Internet-delivered Parent-Child Interaction Therapy and Sleep Quality in Children With Developmental Delay: Examining the Mediating Role of Bedtime Resistance Behaviors

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ABSTRACT

Objective: Sleep problems are frequently reported and associated with externalizing behavior problems in young children, especially those with developmental delay (DD). Parent-child interaction therapy (PCIT) led to improved sleep in young children with DD, but research has not examined the effect of internet-delivered PCIT (iPCIT) on sleep quality or changes in bedtime resistance behaviors as a mediator. This study examined iPCIT's effect on sleep quality in young children with DD through its impact on bedtime resistance behaviors.

Method: Participants were from a previously completed randomized controlled trial and included 150 children with DD (*M* age = 36.2 months, SD = 1.0 months) and their caregivers who were randomized to iPCIT or referrals as usual (RAU). Path analyses examined links between treatment condition, post-treatment bedtime resistance, and sleep quality reported at 6-month follow-up.

Results: Treatment condition significantly influenced bedtime resistance behaviors ($\beta = 0.17$, 90% CI, [0.04, 0.29], $p = 0.01$), and these changes, in turn, significantly affected sleep quality reported at 6-month follow-up ($\beta = 0.18$, 90% CI, [0.03, 0.33], $p = 0.02$). Caregivers receiving iPCIT reported fewer bedtime resistance behaviors after treatment and improved child sleep quality at 6-month follow-up than caregivers receiving RAU.

Conclusion: Although effects were smaller than in other studies examining PCIT's effect on sleep, these results highlight how iPCIT led to improved sleep quality in children with DD through changes in bedtime resistance. Further research is needed to explore differences in the effectiveness of in-person versus iPCIT, as well as other mechanisms (such as parenting behaviors) through which iPCIT affects child sleep quality.

Index terms: developmental delay, bedtime resistance behaviors, sleep quality, iPCIT

SLEEP PROBLEMS IN CHILDREN WITH DEVELOPMENTAL DELAY

Sleep problems (e.g., difficulty falling or staying asleep) in children are a public health issue in the United States,[1] and they can affect a child's physical health, daytime behavior, and quality of life.[2] Poor sleep is linked to child medical conditions, such as obesity and insulin resistance, as well as maladaptive daytime behaviors, such as aggression, irritability, inattention, and hyperactivity.[2] Thus, addressing sleep problems is crucial in treating young children with developmental delay (DD), who display double the rate of sleep problems compared with typically developing children.[3]

RELATION BETWEEN SLEEP AND BEHAVIOR PROBLEMS IN CHILDREN WITH DEVELOPMENTAL DELAY

Behavior problems in young children with DD are common and may be exacerbated by sleep problems.[4] Studies have reported that children with an intellectual disability (ID) and sleep disturbances exhibit higher rates of externalizing behavior problems than children with ID and with no reported sleep problems.[5] In addition, higher rates of oppositional behaviors (e.g., aggression, noncompliance) are more common in children with ID and sleep problems than those with ID and no sleep problems.[6]

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Bedtime resistance behaviors in young children encompass a range of oppositional behaviors around bedtime (e.g., stalling, refusing to go to bed). Approximately 25% to 30% of young children exhibit bedtime resistance behaviors, and such behaviors are one of the most common parent complaints to pediatricians.[7] Children who are more compliant at bedtime (i.e., less bedtime resistant) tend to have better overall sleep quality.[8] In addition, children have different biological needs for sleep (e.g., varying sleep duration needs), contributing to bedtime difficulties.[9] Considering the prevalence of oppositional behaviors in children with DD,[10] addressing bedtime resistance behaviors is crucial for enhancing their sleep quality.

PARENTING BEHAVIORS

Child sleep problems are linked to parenting behaviors, such as affection, limit setting, and monitoring, which are positively associated with child sleep regulation.[11] The quality of parent-child interactions, including higher parental sensitivity, led to longer duration of night-time sleep in young children.[12] The connection between parenting behaviors and child sleep quality highlights the importance of evaluating how bedtime resistance behaviors affect overall sleep quality.

In addition to sleep problems, parenting behaviors have been associated with externalizing behavior problems[13] and bedtime resistance behaviors.[14] Parenting behaviors characterized by affection, responsiveness, and consistent discipline correlate with fewer externalizing behavior problems in children.[13] Research suggests children with consistent bedtime routines are more likely to comply with parent directives at bedtime[7] and display fewer bedtime resistance behaviors.[15] Given these findings, the relations between parenting behaviors and child sleep and behavior problems suggest parenting behaviors represent an important target of treatment of young children with DD.

TREATMENT OF SLEEP AND BEHAVIOR PROBLEMS IN CHILDREN WITH DEVELOPMENTAL DELAY

Treatment targeting parenting behaviors has shown efficacy in addressing sleep problems in children with DD.[16] A systematic review and meta-analysis of 9 randomized controlled trials (RCT) involving 690 children with neurodevelopmental disorders found behavioral sleep interventions significantly improved sleep disturbances (e.g., bedtime resistance, night wakings, sleep-onset latency).[17] Moreover, an RCT examining a telehealth-delivered parent-based intervention for insomnia in 62 caregivers of preschool children with autism spectrum disorder (ASD) found those randomized to the intervention demonstrated significant improvements in overall sleep problems, bedtime resistance, and sleep-onset delay compared with those randomized to treatment as usual.[16]

Behavioral sleep interventions for young children with DD show promise but primarily focus on modifying parenting behaviors to establish effective sleep routines, without broadly addressing related parenting behaviors that could also reduce sleep disturbances and behavioral challenges. By contrast, parent-child interaction therapy (PCIT) is a behavioral parenting intervention focused broadly on externalizing behavior problems in young children, which has shown some initial success in reducing sleep problems in 44 young children with DD (n = 44).[18] However, further research is needed to examine PCIT's effectiveness in reducing sleep problems in young children with DD through changes in oppositional bedtime behaviors.

Previous studies examining the effectiveness of in-person PCIT on improving sleep quality in young children with DD did not examine the mediating effect of bedtime resistance behaviors on sleep quality. The current study addresses this gap by investigating the effect of internet-delivered parent-child interaction therapy (iPCIT) on sleep quality in young children with DD through changes in bedtime resistance behaviors. By leveraging a telehealth format and focusing on bedtime resistance as a mediator, this study aims to advance understanding of how iPCIT improves sleep quality in young children with DD.

IPCIT

Despite preliminary evidence that PCIT leads to reductions in sleep problems in young children with DD, barriers (e.g., transportation obstacles, stigma-related concerns) hinder access to traditional clinic-based PCIT.[19] Furthermore, disparities exist in health care quality between children with DD and typically developing children.[20] iPCIT, which includes videoconferencing and real-time coaching with a bluetooth earpiece, overcomes these barriers and extends the reach of behavioral parenting interventions that can reduce sleep problems in young children with DD. Studies show iPCIT is effective in treating externalizing and behavior problems in young children with DD,[21] with high engagement and satisfaction in minoritized families.[22] iPCIT may even outperform clinic-based PCIT[23] due to its improved ecological validity in families' natural home setting. The rising use of telehealth formats of care necessitates further exploration of home-based interventions for sleep problems in young children with DD.

CURRENT STUDY

While traditional clinic-based parenting interventions have shown promise in reducing sleep problems in children with DD, the effect of telehealth parenting interventions on sleep in children with DD remains unexplored, and the mechanisms behind positive sleep outcomes are unclear. Given the prevalence of oppositional behaviors like bedtime resistance in children with DD, further investigation is needed to explore how technology-based parenting interventions delivering real-time coaching at home can influence sleep through changes in bedtime resistance behaviors. The current study aims to examine the indirect effect of iPCIT on sleep problems across time in young children with DD through the intervention's effects on bedtime resistance behaviors. We hypothesize that, compared with caregivers receiving usual care, caregivers receiving iPCIT would report a decrease across time in overall child sleep problems (e.g., difficulty falling or staying asleep, insufficient sleep duration), mediated by decreases in bedtime resistance behaviors.

METHODS

Participants

Baseline descriptive statistics for the sample in the current study are presented in Table 1. Participants were 150 children (*M* age = 36.2 months) and their primary caregivers participating in a RCT[21] examining the efficacy of iPCIT in treating behavior problems in young children with DD. Inclusion criteria for the trial required families to have (1) a 3-year-old child exiting early intervention (EI) services for a DD, (2) a clinically significant score (i.e., T-score >60) on the Externalizing Problems scale of the

Table 1.

Baseline Demographic Variables Across Conditions

Characteristic	Treatment Condition, No. (%)		
	Total (n = 150)	iPCIT Group (n = 75)	RAU Group (n = 75)
Child sex			
Male	111 (74.0)	54 (72.0)	57 (76.0)
Female	39 (26.0)	21 (28.0)	18 (24.0)
Child age, mean (SD), mo	36.20 (1.0)	36.30 (1.3)	36.10 (0.6)
Child ethnicity and race[a]			
Asian	5 (3.4)	1 (1.4)	4 (5.3)
Black/African-American	35 (23.5)	14 (18.9)	21 (28.0)
Hispanic or Latine	105 (70.5)	58 (78.4)	47 (62.7)
Non-Hispanic or non-Latine White	10 (6.7)	3 (4.1)	7 (9.3)
Other[b]	2 (1.3)	0 (0)	2 (2.7)
Child language			
English	96 (64.0)	41 (54.7)	55 (73.3)
Spanish	54 (36.0)	34 (45.3)	20 (26.7)
Parent-reported diagnosis			
Autism and related disorders	32 (42.7)	11 (14.7)	21 (28.0)
Medical and genetic disorders	19 (25.4)	8 (10.7)	11 (14.7)
Speech/language and related delays	14 (18.7)	8 (10.7)	6 (8.0)
Mental health disorders	5 (6.7)	2 (2.7)	3 (4.0)
Primary caregiver education (highest)[c]			
Did not complete high school	14 (9.6)	7 (9.7)	7 (9.5)
Graduated high school	60 (41.1)	27 (37.5)	33 (44.6)
Graduated college	49 (33.6)	25 (34.7)	24 (32.4)
Completed graduate degree	23 (15.4)	13 (18.1)	10 (13.5)
BDI developmental quotient, mean (SD)	74.74 (10.0)	75.23 (9.6)	74.26 (10.4)
SRS total raw score, mean (SD)	72.17 (22.4)	69.65 (23.1)	74.69 (21.6)
CBCL Sleep Composite raw score, mean (SD)	4.66 (3.5)	3.8 (2.8)	5.52 (3.9)
CSHQ Bedtime Resistance score, mean (SD)	12.11 (3.5)	11.69 (3.5)	12.54 (3.4)

[a] Based on 149 primary caregivers who reported ethnic or racial identity data. Percentages add up to more than 100% as categories are not mutually exclusive.
[b] Other race or ethnicity indicate biracial.
[c] Based on n = 146 of primary caregivers who reported education data.
BDI, Battelle Developmental Inventory; CBCL, Child Behavior Checklist; CSHQ, Child Sleep Habits Questionnaire; iPCIT, internet-delivered parent-child interaction therapy; RAU, referrals as usual; SRS, Social Responsiveness Scale.

Child Behavior Checklist (CBCL), and (3) an English-speaking or Spanish-speaking primary caregiver. Exclusion criteria were (1) the child taking medication for behavior problems; (2) child deafness or blindness; (3) the child displaying severe social communication deficits (i.e., score >75 on the Social Responsiveness Scale), although children with ASD were included; or (4) the primary caregiver receiving a standard score of <4 on the vocabulary subtest of the Wechsler Abbreviated Scale of Intelligence for English-speaking families or La Escala de Inteligencia Wechsler Para Adultos, Third Edition (EIWA-III) for Spanish-speaking families. Children were predominantly boys (74%), and caregivers were predominantly mothers (91%).

Procedure

All study procedures were approved by the Florida International University Institutional Review Board. After completing informed consent procedures, eligible families completed a baseline assessment, which included caregivers completing the CBCL and Child Sleep Habits Questionnaire (CSHQ) and were then randomized to receive either iPCIT (n = 75) or referrals as usual (RAU; n = 75). The RAU group received typical referrals provided by their EI site at their EI exit interview for their ongoing challenges but did not receive iPCIT. The treatment group received iPCIT, a telehealth adaptation of PCIT delivered via a secure videoconferencing platform for remote delivery to the home.[19] PCIT comprises 2 stages: child-directed interaction (CDI), where parents are coached to enhance warmth and positivity using "PRIDE" skills (i.e., praising the child, reflecting child statements, imitating the child's play, describing the child's actions, and showing enjoyment) and avoiding questions, commands, and criticisms, and parent-directed interaction (PDI), where parents learn effective discipline strategies and time-out procedures. In iPCIT, real-time coaching is delivered via a caregiver-worn bluetooth earpiece.

Families randomized to iPCIT were given a 20-week window to complete the intervention. After the CDI Teach session and subsequent 5 coaching sessions, families moved to PDI. On average, families completed 9.44 sessions of iPCIT. After 20 weeks, all families were invited to complete a post-treatment assessment, which included caregiver questionnaires, including the CBCL and CSHQ. After 6 months, all families were again invited to participate in a follow-up assessment (Wave 3), consisting of the same caregiver questionnaires administered at baseline (Wave 1) and post-treatment (Wave 2).

In addition to the telehealth format,[19] PCIT was tailored to meet the needs of families of children with DD without altering or systematically modifying the PCIT protocol, consistent with previous research of PCIT for children with DD.[24] For example, expectations for reflections were lowered due to limited child expressive language.

Measures

Bedtime Resistance Behaviors. The CSHQ is a 33-item parent-reported questionnaire designed to examine sleep behavior in

children and shown to be both reliable and valid in community and clinical samples.[25] The CSHQ includes items relating to several common sleep complaints in young children, including bedtime resistance. The Bedtime Resistance subscale ($\alpha = 0.77$ in the current sample) was used as a measure of bedtime resistance at Wave 2. This subscale includes 6 items on a 3-point scale from "usually" (5–7 times/week) to "rarely" (0–1 time/week). Scores on the items are summed (range from 6 to 18), and a higher score is indicative of higher levels of bedtime resistance. The CSHQ, was administered at baseline, post-treatment, and 6-month follow-up assessments.

Child Sleep Quality. The CBCL is a 99-item parent-rated questionnaire for 18 to 60 month olds with excellent psychometric properties.[26] Caregivers respond to each checklist item using a 3-point scale ranging from 0 (not true) to 2 (very true or often true). The CBCL provides an estimate of many areas of a child's functioning over the previous 6 months including sleep. For the present study, the 7-item CBCL Sleep Composite subscale ($\alpha = 0.81$ in the current sample) was used as a valid measure of child sleep quality at Wave 3. Items are summed (range from 0 to 14), with higher scores indicating more problems with sleep quality (e.g., trouble falling asleep, low sleep duration, wakes often). The CBCL was administered at baseline, post-treatment, and 6-month follow-up assessments.

Data Analysis Plan

Path analyses were conducted using Mplus version 8.4 to test the hypothesized longitudinal model examining the link between group and sleep outcomes through changes in bedtime resistance behaviors. The following fit statistics were used to evaluate model fit: χ^2 ($\chi^2 > 0.05$ excellent), Comparative Fit Index (CFI; > 0.90 acceptable, > 0.95 excellent), root mean square error of approximation (RMSEA; < 0.08 acceptable, < 0.05 excellent), and standard root mean square residual (SRMR; < 0.08 acceptable, < 0.05 excellent). Mediation was tested when an "a" path (group to mediator) and "b" path (mediator to sleep quality) involving the same mediator were significant. Full-information maximum likelihood estimation techniques were used to leverage all available data.

Covariates. To enhance the robustness of the model, key baseline variables were included as covariates based on their relevance to child sleep patterns. These included caregiver education, as well as child race, ethnicity, and preferred language. Child sex also was included as a covariate given research indicating boys sleep longer than girls.[27] Finally, body mass index (BMI) was included as a covariate given its inverse relationship with sleep duration.[28]

RESULTS

Descriptive Findings

At Wave 1, caregivers completed the CBCL and CSHQ. The CBCL Sleep Composite subscale showed a mean score of 4.66 (SD = 3.52) for the entire sample, with 67 out of 150 children (44.7%) scoring above 4, indicating sleep disturbances. Specifically, 28 out of 75 children (37.3%) in the iPCIT group and 39 out of 75 children (52%) in the RAU group scored above the cutoff. At Wave 3, the mean score was 3.34 (SD = 3.15) across the sample, with 42 out of 131 children (32.1%) scoring above the cutoff—14 out of 62 children (22.6%) in the iPCIT group and 28 out of 69 children (40.6%) in the RAU group. The CSHQ Bedtime Resistance subscale, which lacks a clinical cutoff, recorded a mean score of 12.07 (SD = 0.73) for the entire sample. Compared with typical scores in a community sample of toddlers and preschool children (n = 383), which had a reported mean of 7.06 (SD = 1.89),[23] the current sample's average is higher, indicating more bedtime resistance behaviors.

Primary Analyses

The model demonstrated excellent fit: χ^2 (24) = 29.99, $p = 0.185$, RMSEA = 0.041 (90% CI, 0.000–0.082), CFI = 0.97, and SRMR = 0.068. Standardized estimates of the direct effects of group on bedtime resistance behaviors, bedtime resistance behaviors on sleep quality, and group on sleep quality are displayed in Figure 1. Group assignment at Wave 1 was associated with bedtime resistance behaviors at Wave 2 ($\beta = 0.17$, 90% CI, [0.04, 0.29], $p = 0.01$), and bedtime resistance behaviors at Wave 2 were associated with sleep quality at Wave 3 ($\beta = 0.18$, 90% CI, [0.03, 0.33], $p = 0.02$). Specifically, caregivers receiving iPCIT reported fewer bedtime resistance behaviors at Wave 2 ($d = 0.49$), which, in turn, was associated with higher levels of child sleep quality at Wave 3 compared with families in the RAU group ($d = 0.45$). However, the indirect effect of Wave 1 group assignment on Wave 3 sleep quality was not significant ($\beta = 0.03$, 90% CI, [−0.35, 1.29], $p = 0.09$).

For the CBCL sleep quality outcome, no covariates showed significant associations. However, language and child sex were significantly associated with bedtime resistance behaviors. Spanish-speaking families reported higher levels of bedtime resistance, and boys were more likely to exhibit these behaviors than girls. Parent education, child ethnicity, race, and BMI were not significantly associated with bedtime resistance.

DISCUSSION

The current study examined the effect of a telehealth parenting intervention, iPCIT,[23] on sleep quality in young children with DD, with a focus on the intervention's impact on bedtime resistance behaviors as an explanatory mechanism for understanding the treatment's lasting effects on sleep quality across time. As hypothesized, children receiving iPCIT showed greater sleep quality improvements at the 6-month follow-up, attributed to reductions in bedtime resistance behaviors reported after the intervention, relative to those in the RAU group. These results align with earlier studies supporting the use of traditional clinic-based behavioral parenting interventions to enhance sleep quality in young children with DD.[18]

To our knowledge, this was the first study exploring the effect of iPCIT on enhancing child sleep quality through reductions in bedtime resistance behaviors. Improvements in child sleep quality may be attributed to changes in parenting behaviors targeted by iPCIT, including enhanced parental monitoring and consistent limit setting, which likely improved bedtime interactions, fostered healthier sleep habits, and enhanced children's self-regulation. Future research should examine *how* changes in parenting behaviors following iPCIT affect child sleep quality.

Furthermore, the findings of this study are significant because they involved families from predominantly underrepresented and underserved backgrounds. Most participants identified with minoritized ethnic and/or racial backgrounds, and almost half of the iPCIT group received treatment in Spanish. The positive

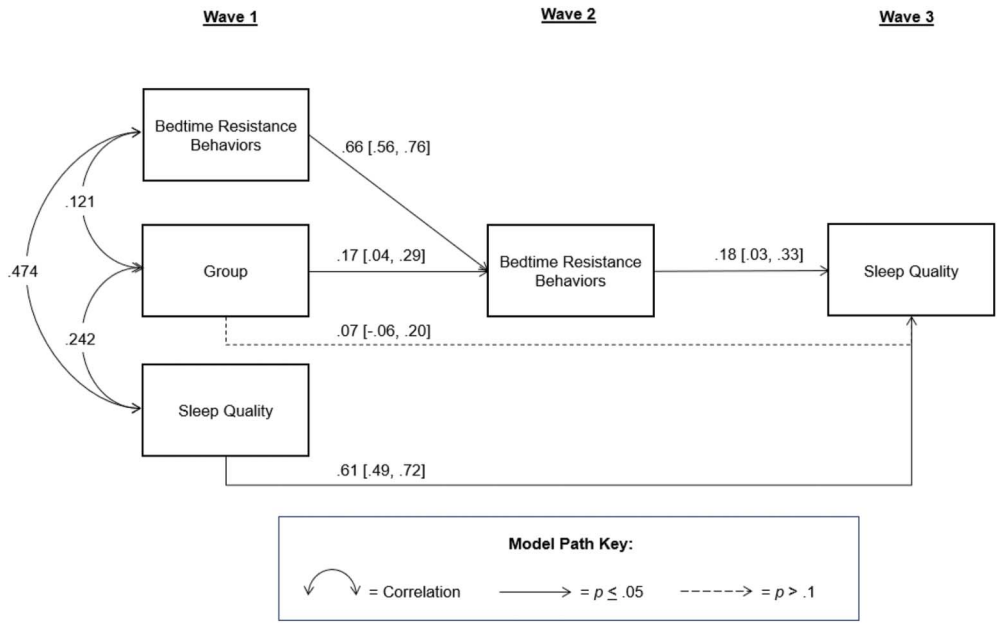

Figure 1. Path diagram. Path diagram of standardized direct effects and associations among group, bedtime resistance behaviors, and sleep quality. Parent education and child sex, language, race, ethnicity, and BMI were included as covariates (controlling for baseline) but are not depicted to simplify presentation of primary results. BMI, body mass index.

outcomes on sleep improvement among children from marginalized backgrounds suggest that iPCIT's core principles are effective across cultural and language differences. These findings align with high satisfaction rates with iPCIT previously reported among Hispanic/Latine caregivers.[22] Overall, these findings provide preliminary evidence that iPCIT can effectively improve sleep quality in children from diverse backgrounds.

Study findings highlight the positive impact of behavioral parenting interventions like iPCIT on sleep outcomes in young children with DD. Caregiver-reported improvements suggest iPCIT can promote better sleep quality in children with DD while addressing broader behavioral challenges, offering a foundation for future research on more tailored approaches. This study enhances understanding of iPCIT's effectiveness and the role of telehealth in expanding care access, particularly in underserved populations facing multiple barriers to care.

This study's results have important clinical implications for children with DD, who display high rates of sleep problems that adversely affect behavior, physical health, and development.[2] A notable challenge faced by families of children with DD is accessing services, making iPCIT a readily accessible treatment option. The study highlights the importance of incorporating key components like fostering parent-child relationships and setting clear boundaries, which are integral to behavioral sleep interventions. In addition, the lack of focus on sleep issues in children with DD underscores the need for more accessible interventions. The current findings represent an important step toward addressing this gap by demonstrating that iPCIT offers an accessible treatment option for families of children with DD and effectively targets behavioral issues.[21]

Interpreting these results requires consideration of some study limitations. First, the original RCT was not designed to examine the effect of iPCIT on sleep. Second, reports of bedtime resistance behaviors and sleep quality were only collected from the caregiver, which was the mother in most cases. Future research should include reports from multiple informants (e.g., coparents, grandparents) for a more comprehensive assessment of child sleep. Third, this study did not examine the variability in biological sleep needs or factors like time spent outdoors, physical activity levels, and meal timing, which are critical for a holistic approach to behavioral sleep medicine. Future research should include these variables in behavioral parenting interventions. Although some cognitive behavioral therapy for insomnia strategies, such as limit setting, overlap with iPCIT components, iPCIT addresses general limit setting and does not directly implement sleep-focused strategies, such as sleep environment adjustments. Fourth, we measured sleep quality based on caregiver report of child bedtime resistance behaviors and sleep quality; thus, expectancy and attention effects cannot be ruled out. While objective measures like actigraphy and polysomnography are effective, their high costs and feasibility challenges limit their applicability in large-scale studies and clinical practice. Although the present measures correlate moderately to strongly with objective measures of sleep quality (e.g., actigraphy and sleep diaries),[29] relying solely on questionnaires can introduce bias. Nonetheless, these measures offer practical and accessible means to assessing child sleep in clinical settings. Future research should adopt a broader multimethod approach to better understand the effects of behavioral parenting interventions on bedtime resistance and sleep quality. Fifth, the sample only included young children with DD; therefore, the findings may not apply to typically developing children with externalizing behavior problems. While specificity in the sample selection limits generalizability, it also represents a key strength of the research—children with DD are at higher risk of sleep problems compared with their typically developing counterparts,[3] highlighting the relevance and necessity of targeting this population. Future research should explore iPCIT's effectiveness in improving sleep quality by modifying bedtime resistance in typically developing children, broadening its applicability and providing comparative insights across developmental levels. Finally, we did not expect caregivers to demonstrate mastery criteria in their

skills within intervention's time limits. While mastery-based PCIT shows excellent outcomes, time-limited approaches can be also effective, especially with logistical constraints.[30] Future research should explore the impact of shorter treatment durations on sleep outcomes in iPCIT.

In addition to these limitations, it is important to consider the sample's power for detecting indirect effects. Although significant direct effects were observed, the indirect effect of Wave 1 group assignment on Wave 3 sleep quality was not significant. This may be due to sample size constraints limiting the ability to detect small but meaningful indirect effects. Future research with larger samples is needed to better assess the efficacy of iPCIT on child sleep quality through changes in bedtime resistance behaviors. The study's smaller effect size compared with in-person PCIT[18] may reflect differences in delivery methods (e.g., reduced direct therapist-child interaction, home environment variability). While iPCIT shows promise in addressing sleep quality by reducing bedtime resistance, the absence of a main effect on sleep quality suggests future research is needed to explore its impact on sleep quality in young children with DD.

Despite these limitations, this study addresses an understudied research area and offers preliminary findings with significant clinical relevance, particularly addressing sleep problems in young children with DD. Sleep problems pose serious risk to the physical and mental health of young children with DD. The current findings suggest that interventions targeting parenting behaviors and telehealth interventions delivered to the home setting can effectively address sleep and behavioral challenges in this high-risk group. Moreover, the study highlights the critical role of reducing bedtime resistance behaviors to enhance sleep quality across time. Future research with additional time points of assessment should examine the transactional interplays between parenting behaviors and child sleep health and how these associations influence one another over the course of development.

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