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Affective and Behavioral Responses to Time-Out in Preschool Children With Conduct Problems and Varying Levels of Callous-Unemotional Traits

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Punishment insensitivity characterizes individuals with callous-unemotional (CU) traits. This has been put forward as an explanation for their persistent conduct problems despite intervention. The purpose of the current study was to compare the emotional and behavioral responses to parent-implemented time-out within a behavioral parent training intervention between children with conduct problems who are high versus low on CU traits. Children ($N = 87$; M age = 4.88 years, $SD = 1.32$; 78% male) referred to a specialty clinic for the treatment of conduct problems were observed and coded during time-out, and their parents rated their conduct problem severity and CU traits using psychometrically robust measures. Children with conduct problems and high CU traits showed significantly more calm/neutral emotion and less negative emotion upon initial placement in time-out by parents, but did not engage in more negative behaviors or spend longer in time-out relative to children with conduct problems alone. After a minimum of 3 weeks of exposure to this form of parental discipline, most children complied with effective parental commands in that they did not require time-out for noncompliance during the fourth discipline-focused treatment session. Findings have implications for understanding why children with CU traits continue showing high levels of conduct problems post behavioral interventions, and they lend further support for the need to personalize treatment to their distinct needs.

Keywords: conduct problems; callous-unemotional traits; limited prosocial emotions; time-out; punishment insensitivity; parent training

Effective consequences for misbehavior are essential for survival and social harmony by deterring harmful actions and promoting responsible behavior. There are individual differences in punishment sensitivity (Dadds & Salmon, 2003; Jean-Richard-Dit-Bressel et al., 2021), and extreme ends of the continuum are linked with psychiatric disorders. Adult psychopathy and its juvenile analogue, callous-unemotional (CU) traits, are thought to originate from an early-emerging insensitivity to consequences intended to be aversive and thus punishing (Blair et al., 2001; Byrd et al., 2014; Frick et al., 2003; Lykken, 1957). Insensitivity to typical punishment regimes is thought to increase risk for CU traits by undermining parental

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socialization efforts and children's moral development, thus contributing to their early-starting and persistent pattern of aggressive antisocial behavior co-occurring with empathic deficits, remorselessness, and uncaring attitudes (Frick et al., 2014; Kochanska, 1993; Nichols et al., 2015). However, research findings linking CU traits and punishment insensitivity have been inconsistent, possibly due to methodological differences between studies. There is debate around the underpinnings of punishment insensitivity and, relatedly, its operationalization across studies (see Jean-Richard-Dit-Bressel et al., 2021). For the purposes of the current study, which focuses on a behavioral parent training context, we conceptualize this insensitivity as children's diminished affective reactivity or continued misbehavior when confronted with disciplinary action (i.e., "time-out") for their noncompliance. This study specifically aimed to examine whether well-characterized clinical groups of children with conduct problems (i.e., defiance, aggression, property destruction), grouped according to their levels of CU traits, differ in their responses to time-out.

Teaching parents effective consequences, such as time-out, to reduce antisocial behaviors in children is a core component of behavioral parent training programs that are identified as first-line treatments for child conduct problems (Kaminski & Claussen, 2017). However, several studies find that children with conduct problems and elevated CU traits are less likely to demonstrate behavioral improvement to this discipline strategy, possibly explaining why they begin and end behavioral interventions, including parent training, with more severe conduct problems relative to children low on CU traits (Haas et al., 2011; Perlstein et al., 2023). For example, Hawes and Dadds (2005) found that 4- to 8-year-old boys ($N = 49$) referred to parent training to treat their conduct problems were less responsive to time-out, reacting with less negative affect (i.e., sadness, anger, fear) and more neutral affect at posttreatment and follow-up, when CU traits were high versus low. These findings held when controlling for conduct problem severity and for observed differences between parents in their implementation of time-out. Parents also rated time-out as significantly less effective for children with high CU traits relative to low CU traits (Hawes & Dadds, 2007). However, shared method variance and informant biases in these studies may have artificially inflated associations between parent-reported CU traits and child reactions to time-out assessed via parent-report on single items.

Direct observation of child behavior in time-out is less likely to be influenced by parental biases when assessing individual differences in disciplinary learning. A small pilot study used direct observation to examine the affective responses to time-out of 7- to 11-year-olds ($N = 11$, 1 female) with elevated CU traits and comorbid oppositional-defiant disorder (ODD) and/or conduct disorder (CD), and attention-deficit/hyperac tivity disorder (ADHD), who received behavioral therapy in a summer treatment program (STP; Pelham & Hoza, 1996). Children were mostly rated as "calm" or "unemotional" by their counselors when first assigned time-out and while serving time-out (M length = 89.45 minutes, $SD = 77.18$) (Bansal et al., 2020); however, without a comparison group it is unknown whether these observed emotional responses differ from children low on CU traits. Contrary to Bansal et al. (2020), Hawes and Dadds (2005, 2007) found significant differences in children's emotional responses to time-out at posttreatment, but not midtreatment when this punishment strategy was first introduced by parents. This inconsistency may be due to study differences in participants' age, and therefore their prior experiences with time-out; measurement methods used to assess punishment insensitivity (parent report *v.* observation) and CU traits; and/or who administered time-out (parents *v.* counselors) and in what context (clinic *v.* summer treatment camp). However, despite their methodological differences, both studies found that children with conduct problems and high CU traits showed low levels of emotional reactivity to time-out, suggesting that they experienced this form of punishment as less aversive than children low on CU traits (Dadds & Rhodes, 2008).

Similarly, children with elevated CU traits show blunted emotional reactivity to aversive stimuli (Frick et al., 2014). For example, youth with CU traits report less subjective experiences of fear and arousal during emotional events or when viewing aversive images (Marsh et al., 2011; Sharp et al., 2006), and show lower fear responses to punishment cues in infancy (Barker et al., 2011), reduced skin conductance response when anticipating and viewing aversive stimuli (Isen et al., 2010), less salivary cortisol reactivity to stress (Stadler et al., 2011), and atypical brain responses during punishment learning tasks (Finger et al., 2008) relative to children with low CU traits. This pattern of emotional underarousal has been linked to their fearless temperamental style, which in early childhood was found to

predict later CU and adult psychopathic traits (Barker et al., 2011; Glenn et al., 2007). Research from Kochanska (1997) explains that children who are temperamentally fearless are at heightened risk of developing antisocial behavior and impaired conscience because this insensitivity interferes with their internalization of parental norms and values. That is, a state of moderate arousal is most effective for children's development of conscience but is not easily reached for children with fearless temperaments (Kochanska, 1997).

In addition to displaying less negative affect during time-out, children with high CU traits also showed more negative (i.e., aggressive, disruptive) behavior, leading to lengthier time-out episodes in some studies (Garcia et al., 2018) but not others (Haas et al., 2011). For example, in a mixed sex sample of 7- to 12-year-old children ($N = 51$) with conduct problems and ADHD participating in a STP, high CU traits were uniquely associated with greater counselor-rated observed negative behaviors while in time-out, but not the length of time-out or the number of daily time-outs after controlling for conduct problem severity (Haas et al., 2011). In another study involving counselor-rated observed responses to time-out of young children with conduct problems ($N = 190$, M age = 4.92 years; 76% boys; 66% with comorbid ADHD), CU traits were significantly positively associated with time-out frequency and length during the last 2 weeks, but not the first 2 weeks, of an 8-week STP, controlling for initial levels of ADHD and conduct problems (Garcia et al., 2018).

Taken together, these findings suggest that time-out may not only be experienced by children with high versus low CU traits as less aversive, but it may also escalate their antisocial behavior (Dadds & Salmon, 2003). This escalation may function as a punishing contingency to parents' disciplinary efforts, leading them to prematurely abandon attempts to use time-out and reduce their likelihood of using time-out again in the future (Patterson, 1979). Thus, the reduced utility of time-out for children with CU traits may be because they are more coercive and more punishing of parents when they use this disciplinary strategy, relative to children low on CU traits. However, both prior studies investigating behavioral responses relied on counselor-administered and -rated time-out in the context of a summer treatment program (Garcia et al., 2018; Haas et al., 2011). Consequently, children's manipulative, destructive, and aggressive behavior during time-out may have been rewarded with gained social influence from onlooking peers, thus lessening the impact of this punishing consequence. Children's behavioral responses to time-out may differ within behavioral parent training contexts where parents are the primary agents of change, because of the important impact of the parent-child relationship on socialization and conscience development (Kochanska, 1995). Consequently, further research is needed using observation of both child affect and behavior during parent-implemented time-out in large, mixed sex samples of children with clinical levels of conduct problems, to elucidate what might be impeding disciplinary learning for children with high CU traits.

A final limitation of the extant literature is the use of measures of CU traits with questionable psychometric properties. Prior studies of responses to time-out in children with elevated CU traits varied in their measurement of CU traits. Hawes and Dadds (2005, 2007) measured CU traits using a questionnaire scale that pools selected items from the parent-report Strengths and Difficulties Questionnaire (Goodman, 1997) and the Antisocial Process Screening Device (APSD; Frick & Hare, 2001) CU scale. Several other studies relied solely on the APSD CU scale (e.g., Haas et al., 2011), which has consistently demonstrated poor internal consistency in prior studies (Poythress et al., 2006). To improve upon the poor psychometric properties of the APSD's CU scale, Frick (2004) developed the Inventory of Callous-Unemotional Traits (ICU) as a standalone comprehensive measure of CU traits. A meta-analysis demonstrated that the 24-item ICU total score showed good internal consistency across studies (pooled Cronbach's $\alpha = .83$, Cardinale & Marsh, 2020), which is reported for children as young as age 3 through to young adults (Kimonis et al., 2008, 2013, 2016). ICU total scores correlate with measures of aggressive behavior, empathy, and academic underachievement (Ciucci et al., 2014; Kimonis et al., 2016); and predict later diagnoses of ODD and CD (Ezpeleta et al., 2013). To date, except for Garcia et al. (2018), who used an abbreviated 12-item brief version of the ICU, the full scale has not been investigated in association with children's responses to time-out. This constitutes a critical gap in knowledge because the 12-item ICU scale underrepresents certain CU symptoms (e.g., shallow/deficient affect) that are theoretically relevant to punishment insensitivity.

The aim of the present study was to test whether mixed-sex young children referred for clinically significant conduct problems, categorized into Low and High CU trait groups according to 24-item total scores on the well-validated ICU measure, differed in their emotional and behavioral

responses to time-out administered by parents undergoing a behavioral parent training intervention. It was hypothesized that children with High CU traits would be more insensitive to time-out relative to children with Low CU traits, evidenced by showing fewer and less intense negative emotions and more neutral emotion when first placed in time-out, during time-out, and immediately after time-out ends, as well as more disruptive behaviors during both initial and subsequent time-out treatment sessions. It was further hypothesized that children with High CU traits would spend more time in time-out, relative to children with Low CU traits.

Method

PARTICIPANTS

We obtained ethical approval for this study from the University of New South Wales Human Research Ethics Committee. Participants were 87 children (M age = 4.88 years, SD = 1.32, range 2-7; 78% boys, see Table 1 for sample demographics) and their parent(s), referred to a university-based clinic for conduct problems in Sydney, Australia. Of the 87 children, participating parents included 85 biological mothers and 2 adoptive mothers, as well as 23 biological fathers. Participants were a subset with video recordings of treatment sessions available drawn from across several clinical trials conducted at the research clinic: an open trial of Parent-Child Interaction Therapy (PCIT) enhanced for children with CU traits (PCIT-CU, n = 18); one of two randomized trials comparing standard PCIT delivered in-clinic against (a) PCIT-CU (n = 35) also delivered in-clinic, or against (b) Internet-delivered PCIT (iPCIT, n = 16) (all registered with the Australian New Zealand Clinical Trials Registry); or were receiving in-clinic or internet-delivered standard or enhanced PCIT at the University clinic for a private fee (fee-for-service [FFS]; n = 18). Children were excluded from participation in clinical trials if they had a primary mental health diagnosis other than ODD and/or CD (e.g., autism spectrum disorder, intellectual disability), or were deaf, since PCIT is heavily language-based. The Supplemental Materials detail comparisons between participants enrolled in these sub-studies. We statistically controlled for study sample in our analyses to account for potential sampling differences.

PROCEDURE

Video recordings of participants completing the time-out procedure during the second discipline phase of all versions of PCIT treatment were accessed from preexisting databases. Video recordings of the first parent coaching session of the discipline phase of PCIT (Parent Directed Interaction treatment phase [PDI1]) were available for 83 participants, and for 80 participants for the fourth coaching session (PDI4). PDI videos were coded at this fourth PDI session to assess children's insensitivity to punishment after at least 3 weeks of experience with the time-out procedure. The fourth PDI session involves greater opportunity for time-out than other PDI sessions following PDI1 because it does not involve therapist coding of PCIT skills that is used by therapists to tailor treatment (Eyberg & Funderburk, 2011). Participants from the broader studies with video recordings of these treatment sessions did not differ from those without recordings available on conduct problem severity, ICU scores, child age or sex, or mode of PCIT delivery (clinic v. internet), but as expected were significantly more likely to be receiving PCIT treatment as part of a research trial (v. for a private fee, $\chi^2[3,122] = 28.04$, $p < .001$) and less likely to be a treatment dropout, $\chi^2(1,66) = 41.18$, $p < .001$.

MEASURES

All questionnaire measures were completed by parents during pretreatment assessments. Caregiver scores on measures were combined in a conservative fashion by taking the higher item-level rating between raters ("resolved" score) to circumvent potential underreporting of problems. Supplemental Table 2 presents zero-order correlations between main study variables.

Conduct Problems

The 36-item Eyberg Child Behavior Inventory (ECBI; Eyberg & Pincus, 1999) completed at the pretreatment assessment was used to assess child conduct problem severity. Parents rated the frequency of conduct problems (e.g., "physically fights with friends of own age") on a 7-point scale, 1 (*never*) to 7 (*always*). Item scores were summed to yield ECBI Intensity scale scores, with higher scores indicating greater conduct problem severity. ECBI Intensity scores demonstrated good psychometric properties, including high internal consistency (Cronbach's α α = =.88, McDonald's ω =.87, mean inter-item correlation [MIC] = .19) and convergent validity with similar measures of disruptive child behavior (Eyberg & Pincus, 1999).

Callous-Unemotional Traits

The 24-item preschool parent-report version of the Inventory of Callous-Unemotional Traits (ICU; Kimonis et al., 2016) was used to determine the level of CU traits. Parents rate statements about

Table 1
Demographic Characteristics and Clinical Measures by CU Trait Group

Parameter	Full Sample ($N = 87$)		Low CU ($n = 33$)		High CU ($n = 54$)		
	Mean (SD)	*Range*	*Mean (SD)*	*Range*	*Mean (SD)*	*Range*	
Child age	4.88 (1.32)	2.00–7.56	4.76 (1.26)	2.42–7.56	4.99 (1.35)	2.00–7.31	$t(87) = -0.98$, $p = .327$
Mother age	38.87 (4.60)	31.00–53.00	39.61 (7.76)	31.00–35.00	38.82 (4.61)	31.00–53.00	$t(50) = .13$, $p = .900$
Father age	41.77 (6.00)	31.00–61.00	41.24 (4.71)	35.00–55.00	42.33 (6.80)	31.00–61.00	$t(62) = -.87$, $p = .387$
Income ($'000)	184.34 (153.03)	0–1,000	205.10 (218.80)	0–1,000	169.76 (80.92)	45–400	$t(61) = .90$, $p = .371$
Mother ethnicity (% White/Asian/Other)	54.02/12.64/ 33.34	–	51.54/18.62/ 30.35	–	55.6/9.3/ 35.1	–	$\chi^2(df = 4, N = 61) = 3.509$, $p = .477$
Father ethnicity (% White/Asian/Other)	56.32/8.05/ 35.63	–	54.57/9.41/ 36.4	–	57.4/7.4/ 35.2	–	$\chi^2(df = 4, N = 54) = 3.352$, $p = .501$
Mother Education Level (%Bachelors/ Vocational/Other)	40.23/14.94/ 44.83	–	39.44/18.22/ 42.44	–	40.7/13.0/ 46.3	–	$\chi^2(df = 8, N = 67) = 7.775$, $p = .456$
Father Education Level (% Bachelors/ Vocational/Other)	28.74/9.19/ 61.07	–	30.32/9.48/59.92	–	27.8/9.3/ 63.9	–	$\chi^2(df = 8, N = 67) = 6.778$, $p = .561$
ECBI Intensity T-score	72.23 (6.87)	50–86	68.39 (7.19)	50–83	74.75 (5.53)	60–86	$t(87) = -4.51$, $p < .001$
ICU total	35.45 (9.50)	13–58	29.09 (4.80)	13–32	41.18 (6.68)	33–58	$t(87) = -11.29$, $p < .001$

Note. ICU = Inventory of Callous-Unemotional Traits, CU severity. ECBI = Eyberg Child Behavior Inventory, conduct problem severity. Income reported in Australian Dollars. Data on participating parents' age, ethnicity, and income were not uniformly available due to the aggregation of data from multiple clinical trials, some of which did not include questions pertaining to age, ethnicity, or income in their data collection protocols. Consequently, these variables were not reported for all participants.

their child (e.g., "feels bad or guilty when he/she has done something wrong") on a 4-point scale, 0 (*not at all true*) to 3 (*definitely true*). Item scores are summed to yield total ICU scores, with higher scores indicating higher level of CU traits (Cronbach's $\alpha = .87$, McDonald's $\omega = .85$, MIC = .22).

Children were categorized into High and Low CU groups using an ICU cut score of 29 (Kaouar et al., 2023). When benchmarked within a normative range of scores for a large community sample, this cut-off score equated to approximately one standard deviation above the 24-item ICU mean reported for typically developing preschoolers (Ezpeleta et al., 2013) and corresponds to an average item rating of 1.20, which falls between ratings 1 (*somewhat true*) and 2 (*very true*). This ICU cut-off score of 29 was also used to identify elevated levels of CU traits in adolescent populations, as determined through both empirical and normative cut-off methods (Colins, 2023; Kemp et al., 2021). Using this group-based approach allows us the unique opportunity to examine clinically meaningful subgroups within a clinical sample of young children with conduct problems. It also enables others to adopt a consistent approach to studying conduct problem subtypes within other clinical populations of young children. This procedure resulted in $n = 54$ children classified into the High CU group (62.1%), and $n = 33$ classified into the Low CU group (37.9%), likely due to the oversampling of children with elevated CU traits to participate in the trials of PCIT-CU (Fleming et al., 2022; Kimonis et al., 2019). High and low CU groups did not differ on most demographic variables, but as expected, children high on CU traits had higher conduct problems (Table 1).

Affective and Behavioral Responses to Time-Out

Child insensitivity to punishment was coded from observations of the child during the PCIT time-out procedure. Coding was completed by a trained research assistant masked to child CU and treatment status. This research assistant underwent approximately 2.5 months of didactic and experiential training on the time-out coding procedure, weekly supervision meetings, and demonstrated reliable coding of criterion video-recordings, as evidenced by at least 80% interrater reliability with an experienced graduate-level supervisor. The time-out procedure is introduced to the child in the second discipline phase of all versions of PCIT, called Parent-Directed Interaction (PDI; Eyberg & Funderburk, 2011). In all PDI sessions, the PCIT therapist coaches the parent to implement time-out with the child via a wireless bug-in-ear device. Coaching occurs in real time from behind a one-way mirror (or via wireless earpiece and webcam in iPCIT) while the parent-child dyad is engaged in play. In the first PDI coaching (PDI1) session, the therapist directs the parent through each standardized step of the PCIT time-out procedure for the first time by feeding them scripted lines to repeat back to the child, prior to the parent independently administering this PDI procedure at home with their child over subsequent weeks. PDI1 videos were coded to capture the child's initial response to time-out.

Of the 83 participants with a videorecorded PDI1 session, 56 (67.5%) children received time-out in this treatment session. Of the participants with a videorecorded PDI4 session ($n = 80$), only 17 children (21.3%) received time-out, resulting in a lack of statistical power to detect significant effects for group differences. Of these 17 children, 76.5% were classified in the High CU group *v.* 23.5% in the Low CU group.

The PCIT time-out sequence is highly structured, predictable, and fair to children (p. 75, Eyberg & Funderburk, 2011): When the child does not comply with a direct command from the parent (e.g., "Please hand me the fire truck"), the parent issues a time-out chair warning (e.g., "If you do not hand me the fire truck, you will have to sit on the time-out chair"). If the child does not comply with the warning, the parent gives a consequence statement ("You didn't do what I told you to do, so you have to sit on the time-out chair") and guides the child to sit on the time-out chair. The child is required to remain sitting on the time-out chair for three minutes and five quiet, calm seconds. If the child leaves the time-out chair before this is achieved, the parent gives a consequence statement ("You got off the chair before I said you could, so you have to go to the time-out room") and guides the child to stand in an empty time-out room (see Supplemental Figure 1 for a graphic of a prototypical PCIT clinic suite). The child is required to remain in the time-out room for 1 minute and 5 quiet, calm seconds, after which the parent guides the child to return to the time-out chair. Time-out ends when the child complies with the parent's original command and a second learning command that immediately follows, after which the dyad returns to child-led play. The parent is present with the child throughout this sequence.

Coding for the purposes of operationalizing child insensitivity to punishment began when the parent delivered the consequence statement to the child for noncompliance with their warning statement, which was immediately followed by placing/guiding the child to the time-out chair.

Discrete time-out chair episode coding ended once the child complied with the parent's original command, or when the child entered the time-out room because of prematurely leaving the chair. Time-out room episode timing began as a new discrete event from when the child was first placed in the time-out room by the parent for leaving the chair and ended when the child was placed back on the time-out chair by the parent after being removed from the time-out room. Time-out chair coding began as a new discrete event once the child was seated on the chair and ended when the child complied with the original command. Within each PDI session, the total length of the first instance of time-out was computed by summing the above discrete time-out room/chair episodes covering the period from noncompliance with the parent's first command to the child's compliance with this original command. If the child participated in the PDI session, but did not receive time-out, they would be scored "0 seconds" for time spent in time-out for that session.

A coding scheme was developed (see Supplemental Materials Appendix A) to assess the child's insensitivity to punishment while sitting in the time-out chair by adapting preexisting coding schemes for response to time-out (Bansal et al., 2020; Dadds & Sanders, 1992). An adapted version of Bansal et al.'s (2020) Counsellor Ratings of Time-Out Emotions coding scheme was used to code the child's affect while on the time-out chair. Coding items assessed the type and intensity of emotion displayed by the child in PDI from when the parent first delivered the noncompliance consequence statement to placing the child in time-out (response when first assigned to time-out), for the full time-out episode (response while serving time-out), and also within 5 seconds after time-out ended following the child's compliance with the original command (after time-out) since research suggests that children with high CU traits recover quickly due to their shallow affect (Bansal et al., 2020). Consistent with Bansal et al. (2020), the current study categorized child emotions as positive/neutral ("amused; happy; entertained," "calm; matter of fact; accepting," or "unemotional; indifferent; dismissive") and negative ("angry; hostile; irritated," "sad; unhappy; distressed," "scared; anxious; nervous," "guilty; ashamed; embarrassed") and the intensity of their emotion was rated on a three-point scale (low, medium, high) (see Supplemental Materials Appendix A).

Additionally, the type of negative, disruptive, or otherwise inappropriate behaviors displayed by the child while in the time-out chair during PDI was coded, based on the behaviors (e.g., whining, crying, vocal protests) outlined in Dadds' and Sanders's (1992) Behavioural Observation Coding System. Behaviors in the current study were categorized as upset/verbal (e.g., shouting), manipulative (e.g., saying they are sick or hurt), or destructive/violent (e.g., actual or threatened violence). Observational coding of child affect and behavior could not be completed while the child was in the time-out room because it was not outfitted with audio-visual equipment.

PLANNED ANALYSES

To test whether a greater proportion of children with High CU traits showed less negative and more neutral emotions, relative to the proportion of children with Low CU traits, chi-square analyses were conducted. High *v*. Low CU groups were compared on their displays of positive/neutral affect compared to negative affect. This analysis was conducted for emotional displays when participants were first placed in time-out, while serving time-out, and immediately after their first time-out sequence ended, in both their first and fourth discipline-focused sessions. To test whether children with High CU traits showed less intense expressions of emotion than those with Low CU traits, a repeated-measures analysis of variance (ANOVA) was conducted with time-out phase as the within-subjects variable (when first placed in, while serving, and immediately after time-out) and CU group as the between-subjects variable (Low CU, High CU). To test whether there were group differences between the High and Low CU groups in relation to the type of behavior displayed in time-out, a chi-square analysis was conducted.

To test whether children with higher CU traits spent more time in time-out relative to children lower on CU traits, a negative binomial regression was conducted. For this analysis, continuous ICU scores were entered into the model to predict time spent in the first time-out sequence (in seconds) during the first and fourth PDI coaching sessions. Negative binomial regressions are appropriate for use with count variables where normality is violated, as was the case in the current study due to an inflation of zeros (Hilbe, 2007). Negative binomial regression was determined to be more appropriate than both Poisson Regression and Generalised Poisson Regression analyses, as this model was better able to account for the overdispersed count data, evidenced by goodness-of-fit tests (see Supplemental Table 1).

Each of these analyses were repeated controlling for child age, conduct problem severity (continuous ECBI intensity scores), version of treatment received (standard vs enhanced PCIT), and the

therapist providing treatment ($n = 12$, 91.7% female) to account for any differences in delivery of the PDI time-out sequence.

Results

DATA DIAGNOSTICS

Extreme univariate outliers on dependent variables (i.e., scores below the 5th percentile and above the 95th percentile) were winsorized to the benchmark set for defining extreme scores. Normality was not assumed for time-out variables given that only $n = 56$ participants received time-out in PDI1 and $n = 17$ participants received time-out in PDI4. Negative binomial analyses were conducted for these variables to account for the deviations from normality. Children who went to time-out in PDI1 (versus those who did not) were significantly younger, $t(81) = 2.10$, $p = .039$, more likely to be enrolled in the randomized trial of enhanced PCIT for children with CU traits relative to other trials, $\chi^2(3,83) = 10.97$, $p = .012$, and more likely to be receiving standard PCIT relative to enhanced PCIT, $\chi^2(1,83) = 5.52$, $p = .019$. They did not differ on delivery mode (in clinic *v.* internet), child sex, conduct problem severity, or ICU scores. Children who went to time-out in PDI4 (versus those who did not) were significantly more likely to be male, $t(46) = 2.24$, $p = .030$, enrolled in the open trial of enhanced PCIT for children with CU traits relative to other trials,$\chi^2(3,80) = 9.41$, $p = .024$, receiving enhanced PCIT,$\chi^2(1,80) = 8.36$, $p = .004$, and to be a treatment completer *v.* a dropout, $\chi^2(1,64) = 8.95$, $p = .003$. They did not differ on the other variables.

Zero-order correlations between main study variables are presented in Supplemental Table 2. ICU scores were negatively correlated with emotion ratings (1 = positive/neutral emotion, 2 = negative emotion) when children were first assigned time-out in PDI1. Emotion ratings when first assigned time-out in PDI1 were positively correlated with emotion ratings while serving time-out at PDI1. Emotion displayed was positively correlated with emotion intensity ratings within the same phase of time-out. Children who showed greater emotional intensity while serving time-out also engaged in more problematic behaviors and served longer time-outs. Child problematic behaviors (i.e., ranging between no disruptive behavior and destructive/violent behavior) while serving time-out in PDI1 were also positively correlated with PDI1 time-out length. Finally, younger children showed significantly more negative emotion during time-out, less negative emotion after time-out, less intense emotions when first placed in time-out and after time-out ended, and they spent significantly longer in time-out in PDI1 than older children, consistent with Garcia et al. (2018). There were no significant zero-order correlations between conduct problem severity, child sex, or therapist and all time-out variables.

ARE CHILDREN WITH HIGH CU TRAITS LESS EMOTIONALLY AFFECTED BY TIME-OUT THAN CHILDREN WITH LOW CU TRAITS?

Chi-square analyses indicated that children with High CU traits were significantly more likely to display positive/neutral affect and less likely to display negative affect when first placed in time-out in the first PDI session, compared to those with Low CU traits, χ^2 (1, $n = 54$) = 8.19, $p = .004$ (see Figure 1). The odds ratio indicated that the likelihood of displaying more positive/neutral affect was 6.9 times higher for children in the High CU group compared to the Low CU group. CU group remained a significant predictor of affect when first assigned to time-out in PDI1 in a logistic regression analysis controlling for child age, therapist, treatment condition, and conduct problem severity ($\beta = 2.27$, SE = 1.01, Wald $\chi^2 = 5.10$, $p = .024$). The difference between High and Low CU groups in displayed affect was not significant while serving time-out, χ^2 (1, $n = 56$) = 2.03, $p = .154$, or immediately after time-out ended, χ^2 (1, $N = 55$) = 1.01, $p = .315$, in the first PDI session, and remained nonsignificant when controlling for covariates in a logistic regression analysis (while serving time-out: $\beta = .90$, SE = .86, Wald $\chi^2 = 1.11$, $p > .05$; after time-out ended: $\beta = .85$, SE = 1.05, Wald $\chi^2 = .65$, $p = .42$). The most and least common emotions displayed in time-out are reported in the Supplemental Materials.

Results of a repeated measures ANOVA indicated no significant CU Group × Time-Out phase interaction on children's intensity of emotion displayed across the time-out phases, $F(2, 84) = 1.99$, $p = .143$, $\eta_p^2 = .045$, which remained nonsignificant when controlling for child age, therapist, treatment condition, and conduct problem severity, $F(2, 74) = 1.20$, $p = .308$, $\eta_p^2 = .031$. The pattern of estimated marginal means showed that on average the intensity of emotion reduced when time-out ended for both CU groups, after increasing somewhat for the Low CU group between first being placed in time-out and while

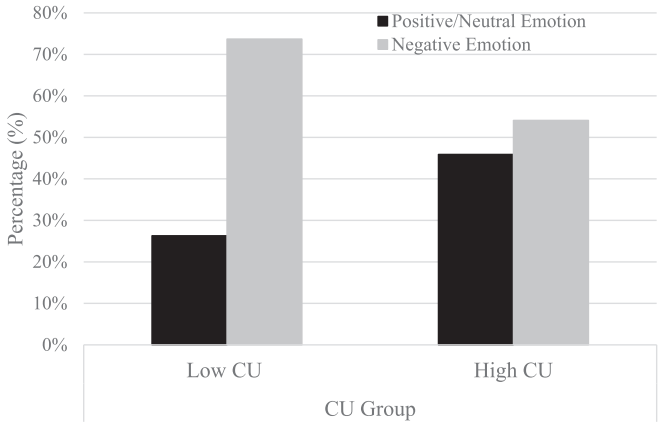

FIGURE 1 Group Differences Between Type of Affect Observed Immediately After Being Placed in Time-Out. *Note.* Group differences between children with High CU (ICU ≥ 29) and Low CU (ICU < 29) traits, in relation to type of affect (positive/neutral vs. negative) observed when first placed in time-out in PDI1.

serving time-out, while remaining relatively unchanged between these phases for the High CU group.

DO CHILDREN WITH HIGH CU TRAITS SHOW MORE DISRUPTIVE BEHAVIOR IN TIME-OUT THAN CHILDREN WITH LOW CU TRAITS?

Results of chi-square analysis indicated no significant differences between High and Low CU groups in relation to the type of behavior, i.e., upset/verbal, manipulative, destructive/violent, displayed during time-out in the first PDI session, χ^2 (3, N = 52) = 1.75, p = .627. CU status remained a nonsignificant predictor of destructive/violent relative to no disruptive behavior (β = −.35, SE = 1.32, Wald χ^2 = .07, p = .79), upset/verbal (β =.58, SE = .87, Wald χ^2 = .45, p = .50), and manipulative (β = −.94, SE = 1.38, Wald χ^2 = .46, p = .50) behavior in time-out in a multinomial logistic regression controlling for child age, condition, therapist, and baseline conduct problem severity.

Analyses of affect or negative behaviors while in time-out were not conducted for PDI4, given the small number of participants who received time-out in this session. However, descriptive differences between Low and High CU groups for time-out affect and behavior in PDI4 are provided in the Supplemental Materials.

DO CU TRAITS PREDICT LONGER TIME SPENT IN TIME-OUT?

As shown in Table 2, ICU scores did not significantly predict time-out length during the first time-out sequence in the first or fourth PDI coaching session. In the fourth PDI coaching session, children who were younger, received the enhanced PCIT treatment, and with more severe pretreatment conduct problem symptoms spent significantly longer in time-out than older children, those receiving standard PCIT, and with lower baseline conduct problem symptoms, respectively.

Discussion

This study examined whether children with elevated CU traits and conduct problems differ from children with conduct problems alone in their overt emotional and behavioral responses to parent-issued consequences (i.e., time-out) for noncompliance, delivered within a behavioral parent training intervention context. It advances prior research by directly observing both the affect and behavior of young children during a highly standardized time-out procedure involving parents administering time-out while being coached (i.e., line-fed) in-vivo through a parent-worn bug-in-ear device by a therapist trained in Parent-Child Interaction Therapy (PCIT; Eyberg & Funderburk, 2011). This method represents an improvement over prior studies of time-out, which involved parents implementing time-out unsupervised at home after a therapist explained in-session how to implement the procedure (Hawes & Dadds, 2005, 2007). Understanding how children on different developmental pathways for conduct problems respond to parental consequences for misbehavior is an important focus in the context of recent advances in developing targeted parenting interventions for children with CU-type conduct problems. These interventions variously focus on adapting behavioral interventions to align with children's temperamental differences in fearlessness/sensitivity to punishment, to others' distress signals, and the emotional closeness of

Table 2
Negative Binomial Regression, Using ICU Scores to Predict Time (in seconds) Spent in the First Time-Out Sequence During PDI 1 and PDI 4

Parameter			95% Wald CI						95% Wald CI for Exp(B)	
	B	*SE*	*LL*	*UL*	*Wald* χ^2	*df*	*p*	*Exp(B)*	*LL*	*UL*
PDI 1										
Intercept	6.53	.95	4.66	8.39	47.00	1	<.001	683.28	105.73	4415.47
Child Age	−.06	.09	−.23	.12	.43	1	.511	.94	.79	1.12
Therapist	−.13	.06	−.24	−.02	5.52	1	.019	.88	.78	.98
Treatment condition	−.27	.28	−.81	.27	.93	1	.334	.77	.45	1.32
ICU	−.003	.02	−.04	.03	.03	1	.855	1.00	.96	1.03
ECBI	.01	.01	−.01	.02	1.30	1	.254	1.01	.99	1.02
PDI 4										
Intercept	−2.47	2.18	−6.75	1.81	1.28	1	.258	.09	.001	6.10
Child Age	−.47	.14	−.74	−.21	11.95	1	<.001	.62	.48	.82
Therapist	.23	.06	.11	.34	13.91	1	<.001	1.25	1.11	1.41
Treatment condition	2.48	.40	1.69	3.27	37.68	1	<.001	11.93	5.41	26.32
ICU	−.03	.03	−.10	.03	.94	1	.333	.97	.91	1.03
ECBI	.05	.02	.02	.08	8.46	1	.004	1.05	1.02	1.08

Note. ICU = Inventory of Callous-Unemotional traits, CU severity; PDI = Parent Directed Interaction (second discipline-focused phase of Parent-Child Interaction Therapy; PDI1 = first PDI session; PDI4 = fourth PDI session; *B* = unstandardised coefficient; SE = Standard error; CI = Confidence Interval; LL = Lower Limit; UL = Upper Limit; *Exp(B)* = Odds Ratio; Treatment Condition (0 = standard treatment, 1 = enhanced treatment); ECBI = Eyberg Child Behavior Inventory, conduct problem severity.

parent-child interactions (Dadds et al., 2019; Fleming et al., 2022; Fleming, 2023; Kimonis et al., 2019).

The current study contributes several novel findings that advance understanding about the impact of child CU traits on the effectiveness of behavioral parent training interventions. First, young children high on CU traits initially responded to parent-implemented time-out for noncompliant behavior with more calm and neutral emotion relative to children with conduct problems alone, suggesting that they experience this form of parental discipline as less aversive. This low level of emotional discomfort experienced by children with elevated CU traits when disciplined for wrongdoing is thought to be below what is optimal and required for healthy socialization (Kochanska, 1995; Kochanska et al., 2002). Our finding of diminished observed affective reactivity to parent-implemented discipline aligns with prior studies using parent-report of children's responses to time-out (Hawes & Dadds, 2005; 2007), and a small pilot study that used direct observation of summer counselor-implemented time-out (Bansal et al., 2020). Critically, individual differences in punishment learning is offered as a key explanation for why children with CU traits end traditional interventions, which rely heavily on changing contingencies to reduce problematic behaviors, with conduct problems that are more severe and more likely to meet thresholds for diagnosis than children low on CU traits (Hawes & Dadds, 2007; Perlstein et al., 2023).

Punishment insensitivity was a key basis for adapting the PCIT behavioral parent training program for children with elevated CU traits to deemphasize punishment, and instead target their reward-dominant response styles using a token economy system integrated into the original PCIT time-out sequence. This PCIT-CU adaptation better maintained treatment gains in conduct problems for children with co-occurring CU traits relative to standard PCIT, for which time-out is the primary disciplinary strategy (Fleming et al., 2022). Similarly, for older children (7–11 years) with comorbid ODD and/or CD and ADHD receiving a 7-week behavior therapy intervention implemented within a summer treatment program (STP), those with high CU traits ($N = 11$) showed better response to treatment when the program was modified to deemphasize punishment (Miller et al., 2014). The current study advances prior research in being the largest sample to date of clinic-referred mixed-sex children that involved examining behavioral observations of child responses during a standardized time-out procedure. It is the first to focus on parent-implemented time-out administered via direct instruction from therapists behind a one-way mirror. The findings lend support to adapting the discipline component of traditional psychosocial interventions for child conduct problems to better

address differences in punishment learning for children with elevated CU traits from preschool age onwards.

A second key finding was that, contrary to Bansal et al.'s (2020) pilot study ($N = 11$), children high on CU traits did not show attenuated emotional responses *while serving* time-out relative to low-CU children. It is possible children with CU traits experience time-out as increasingly aversive the longer they are removed from parental reinforcement and not in control of when they can return to play. The lack of external stimulation during extended periods in time-out may provoke aversive reactions in children with high CU traits who are high in boredom susceptibility (Fanti et al., 2013). Also, the quality of "time-in" (i.e., the normal, interactive environment from which the child is removed during a time-out) is an important factor that modulates the effectiveness of time-outs. A time-in environment that is rich in positive reinforcement and engaging activities provides a more pronounced contrast with time-out. Consequently, the costs to the child are greater for choosing antisocial over alternative, more prosocial behaviors. By the fourth discipline coaching session, these children had ample opportunity to experience the contrast between time-out and time-in and learn that they are not in control, which potentially increased the effectiveness and aversiveness of time-out. Indeed, so few children ($n = 17$) were placed in time-out for failing to comply with their parent's effective command in PDI4 that our sample size was insufficient to test for group differences in response to time-out. That said, of the children who went to time-out after at least 3 weeks of experience with PDI, a greater proportion had high CU traits or were receiving PCIT-CU (only provided to children high on CU traits). These findings suggest that time-out was at least partly effective at reducing noncompliance for children with conduct problems both with and without elevated CU traits. This finding aligns with Fleming et al. (2022), who found that children with elevated CU traits randomized to the standard version of PCIT that emphasizes time-out and the enhanced version that deemphasizes time-out in the discipline phase, both showed improved noncompliant/ODD symptoms that maintained to a 3-month follow-up. However, other conduct problems deteriorated over the follow-up period for children in standard PCIT.

So, reduced aversion to time-out in children with CU traits did not prevent eventual prosocial changes to behavior when administered in this PCIT context. The mechanisms underpinning punishment sensitivity are disputed and poorly understood, ranging from low anxiety/fear/emotional reactivity to punishment, which was a central focus of this study, to behavioral disinhibition/impulsivity, to deficient punishment contingency detection (Jean-Richard-Dit-Bressel et al., 2021). Rodent and human adult studies using a conditioned punishment task found a bimodal distribution of punishment sensitivity, with the capacity to detect and learn instrumental contingencies differentiating punishment-insensitive from punishment-sensitive individuals. That is, punishment-insensitive individuals often failed to learn their volitional control over aversive outcomes (rodent: Jean-Richard-Dit-Bressel et al., 2019; human: Jean-Richard-Dit-Bressel et al., 2021). Similarly, individuals with psychopathy, which includes a CU trait dimension, often fail to learn to change their behavior to avoid punishment (i.e., passive avoidance learning deficits; Lykken, 1957).

One hypothesis offered for these differences in aversive associative learning (i.e., punishment learning) among individuals with CU and psychopathic traits is that they have a wider "learning window" compared to punishment-sensitive populations (i.e., anxious populations; Moul et al., 2021). Applied to PCIT, a key aim is to increase parental consistency and predictability in delivering consequences for noncompliant child behavior. The extensive therapist-supported in-clinic coaching sessions and structured between-session home practice to facilitate parent's consistent delivery of the scripted time-out procedure likely provided ample opportunities for children with elevated CU traits to learn the necessary contingencies. Deficits in learning punishment associations can also be addressed by supplying punishment-insensitive individuals with information about how their behavior relates to punishment, given punishment is delivered consistently (Jean-Richard-dit-Bressel et al., 2023). Applied to PCIT, the time-out script provides children with a standardized explanation that they must sit in time-out because they did not do what they were told, providing an informational frame to appropriately interpret the consequences they are experiencing.

Another possible explanation for the high compliance of high-CU children in PDI4 is that PCIT's enhancement of the parent-child relationship may have bolstered the effectiveness of time-out for these children. That is, the first phase of PCIT and its adaptation for children high on CU traits aims to increase positive parenting skills and parental warmth and sensitivity, respectively. These foci likely improved mutually responsive orientation (MRO) between parent and child, which is

defined as a close, reciprocal, mutually cooperative, and affectively positive dynamic parent-child relationship. At high levels of MRO, children are more willing to accept, cooperate with, embrace, and internalize parent's values, standards of conduct and socialization attempts and showed lower CU traits at age 10 (Kochanska et al., 2010; Kochanska, Boldt, et al., 2015). High MRO offsets the biologically based temperamental risk of children with or at risk for CU traits (e.g., fearlessness) by protecting against the development of antisocial, destructive, and callous behaviors; promoting more prosocial and adaptive behavioral and emotional trajectories over time; and counteracting the tendency and need for their parents to engage in increasingly power-assertive discipline that maintains the child's antisocial and callous behaviors (Fowles & Kochanska, 2000; Kochanska, 1997; Kochanska et al., 2008; Kochanska, Boldt, et al., 2015; Kochanska, Brock, et al., 2015; Trentacosta et al., 2019). An important mechanistic question for future research is whether interventions like PCIT and PCIT-CU improve the defiance/noncompliance of children with CU traits through their emphasis on increasing MRO. It is likely that PCIT's balance of relationship enhancement and consistent, information-laden discipline makes time-out an effective deterrent against undesired behaviors and promotes parent's continued use of this discipline tool.

Another key finding was that, contrary to Haas et al.'s (2011) pilot study with older children (*M* age = 9.48 years, *SD* = 1.58), we did not find that our younger sample of children with high CU traits showed more manipulative, destructive, or aggressive behaviors, or spent more time in time-out the first time it was implemented in treatment by parents, relative to children with conduct problems only. Within the PCIT treatment context, lengthier time-outs occur when children repeatedly defy parental commands, fail to achieve 5 quiet and calm seconds at the end of time-out, or refuse to comply with the parent's original play-based command after serving time-out. Although these findings were contrary to hypotheses established based on this prior research with older children treated by trained counselors within a STP, it is reasonable to expect that children who experience time-out as less aversive would also be less likely to express their negative affectivity to this putatively unpleasant experience in antisocial behaviors. An alternative explanation for these mixed findings is that children in Haas et al. (2011) also had comorbid ADHD diagnoses. This combination of high CU traits *and* impulsivity may have rendered these children less able to inhibit the urge to act violently towards their parents/counsellors, while at the same time feeling less distressed by time-out as Haas et al. (2011) speculated. Consistently, the combination of CU traits and impulsive behavior predicted greater risk for child-to-parent violence (Del Hoyo-Bilbao et al., 2022). A final possibility is that the headstrong-defiant characteristic that would have led to these behaviors does not differ significantly between children with conduct problems at high and low levels of CU traits. Indeed, research finds that the vindictive dimension of ODD, and not the headstrong dimension, is most strongly uniquely associated with CU traits (Stringaris & Goodman, 2009).

Results for covariates indicated that children who received the PCIT-CU adaptation were significantly less likely to receive time-out in the first PDI session but more likely to have lengthier time-outs in the fourth PDI session, relative to those receiving standard PCIT. In PCIT-CU, the standard time-out sequence is integrated into a highly individualized token economy system, such that children receive a token when they comply with a parental command. Following noncompliance, the parent issues a warning emphasizing that ongoing noncompliance will not only result in time-out, but also the loss of the token (e.g., "If you do not hand me the fire truck, you will not get a token for listening and you will have to sit on the time-out chair") (see Fleming & Kimonis, 2018). As was intended in the development of this PCIT-CU adaptation, using this token economy system appears to have reduced children's initial likelihood of noncompliance and consequent need for time-out, possibly because they had more to gain from immediate compliance (labelled praise plus token) or more to lose if assigned to time-out (i.e., time-out from reinforcing parental interaction plus token loss). However, this adaptation may have delayed noncompliance for some high CU children (since CU traits were high for all children receiving PCIT-CU). This may have been due to the reduced novelty of the token system by the fourth PDI session. Although, as noted above, even for these children there was a low incidence of time-out in the fourth PDI session. While we controlled for the version of PCIT received in analyses, and both versions involved identical time-out procedures following noncompliance, it will be important for future research to examine conduct problem subgroup differences to time-out implemented alone, as in standard Parent Management Training (PMT) programs, and in combination with tangible reinforcement for compliant child behavior, as in PCIT-CU. It will also be important for future studies with larger sample sizes to exam-

ine differences in responses to time-out between primary and secondary CU variants (see Kimonis, 2023).

LIMITATIONS AND STRENGTHS

Beyond those study limitations mentioned above, there are some other limitations to consider when interpreting results. First, the small sample size for PDI4 sessions limited our ability to test aims related to extended exposure to time-out. Second, children's affect and behavior while in the time-out room could not be coded because this room was not outfitted with audio-visual equipment, although the period spent in the time-out room was short relative to that spent in the time-out chair. Third, we used children's coded emotional and behavioral responses while seated in time-out as a proxy for sensitivity to punishment and future research would benefit from a multimethod approach. Fourth, it is possible that therapists differed in their coaching of parents to implement the PDI time-out script, although therapist was uncorrelated with our main study variables (see Supplemental Table 2). While we accounted for this possibility by controlling for therapist effects in our analyses, future research may code therapist fidelity to the PDI sequence to examine whether it impacts children's responses to time-out. Finally, children's responses to time-out may have also been impacted by parents' emotional responses during PDI coaching, which were not coded in the current study but may warrant future investigation. Strengths of this study include its multimethod design and its use of behavioral observation to assess children's responses to parent-implemented time-out; its focus on a well-characterized clinical sample oversampled for elevated CU traits; and its use of psychometrically robust and comprehensive measures of CU traits and conduct problems to classify children into clinical subgroups.

CONCLUSION

Our findings are consistent with the notion that children with CU-type conduct problems are uniquely characterized by insensitivity to parental discipline from early childhood. While this reduced aversion to time-out in children with CU traits likely complicates typical socialization, it can possibly be overcome via consistent, information-laden consequences delivered within the context of a positive, emotionally close, and mutually cooperative caregiver-child relationship. Parents' effective delivery of time-out and other consequences for misbehavior are also likely to impact the relational context more broadly. That is, when parents successfully establish time-out as a reliable consequence for misbehavior, this shifts the dysfunctional power hierarchy of the family (Minuchin et al., 1975; see also Dadds & Tully, 2019). These social experiences reflecting the changed family dynamic can alter children's beliefs about their parent's capacity to prevail when the child's goal is at odds with the parent's goal (social cognitive theory; Bandura, 2001). Which of these factors best explains the positive behavior change of children with CU traits, and whether they operate through improved punishment contingency detection and differ from children low on CU traits, are research questions that merit further investigation. Their answers have implications for enhancing the efficacy of parenting interventions for children with CU traits.

Importantly, the mechanisms underpinning punishment sensitivity are disputed and poorly understood. An important future research direction is to simultaneously investigate the various mechanisms underpinning punishment insensitivity in individuals with CU and psychopathic traits, which will be critical to refining etiological models. Advancing understanding of the development of callous antisociality can refine treatment targets and improve outcomes for a population that causes significant societal harm. If diminished affective response to discipline in early childhood is a precursor to life-course persistent antisocial behavior, providing this population with tailored early intervention could prevent the later transition to more severe CU and psychopathic traits, which is described as the costliest mental health disorder over the life course (De Brito et al., 2021).

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