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To cite this article: Alperen Avcı & Duygu Yalman Polatlar (27 Mar 2026): A Family-Mediated Behavioral Home Literacy Program to Support Developmental Vulnerabilities: Habilitative Outcomes for Preschoolers Exhibiting Sluggish Cognitive Tempo (SCT)/Cognitive Disengagement Syndrome (CDS), *Child & Family Behavior Therapy*, DOI: [10.1080/07317107.2026.2650305](https://doi.org/10.1080/07317107.2026.2650305)

To link to this article: <https://doi.org/10.1080/07317107.2026.2650305>



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A Family-Mediated Behavioral Home Literacy Program to Support Developmental Vulnerabilities: Habilitative Outcomes for Preschoolers Exhibiting Sluggish Cognitive Tempo (SCT)/Cognitive Disengagement Syndrome (CDS)

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ABSTRACT

This study examined the effects of a family-mediated, naturalistic behavioral home literacy intervention on preschool children exhibiting Sluggish Cognitive Tempo (SCT)/Cognitive Disengagement Syndrome (CDS). Using a mixed design with three parent–child dyads, changes in the home literacy environment, parent–child interaction patterns, and children's early literacy, numeracy, and executive function–related performance were evaluated. Results indicated intervention-related behavioral improvements in parents' literacy-supportive behaviors and positive interaction patterns, alongside marked and sustained gains in children's task engagement, academic performance, and executive functioning. Overall, the findings highlight the potential of parent-mediated behavioral home literacy interventions as effective habilitative supports for preschool children with attentional and self-regulatory vulnerabilities.

ARTICLE HISTORY

Received 11 January 2026
Revised 16 March 2026
Accepted 17 March 2026

KEYWORDS

Home literacy environment; sluggish cognitive tempo; cognitive disengagement syndrome; preschool children

Introduction

High-quality interactions within early childhood education and care (ECEC) environments are critical for children's cognitive, social, and emotional development, particularly for those who are disadvantaged or at developmental risk (Pianta et al., 2020; Siraj-Blatchford et al., 2002). Within this broader ecological context, the Home Literacy Environment (HLE) has been conceptualized as a foundational microsystem that supports children's early language exposure, scaffolds emerging literacy skills, and provides predictable learning routines shaped by parents' attitudes, responsiveness, and resources (Hood et al., 2008; Sénéchal & LeFevre, 2014). Empirical

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 Supplemental data for this article can be accessed online at <https://doi.org/10.1080/07317107.2026.2650305>.

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research consistently demonstrates that enriched HLEs contribute not only to vocabulary and early literacy development but also to early numeracy skills and self-regulatory capacities through shared reading, parent–child dialogue, and cognitively stimulating home activities (Barnes & Puccioni, 2017; Frijters et al., 2000; Manolitsis et al., 2013; Niklas et al., 2016). However, it is important to acknowledge that dialogue-based parent–child interactions represent only one pathway through which children’s cognitive and social development may be supported.

Developmental research increasingly recognizes that children’s learning environments vary across cultural contexts, and that practices supporting neurodevelopment may differ substantially across societies (Henrich et al., 2010; Keller, 2018; Rogoff, 2003). In many communities, children’s development is fostered not only through structured literacy interactions but also through play-based learning, collaborative family activities, storytelling traditions, and everyday participation in shared social practices. Recognizing these diverse developmental pathways is essential in order to avoid overly narrow assumptions about the forms of interaction that support children’s learning.

Consistent with this broader perspective, research has highlighted the role of diverse intervention approaches in supporting children’s cognitive and social development. For instance, play-based and collaborative activities have been shown to enhance engagement and social interaction in developmental contexts (LeGoff, 2004; Vegni et al., 2023). Similarly, technology-mediated environments, including video-based or digital social learning platforms, have been proposed as innovative contexts for promoting interaction and participation in learning activities (Babb et al., 2020). Multisensory and creative practices such as storytelling combined with hands-on activities may also contribute to children’s listening skills, spatial reasoning, and memory processes (Petrell Kallevig, 2009). Recognizing this diversity of developmental supports, the present study focuses specifically on a family-mediated home literacy approach as one structured pathway among many possible ways of supporting children’s developmental competencies. Home literacy environments provide repeated opportunities for joint attention, guided participation, and scaffolded interaction between parents and children, making them a meaningful context for examining parent-mediated support for children exhibiting attentional and engagement-related vulnerabilities.

Parent-mediated interventions implemented in natural environments have been reported to enhance the quality of children’s educational experiences by increasing their learning opportunities (Leijten et al., 2016). For parent education programmes to be structured effectively, factors such as the child’s developmental level, individual needs, cultural context, and families’ access to resources should be taken into consideration (Coople

& Bredekamp, 2009) In this context, one of the most concrete areas where parent-mediated interventions are implemented within the home is the Home Literacy Environment (HLE). The home literacy environment is defined as a multidimensional construct encompassing children's literacy-related activities with family members at home, their access to written materials and resources within the household, and parents' attitudes, habits, and interaction patterns related to literacy (Bracken & Fischel, 2008; Burgess et al., 2002; Justice et al., 2016; Weigel et al., 2006)

A substantial body of research has demonstrated the long-term benefits of early intervention practices for children's cognitive, academic, and social development (Kirk & MacCallum, 2017). Such interventions facilitate the early identification of developmental difficulties and support children's adaptation to educational environments by strengthening competencies related to school transition. However, the existing literature predominantly focuses on early intervention programmes targeting specific diagnostic groups such as autism spectrum disorder, attention-deficit/hyperactivity disorder, language disorders, and learning disabilities (Er-Sabuncuoglu & Diken, 2010; Howlin et al., 2009; Passolunghi & Lanfranchi, 2012). Consequently, interventions targeting children who experience difficulties in attention, processing speed, and self-regulation during early childhood but do not fall within a clearly defined diagnostic category remain relatively limited.

Within this emerging line of inquiry, Sluggish Cognitive Tempo (SCT) more recently referred to as Cognitive Disengagement Syndrome (CDS) has attracted increasing scholarly attention as a profile of attention-related difficulties characterized by slowed cognitive processing, excessive day-dreaming, mental fogginess, low initiative, and hypoactivity (Barkley, 2013; Becker et al., 2016, 2023) Although SCT/CDS is not currently classified as an independent diagnostic disorder within major diagnostic systems, accumulating empirical evidence suggests that it represents a distinguishable attentional profile that is partially independent from Attention-Deficit/Hyperactivity Disorder (ADHD), particularly the inattentive presentation (Burns & Becker, 2021; Servera et al., 2018). Recent scholarship suggests that CDS is now at an important conceptual crossroads, with growing psychometric evidence and an expanding literature base pointing to the need for more theory-driven, developmentally sensitive, and intervention-focused research (Becker, 2025).

Children exhibiting elevated SCT/CDS symptoms often demonstrate patterns of internally oriented attention characterized by mind wandering, task-unrelated thoughts, and disengagement from external task demands (Becker et al., 2022a; Becker & Barkley, 2021). In everyday learning contexts, these attentional patterns may manifest as slow task initiation, reduced persistence in goal-directed activities, diminished motivation, and

difficulties sustaining engagement with cognitively demanding tasks. Qualitative findings further indicate that children and parents may perceive CDS/SCT as a profile with both burdens and relative strengths; although daydreaming and mental disengagement may at times be linked to imagination or psychological escape, these behaviors are also described as interfering with academic functioning, routines, emotional adjustment, and self-esteem (Becker et al., 2022b). Consequently, SCT/CDS has been associated with functional difficulties across multiple domains including academic performance, executive functioning, classroom participation, and learning engagement (Becker et al., 2022a; Fredrick & Becker, 2023; Langberg et al., 2014).

Importantly, SCT/CDS-related difficulties extend beyond cognitive functioning and also involve emotional and interpersonal processes. Children displaying elevated SCT/CDS symptoms have been reported to show higher levels of internalizing difficulties, including anxiety, emotional withdrawal, and reduced social participation (Becker et al., 2016; Inci Izmir et al., 2025; Tahillioğlu et al., 2024). These findings suggest that children exhibiting SCT/CDS characteristics may be particularly sensitive to the quality of family interaction patterns and home-based learning support.

The intervention design of the present study was conceptually informed by behavioral intervention frameworks and broader developmental theories emphasizing the role of social interaction and environmental context in children's learning. From a behavioral perspective, structured routines, repeated practice, and responsive feedback can strengthen attentional engagement and self-regulation in young children (Barkley, 2013; Kazdin, 2001). Parent-mediated interventions are particularly effective in early childhood because caregivers serve as proximal agents who organize children's learning environments and reinforce adaptive behavioral patterns (Landry et al., 2006; Sheridan et al., 2011).

These principles are also consistent with Social Cognitive Theory, which posits that children acquire cognitive and behavioral competencies through modeling, guided interaction, and reciprocal engagement with caregivers (Bandura, 1986). In home literacy contexts, parent-child interactions provide opportunities for attentional scaffolding, language modeling, and shared regulation of learning behaviors, which support early cognitive development (Niklas & Schneider, 2017; Sénéchal & LeFevre, 2014).

In addition, the intervention aligns with sociocultural and ecological perspectives on development. According to Sociocultural Theory, children's cognitive growth occurs through socially mediated interactions with more knowledgeable others who provide guidance and scaffolding within everyday activities (Vygotsky, 1980). Similarly, Ecological Systems Theory emphasizes the central role of the family environment as a primary microsystem shaping children's developmental trajectories (Bronfenbrenner, 1979).

Within this framework, the home literacy environment represents a context in which repeated parent–child interactions can foster attentional engagement, early academic skills, and self-regulation.

Previous research suggests that structured home learning environments and parent-mediated interventions can positively influence attentional engagement, language development, and self-regulation in young children, including those exhibiting developmental vulnerabilities. Studies on children with attention-related difficulties, such as ADHD, have shown that enriched home learning environments and responsive parent–child interactions can support attentional control, behavioral regulation, and early academic skills (Landry et al., 2006; Niklas & Schneider, 2017; Sénéchal & LeFevre, 2014). Similarly, parent-mediated interventions have demonstrated beneficial effects on communication, engagement, and learning behaviors in children with developmental differences such as autism spectrum conditions (Beaudoin et al., 2019; Kasari et al., 2014).

Although intervention studies focusing specifically on Cognitive Disengagement Syndrome (CDS), previously referred to as Sluggish Cognitive Tempo (SCT), remain relatively limited in early childhood populations, the behavioral characteristics associated with this profile, such as reduced attentional engagement, slowed behavioral initiation, and difficulties sustaining cognitive effort suggest that structured and interactive learning environments may be particularly beneficial. Home literacy practices provide repeated opportunities for shared attention, guided participation, and scaffolded engagement with learning tasks, which may support attentional regulation and cognitive activation in young children.

This rationale is also consistent with qualitative evidence indicating that parents of youth with elevated SCT symptoms commonly identify academic functioning, mind wandering, daily routines, emotional functioning, and self-esteem as key targets for intervention (Becker et al., 2022b). Importantly, the present study does not assume that the intervention is unique or specific to CDS. Rather, CDS symptoms were used as a focal vulnerability profile because this phenotype remains understudied in preschool intervention research and is theoretically linked to difficulties in task initiation, sustained engagement, and cognitive activation.

For these reasons, a home literacy-based intervention was selected as a developmentally appropriate and ecologically valid approach. Unlike clinic-based interventions, home-based programs allow learning activities to occur within children's natural environments and enable caregivers to provide continuous scaffolding and structured engagement in everyday contexts.

From a behavioral intervention perspective, many components of the program, such as dialogic reading, structured questioning, guided play, and routine-based learning activities can be conceptualized as naturalistic

behavioral interventions that increase children's opportunities for active responding and sustained engagement. Such strategies may be particularly relevant for children exhibiting symptoms of SCT/CDS, whose learning difficulties are often associated with passive disengagement, reduced cognitive activation, and low task initiation (Becker et al., 2016, 2023).

Within this framework, structured parent-mediated learning interactions may function as a form of behavioral activation and attentional scaffolding, helping children remain cognitively engaged during learning activities. These findings extend behavioral parent training approaches by demonstrating that structured home literacy routines may also function as behaviorally oriented engagement supports for children with SCT/CDS-related attentional vulnerabilities.

The present study therefore examines the effectiveness of a structured, dialogic home literacy program implemented through parent-mediated interactions for preschool children exhibiting symptoms of SCT/CDS. Specifically, the study investigates how targeted home-based practices influence the quality of the home literacy environment, parent-child interaction patterns, early literacy and numeracy skills, and components of executive functioning. In the present study, the term "habilitative outcomes" refers to developmental gains in emerging competencies, rather than the restoration of previously lost functions, through structured support targeting literacy, numeracy, executive functioning, and parent-child engagement. By situating SCT/CDS within a family-centered behavioral and habilitative framework, this research aims to address existing gaps in the literature and provide practical implications for behavioral clinicians, family therapists, and professionals working with young children presenting attentional and self-regulatory vulnerabilities.

Research Questions

1. Does participation in the Home Literacy Program Intervention significantly improve the quality of the home literacy environment among parents of children with SCT/CDS symptoms?
2. Does the intervention significantly enhance the quality of parent-child relationships?
3. Does participation in the intervention significantly improve early literacy, numeracy, and executive function skills in children with SCT/CDS symptoms?
4. Does participation in the Home Literacy Program Intervention lead to a reduction in SCT/CDS symptom levels, as evaluated by parent ratings at post-test and follow-up?

Hypotheses

- **H1:** The intervention will lead to significant improvements in the quality of the home literacy environment.
- **H2:** Participating parents will demonstrate more positive interaction patterns with their children.
- **H3:** Children will show significant gains in early literacy, mathematics, and executive function skills following the intervention.
- **H4:** Participation in the Home Literacy Program Intervention will significantly reduce the severity of SCT/CDS symptoms, as reflected in parent and/or teacher ratings at post-test (and follow-up, if applicable).

Method

This study aimed to strengthen high-quality family–child interactions and enhance home–school continuity through the Dialogic Home Literacy Program Intervention designed for preschool children exhibiting SCT/CDS symptoms. A multi-level methodological design was used, integrating a pretest/post-test quasi-experimental approach at the parent/environment level ($n=3$) with a single-case experimental design (AB + follow-up) at the child level. This structure enabled systematic monitoring of individual behavioral change while also evaluating group-level improvements in parent–child interaction and the home literacy environment.

The Dialogic Home Literacy Program Intervention was implemented as a family-mediated, naturalistic behavioral intervention grounded in principles of applied behavior analysis and behavioral parent training. The intervention was designed to modify functional behaviors related to attention regulation, task engagement, and parent–child interaction quality within everyday home routines, rather than targeting isolated academic skills alone.

Target behaviors included (a) sustained attention during shared activities, (b) task initiation and completion, (c) verbal responsiveness and expressive engagement, and (d) positive parent–child interaction patterns such as contingent responding, joint attention, and turn-taking. These behaviors were operationally defined prior to implementation and systematically monitored across baseline, intervention, and follow-up phases.

Behavior change strategies embedded within the intervention included modeling, prompting, shaping, repetition, and natural reinforcement. Parents were trained to provide immediate and contingent verbal and social reinforcement (e.g., praise, expansion, shared affect) following desired child behaviors. When disengagement or task avoidance occurred, parents were guided to use structured routines, redirection, and increased instructional clarity rather than punitive or corrective strategies.

Parents served as the primary agents of behavior change, implementing intervention procedures within naturally occurring home activities such as shared book reading, play-based learning routines, and daily problem-solving interactions. This parent-mediated delivery model was selected to maximize ecological validity and ensure consistency across home contexts.

Participants

Participants were selected through criterion-based sampling using a multi-stage screening procedure. In the first stage, 489 preschool children aged 60–72 months were screened using the Barkley Child Attention Scale (Barkley, 2013), which was completed independently by both teachers and parents. Consistent with screening approaches commonly used in the SCT/CDS literature, elevated SCT/CDS symptom presentation was defined using item-level frequency ratings rather than normative cutoffs. Children were considered at risk for SCT/CDS if they received ratings of 3 (“often”) or 4 (“very often”) on at least five items of the scale. A more conservative threshold indicating high SCT/CDS symptom presentation was defined as ratings of 3 or 4 on seven or more items. Based on these criteria, 12 children met the threshold for elevated SCT/CDS symptoms according to both parent and teacher reports.

In the second stage, additional inclusion criteria were applied. Children were required to (a) demonstrate elevated SCT/CDS symptoms according to both informants, (b) have no prior psychiatric diagnosis, and (c) obtain below-average scores on the Marmara School Readiness Scale. Because the intervention employed a single-case experimental design requiring intensive and repeated measurement across baseline, intervention, and follow-up phases, only children whose families were able to commit to consistent participation in the 12-week home-based program and complete the full assessment protocol were considered eligible for the intervention phase.

Of the 12 children who met the screening threshold, three children satisfied all inclusion criteria and had families willing and able to participate in the full intervention and data collection process. These three cases were therefore selected for the intervention phase of the study.

Importantly, none of the participating children had a prior diagnosis of Attention-Deficit/Hyperactivity Disorder (ADHD), and available parent and teacher reports did not indicate a symptom pattern consistent with clinically significant ADHD presentation. This distinction was considered important given the documented conceptual overlap between SCT/CDS and ADHD symptoms.

The final sample consisted of three children aged between 60 and 72 months (two girls and one boy). The participating children were 68,

68, and 65 months old, respectively, and their duration of preschool attendance ranged from 6 to 24 months.

The demographic characteristics of the participating families varied across several dimensions. In terms of parental education, the mothers held associate or bachelor's degrees, whereas the fathers held associate, bachelor's, or doctoral degrees. Occupational backgrounds also differed and included positions such as homemaker and civil servant. Reported family income levels represented low, middle, and high socioeconomic categories, indicating socioeconomic diversity within the sample.

With respect to geographical context, one family resided in a village, one in a district center, and one in a city center. Family size also varied, with the number of children in the household ranging from two to four.

Regarding parental participation in the intervention, one primary caregiver from each family implemented the program activities. In two families, the mother carried out the intervention, whereas in one family, the father was responsible for implementing the activities with the child. Prior to the implementation phase, participating parents received brief orientation training and subsequently conducted the intervention within naturalistic home routines.

The variation observed in socioeconomic background, geographical context, and family structure contributed to the ecological validity of the study by allowing the intervention to be implemented across different family environments.

Data Collection Procedures and Analysis

Participant selection was conducted using the Barkley Child Attention Scale (Barkley, 2013; Firat et al., 2018; $\alpha = .86$) and the Marmara School Readiness Scale (Polat Unutkan, 2003; $\alpha = .93$). Because the participants in the present study were between 60 and 72 months of age, and age-based normative cutoff scores are not currently available for this preschool age group for the Barkley Sluggish Cognitive Tempo Scale, the instrument was used as a criterion-based screening tool rather than a diagnostic measure. The purpose of the scale in this study was to identify children showing elevated SCT/CDS symptom presentation according to parent and teacher ratings, rather than to establish a clinical diagnosis.

Prior to data collection, the developmental appropriateness of the scale items for children within this age range was carefully evaluated. Three independent experts a child development specialist, an early childhood education specialist, and a child and adolescent psychiatrist reviewed the item content and confirmed that the behavioral descriptions were developmentally interpretable and applicable for children aged 60–72 months. Based on this evaluation, the scale was considered suitable for use as a

screening instrument for identifying elevated symptom patterns in the present sample. Based on their evaluations, the scale was considered suitable for use as a screening instrument in the present study. Intervention effectiveness was assessed using researcher-developed Early Literacy, Early Mathematics, and Executive Function Skill Assessment Forms, which were validated through expert review. In addition, the Parent–Child Relationship Scale (Hetherington, 2008; (Aytaç et al., 2018); $\alpha = .81-.80$) and the Home Literacy Environment Scale (Laçin & Doğan, 2023; $\alpha = .90$) were used to evaluate changes in parent–child interaction quality and the home literacy environment.

The intervention consisted of a 12-week parent-mediated home literacy program implemented in the natural home environment. The program was organized into three sequential modules targeting key school readiness domains: emergent literacy, early mathematics, and executive functions. Each module lasted four weeks and included structured activities embedded in shared book reading, play-based learning, and everyday family routines.

The intervention program was developed based on research on home literacy environments, parent-mediated learning, and behavioral learning principles emphasizing structured routines, modeling, and guided participation in early learning contexts (Niklas & Schneider, 2017; Sénéchal & LeFevre, 2014). The design also incorporated principles from dialogic reading approaches and early childhood learning frameworks that highlight the role of parent–child interaction in supporting language, cognitive, and self-regulation development.

Before the intervention began, parents participated in a two-week orientation phase designed to introduce the principles of home literacy and demonstrate how the activities could be implemented with their children. During this phase, parents received two instructional booklets explaining home literacy practices and interactive reading strategies, as well as video demonstrations illustrating examples of phonological awareness games, counting activities, and executive-function exercises. These materials were designed to enable parents to implement the activities independently within daily family routines.

Following the orientation phase, parents implemented the activities with their children three to four times per week, with each session lasting approximately 20–30 minutes. Activities followed a standardized format including the activity title, learning objectives, required materials, duration, and step-by-step implementation procedures. Parents were encouraged to integrate these activities into natural family contexts such as shared book reading, playtime, and everyday problem-solving situations.

Throughout the intervention, the researcher provided ongoing mentoring and feedback to support parents' implementation of the activities and ensure consistency across families. This mentoring process included regular

Table 1. Overview of the 12-Week parent-mediated home literacy intervention.

Week	Module	Example Activities	Parent Role	Target Skills
1	Emergent Literacy	Interactive reading, print awareness games	Model dialogic questioning and encourage child responses	Print awareness
2	Emergent Literacy	Word search games, phonological awareness tasks	Provide prompts and scaffold vocabulary use	Vocabulary and phonological awareness
3	Emergent Literacy	Letter recognition, drawing and storytelling	Guide child responses and reinforce participation	Letter knowledge and pre-writing skills
4	Early Mathematics	Counting games, object grouping, movement counting	Use guided questioning and feedback	Number sense
5	Early Mathematics	Pattern construction, block sequencing	Encourage reasoning and verbal explanation	Part-whole reasoning
6	Early Mathematics	Measurement and comparison games	Prompt predictions and support problem solving	Measurement concepts
7	Executive Functions	Routine planning activities	Structure task sequences and reinforce attention	Attention regulation
8	Executive Functions	Role-play and flexibility games	Encourage shifting perspectives and responses	Cognitive flexibility
9	Executive Functions	Cooperative problem solving	Model turn-taking and collaborative strategies	Social problem solving
10	Integrated Skills	Classification and storytelling tasks	Support narrative organization and reasoning	Narrative reasoning
11	Integrated Skills	Dramatic play and sequencing games	Facilitate emotional understanding and dialogue	Empathy and event sequencing
12	Integrated Skills	Story creation and planning activities	Encourage reflection and independent planning	Planning and reflection

communication with parents and clarification of activity instructions when necessary. An overview of the weekly intervention structure is presented in Table 1.

Baseline performance was defined as the mean of three stable pre-intervention measurements and plotted as a single point based on single-case design recommendations (Kratochwill et al., 2010; Ledford & Gast, 2018). Follow-up assessments were collected two and four weeks after each module to examine maintenance of gains.

Child-level progress was analyzed through percentage of correct responses, *Tau-U* trend analyses, and Non-overlap of All Pairs (NAP). Visual displays included phase lines, trend lines, and non-overlapping data points following standard single-case graphing conventions.

Changes in parent-child interaction and home literacy environment were analyzed through pretest/post-test comparisons. Due to the small sample size ($n = 3$), both dependent-samples *t*-tests and Wilcoxon Signed-Rank Test were conducted to ensure robustness. Effect sizes (Cohen's *d*) were calculated to interpret the magnitude of improvement.

In order to examine whether improvements observed in literacy, mathematics, and executive function skills occurred independently of changes in sluggish cognitive tempo/cognitive disengagement syndrome (SCT/CDS)

symptoms, SCT/CDS scores were also analyzed across measurement points. The 12-item SCT scale was scored by summing item responses (1–4), yielding a total score ranging from 12 to 48, with higher scores indicating greater symptom severity. For each participant, total SCT/CDS scores were calculated and reported for pretest, post-test, and follow-up measurements. Reporting total scores allowed direct observation of the magnitude of raw change in SCT/CDS symptoms across phases of the intervention.

Reliability and Implementation Fidelity

To ensure rigor, 30% of sessions were video-recorded and evaluated independently using a Fidelity Monitoring Checklist. Inter-rater agreement, calculated via the (Miles and Huberman, 1994) method, reached 100% across all modules and families, demonstrating full procedural fidelity. Interobserver reliability for child performance data, established through double coding of 30% of sessions, also reached 100%, confirming strong internal reliability.

Results

This section presents the findings related to the research questions concerning the effectiveness of the Home Literacy Program Intervention. The results are structured around two main themes aligned with the study's problem statements:

1. Findings Related to Parent–Child Interaction
2. Findings Related to School Readiness and Child Skill Development

All reported outcomes are presented as intervention-related behavioral changes observed across parent- and child-level measures.

Findings Related to Parent–Child Interaction

The first research question examined whether participation in the Home Literacy Program Intervention improved the quality of the home literacy environment among families of children with SCT/CDS symptoms.

This aspect was assessed using the Early Home Literacy Behaviors Scale. Table 2 presents the pretest, post-test, and follow-up results for this measure.

As shown in Table 2, parents' Early Home Literacy Behaviors scores showed a significant intervention-related increase, rising from pretest ($M=84.00$, $SD=6.56$) to post-test ($M=108.00$, $SD=10.39$). The paired-samples t -test indicated that this improvement was statistically significant, $t(2) = 5.22$, $p = .04$, with a large effect size, $d=1.28$; 95% CI [0.45, 2.05].

According to Cohen (1988), this qualifies as a large effect (threshold: $d=0.80$). The Wilcoxon Signed-Rank Test also revealed a consistent directional trend, although the p -value did not reach statistical significance ($Z=-1.60$, $p=.08$), further supporting the reliability of the result despite the small sample.

At the follow-up stage ($M=104.00$, $SD=8.54$), scores remained close to the post-test level, with no statistically significant difference, $t(2)=0.98$, $p=.43$. This pattern indicates that intervention-related gains in literacy-supportive parenting behaviors were maintained beyond the active intervention phase.

Overall, findings should be interpreted with caution due to the exploratory nature of the study and small sample size; however, the observed effect size ($d=1.28$) indicates a substantial magnitude of change in parent-child interaction behaviors following the intervention.

The second research question examined whether participation in the intervention led to a statistically significant change in the quality of the parent-child relationship.

To evaluate this change, the Parent-Child Relationship Scale was used.

Table 3 presents the pretest, post-test, and follow-up results obtained from this measure.

As shown in Table 3, parents' positive relationship scores increased substantially from pretest ($M=35.00$, $SD=3.61$) to post-test ($M=44.33$, $SD=4.16$). This improvement was statistically significant, $t(2)=4.32$, $p=.05$, and was associated with a large effect size ($d=1.10$, 95% CI [0.30, 1.90]). Although the Wilcoxon Signed-Rank Test did not reach significance ($Z=-1.60$, $p=.078$), its directional consistency provides convergent support for the observed gains. At follow-up ($M=43.67$, $SD=4.04$), scores remained stable, with no significant decline from post-test, $t(2)=0.48$, $p=.67$. This pattern indicates maintenance of intervention-related improvements in positive interaction behaviors over time.

For the negative relationship dimension, parents' scores decreased from pretest ($M=16.33$, $SD=1.53$) to post-test ($M=11.33$, $SD=1.53$). Although the change did not reach statistical significance, $t(2)=3.95$, $p=.06$, the associated effect size was moderate-to-large ($d=0.95$, 95% CI [0.25, 1.75]). The Wilcoxon Signed-Rank Test yielded a comparable non-significant trend ($Z=-1.60$, $p=.078$). Follow-up scores ($M=12.00$, $SD=1.00$) indicated a slight increase relative to post-test, but this change was not statistically significant, $t(2)=0.69$, $p=.55$. Overall, these results indicate reductions in controlling and negative interaction behaviors, with effects generally sustained during the follow-up period, though statistical interpretation remains limited due to the very small sample.

Table 2. Comparison of pretest, post-test, and follow-up scores of parent measures using paired-samples t-test and wilcoxon signed-rank test.

Measure	N	Pretest <i>M</i> (<i>SD</i>)	Post-Test <i>M</i> (<i>SD</i>)	Follow-Up <i>M</i> (<i>SD</i>)	Δ_1	<i>t</i> (2)	<i>p</i>	<i>Z</i>	<i>p</i>	Δ_2	<i>t</i> (2)	<i>p</i>	<i>d</i> [95% CI]
Early Home Literacy Behaviors (EVOD)	3	84.00 (6.56)	108.00 (10.39)	104.00 (8.54)	+24.00	5.22	.04*	-1.60	.08	-4.00	0.98	.43	1.28 [0.45–2.05]

Note.

Δ_1 = pretest to post-test change; Δ_2 = post-test to follow-up change.
t values represent paired-samples *t* tests; *Z* values represent Wilcoxon signed-rank tests.
p values are two-tailed. CI = confidence interval.

Table 3. Comparison of pretest, post-test, and follow-up scores on the parent–child relationship scale using paired-samples t-test and wilcoxon signed-rank test.

Measure	N	Pretest <i>M</i> (<i>SD</i>)	Post-Test <i>M</i> (<i>SD</i>)	Follow-Up <i>M</i> (<i>SD</i>)	Δ_1	<i>t</i> (2)	<i>p</i>	<i>Z</i>	<i>p</i>	Δ_2	<i>t</i> (2)	<i>p</i>	<i>d</i> [95% CI]
Parent–Child Relationship (Positive)	3	35.00 (3.61)	44.33 (4.16)	43.67 (4.04)	9.33	4.32	.05*	-1.60	.08†	-0.67	0.48	.67	1.10 [0.30–1.90]
Parent–Child Relationship (Negative)	3	16.33 (1.53)	11.33 (1.53)	12.00 (1.00)	-5.00	3.95	.06	-1.60	.08	0.67	0.69	.55	0.95 [0.25–1.75]

Note.

Δ_1 = pretest to post-test change; Δ_2 = post-test to follow-up change.
t values represent paired-samples *t* tests; *Z* values represent Wilcoxon signed-rank tests.
p values are two-tailed. CI = confidence interval.

Children's School Readiness Level

This section of the study focuses on evaluating the impact of the Home Literacy Program Intervention on the school readiness levels of children exhibiting SCT/CDS characteristics. The research employed a single-case, multiple-baseline (A–B–follow-up) design conducted with three participants.

For each child, data were systematically collected across three phases: baseline (A phase), intervention (B phase), and follow-up (maintenance phase).

Findings on Early Literacy Skills

Visual analysis of the Early Literacy Skill Performance graphs across the A–B–follow-up phases ([Figure 1](#)) revealed systematic, replicable, and consistent pattern of intervention-related behavioral improvement in task performance.

- **Participant X:** Baseline = 45% → Intervention = 80% → Follow-Up = 90%
- **Participant Y:** Baseline = 35% → Intervention = 70% → Follow-Up = 85%
- **Participant Z:** Baseline = 20% → Intervention = 50% → Follow-Up = 70%

The mean increase between baseline and intervention phases was approximately 40%, indicating substantial gains across participants. Visual analysis indicated very low data overlap between phases (approximately 18%), suggesting a strong intervention effect. In addition, the visual effect size (Tau-U) was estimated at $\approx .82$, further supporting the presence of a substantial intervention effect (Parker et al., 2011; Scruggs and Mastropieri, 1998).

Trend lines indicated positive linear trajectories, with a mean $R^2 \approx .85$, reflecting consistent improvement across sessions. Accuracy rates during the follow-up phase remained close to post-test levels, indicating maintenance of behavioral gains over time.

These results demonstrate that, despite attention and task initiation challenges associated with SCT/CDS, the participants exhibited parallel developmental gains.

Findings on Early Mathematics Skills

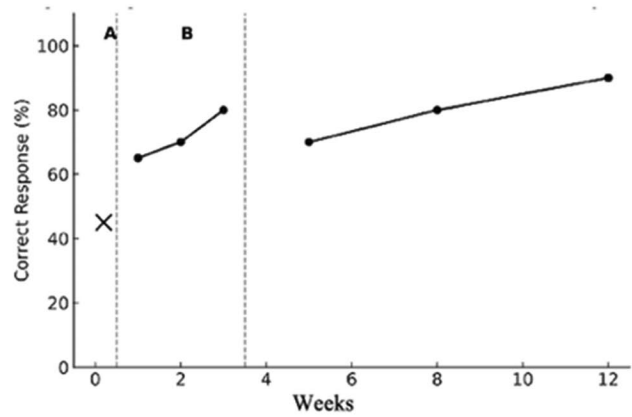
Visual analysis of the Early Math Skill Performance graphs [Figure 2](#) revealed that all three participants showed substantial improvement following the intervention;

- **Participant X:** Baseline = 45% → Intervention = 80% → Follow-Up = 85%
- **Participant Y:** Baseline = 40% → Intervention = 90% → Follow-Up = 90%
- **Participant Z:** Baseline = 30% → Intervention = 60% → Follow-Up = 70%

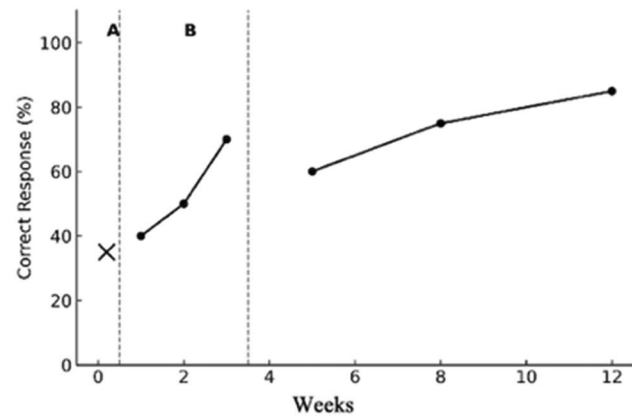
The average improvement from baseline to intervention was approximately 45%. Visual analysis indicated very low data overlap between phases

Early Literacy Skill Performance in the AB Process

Participant X



Participant Y



Participant Z

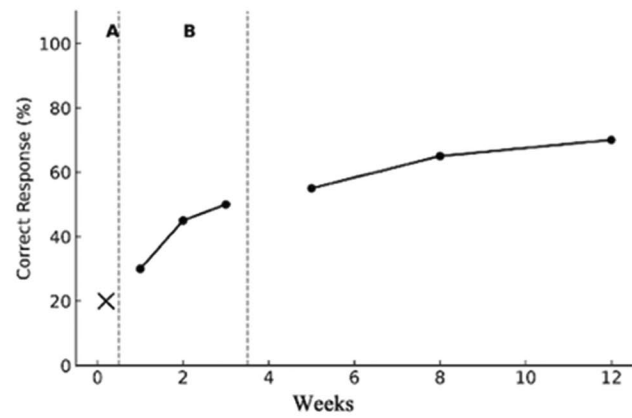


Figure 1. Early literacy skill performance in the A-B process.

(approximately 15%), suggesting a strong intervention effect. Consistent with this pattern, the effect size estimate ($\text{Tau-U} \approx .85$) also indicated a substantial intervention effect.

The trend lines were consistently positive and linear, with a mean $R^2 \approx .88$, indicating steady weekly growth in accuracy rates. Performance levels during the follow-up phase remained near post-test levels, suggesting that mathematical concepts were retained over time.

These outcomes were observed across participants, including improvements in planning-related performance, sustained attention, and inhibitory control. This supports the notion of literacy–numeracy integration, where shared cognitive and linguistic strategies promote broader academic development.

Findings on Executive Function Skills

This section examines the impact of the Home Literacy Program Intervention on children's executive function skills. Related performance data are presented in [Figure 3](#).

- **Participant X:** Baseline = 55% → Intervention = 95% → Follow-Up = 90%
- **Participant Y:** Baseline = 80% → Intervention = 100% → Follow-Up = 95%
- **Participant Z:** Baseline = 40% → Intervention = 70% → Follow-Up = 80%

The average gain from baseline to intervention was 35%. Visual inspection indicated minimal overlap between baseline and intervention data (approximately 18%), and the effect size estimate ($\text{Tau-U} \approx .83$) further supported the presence of a strong and consistent intervention effect.

Trend lines were steeply positive, with an average $R^2 \approx .90$, reflecting a systematic and predictable developmental trajectory in executive function performance across sessions.

Notably, the follow-up phase confirmed the maintenance of gains, indicating that executive function improvements were not transient but sustained over time.

Despite the cognitive slowing and attentional challenges commonly associated with the SCT/CDS profile, children demonstrated consistent behavioral improvements in planning-related performance, sustained attention, and inhibitory control. These outcomes suggest that structured, home-based interventions can generate neurodevelopmentally responsive and generalizable impacts, even among children with processing delays.

Replication, Reliability, and Overall Trends

The presence of similar directional improvements across all three participants meets the criterion for inter-case replication (Horner et al., 2005). This suggests that the intervention's effects were not only individual but also functionally generalizable across cases.

While raw percentage data for each skill × participant combination is included in [Appendix I](#), the main text presents only summary trend Tables (e.g., *NAP*, *Tau-U*) and graphical analyses.

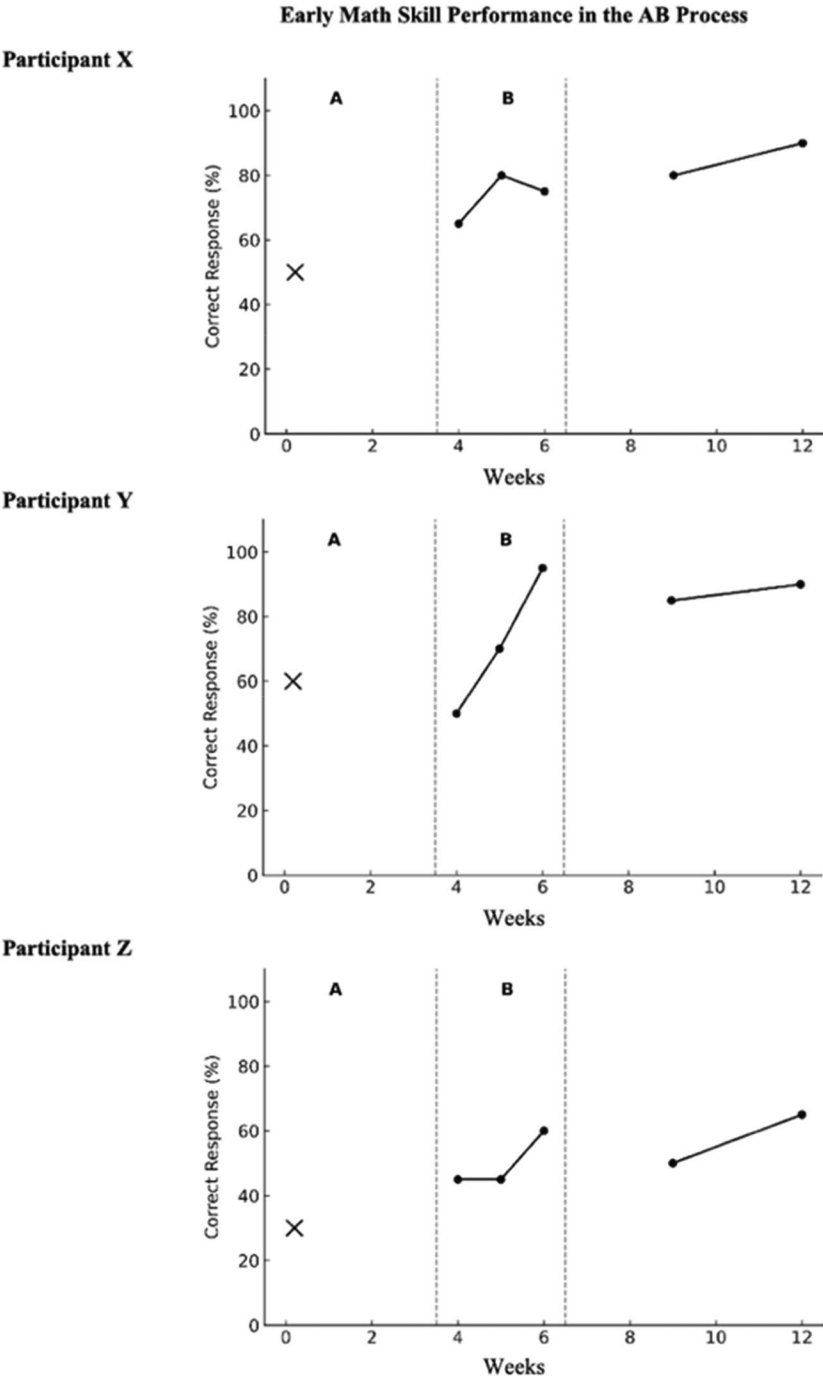


Figure 2. Early math skill performance in the A–B process.

Visual data showed low data overlap (<20%), positive trend slopes, high-level changes ($\geq 35\%$), and stable follow-up performance, consistent with established benchmarks for meaningful effects in single-case research.

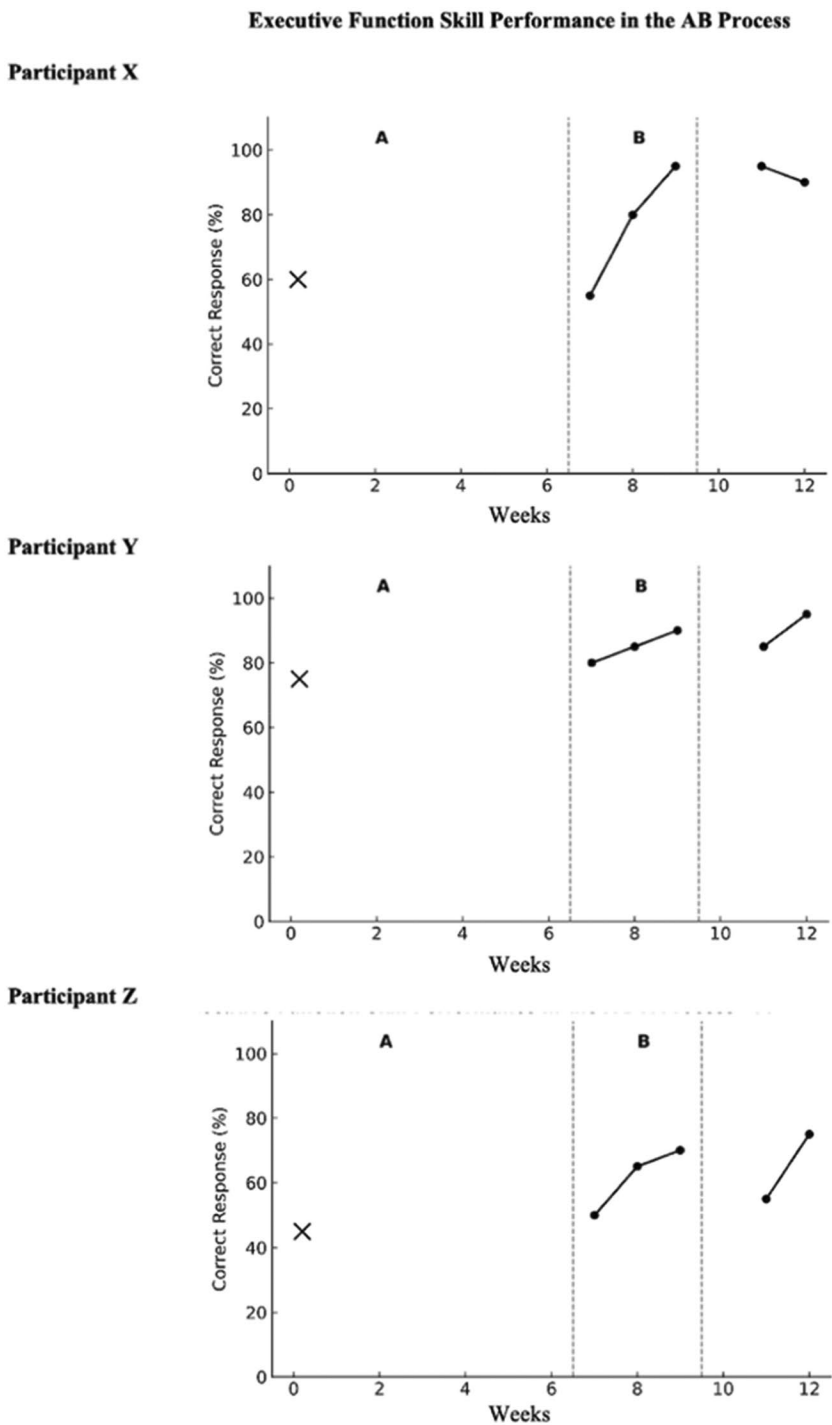


Figure 3. Executive function skill performance in the A–B process.

Collectively, visual analyses indicated consistent directional changes, low data overlap, and stable performance during follow-up across participants.

Changes in Sluggish Cognitive Tempo/Cognitive Disengagement Syndrome (SCT/CDS) Symptoms

Sluggish Cognitive Tempo/Cognitive Disengagement Syndrome (SCT/CDS) symptoms were examined across measurement points using the total scores obtained from the 12-item SCT scale. Higher scores indicate greater symptom severity.

As shown in Table 4, all three participants demonstrated reductions in SCT scores from pretest to follow-up. Child 1’s score decreased from 41 at pretest to 36 at post-test and further declined to 26 at follow-up. Child 2 showed a reduction from 39 at pretest to 31 at post-test, with a follow-up score of 29. Similarly, Child 3’s score decreased from 42 at pretest to 39 at post-test and showed a substantial decline to 21 at follow-up.

Overall, the pattern of results indicates a gradual reduction in SCT/CDS symptom severity across participants, with the most pronounced decreases observed at the follow-up assessment.

Discussion

From a child and family behavior therapy perspective, the present findings support the effectiveness of parent-mediated, naturalistic behavioral interventions delivered within everyday family routines. Consistent with behavioral parent training models, embedding behavior change strategies into parent–child interactions appears to enhance ecological validity and maintenance of treatment effects. Unlike clinic-based or therapist-delivered interventions, the current approach positioned parents as continuous agents of behavior change, allowing behavioral gains to generalize across contexts and persist beyond the intervention period. This aligns with evidence indicating that family-mediated behavioral interventions promote sustained improvements in attention regulation, engagement, and interactional quality in early childhood.

The present study provides evidence that a structured, dialogic home literacy program intervention can produce meaningful improvements in parent–child relational quality and HLE quality, as well as in children’s early learning skills, and may also contribute to reductions in observable SCT/CDS symptom levels among preschool children exhibiting SCT/CDS. Although reductions were observed in negative parent–child interaction

Table 4. Sluggish cognitive Tempo/Cognitive Disengagement syndrom (SCT/CDS) total scores across measurement points.

Child	Pretest (Total)	Post-test (Total)	Follow-up (Total)
Child 1	41	36	26
Child 2	39	31	29
Child 3	42	39	21

scores, these changes did not reach statistical significance. This finding may partly reflect the limited statistical power associated with the very small sample size of the present study. However, it is also possible that dysfunctional interaction patterns are inherently more resistant to change and may require more intensive or clinically oriented interventions. Home literacy-based interventions primarily aim to enrich learning environments, increase positive engagement, and structure everyday educational routines rather than directly targeting entrenched relational or behavioral difficulties. Previous research indicates that reducing negative interaction patterns often requires structured behavioral parent training or therapeutic interventions designed to address coercive interaction cycles and emotional regulation processes (Eyberg et al., 2008; Sanders, 1999). Therefore, while the present intervention appears effective in strengthening positive interactional behaviors, addressing persistent negative interaction patterns may require additional clinical or therapeutic support.

Improvements in parents' positive interaction behaviors and reductions in negative relational patterns align with prior findings demonstrating that parent-mediated interventions strengthen emotional climate, responsiveness, and joint engagement within the home (Fay-Stammbach et al., 2014; Sheridan & Garbacz, 2022). These relational gains are particularly noteworthy given that children with elevated SCT/CDS symptoms frequently present with emotion-regulation difficulties, withdrawal tendencies, and reduced motivation (Inci Izmir et al., 2025; Tahillioğlu et al., 2024). Thus, enhanced parental sensitivity and reduced controlling behaviors observed in this study may constitute an important habilitative mechanism that supports children's regulatory functioning and engagement.

At the child level, gains in early literacy, numeracy, and executive function skills were consistent with research showing that cognitively stimulating home literacy and numeracy routines enhance foundational academic skills (Mol et al., 2009; Ramani & Siegler, 2008). The parallel improvement across domains suggests shared developmental pathways, echoing studies identifying strong connections between language, symbolic reasoning, and early number competencies (Manolitsis et al., 2013; Napoli & Purpura, 2018). These cross-domain increases may be especially relevant for children with SCT/CDS, whose difficulties often span processing speed, working memory, and attentional persistence (Hartman et al., 2004; Langberg et al., 2014). The dialogic structure of the intervention likely supported attentional networks and executive processes by providing repeated opportunities for guided conversation, prediction, and joint problem-solving mechanisms that are theorized to facilitate "cognitive synchronization" in SCT/CDS (Horowitz-Kraus & Hutton, 2015, 2018).

Parent-child relationship improvements and the stabilization of gains in the follow-up period also align with literature showing that naturalistic,

home-embedded interventions promote long-term behavioral change by integrating learning into daily routines (Bordelon & Bradley, 2019; Dai et al., 2018). Particularly for children with neurodevelopmental vulnerabilities and limited access to rehabilitation services, parent-mediated interventions are considered both feasible and effective habilitative strategies (Liang et al., 2022; Warren et al., 2011). The sustained effects observed in this study suggest that brief, structured parent training can serve as a practical, low-intensity model that supports families living in rural or underserved contexts.

The findings also resonate with emerging SCT/CDS research indicating that academic difficulties in this population cannot be attributed solely to cognitive slowing but are influenced by emotional climate, interaction quality, and contextual support (Bauermeister et al., 2012; Becker et al., 2022a). These findings are also broadly consistent with qualitative work indicating that families experience SCT/CDS not only as an attentional style, but as a pattern affecting academic routines, emotional functioning, mind wandering, and self-perceptions in everyday life (Becker et al., 2022b). In this sense, the intervention's dual emphasis on literacy skills and relational processes addresses both the cognitive and socio-emotional dimensions of SCT/CDS, a combination rarely examined in intervention studies to date. Future studies should build on these preliminary findings through larger, theory-informed intervention trials capable of clarifying whether changes in engagement, parent-child interaction, and home learning structure represent proximal mechanisms for reducing SCT/CDS-related functional difficulties, an issue that remains central in the next phase of SCT/CDS research (Becker, 2025).

The findings of the present study may have practical implications for clinicians, child development specialists, and educators working with young children exhibiting attentional disengagement and learning-related vulnerabilities. In particular, for practitioners implementing Cognitive Behavioral Therapy (CBT) or family-based interventions, the results highlight the potential value of integrating structured parent-mediated learning routines into intervention planning. Dialogic parent-child interactions, structured routines, and guided engagement may function as naturalistic behavioral activation strategies that support task initiation, sustained attention, and self-regulation in young children. At the same time, these findings are relevant for child development professionals and early childhood educators, as they demonstrate how structured home literacy environments and parent-child learning interactions can support school readiness and engagement in everyday contexts. Thus, family-centered, home-based learning practices may complement both clinical and educational interventions by extending support for attention regulation and behavioral engagement beyond therapeutic or classroom settings.

Conclusion

This study demonstrated that the Home Literacy Program Intervention led to meaningful improvements at both the parent and child levels. Results indicated that parents showed a clear increase in behaviors that support their child's learning at home, such as reading aloud, engaging in phonological awareness activities, and discussing printed materials. These behaviors were not only adopted during the intervention but largely sustained post-intervention, pointing to an improvement in home literacy quality. Follow-up measurements confirmed that these positive interaction patterns were largely maintained, suggesting durable effects.

At the child level, consistent and lasting improvements were observed across early literacy, mathematics, and executive function domains. The substantial gains between baseline and intervention, as well as maintained progress during the follow-up phase, demonstrate that the intervention was both effective and durable. The parallel increase in literacy and numeracy performance suggests that meaning-focused and code-focused activities worked complementarily. Progress in executive function points to strengthened planning, attentional control, and cognitive flexibility.

Overall, the pattern of results indicates a gradual reduction in SCT symptom severity across participants, with the most pronounced decreases observed at the follow-up assessment. These reductions may be associated with improvements in the quality of the home literacy environment and strengthened parent-child interactions observed during the intervention period, which may have contributed to more structured engagement, increased attentional support, and more responsive learning interactions within the home setting.

In summary, the Home Literacy Program Intervention enhanced both parent-child interactions and early learning outcomes among children exhibiting SCT/CDS symptoms. These findings support the use of structured, dialogic, home-based interventions for children with attentional and processing challenges.

Limitations

Several limitations should be considered when interpreting the findings. First, the very small sample size (three parent-child dyads) restricts the generalizability of results. Although the single-case design enabled a fine-grained examination of individual change, larger and more diverse samples are needed to determine whether similar effects can be replicated across broader developmental populations.

Second, the parent-mediated implementation, while intentionally chosen to enhance ecological validity, may have introduced variability in fidelity due to differences in parents' literacy skills, instructional experience, and home routines. Future studies could employ hybrid home-school delivery models or

structured coaching to reduce this variation. Additionally, as a parent-mediated, naturalistic behavioral intervention, outcomes may have been influenced by individual differences in parental responsiveness, consistency, and implementation style, despite the use of fidelity monitoring procedures.

Third, weekly measurement intervals and reliance on parent-report instruments may have limited measurement precision and increased susceptibility to common-method bias. Incorporating teacher ratings, independent observations, digital learning analytics, or longitudinal follow-up assessments would strengthen methodological rigor and provide a fuller picture of sustained effects.

Fourth, the study focused specifically on children exhibiting SCT/CDS symptoms. Although this contributes to an underexplored area, future research should examine whether similar home literacy effects occur among children with other developmental conditions such as autism spectrum disorder (ASD), specific learning disorders (SLD), developmental language disorder (DLD), or ADHD to explore cross-condition similarities in home-based habilitative processes.

Finally, cultural and contextual factors may have influenced parent engagement and child responsiveness. Replication across diverse socioeconomic and cultural settings is recommended to determine whether adaptations are needed for different communities.

Despite these limitations, the findings offer preliminary evidence for the value of dialogic, home-based literacy interventions as a habilitative support for children with SCT/CDS-related vulnerabilities and potentially other developmental profiles.

Acknowledgements

This article is derived from the findings of the first author's doctoral dissertation and was prepared using the data collected as part of the dissertation research. The authors were equally involved and contributed to the research processes.

Author's Contribution

CRedit: **Alperen Avci**: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Writing – original draft, Writing – review & editing; **Duygu Yalman Polatlar**: Conceptualization, Resources, Supervision, Writing – original draft, Writing – review & editing.

Consent to Participate

Parental consent and children's verbal assent were obtained.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Statement Regarding Informed Consent

Informed consent was obtained from the parents and themselves of all individual participants included in the study.

Statement Regarding Ethical Approval

The study protocol has been approved by Mus Alparslan University unit of Scientific Research and Ethical Review Board (Report Number: 03.06.2025).

Statement Regarding Research Involving Human Participants and/or Animals

The study was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its following updates.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

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Data availability statement

The data used in this study were collected from children at developmental risk. Due to ethical considerations and confidentiality requirements, the dataset is not publicly available. However, the data can be accessed upon reasonable request by contacting the corresponding author, provided that proper ethical approval is obtained.

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