje et al. (2018) found no significant improvements in parental sensitivity or parent-child interaction quality in the VIPP-V group. Similarly, Whitehouse (2019) reported no significant changes in parenting satisfaction or efficacy following the iBASIS-VIPP intervention. One potential explanation for these null findings is the complexity of the behaviours being targeted, as certain skills or behavioural changes (e.g., sensitivity or competence) may require more time or different methods to observe measurable improvements. Additionally, Poslawsky et al. (2015) found no significant improvements in play levels or child responsiveness following VIPP-AUTI, suggesting that while the intervention was effective in specific areas (like joint attention), its broader effects on play behaviour were limited.

These inconsistencies may also be due to methodological issues, such as short intervention durations, small sample sizes, or the use of less sensitive measurement tools that fail to capture the full range of changes in parental behaviour and child development.

The findings of this systematic review were consistent with existing research on video-feedback interventions' influence on improvement in behavioural and developmental outcomes in children with developmental disabilities (Aldharman et al, 2023, Provenzi et al, 2020). The promotion of positive parenting and relational interventions has been consistently advocated in the field of ND, as they have the highest probability of resulting in long-lasting protective effects on child development and family well-being (Spittle and Treyvaud, 2016).

3.4.1 Limitations

A recurring limitation across many studies is the small sample size (Sharry, 2005; Kim, 2005; Bakerman, 2008; Glanemann, 2013; Poslawsky, 2015; Sealy, 2016; Cassetarri, 2017; Whitehouse, 2019; Wadnerkar, 2020; Costanza, 2021; Aiello, 2022; Cleary, 2022; Oliveira,

2023), which reduces the statistical power of the findings and increases the risk of Type I errors, limiting the ability to detect significant effects and generalize results to larger populations.

Many of the studies, such as Kim (2005) and Bakerman (2008), lacked long-term follow-up assessments, focusing primarily on short-term outcomes, which leaves questions about the sustained effectiveness of the interventions. The absence of control groups in some studies (Sharry, 2005; Salisbury, 2022) further weakens the validity of their conclusions, as changes observed could be due to factors unrelated to the intervention itself. In addition, selection bias due to high educational levels or specific participant demographics (Aiello, 2022; Glanemann, 2013) reduces the applicability of findings to broader populations.

A number of studies, such as Oliveira (2023), relied heavily on self-reported measures and did not incorporate objective assessments or inter-rater reliability, raising concerns about subjectivity and potential bias in the findings. Other methodological issues, such as imbalances in child variables between groups (Glanemann, 2013) and lack of randomization (Olhaberry, 2019), further limit the validity of the outcomes.

Technological barriers and logistical challenges, particularly in the use of video feedback (Costanza, 2021), also contributed to incomplete data and high participant burden. Additionally, the lack of robust statistical methods and reliance on non-parametric tests (Oliveira, 2023) further limits the strength of the findings.

3.4.2 Future directions

Future research should focus on addressing these methodological concerns by increasing sample sizes to improve statistical power and the generalizability of results. Incorporating control groups and randomization to strengthen the validity of findings and conducting

long-term follow-ups to assess the sustained impact of interventions. Using objective measures alongside self-reports will help reduce bias and improve the reliability of the outcomes. Triad video-feedback interventions (mother-father-child) could be implemented as they have been found to be feasible and reported greater self-efficacy in the parental role (Olhaberry et al., 2017).

Conclusion

Parenting children with developmental disabilities presents unique challenges that affect both the child and family well-being. Recent advancements, such as video-feedback interventions, show promise in improving parent-child interactions and enhancing developmental outcomes. Video-feedback involves recording parent-child interactions and reviewing them with a therapist to promote better parenting strategies. Despite the potential of these interventions, a comprehensive synthesis of their effectiveness was still lacking. Studies suggest positive outcomes, including improved parental sensitivity, reduced stress, and better child social-emotional development, but these results were scattered and vary based on settings, methodologies, and child conditions. Therefore, a systematic review of the current evidence was conducted to better understand the effectiveness of these interventions, identify gaps in the literature, and provide recommendations for future research and practice.

The systematic review underscores the substantial benefits of parent-focused interventions on both child development and parental well-being, especially in reducing behavioural issues and improving parent-child interactions. These interventions consistently enhanced parental sensitivity, self-efficacy, and confidence, while promoting turn-taking, and joint attention, and reducing externalizing behaviors in children. Tailored approaches, particularly those integrating video feedback, proved highly effective in fostering responsive caregiving and improving overall family dynamics. However, the review also highlights key limitations, such as small sample sizes, lack of control groups, and short intervention durations, which limit the generalizability and reliability of findings. Future research should focus on larger, randomized trials with long-term follow-ups and objective measures to better assess the sustained impact of these interventions.

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