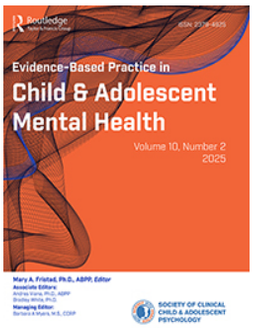

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Examining Change in Callous-Unemotional Behaviors in Young Children with Attention-Deficit/hyperactivity Disorder (ADHD) and Comorbid Disruptive Behavior Disorders: Impact of the Summer Treatment Program for Pre-Kindergarteners (STP-PreK)

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ABSTRACT

Background: Young children with attention-deficit/hyperactivity disorder (ADHD) and comorbid disruptive behavior disorders (DBD) exhibit significant impairments across functional domains, which are compounded by co-occurring callous-unemotional (CU) behaviors.

Objective: This study examined the impact of the Summer Treatment Program for pre-kindergartners (STP-PreK) on reducing callous-unemotional (CU) behaviors in children with and without ADHD and DBD.

Method: This study utilized a multi-informant approach to examine the change in CU behaviors in response to the STP-PreK via parent and teacher report across three time points. The current sample included three groups based on diagnostic status (68.7% boys; mean age = 5.47, SD = 0.77, 81.4% Latinx): ADHD Only ($n = 46$), ADHD+DBD ($n = 129$), and typically developing (TD; $n = 148$).

Results: Linear mixed models revealed significant initial differences in CU scores, with ADHD+DBD displaying higher CU scores, followed by ADHD Only, and then TD. Per teacher report, both ADHD groups experienced substantial decrease in CU behaviors over time, with moderate effect sizes (Cohen's $d = .67$-$.71$). At the 1-year follow-up, children in the ADHD Only group no longer significantly differed from TD peers, while the ADHD+DBD group continued to exhibit significantly higher CU scores.

Conclusion: The findings suggest that the STP-PreK has a positive impact on reducing CU behaviors in children with ADHD during the transition to kindergarten or first grade. Understanding and addressing CU traits in early childhood may contribute to improved treatment outcomes and long-term social-emotional development.

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder that is marked by symptoms of inattention, hyperactivity, and impulsivity (Barkley, 2014), and is one of the most common reasons for referrals of young children to mental health agencies (Bitsko et al., 2022; Centers for Disease Control and Prevention, 2023). ADHD affects about 5% to 10% of school-age children and adolescents (Bitsko et al., 2022; Perou et al., 2013), and is even more common among preschool children (Huaqing Qi & Kaiser, 2003). Children diagnosed with ADHD are more likely to experience a variety of negative outcomes compared to their typically developing (TD) peers, including lower academic achievement (Arnold et al., 2020), impaired social functioning (Ros & Graziano, 2018), and worse emotion regulation (Bunford et al., 2015; P. A. Graziano & Garcia, 2016), which are exacerbated by comorbid disruptive behavior disorders (DBD; Cuffe et al., 2020; Liu et al., 2017), such as oppositional defiance disorder (ODD) and conduct disorder (CD). Due to the high prevalence rates and significant impairments associated with ADHD and comorbid DBD, it is not surprising that a great deal of research has focused on psychosocial interventions, with the Summer Treatment Program (STP) emerging as one of the most widely regarded and effective multimodal psychosocial treatments for children with ADHD and comorbid DBD (Pelham & Hoza, 1996; for a description of the STP; Fabiano et al., 2014).

Over the last 15 years, the STP has been adapted for preschoolers transitioning into kindergarten, with similar success in not only improving general

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externalizing behavior problems (EBP), but also other school readiness outcomes (e.g., self-regulation and academic functioning; P. A. Graziano et al., 2014). Part of the STP for pre-kindergartners' (STP-PreK) successful adaption is due to the recognition of the importance of addressing children's emotion dysregulation, which has not only been identified as a core impairment among children with ADHD (Barkley & Fischer, 2010; Bunford et al., 2015; P. A. Graziano & Garcia, 2016), but also a contributing factor in the development of DBDs (Steinberg & Drabick, 2015). Callous-unemotional traits (CU) is one emotion dysregulation domain that amplifies impairments associated with ADHD and DBDs (Haas et al., 2018; Waschbusch et al., 2015), and can attenuate the response to evidence-based treatments (D. J. Hawes et al., 2014). Given the role of CU traits in the development and treatment of DBDs, the current study examines the extent to which the STP-PreK can reduce CU behaviors in a sample of young children with ADHD and co-occurring DBDs, compared to their TD peers.

Callous-unemotional traits (CU) and treatment

CU traits ("behaviors" when considered in early childhood) refer to low levels of empathy and guilt, reduced emotional sensitivity, and apathy toward rules (Frick et al., 2014). Children with DBDs and high levels of CU engage in the most pervasive, severe, and aggressive patterns of anti-social behavior (Frick et al., 2013) and have significantly worse treatment outcomes compared to children with low levels of CU (D. J. Hawes & Dadds, 2005; D. J. Hawes et al., 2013; Kimonis et al., 2014; Waschbusch, Carrey, et al., 2007). Notably, CU behaviors can be reliably identified in preschool children (Kimonis et al., 2016) and as young as age three (Ezpeleta et al., 2013). Such CU behaviors are also distinguishable from general symptoms of DBDs (Willoughby et al., 2011). A review by Waller et al. (2020) highlights different developmental precursors (e.g., fearlessness and low social affiliation) of CU behaviors in preschoolers versus more general DBD symptoms such as oppositionality. CU behaviors, most notably empathy, has also been identified as one of four domains of emotion dysregulation (i.e., emotion regulation, emotion knowledge, and reactivity/lability; see P. A. Graziano & Garcia, 2016) that differentiate children with ADHD + DBD and AHDH only from typically developing children, which may further explain the heterogeneity in trajectories associated with later functional impairments (Hernandez et al., 2024).

Although prior work proposes that CU traits are stable across childhood and adolescence (Frick et al., 2014), studies have documented significant variability in trajectories of these traits beginning in early childhood (Fanti et al., 2017), suggesting that CU behaviors in young children may be amenable to treatment. In fact, several treatment outcome studies identified in a review document improvements in CU symptoms in response to treatment (D. J. Hawes et al., 2014), particularly those involving *social-learning-based parent training*. A review by Wilkinson et al. (2016) also found that four out of seven intervention studies showed a reduction in levels of CU behaviors, allbeit none of the studies included children under the age of 6. More recently, a review by Perlstein et al. (2023), which did include preschool age children, found that only interventions that had a *parent* component showed reduced CU behaviors. For example, Kimonis et al. (2019) developed an adaption of Parent-Child Interaction Therapy (PCIT) for children with high levels of CU traits (PCIT-CU), which emphasizes warm emotionally responsive parenting, focuses on rewards rather than punishment, and includes an additional parenting module on rewarding emotional skills. In an open pilot trial study with children between the ages of 3 to 6, parents who completed PCIT-CU reported not only decreased conduct problems, but also lower levels of CU at 3-month follow up (Kimonis et al., 2019). Additionally, positive effects on CU traits in a sample of 9 to 12 year olds have also been found in response to Coping Power, another well-known evidence-based treatment for youth with DBDs which includes a child and parent group component (Muratori et al., 2017).

However, the extent of positive treatment outcomes is debatable as some treatment studies have reported no change in CU behaviors or mixed findings in response to treatment (Bansal et al., 2019; Högström et al., 2013; Manders et al., 2013). As alluded by Bansal et al. (2019), it is important to

acknowledge differences in terminology when discussing treatment studies such that *treatment response* refers to the magnitude of change from pre to post treatment while *treatment outcome* often refers to the normalization of the targetted behavior relative to a comparison group. Frick (2023)'s commentary when discussing the review by Perlstein et al. (2023) points out this distinction as many treatments for conduct problems in youth with high levels of CU traits are effective in terms of a reduction from pre to post (*treatment response*). However, CU traits serve as a severity indicator such that those youth that respond to treatment still end up with higher levels at the end of treatment relative to other comparison groups (*treatment outcome*). In light of the variability in trajectories of CU in early childhood and the mixed outcomes of various interventions, it is imperative to explore the effects of other well-established multi-modal treatments, such as the STP-PreK, during the early school years, in terms of both *treatment response* and *treatment outcome*.

STP-PreK

Based on Rimm-Kaufman and Pianta's (2000) Ecological and Dynamic Model of transtition, the kindergarten classroom environment is markedly different from preschool, such that in kindergarten children are expected to meet explicit goals for literacy, numeracy, and socilization that are not formal expectations in the preschool and/or home environment. These expectations are significantly more difficult for children with DBDs, given that they exhibit worse self-regulation skills (e.g., executive functioning and emotion regulation), which are positively associated with school success (P. A. Graziano et al., 2007; McClelland et al., 2007). Although several existing early interventions aim to enhance school readiness by addressing social-emotional competence in preschoolers (August et al., 2007; Greenberg et al., 1995; Kaminski & Stormshak, 2007; Walker et al., 1998; Webster-Stratton et al., 2008), they do not comprehensively target various facets of school readiness or provide services during the summer transition to kindergarten, such as the STP-PreK. Providing such intervention services during the summer is particularly important given that children often experience learning losses during the summer (Cooper et al., 2000).

The STP-PreK is a 7 to 8-week summer program for children with ADHD and comorbid DBDs entering kindergarten (P. A. Graziano et al., 2014). The STP-PreK is modeled after the evidence-based behavior modification program used in the STP-Elementary Academic Learning Centers (Fabiano et al., 2007; Pelham et al., 2010) and includes a range of additional intervention strategies within a natural school-like environment (e.g., behavioral parent training, social-emotional/self-regulation and academic enrichment curriculum; see Method section for a fuller description). More pertinent to the current study's focus on CU behaviors is the social-emotional/self-regulation curriculum of the STP-PreK. The curriculum implements social skills (i.e., using kind words, helping, and sharing) and emotional awareness training via the use of puppets, in-vivo tasks, and reinforcement of the skills throughout the day. Children are provided with "tokens" for participating in group activities that require accurate identification and expression of emotions (i.e., happy, mad, angry, scare), as well as appropriate problem-solving skills in the context of social interactions (e.g., cheering someone up; saying sorry). Children also learn how to cope with negative emotional states and participate in a daily 30-minute self-regulation period in which they engage in various executive functioning games (e.g., Red Light/Green Light, Orchestra), adapted from a series of circle time games shown to improve preschoolers' self-regulation (Tominey & McClelland, 2011). The curriculum aims to reinforce appropriate emotional responsiveness including empathy in a naturalistic setting, which is typically blunted among children who exhibit CU behaviors. In line with previous work, which highlights the importance of including a parent component in treatments for children with CU (Perlstein et al., 2023), the STP-PreK also includes an 8-week parenting program which further targets the social-emotional/self-regulation skills children learn throughout the day (see Method section for a fuller description). Results from an open trial (P. A. Graziano et al., 2014) indicate not only high parental treatment satisfaction after

completing the STP-PreK, but also significant improvements in children's school readiness outcomes including academic skills, parental report of behavioral problems, adaptive functioning, and overall readiness for kindergarten, with maintenance of gains 6-months post-intervention. Results from a randomized controlled trial (RCT) comparing the STP-PreK with and without the social-emotional curriculum to a parent training only group, also demonstrated that while children's EBP decreased significantly across all three groups, children who received the additional social-emotional component had greater growth across a 6-month follow-up period in multiple functional domains compared to the other groups (P. A. Graziano & Hart, 2016; e.g., academic achievement, emotion knowledge, emotion regulation, and executive functioning). Similarly, a second RCT also documented greater initial growth in kindergarten in behavioral functioning, academic readiness, adaptive skills, and executive functioning for children involved in a 4- or 8-week STP-PreK, compared to a traditional form of school consultation at the start of kindergarten (Hart et al., 2019). Results from multiple years of implementation of the STP-PreK have demonstrated significant improvements in not only child functioning, but also parenting outcomes, such as parenting stress, positive parenting/involvement, and inconsistent discipline (P. A. Graziano et al., 2018). The STP-PreK has also been adapted for children diagnosed with autism spectrum disorder (ASD) and EBP (Ros-Demarize & Graziano, 2021), with results demonstrating improved performance on academic achievement, emotion knowledge, executive functioning, and parent report of hyperactivity, inattention, aggression, and social adaptive skills. It is important to also note that the various studies of the STP-PreK aforementioned were conducted with a large Hispanic/Latinx population (77–93%) which has been historically underrepresented in intervention research (P. A. Graziano et al., 2014, 2018; Hart et al., 2019). Despite the various research studies demonstrating the STP-PreK's effectiveness in improving parenting outcomes, children's school readiness, and general EBP, the effects on CU behaviors remain unclear.

Current study

In summary, young children with ADHD and comorbid DBDs have significant impairments across multiple functional domains, which are compounded by elevated levels of CU behaviors. While multimodal treatments, such as the STP, are effective in improving ADHD and related DBDs, there are mixed findings on their effects on CU behaviors (Waschbusch et al., 2020). The STP-PreK is a promising adaptation of the STP for younger children with ADHD and comorbid DBDs and its social-emotional/self-regulation curriculum lends itself to further examination on whether it can attenuate CU behaviors. Additionally, most studies related to the treatment response or treatment outcomes of children with high levels of CU behaviors tend to rely on only parent report (Deng et al., 2019). However, recent work highlights the importance of teacher ratings in measuring young children's social-emotional functioning including CU behaviors (Frick et al., 2020). Thus, the current study aims to address this gap by examining the extent to which CU behaviors, rated by both parents and teachers, in a group of young children with ADHD (with and without comorbid DBD) who are transitioning to kindergarten or first grade and who participate in the STP-PreK are reduced and maintained across the following school year (e.g., baseline, 6-months/post-intervention, and 1-year follow-up/end of school year) relative to a TD group. We expected higher initial rates of CU in the ADHD+DBD group, followed by the ADHD only group, relative to the TD group. Most importantly, we expected intervention effects such that children in both ADHD groups (with or without DBD) to have steeper negative trajectories (i.e., decrease in CU behaviors across time) relative to the expected stable-low CU trajectory for the TD group.

Methods

Participants

The current study was conducted at a large urban university in the southeastern region of the United States with a predominately Hispanic/Latino population. Families were recruited from local schools and mental health agencies via brochures, open

houses, and online ads. Symptoms of ADHD and DBDs (i.e., ODD and CD) were assessed through a combination of a parent structured interview (Computerized-Diagnostic Interview Schedule for Children [C-DISC]; Shaffer et al., 2000) and parent/teacher ratings of symptoms and impairment (Disruptive Behavior Disorders Rating Scale [DBD-RS] and Impairment Rating Scale [IRS]; Fabiano et al., 2006; Pelham et al., 1992, respectively) as is recommended practice (Pelham et al., 2005). Dual Ph.D. level clinician review was used to determine diagnosis and eligibility. Children in the TD group had to have endorsed less than four ADHD symptoms (across either Inattention or Hyperactivity/Impulsivity), less than four ODD symptoms, less than three CD symptoms, and indicated no clinically significant impairment (score below 3 on the IRS). Children in the ADHD Only group had to have endorsed at least 6 ADHD symptoms of Inattention and/or Hyperactivity/Impulsivity, less than four ODD symptoms, less than three CD symptoms, and indicated clinically significant impairment (score above 3 on the IRS) across parent and/or teacher report. Lastly, the ADHD+DBD group not only met criteria for ADHD, but also had to have endorsed at least 4 symptoms of ODD ($n = 118$) and/or at least three symptoms of CD ($n = 11$) across parent and/or teacher report, per the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association [APA], 2013) criteria. As part of a larger longitudinal study, all participants were also required to be enrolled in school during the previous year, have an estimated IQ of 70 or higher, not currently taking any psychotropic medication, and have no confirmed history of an Autism Spectrum Disorder diagnosis. For the ADHD and ADHD+DBD group, they also had to attend a 7 to 8-week Summer Treatment Program (P. A. Graziano et al., 2014). The final sample consisted of 323 young children: ADHD Only ($n = 46$, Mage = 5.65, $SD = 0.81$), ADHD+DBD ($n = 129$, Mage = 5.48, $SD = 0.66$), and TD children ($n = 148$, Mage = 5.41, $SD = 0.84$). See Table 1 for sample demographics which were not significantly different between groups (p value range = .06–.26).

Study design and procedures

This study was approved by the university's Institutional Review Board and informed consent and assent was obtained from all participants. All families participated in a baseline assessment, which included completion of the ADHD, ODD, and CD modules on the C-DISC (Shaffer et al., 2000) and various questionnaires (parent and teacher) regarding the children's behavioral, academic, and emotional functioning. Children also

Table 1. Demographic variables.

	Total Sample ($n = 323$)	TD ($n = 148$)	ADHD only ($n = 46$)	ADHD + DBD ($n = 129$)
Demographic Variables				
Child sex (% male)	68.7	62.8	69.6	75.2
Mean Child age (SD)	5.47 (.77)	5.41 (.84)	5.65 (.81)	5.48 (.66)
Child Race (%)				
White	86.6	84.4	89.2	88.3
Black/African American	5.6	4.7	4.3	7.0
American Indian/Alaska Native	0.6	0.7	0	0.7
Asian	1.9	3.4	2.2	0
Multiracial	5.3	6.8	4.3	4.0
Child Ethnicity (%)				
Hispanic/Latino	81.4	78.4	89.1	82.0
Non-Hispanic/Latino	18.6	21.6	10.9	18.0
Home language (%)				
Monolingual (English only)	42.1	34.5	47.8	48.8
Monolingual (Spanish only)	4.0	5.4	2.2	3.1
Bilingual (Spanish/English)	53.0	58.8	50.0	47.3
Other language spoken	0.9	1.4	0	0.8
Maternal Education (%)				
Some High School	1.6	2.7	0	0.8
High School Diploma/GED	5.3	5.4	6.5	4.7
Some College	12.7	8.2	17.4	16.3
Associate's Degree	11.8	11.6	10.9	12.4
Bachelor's Degree	32.3	34.0	37.0	28.7
Advanced Degree	36.3	38.1	28.3	37.2

completed a series of social-emotional tasks in the laboratory. Families of children with ADHD subsequently received an intervention (Summer Treatment Program for Prekindergartners; P. A. Graziano et al., 2014) at either no cost via a federal grant or at a subsidized cost via a local grant, and all families received compensation (up to $300 gift card for completing the assessments). Teachers also received compensation ($50 gift card) for study participation. Parents and teachers filled out similar questionnaires after the intervention (which was approximately 6 months after the baseline assessment; $M = .59$ years, $SD = .22$ years) as well as 1 year after the baseline assessment (M time from baseline assessment = 1.22 years, $SD = .27$ years).

Callous-unemotional behaviors (CU)

Parents and teachers completed an abbreviated version of the Inventory of Callous-Unemotional Traits (ICU; Frick, 2004) consisting of 12 items identified by S. W. Hawes et al. (2014) as showing psychometric properties like those of the full ICU. The items were rated on a four-point Likert scale ranging from 0 (not at all) to 3 (very much), and a CU composite was created by averaging these 12 items. We examined parent and teacher reports separately with higher scores indicating more severe impairment ($\alpha = .83–.92$ across reporters and time points). The ICU is a well-established measure of CU in preschoolers across parent and teacher report (Kimonis et al., 2016), and has also shown acceptable internal consistency in different languages, including Spanish (Ezpeleta et al., 2013). A Spanish version of the ICU was provided to families that preferred completing questionnaires in Spanish (21%), which was provided by the author.

Description of the intervention: STP-PreK.

Only the families of children with ADHD (both the ADHD Only and ADHD+DBD groups) participated in the STP-PreK for 7 to 8 weeks during the summer months preceding the start of kindergarten ($n = 98$) or first grade ($n = 77$). The STP-PreK is a multimodal intervention including a school readiness class, which consists of a behavior modification program as well as an academic and social-emotional curriculum, along with a parenting program (P. A. Graziano et al., 2014).

School readiness class. The school readiness class operated daily, Monday-Friday, from 8 a.m. to 4 p.m. for 7–8 weeks during the summer prior to school starting. Throughout the day children participated in activities designed to promote a) behavioral and social-emotional skills consistent with the expectations of kindergarten and first grade, b) academic skills, c) physical activity, good sportsmanship, basic sports skills, and c) a positive attitude toward learning and school. Fifteen children were assigned to a classroom, staffed by one lead teacher, one lead counselor, and four paraprofessional developmental aides, yielding a 2:5 staff to student ratio. Lead teachers were certified early childhood or elementary teachers; Lead Counselors were clinical and counseling psychology graduate students; and developmental aides were undergraduate and post-baccalaureate paraprofessionals. All staff completed a 10-day training in program procedures and were supervised daily by the first author, the co-developer of the STP-PreK, and a licensed clinical psychologist with over 15 years of experience implementing interventions with children with EBP. The behavior modification program used across activities was modeled after the evidence-based system used in the STP-Elementary Academic Learning Centers (Pelham et al., 2010). The combination of the point and response-cost system allows for development of children's abilities to follow instructions, complete tasks accurately, comply with teacher requests, and interact positively with peers. Staff members used a public flip-card color chart in combination with the point system, where students began each activity on green and flipped their color to yellow after 5 points lost and red after 10 points lost. At the end of the activity, there was a public point check to provide feedback to the children on points earned and to receive tangible chips representing points earned for ending on green or yellow, but not red. At the start of the next activity, the flip color chart was reset to green with the opportunity to earn green the next period. Serious violations (e.g., aggression, destruction of property, and repeated noncompliance) resulted in a time out from positive reinforcement using procedures from PCIT. Children exchanged points earned for daily classroom rewards and privileges (e.g., recess). At the end of each day, parents were provided verbal and written feedback about children's behavioral

and academic progress via a daily report card (DRC). Parents were instructed on how to provide daily, home, DRC-contingent rewards during the first session of parent training (see Fabiano et al., 2014 for a detailed description of the DRC). In terms of the academic curriculum, the Literacy Express, an evidence-based preschool curriculum (Lonigan et al., 2005), was modified for the program so that all core literacy and numeracy skills were covered sequentially. Each week followed a Literacy Express theme. For example, during the week of Under the Sea, all of the academic activities, centers, vocabulary of the week, seatwork, and homework, were related to the theme and followed suggested curriculum activities. The mode of instruction varied from whole to small-group and independent activities. Finally, the social-emotional curriculum consisted of social skills (i.e., participation, communication, cooperation, and encouragement) and emotional awareness (i.e., happy, sad, mad, scared, surprised, disgusted, embarrassed, and guilty) training (30 min. daily) via the use of puppets, videos, and in-vivo reinforcement of skills throughout the day. Children learned how to cope with negative emotions via the Turtle Shell Technique (Schneider, 1974) along with other visual relaxation strategies (i.e., squeeze your lemons, spaghetti arms, etc.). The self-regulation curriculum consisted of children participating in a game period (30 min. daily) in which they engaged in various executive functioning games (e.g., Red Light/Green Light) adapted from a series of circle time games shown to improve preschoolers' EF (Tominey & McClelland, 2011). Children transitioning to first grade received the same behavioral modification system and social-emotional curriculum while academically they received a more advanced scaled up version of the Literacy Express academic curriculum based on state curriculum requirements.

Parent training (PT): The School Readiness Parenting Program (SRPP; P. Graziano et al., 2013) was conducted weekly lasting between 1.5 and 2 hours. The first half of each SRPP session involved traditional aspects of behavioral parent training (e.g., improving parent–child relationship, discipline strategies such as time out) delivered in a group format via COPE (Cunningham et al., 1995) style modeling approach. The behavior management content was based on PCIT (Eyberg et al., 2001) with four core sessions focused on child-directed skills (e.g., labeled praise, description, reflection, enthusiasm) during "special time" while another four core sessions focused on parent-direct skills (e.g., effective commands, time out). Subgroup activities of the core sessions entailed parents practicing the newly acquired skills with their own children while the other parents in the subgroup observed and provided positive feedback. During the second half of each SRPP session, parents participated in group discussions on several school readiness topics including: how to manage behavior problems during homework time and in public settings, how to promote early literacy (parents practiced and received feedback on using dialogic reading) and math skills, how to implement a home-school communication plan with teachers (i.e., DRC), and how to prepare for kindergarten or first grade. Specific to CU behaviors, parents also learn how to promote their child's social-emotional functioning. Parents are taught various ways to provide their child opportunities to reinforce positive social-emotional skills such as being polite, showing empathy, sharing, and encouraging others.

Analytic plan

Linear mixed models (LMMs) with random intercepts were conducted in SPSS 28. Separate LMMs were conducted for parent and teacher CU outcomes and dummy codes were created for group comparisons. Time was coded as a continuous, subject-specific measure reflecting months since BL (BL time = 0). Missing data was 4% at baseline, 20% at post-treatment, and 33% at follow-up and were determined to be missing completely at random per Little's MCAR test ($p = .98$). Mixed models are also robust in handling missing at random data with the use of full information robust Maximum Likelihood estimator (Schafer & Graham, 2002). For each outcome, the following specifications were evaluated. The linear effects of time and group x time were the effects of primary interest to test our hypotheses.

$$\text{Level 1: } Yij = \pi 0i + \pi 1(time) + eij$$

$$\text{Level 2: } \pi 0i = \beta 00 + \beta 01(group) + r0i$$

$$\pi 1 = \beta 10 + \beta 11(group)$$

$$\text{Combined: } Yij = \beta 00 + \beta 01(group) + \beta 10(time) + \beta 11(group*time) + r0i + eij$$

Comparisons between groups were conducted via the use of dummy codes. Hence, the above mixed model was applied twice: the first set of dummy-coded variables represented the comparison between (a) ADHD+DBD and TD groups and (b) ADHD only and TD groups while the second alternative dummy-coding scheme was used to get the final comparison between the ADHD+DBD and ADHD only groups. The group difference in intercepts (β01 fixed effect) reflects group differences at baseline. Of particular interest are the group x linear trend effect (given by the β11 fixed effect). These values and their significance reflect average differences between the groups in instantaneous linear trend across time. All LMMs were conducted a second time with the time variable re-centered at the 1-year follow-up. Significance of group effect (assessed via the dummy codes) in these models indicate a significant difference in intervention groups at the 1-year follow-up.

Lastly, within subject effect size estimates were calculated separately for each group by comparing baseline to post and baseline to follow-up (Morris & DeShon, 2002). Such Cohen's *d* estimates were calculated by utilizing the estimated marginal means from the LMMs in the numerator while pooled standard deviations were used in the denominator. Confidence intervals for all ES were also included (Thompson, 2002).

Results

CU outcomes (parent Model)

First, initial status differences were noted such that children in the ADHD+DBD group had significantly higher CU scores at baseline relative to the TD group and ADHD only group (Cohen's $d = 0.84$ [95% C.I. 0.59, 1.09] and 0.51 [95% C.I., 0.17, 0.85, respectively). No differences were noted in initial status between children in the ADHD only group and children in the TD group ($d = 0.28$ [95% C.I., −.05, 0.61]). There were no acute effects for pre- to post-treatment, nor pre to follow-up across the three groups (Table 2). As seen in Table 3, a significant effect for time, but no time by group interaction, was noted for both CU behaviors as rated by parents. These results indicated no significant differences in the *slope* of CU behaviors improvement (per parent report) between (a) children with ADHD+DBD and children in the TD group ($b = .07$, $SE = .04$, $p = .07$), (b) children with ADHD only and children in the TD group ($b = .07$, $SE = .06$, $p = .28$), or (c) children with ADHD+DBD and children with ADHD only ($b = .01$, $SE = .06$, $p = .91$). ES from baseline to the 1-year follow-up for both children in the ADHD only group and the ADHD+DBD group were non-significant (Cohen's $d = 0.17$ [95% C.I., −0.24, 0.58] and 0.19 [95% C.I. −.06, 0.43], respectively). At the 1-year FU, children in the ADHD only group and children in the TD

Table 2. Mean CU scores across time-points.

	BL *M* (*SD*)	6-months/PT *M* (*SD*)	1-year/FU *M* (*SD*)	Effect size Pre to Post		Effect size Pre to Follow-up	
				d	*95% CI* [UP, LB]	*d*	*95% CI* [UP, LB]
CU mean score (P)	–	–	–	—	—	—	—
TD group	.33 (.33)	.34 (.31)	.34 (.32)	-.03	-.26, .20	-.03	-.26, .20
ADHD only	.43 (.42)	.40 (.33)	.36 (.32)	.08	-.33, .49	.19	-.22, .60
ADHD+DBD	.65 (.43)	.61 (.36)	.57 (.43)	.10	-.14, .34	.19	-.06, .43
CU mean score (T)	–	–	–	—	—	—	—
TD group	.33 (.29)	.39 (.34)	.46 (.35)	-.19	-.42, .04	-.40	-.63, -.17
ADHD only	.68 (.44)	.53 (.34)	.37 (.43)	.38	-.03, .79	**.71**	.29, 1.13
ADHD+DBD	1.14 (.60)	.96 (.59)	.77 (.50)	**.30**	.06, .55	**.67**	.42, .92

M = Means, SD = standard deviation, *d* = Cohen's *d* effect size, CI = confidence interval, LB = lower bound, UB = upper bound, *p* = Parent report, *T* = Teacher report, BL = baseline assessment, PT = post-treatment assessment, FU = follow-up assessment, DBD = disruptive behavior disorders, TD = typically developing. Cohen's *d* effect sizes were calculated from estimated marginal means (numerator) and pooled standard deviation (denominator).

Table 3. Main outcomes with parameter estimates.

	Intercept estimate	Time Effect	Group Effect				Group x Time Effect			
CU mean score (P)		*B* (SE)	*F*	*B* (SE)	*95% CI*	*p*	*F*	*B* (SE)	*95% CI*	*p*
ADHD only and ADHD+DBD vs. TD model	.75 (.07)	−.13 (.07)	—	—	—	—	—	—	—	—
TD group	–	–	ref	—	—	—	ref	—	—	
ADHD only	–	–	2.90	−.10 (.06)	−.22, .02	.089	1.19	.07 (.06)	−.05, .18	.28
ADHD+DBD	–	–	**55.14*** **	−.32 (.04)	−.40, −.23	**<.001**	3.23	.07 (.04)	−.01, .15	.07
CU mean score (P)										
ADHD + DBD vs. ADHD only model	.55 (.07)	.00 (.07)	—	—	—	—	—	—	—	—
TD group	–	–	—	—	—	—	—	—	—	—
ADHD only	–	–	ref	—	—	—	ref	—	—	—
ADHD+DBD	–	–	**12.89*** **	−.21 (.06)	−.33, −.10	**<.001**	.01	.01 (.06)	−.12, .13	.91
CU mean score (T)										
ADHD only and ADHD+DBD vs. TD model	1.49 (.08)	−.66 (.12)	—	—	—	—	—	—	—	—
TD group	–	–	ref	—	—	—	—	—	—	—
ADHD only	–	–	**23.02*** **	−.35 (.07)	−.49, −.21	**<.001**	**11.33*** **	.36 (.11)	.15, .58	**<.001**
ADHD+DBD	–	–	**239.17*** **	−.81 (.05)	−.91, −.71	**<.001**	**30.98*** **	.41 (.07)	.27, .56	**<.001**
CU mean score (T)										
ADHD + DBD vs. ADHD only model	.79 (.08)	.06 (.12)	–	–	–	–	–	–	–	–
TD group	–	–	–	–	–	–	—	—	—	—
ADHD only	–	–	ref	–	–	–	ref	—	—	—
ADHD+DBD	–	–	**38.32*** **	−.46 (.07)	−.60, −.31	**<.001**	.16	.05 (.12)	−.18, .28	.69

***$p < .001$.SE = standard error, CI = confidence interval, *p* = Parent report, *T* = Teacher report, DBD = disruptive behavior disorders, TD = typically developing, ref = Reference group for time X group comparisons.

group continued to be not significantly different in their CU score ($b = -.02$ $SE = .07$, $p = .77$). Children in the ADHD+DBD group also continued to significantly differ relative to the TD group ($b = -.23$, $SE = .05$, $p < .001$) and the ADHD only group ($b = -.21$, $SE = .07$, $p = .004$).

CU outcomes (teacher model)

First, initial status differences were noted such that children in the ADHD+DBD and children in the ADHD only group had significantly higher CU scores at baseline relative to the TD group (Cohen's $d = 1.75$ [95% C.I., 1.47, 2.03] and 1.05 [95% C.I., 0.70, 1.40], respectively). Children in the ADHD+DBD group also had higher CU scores at baseline relative to children in the ADHD only group ($d = 0.81$ [95% C.I., 0.47, 1.16]). Acute treatment effects were noted for the ADHD+DBD group (Cohen's $d = .30$ [95% C.I., .06, .55]), but not for the ADHD only and TD group (Table 2). A significant decrease in CU from pre to follow-up was also observed for the ADHD only and ADHD +DBD groups (Cohen's $d = .71$ [95% C.I., .29, 1.13] and .67 [95% C.I., .42, .92], respectively). As seen in Table 3, a significant effect for time and time by group interactions were noted for the teacher model of CU. These results indicated significant differences in the *slope* of CU improvement between (a) children in the ADHD+DBD group and children in the TD group ($b = .41$, $SE = .07$, $p < .001$), (b) children in the ADHD only group and children in the TD group ($b = .36$, $SE = .11$, $p < .001$). No significant difference was noted in the slope of CU improvement between children in the ADHD+DBD group and children in the ADHD only group ($b = .05$, $SE = .12$, $p = .69$). Thus, as seen in Figure 1, while children in the TD group maintained their low levels of CU across time, children in the ADHD only group and in the ADHD+DBD groups experienced significant but similar magnitude of decreases in CU across time. In fact, at the 1-year FU, children in the ADHD only group and children in the TD group no longer significantly differed in their CU score ($b = .09$, $SE = .11$ $p = .37$). Children in the ADHD+DBD group continued to significantly differ relative to the TD group ($b = -.31$, $SE = .07$, $p < .001$) and also now differed relative to the ADHD only group ($b = -.40$, $SE = .11$, $p < .001$).

Discussion

The current study examined the malleability of CU behaviors in young children with and without

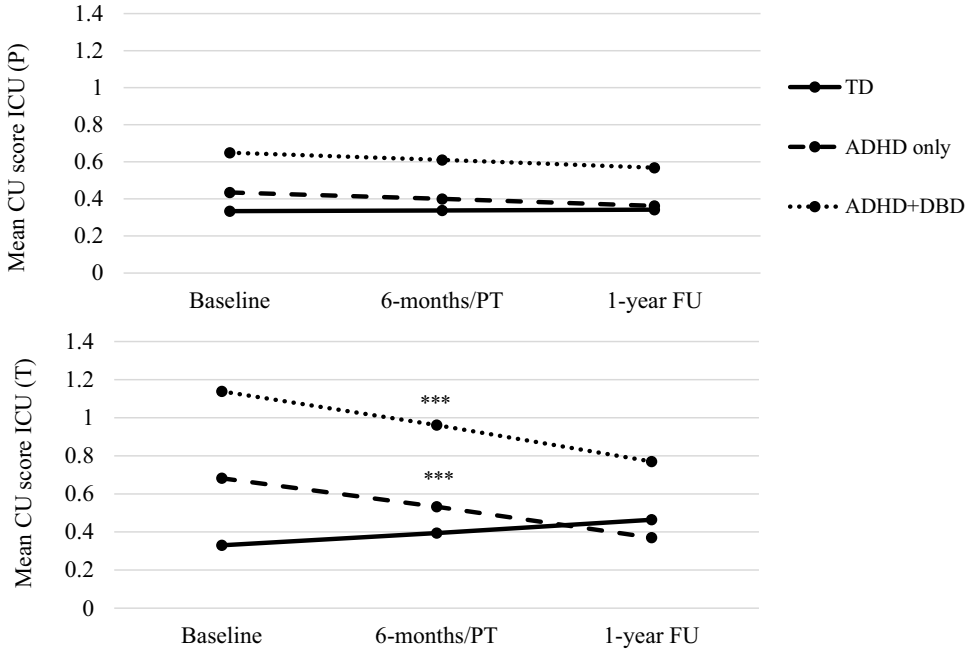

Figure 1. Change in mean CU scores. *** (p <.001) indicates significant *decreasing* slope from baseline to 1 yr follow-up relative to TD group. d = Cohen's d effect size. CU = callous-unemotional traits. ICU = Inventory of Callous-Unemotional Traits. p = parent report. T = teacher report. PT = post treatment. FU = follow-up.

ADHD (with and without comorbid DBD) following a multimodal intervention (i.e., STP-PreK). Across a one-year period, children in the TD group had stable low levels of CU behaviors regardless of the method of measurement (parent or teacher ratings). On the other hand, and as expected, children in the ADHD only group and ADHD+DBD group had significantly higher initial levels of CU behaviors relative to the TD group and experienced significant improvements (i.e., decreases) in such behaviors across time (following the STP-PreK). The ADHD and ADHD+DBD groups had similar magnitudes of improvements that were mainly driven via teacher report. Lastly, at one-year follow-up, CU behaviors in children in the ADHD only group were normalized (no difference with TD group) while CU behaviors in children in the ADHD+DBD group remained significantly higher relative to both the ADHD only and TD groups. The implications of these findings are detailed below.

First, our study replicates prior work (Ezpeleta et al., 2013; Kimonis et al., 2016) suggesting that CU behaviors can be reliability identified in the preschool/early childhood period as both of our clinical groups (ADHD only and ADHD+DBD) had significantly higher levels of CU behaviors (regardless of reporter) relative to the TD group. Our finding also adds to the literature (Fanti, 2013; Rowe et al., 2010) showing that the presence of ADHD on its own also confers an increased risk in CU behaviors which are further exacerbated by the presence of comorbid DBD diagnoses (Fanti et al., 2017; Frick et al., 2003). Growth curve analyses also documented the stability of low levels of CU behaviors among the TD group in this early childhood period which is important as there has been limited prior longitudinal work on CU with most focusing on the later elementary years and/or adolescent period (see review by Frick et al., 2014). Thus, it appears that school entry (whether kindergarten or first grade) does not significantly impact TD children's CU behaviors whereas prior work has shown that children with ADHD and/or DBD struggle with such transition and may in fact see an increase in emotion dysregulation including CU behaviors (Blankson et al., 2017; Olson et al., 2009).

Related to our primary aim, prior studies within the context of the STP have focused on documenting the moderating role of CU traits/behaviors as it relates to suboptimal treatment response *during* the treatment via the point system/weekly ratings or time out

incidents (Garcia et al., 2018; Haas et al., 2011; Waschbusch, Carrey, et al., 2007) or immediately following treatment via parent and teacher ratings (Bansal et al., 2019). Our study showed that the STP-PreK was moderately successful in reducing CU behaviors similarly among children in the ADHD only and ADHD+DBD groups. Prior STP-PreK studies document improvements across other emotion dysregulation domains and/or general self-regulation (P. A. Graziano & Hart, 2016; Ros-Demarize & Graziano, 2021). This marks the first STP-related study, to our knowledge, to show improvements in CU behaviors following STP and *maintained* at the end of the following school year (1 year after baseline assessment). In fact, the CU behaviors among the ADHD only group were normalized and at the same level of the TD group at the 1-year follow-up/end of school year. It may be the case that the *social-emotional/self-regulation* curriculum of the STP-Prek (both within the camp and parenting component) is what contributes to its success in reducing early CU behaviors. It may be that parents are continuing to reinforce positive emotion regulation and pro social skills both them and their child learned during the program, therefore mitigating the long-term development of more severe CU behaviors. This is an important distinction as other work within the elementary age STP attempted to modify the *behavioral* modification system in terms of the balance of reward vs. punishment in the point system with mixed success (Miller et al., 2014; Waschbusch et al., 2020). Thus, despite theoretical and psychopathology work highlighting potential hypo-responsiveness to punishment and hyper-responsiveness to rewards among children with high levels of conduct problems and CU (Blair et al., 2001; Dadds, 2003) our work suggests that an intensive behavioral intervention may also need to target various facets of social-emotional functioning (with direct exposure/instruction with children and with parents) to have an impact on CU behaviors. Lastly, it may also be the case that the significant follow-up effects emerge due to children participating in the STP-PreK having a smoother transition to the school year in which more positive initial interactions with peers and teachers continue to reinforce such prosocial behaviors.

Another significant finding of our study is related to informant differences that impact findings in our field. It has long been established that parent and teacher ratings are only modestly associated with each other (Achenbach et al., 1987) as they each provide unique information regarding children's functioning across different contexts (De Los Reyes et al., 2009). Surprisingly, fewer than 25% of studies examining conduct problems and/or CU include teacher ratings (Comer et al., 2013; S. W. Hawes et al., 2014) and even fewer within treatment studies (Bansal et al., 2019). Our study provided one of the most comprehensive examinations of CU behaviors as a function of treatment across time by conducting our analyses with two different models (parent only and teacher only). Interestingly, we were able to identify improvements in CU behaviors across both the ADHD only and ADHD+DBD groups as reported by *teachers* but not parents. Teachers are likely to have better knowledge of children's social-emotional functioning including CU behaviors as they can observe peer interactions in school more readily versus parents. Bansal et al. (2019) similarly found teacher ratings to have larger treatment effects vs. parent ratings among older elementary age children in the STP with high levels of conduct problems and CU. Treatment effects documented by teachers are even more impressive as Weisz et al. (2017) points out that they tend to be less prominent versus parent reports. Thus, our finding potentially highlights one of the most impactful aspects of STP studies, and particularly the STP-PreK, in which children are receiving the intervention within an authentic classroom environment with same age peers which may help generalize the behavioral improvements to the following school year.

In terms of our study limitations, it is important to acknowledge that we only had one measure of CU behaviors (parent and teacher report of the ICU). It will be important for future intervention studies to examine other CU-related outcomes, including assessments related to peer functioning and social problem solving that tend to be impaired among children with conduct problems and CU (Helseth et al., 2015; Waschbusch, Walsh, et al., 2007). Second, our study was not a randomized trial of the STP-PreK as all children with ADHD (with or without comorbid DBD) received the intervention as

a part of larger longitudinal study that included a comparison TD group. Thus, it is possible that simply the presence of time (developmental maturation) or experience in kindergarten or first grade resulted in natural improvements in CU behaviors across time which could have also been statistically due to regression to the mean. However, these possibilities are low as previous randomized trials of the STP-PreK show stability in general externalizing behavior problems in the groups of children that did not receive the intervention (Hart et al., 2019). Longitudinal studies absent of treatment also show low rates of reduction of CU behaviors overtime. For example, Fanti et al. (2017) found that only 18.6% of school age children with CU traits experience a decrease over a three-year period. Additionally, Klingzell et al. (2016) found that only 12.6% of their sample decreased their CU traits from preschool (ages 3–5) to school age (ages 5 to 7). Finally, Willoughby et al. (2011) found a high correlation ($r = .84$) of CU from 36 to 60-months. Nevertheless, to confirm our findings, future studies should employ an RCT approach toward examining the effectiveness of the STP-PreK on improving CU behaviors in young children with ADHD and comorbid DBD. Part of such RCT approach may also entail disentangling which curriculum components of the STP-PreK are driving the reductions in CU behaviors (e.g., three arm trial comparing two treatment groups [one with and one without the social-emotional curriculum] to a non-treatment group).

Lastly, although this may be a strength of the current study, our sample was predominately Hispanic given the geographic location. It is possible that these results may not generalize to other races/ethnic backgrounds. In fact, a systematic review found differences between racial/ethnic minority groups on self-report measures of emotion regulation in adults (Schick et al., 2020), such that non-White /Hispanics reported greater emotion regulation difficulties compared to White/non-Hispanic individuals. As it relates to CU, a more recent study investigating the network structure of the ICU found that the core features of the ICU among youth appear generalizable across cultures, although item specific differences were noted within the UK, U.S., Australia, and Chinese networks (Deng et al., 2024). Specific to treatment, the review by Perlstein (2023) points out that the majority of studies that documented positive treatment effects were conducted in less diverse samples outside of the U.S. Thus, our positive treatment findings add to this literature about Hispanic children, whom are part of the largest growing and understudied group in the United States (La Greca et al., 2009), and are less likely to be seen by providers and receive a mental health diagnosis compared to White non-Hispanics (Ghandour et al., 2019). Of note, the STP-PreK was developed and informed by a primarily Hispanic community (initial focus groups, open trial; P. A. Graziano et al., 2014) and has been running continuously for 15 years with consistently high satisfaction and child/parent positive outcomes within the Hispanic community (P. A. Graziano & Hart, 2016; P. A. Graziano et al., 2018; Hare & Graziano, 2021; Hart et al., 2019). To continue to deepen our understanding of how to best deliver culturally informed treatment among Hispanic families, future studies should include measures that capture important aspects about their identity (i.e., levels of acculturation, child rearing beliefs, and parenting attitudes), which may help us enhance their treatment experience.

In conclusion, this study is one of the first longitudinal treatment studies to document how an adapted version of the STP, the STP-PreK (P. A. Graziano et al., 2014), may contribute to the reduction in CU behaviors among children with ADHD and those also with comorbid DBD diagnoses. Importantly, these effects were maintained for 1-year with children in the ADHD only group actually having normalized levels of CU behaviors relative to TD children who maintained their low levels throughout the one-year period. Lastly, our multi-informant approach was able to identify that such effects were noted by teachers but not parents. It will be important for future early intervention work to continue to experiment with treatment components (e.g., social-emotional curriculum, reward/punishment systems) and examine multiple CU-related outcomes to determine how to best help these children along with their parents and teachers.

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