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Guilt and Effortful Control: Two Mechanisms that Prevent Disruptive Developmental Trajectories

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Abstract

Children's guilt associated with transgressions and their capacity for effortful control are both powerful forces that inhibit disruptive conduct. We examined how guilt and effortful control, repeatedly observed from toddler to preschool age, jointly predict children's disruptive outcomes in two multi-method multi-trait longitudinal studies (*N*'s 57 and 99). Disruptive outcomes were rated by mothers at 73 months (Study 1) and mothers, fathers, and teachers at 52 and 67 months (Study 2). In both studies, guilt moderated effects of effortful control: For highly guilt-prone children, variations in effortful control were unrelated to future disruptive outcomes, but for children who were less guilt prone, effortful control predicted such outcomes. Guilt may inhibit transgressions through an automatic response due to negative arousal triggered by memories of past wrongdoing, regardless of child capacity for deliberate inhibition. Effortful control that engages a deliberate restraint may offset risk for disruptive conduct conferred by low guilt.

Keywords

Guilt; Effortful control; Disruptive conduct; Longitudinal studies; Observational methods

Two powerful psychological forces have been long considered the crucial inner guiding mechanisms that inhibit disruptive and antisocial conduct and promote conscience. One is guilt -- emotional arousal and discomfort associated with one's actual or even contemplated transgressions. The other is effortful control -- the capacity for deliberate restraint and voluntary inhibition of behavior.

Across a broad range of perspectives, several large bodies of literature, including developmental research, adult personality and psychopathy research, and developmental psychopathology all support such a contention. For example, Fowles and Dindo (2006) review the “dual-deficit” approach to psychopathy that emphasizes compromised guilt and deficient voluntary inhibition. Within the growing field of developmental psychopathology, multiple integrative analyses bridge the developmental and adult clinical research on guilt and effortful control (for example, Blair, Peschardt, Budhani, Mitchell, Pine, 2006; Frick & Morris, 2004). Rothbart and colleagues discuss “two control systems”: one reactive, emotion-based (corresponding to guilt) and one more active and deliberate, underpinned by effortful control and linked to attention (Rothbart, 2007; Rothbart & Ahadi, 1994; Rothbart

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& Bates, 2006). Carver (2005) describes two mechanisms of constraint: In one, restraint follows from anxiety, and in the other, restraint depends on effortful processes that involve planning, deliberation, etc. Cumulatively, that work dovetails with a developmental model that incorporated two distinct components of conscience, the affective (guilt, discomfort, aversive arousal associated with transgressions) and the behavioral control component (effortful control, a capacity for deliberate regulation of conduct; Kochanska, 1993).

Multiple developmental, social, and clinical approaches, classic and recent, from early psychoanalysis to contemporary affective neuroscience, have emphasized the role of guilt and discomfort associated with past transgressions in the development of rule-compatible conduct, and conscience more generally (Barrett, 1998; Baumeister, Stillwell, & Heatherton, 1994; Bybee, 1998; Damasio, 1994, [1996]; Damasio, Tranel, & Damasio, 1991; Dienstbier, 1984; Hoffman, 1983; Sears, Rau, & Alpert, 1965; Tangney & Fischer, 1995; Tracy, Robins, & Tangney, 2007; Kagan, 2005; Lagattuta & Thompson, 2007; Lewis, Sullivan, Stanger, & Weiss, 1989; Zahn-Waxler & Kochanska, 1990). Compromised guilt, callousness, lack of remorse, lack of empathy -- often called “callous-unemotional traits” -- are part of the core deficit in the developmental pathway toward psychopathy (Blair et al., 2006; Cleckley, 1982; Frick & Morris, 2004; Frick, Bodin, & Barry, 2000; Frick & White, 2008; Lykken, 1995).

Effortful control is a characteristic of temperament and personality that underlies the capacity to suppress the dominant but inappropriate response and perform a subdominant, but socially desirable response, to plan and consider future consequences. Research on effortful control, both conceptual and empirical, has also robustly shown its positive contributions to children's rule-compatible conduct and multiple aspects of moral development, and its preventive role regarding antisocial, disruptive trajectories across a broad range of ages, measures, designs (Eisenberg, Smith, Sadovsky, & Spinrad, 2004; Kochanska, Murray, & Coy, 1997; Kochanska, Murray, & Harlan, 2000; Rothbart & Bates, 2006; Rothbart, 2007).

Broad research on internal guiding mechanisms suggests that transgression-related distress and effortful control have both unique and shared neural substrates and socialization antecedents. The amygdala and the sympathetic nervous system are especially involved in “moral affects” or guilt (Damasio, 1996; Kagan, 2005; Kagan & Fox, 2006). Specific neural attentional networks have been identified as linked to effortful control (for example, the anterior cingulate gyrus, Posner, Rothbart, Sheese, & Tang, 2007). However, clinical and experimental evidence supports also shared neural pathways for guilt and effortful control, both involving amygdala and the mid- and prefrontal cortex (Blair et al., 2006; Raine, 2008).

Both unique and shared socialization factors have been implicated in the development of guilt and effortful control. Hoffman (1983) emphasized parents' use of moderate level of power and induction for emerging guilt. Maccoby (1980) stressed a well-structured socialization environment in the development of impulse control. Mutually responsive parent-child relationship has been implicated generally in children's internalization of parental values that in turn leads to both discomfort when the standards are violated and the active, deliberate regulation of behavior (Kochanska, 2002).

Despite those impressive bodies of work, to our knowledge, practically no research has specifically considered both guilt and effortful control as factors that operate *jointly* to influence children's prosocial and disruptive trajectories in personality development. Consequently, basic questions remain open. Are guilt and effortful control positively correlated in individual children? Do they each operate independently to prevent transgressions and more generally, antisocial and disruptive behavior problems, or do they

interact? Are high levels of both guilt and effortful control both necessary to prevent disruptive trajectories, or can one compensate for a deficiency of the other?

Scholars in temperament and personality fields have considered more broadly temperament × temperament or trait × trait interactions (Belsky, Friedman, & Hsieh, 2001; Eisenberg & Fabes, 1992; Eisenberg, Fabes, Guthrie, & Reiser, 2000; Eisenberg et al., 2000; Rothbart & Bates, 2006). In that work, self-regulation, often conceptualized similarly to effortful control, has been shown to interact with other dispositional aspects of children's temperament, including negative emotionality, in predicting adjustment outcomes.

We believe that due to its intensely aversive emotional nature, guilt may be the primary, rapid, and, to a degree, involuntary mechanism that prevents children from transgressing. And over time, it becomes a mechanism that protects children from embarking on disruptive, antisocial trajectories. For children with strong predispositions to experience guilt, somatically marked memories of past wrongdoing and the resulting arousal and anxiety are intensely unpleasant. Consequently, for those children, when such feelings are activated in future, they serve as an effective inhibitory force (Damasio, 1996; Damasio et al., 1991), regardless of the child's capacity for deliberate restraint.

In contrast, for children who are not guilt prone and who do not experience the intense anxiety when tempted to transgress, effortful control may become the alternative inhibitory mechanism. Even though the child may not experience a strong negative affective arousal when contemplating a rule violation, he or she may focus on potential long-term implications of wrongdoing, recall parental prohibitions and socialization messages, and consider alternative courses of action. Those processes engage the child's effortful control – an active suppression of the tempting dominant impulse for the sake of a sub-dominant, rule-compatible behavior (Rothbart & Bates, 2006; Rotbart, Ellis, & Posner, 2004).

In sum, individual differences in guilt proneness may moderate the effect of effortful control on children's antisocial and disruptive conduct, such that for highly guilt-prone children, variations in effortful control are not associated (or associated to a lesser extent) with wrongdoing and misbehavior. For children who are not guilt prone, however, restraint may be the alternative mechanism of preventing transgressions, and for them, individual differences in effortful control should significantly predict engagement in misbehavior and disruptive conduct.

We address these questions using data from two studies. In both studies, we adopted a multi-method multi-trait longitudinal approach. We collected multiple observed measures of children's guilt and effortful control repeatedly over time, in established, standardized laboratory paradigms to allow for the creation of robust trait-like personality constructs from toddler to preschool age (Rushton, Brainerd, & Pressley, 1983). The outcomes – children's disruptive, externalizing behavior problems – were assessed using informants' reports with established clinical validity. Those measures were obtained at later time points, to allow for inferences about developmental predictions from children's emerging early traits to their disruptive patterns of behavior at the age when most have made a transition to expanded academic and social ecologies outside of the family (early kindergarten and school age). The measures were highly parallel across studies to allow for inferences based on replicated effects.

Guilt was observed in scripted, standard laboratory situations, where the child was led to believe that he or she had damaged a valued object (Cole, Barrett, & Zahn-Waxler, 1992; Kochanska, Gross, Lin, & Nichols, 2002). Effortful control was assessed using multi-task, well-established batteries (Kochanska et al., 1997; 2000).

In Study 1, children's guilt and effortful control were both assessed at 22, 33, and 45 months, and their disruptive behavior problems were reported by mothers at 73 months. Study 1 should be treated as a source of preliminary data, because only a relatively modest sub-sample of the original families, successfully re-contacted 2 ½ years after the study's completion, participated in the 73-month assessment.

A much larger Study 2 replicated and expanded the findings, while addressing the limitations of Study 1. Children's guilt measures were obtained at 38 and 52 months, effortful control measures – at 25, 38, and 52 months, and children's disruptive behaviors were rated at 52 months by mothers, fathers, and teachers, and then again at 67 months by both parents.

All behavioral data were coded from videotapes by multiple teams of coders. Reliability was based on at least 15%-20% of cases, with more used for rare codes. Coders also realigned periodically to prevent drift. All measured constructs were extensively aggregated at multiple levels to produce robust scores (Rushton, Brainerd, & Pressley, 1983). Table 1 presents the overview of the measures in both studies.

Study 1

Method

Participants—Mothers and infants (*N* = 112), all from two-parent families, volunteered for the study advertised in local communities. Parents were mostly White (97% of mothers, 92% of fathers), but varied broadly in education and income. About half of the parents completed college or some graduate work and earned more than $40,000 per year, but lower education and income levels were also well represented (see Kochanska, Aksan, Penney, & Doobay, 2007).

The assessments began in infancy. In this article, we use data collected at 22 months (*N* = 106, 53 girls), at 33 months (*N* = 104, 52 girls), at 45 months (*N* = 101, 49 girls), and at 73 months (*N* = 57, 31 girls). There were two lengthy laboratory sessions at 22, 33, and 45 months, and one session at 73 months, conducted by female experimenters (Es). The study officially ended at 45 months; a subset of the families were successfully re-contacted, hence the lower *N* at 73 months. There were no significant differences in any of the measures between that subset and the families that did not return.

Measures of Children's Guilt at 22, 33, and 45 Months

“Mishap paradigms”: At each of those assessments, children were observed in two highly scripted, contrived “mishaps”, one during each of the laboratory sessions. E asked the child “to be very careful” while handling “a special”, “valued” object belonging to E (a doll and a t-shirt, a stuffed cat and a boat, and a xylophone and a coffee mug respectively at 22, 33, and 45 months). As soon as the child began handling the object, it fell apart in a fairly dramatic manner. At that point, E expressed mild regret, sat quietly for 60 s, and then asked the child several standard questions, for example “what happened”, “who did it”. E then left the room for 30 s to “fix” the object, returned with an undamaged exact replica, and fully reassured the child that the damage had not been his or her fault. The parent was in the room, but remained neutral, busy with questionnaires. The paradigms, coding, and data aggregation were described in detail in Kochanska et al. (2002), and consequently, the present description is abbreviated.

Coding and data aggregation: Some codes were applied to 5s segments, and some were applied to the longer "epochs" of the paradigm (e.g., the 60 s following the mishap). Reliability, kappas, ranged from .60 to .93 (average .75) across multiple coding teams.

The codes for the 5s segments included: *avoiding gaze*, the instances when the child looked away, downward, or askance (brief, when child looked away but then resumed looking at E, or long, when child averted gaze for the duration of the coded segment; the latter were multiplied by 2), and the presence of several signs of *tension*, such as twisting or biting lips, squirming, backing away, hanging down head, hunched shoulders, hugging self, covering face with hands.

The codes for the whole epochs included: *overall distress response*, from 1 (child is not distressed/affected by the mishap in any way), to 2 (child appears briefly, mildly distressed/affected), to 3 (child is distressed/affected, as evidenced by stilling, unease, concern), to 4 (child is strongly distressed/affected, freezes, cries, very uncomfortable or uneasy), and the child's *affect* as negative, positive, or neutral. Negative and positive affect was further qualified as strong, if applicable (and strong codes were multiplied by 2).

For each mishap, overall guilt scores were created by aggregating across the standardized scores of avoiding gaze, tension, overall distress response, and negative affect; those scored cohered (alphas for the mishaps at 22, 33, and 45 months were respectively, .76, .72, .76, .87, .83, .77). At each assessment, the codes also cohered significantly across the two mishaps, average $r = .50$, and thus were aggregated into overall guilt scores at 22, 33, and 45 months. Further, they correlated across the assessments (r's from .31 to .61, all p's < .001), and thus were aggregated into one composite guilt score from 22 to 45 months, $M = .01$, $SD = .55$, range -.78 to 2.56.

Measures of Children's Effortful Control at 22, 33, and 45 Months

Batteries of tasks: Batteries of tasks, most of which were multi-trial to yield robust scores, were administered during the laboratory sessions. There were six, 11, and 14 tasks respectively at 22, 33, and 45 months. These batteries, developed in our laboratory and available from the first author, have been described previously, most recently in Kochanska et al. (2007), and they are widely used in the field. Thus, the description here will be brief.

The tasks capture five inter-related core aspects of the child's capacity to suppress a dominant behavior and to perform instead a sub-dominant behavior: delaying, slowing down gross and fine motor activity, suppressing/initiating activity to signal, lowering voice, and effortful attention. *Delaying* tasks entailed waiting to perform a pleasant act (reach for an M&M under a cup, chew an M&M put on the tongue, unwrap gifts, or choose a toy; three tasks at 22 months, five at 33 months and at 45 months). *Slowing-down* tasks called for slowing fine (drawing) or gross (walking) motor activity (one at 22, three at 33 and at 45 months). *Suppressing/initiating activity to signals* tasks were "Go-No Go" tasks, and called for responding to one type of signal and inhibiting a response to another (e.g., "Simon Says", a turn-taking game, or a Red Signs-Green Signs game; one task at 22 and at 33 months, three at 45 months). *Lowering voice* involved whispering (one task at 33 and at 45 months). *Effortful attention* tasks were Stroop-like paradigms that required ignoring a dominant perceptual feature of a stimulus for the sake of a subdominant feature (one at 22 and 33 months, two at 45 months).

Coding and data aggregation: The codes were strongly behaviorally based and required little inference. Each trial's higher score reflected a better capacity for effortful control. The scores were then averaged across trials, where applicable. All kappas were very high

(above .88) across all three ages and across many coding teams, except for two instances (.74 and .53).

The tasks converged increasingly with children's age: Cronbach's alphas were .42, .77, and .79 respectively at 22, 33, and 45 months (although the 22-month alpha was relatively low, alpha for all 31 tasks across all assessments was .88). The standardized scores for individual tasks were then aggregated into a composite for each age. Those were longitudinally stable: from 22 to 33 months, $r(104) = .44$, from 33 to 45 months, $r(101) = .80$, p's $< .001$, average $r = .53$, and they were aggregated into one effortful control score from 22 to 45 months, $M = .00$, $SD = .41$, range -.85 to .86.

Measures of Children's Disruptive Conduct at 73 Months—Mothers rated the children using the 30-item Preschool Behavior Questionnaire (PBQ, Behar, 1977), with each item rated from 0 (does not apply) to 2 (certainly applies). We created a scale of disruptive behavior by averaging across 11 relevant items (e.g., lies, fights, bullies others, kicks, hits others, does not share, explosive temper, disobedient, alpha = .81, $M = .48$, $SD = .29$, range 0 – 1.27).

Results and Discussion

The analyses were straightforward. In a hierarchical multiple regression, we examined children's gender (the covariate), entered in Step 1, the overall guilt score and the overall effortful control score, each from 22-45 months, entered together in Step 2, and the interaction of guilt and effortful control, entered in Step 3, as the predictors of the mothers' ratings of their children's disruptive conduct at 73 months. The composite guilt and effortful control scores correlated, $r(57) = .55$, $p < .001$. The analysis is presented in Table 2.

There was no effect of gender. Both guilt and effortful control had significant main effects in the predicted directions, but only effortful control remained significant when the interaction effect was added. The interaction effect was significant, qualifying the main effect of effortful control.

We then probed the interaction effect using the simple slopes procedure (Aiken & West, 1991). Low guilt and effortful control were represented by scores 1 SD below each variable's mean and high guilt and effortful control were represented by scores 1 SD above the means. Figure 1 depicts the results.

As predicted, children's tendency to experience guilt following transgressions moderated the effect of their effortful control on mother-rated antisocial behavior at early school age. For the highly guilt-prone children, individual differences in effortful control had no implications for their disruptive conduct, simple slope b = -.08 SE = .15, *ns*. In contrast, for children with low guilt, differences in effortful control were significantly associated with disruptive conduct, simple slope b = -.40, SE = .11, $p < .001$.

Because the main effect of effortful control appeared quite strong, we conducted additional re-analyses of its effect, but this time, we examined three rather than two groups: children high, medium, and low on guilt. The high and low groups were determined by +/− 1 SD, as in the prior analysis. The medium group was estimated based on the mean. Then, we estimated the simple slopes for children with medium (i.e., mean) level of guilt, and compared those children with children with low guilt (recall that there was no effect of effortful control on disruptive outcomes in children with high guilt). Note that these additional analyses are *not* depicted in Figure 1.

For children with medium guilt, differences in effortful control were associated with disruptive behavior, simple slope b = −.24, SE = .10, $p < .05$. We then formally compared the magnitudes of the effect of effortful control for children with medium guilt and those with low guilt, by calculating the ratio of the t-values for each effect.

The effect was marginally stronger for children with low guilt, compared to children with medium guilt $t(52) = 1.55$, $p < .10$ (and recall that the effect was absent for children with high guilt). This suggests that as children's tendency to respond with guilt weakens, the role of effortful control in preventing disruptive conduct becomes progressively stronger.

In summary, these findings are straightforward, and they fully support our model. They need to be treated with caution, however, due to the modest sample size. Guilt and effortful control were positively related with each other, but their relations with mother-rated disruptive outcomes were complex. As expected, for children who were highly predisposed to respond with discomfort and guilt when they believed they had transgressed, the capacity for deliberate restraint appeared irrelevant. Presumably, the intensely unpleasant emotions of guilt provided a sufficient protection from embarking on an antisocial trajectory. For children who were not prone to such emotions, the effortful inhibitory skills that allowed the children to consider long-term consequences of their behavior, social and family standards of conduct, and past socialization messages were critical in serving as a protective factor.

Study 2

Method

Participants—Mothers, fathers, and infants (N=102) volunteered for the study (details are in Kochanska et al., 2007). The families were relatively diverse in terms of education and income. Regarding race, 91% of mothers were White, 3% Hispanic, 1% each African American, Asian, Pacific Islander, and 3% “other” non-White. Among fathers, 84% were White, 8% Hispanic, 3% African American, 2% Asian, and 2% “other”. In 20% of families, one or both parents were non-White.

Assessments began in infancy; data for this article were collected at 25 months (N = 100, 50 girls, at 38 months (N = 100, 50 girls); at 52 months (N = 99, 49 girls), and at 67 months (N = 92, 45 girls). There were lengthy laboratory sessions, conducted by female Es, at all assessments (and home and laboratory sessions at 38 months), for the child with each parent.

Measures of Children's Guilt at 38 and 52 Months

Paradigms: Highly scripted “mishap” paradigms, two at each age, fully analogous to those in Study 1, were conducted. The broken objects were: a musical toy (xylophone), a boat, and a decorative doll and an alarm clock, respectively at 38 and 52 months.

Coding and data aggregation: Coding essentially paralleled that in Study 1, with minor coding refinements. The codes applied to the 5s segments included gaze avoidance and tension shown by facial expression and body language, and those applied to the “epochs” of the paradigm included overall response and affect. Reliability, kappas, ranged from .61 to .87 across the assessments and coding teams.

Data aggregation was also essentially identical to Study 1 (although here, we also included reversed positive affect scores in the composite for each mishap). As in Study 1, the codes cohered within each mishap paradigm (at 38 months, alphas were .64 and .66, and at 52 months, .64 and .67), and thus were standardized and aggregated, and those aggregates correlated across mishaps, at 38 months, $r(95) = .21$, $p < .05$, and at 52 months, $r(99) = .52$, $p < .001$. Consequently, they were aggregated into overall guilt scores at 38 months and at

52 months. Those two scores also correlated, $r(99) = .25$, $p < .025$, and they were combined into one composite guilt score from 38 to 52 months, $M = -.01$, $SD = .65$, range -1.08 – 2.46, to be used as a predictor of disruptive conduct at 67 months. Note that only the 38-month score, $M = .02$, $SD = .83$, range -1.68 – 2.20, was used as a predictor of disruptive conduct at 52 months (the concurrent 52-month guilt score, $M = .00$, $SD = .87$, range -1.53 – 4.58, was examined as a covariate in additional analyses).

Additional measures of children's guilt: Analogous mishap paradigms were also conducted at 25 and at 67 months. The 25-month overall guilt score, however, was uncorrelated with the 38-month or 52-month scores (both *r*'s were lower then .06), and thus was not included in the final guilt composite. The 67-month overall guilt score, $M = .00$, $SD = .83$, range -2.07 – 2.20, concurrent to disruptive outcomes at 67 months, was examined as a covariate in additional analyses.

Measures of Children's Effortful Control at 25, 38, and 52 Months

Batteries of tasks: The batteries were essentially parallel to the ones used in Study 1. At 25, 38, and 52 months there were, respectively, five, nine, and 14 tasks. *Delaying* was captured in waiting tasks (four at 25 months, three at 38 months, and five at 52 months). *Slowing down* was assessed in two tasks at 38 months and three tasks at 52 months. *Suppressing/ initiating activity to signals* was captured in one task at 25 months and one at 38 months, and three tasks at 52 months. *Lowering voice, or whispering*, was assessed in one task at 38 and one at 52 months. *Effortful attention* (Stroop-like) tasks that required ignoring a dominant perceptual feature of a stimulus for the sake of a subdominant feature were new: Day-Night and Snow-Grass (Carlson and Moses, 2001), two tasks at 38 months and two at 52 months.

Coding and data aggregation: As in Study 1, the codes were strongly behaviorally based, and each trial was coded so that the higher score reflected a better capacity for effortful control. Reliabilities, kappas, ranged from .71 to 1.00, and alphas ranged from .81 to 1.00.

As in Study 1, the scores were averaged across trials, where applicable. The individual task scores were then standardized and aggregated into *effortful control composites* at 25, 38, and 52 months (Cronbach's alphas were .71, .67, and .72 respectively). Those composites were longitudinally stable, *r's* ranging from .37 to .57, all p's < .001, average $r = .49$, and they were aggregated across 25, 38, and 52 months into an *overall composite of effortful control*, $M = -.01$, $SD = .46$, range -1.58 - .84. This composite was used as a predictor of antisocial outcomes at 67 months; when predicting the outcomes at 52 months, the composite of the 25- and 38-month scores was used, $M = -.01$, $SD = .52$, range -1.59 – 1.05, and the 52-month concurrent score was a covariate, $M = -.01$, $SD = .53$, range -3.19 - .94.

Analogous battery was also administered at 67 months; that score, being concurrent to antisocial outcomes, was excluded from the final effortful control composite, but it served as a covariate, $M = -.00$, $SD = .59$, range -2.13 – 1.26.

Measures of Children's Disruptive Conduct

Measures at 52 months: Mothers, fathers, and teachers rated the children using the same instrument as in Study 1, the PBQ, and the disruptive conduct scores parallel to Study 1 were created based on 11 items. Respectively, for those three informants, alphas were .79, .77, and .90, and the descriptive data were as follows: $M = .56$, $SD = .31$, range 0 – 1.46, $M = .54$, $SD = .27$, range 0 – 1.55, and $M = .26$, $SD = .33$, range 0 – 1.27. Those scores cohered, *r*'s ranging from .27 to .47, all *p*'s < .01, and were aggregated into one overall disruptive conduct score at 52 months.

Measures at 67 months: Mothers and fathers rated the child using three established instruments. Those were: Child Symptom Inventory-4 (CSI-4), Inventory of Callous-Unemotional Traits (ICU), and MacArthur Health behavior Questionnaire (HBQ).

CSI-4 (Gadow & Sprafkin, 2002; Gadow, Sprafkin, & Nolan, 2001; Sprafkin, Gadow, Salisbury, Schneider, & Loney, 2002) includes Symptom Severity scoring, where each item is rated from 0 (never) to 3 (very often). We used the scores for Oppositional Defiant Disorder, ODD, 8 items (mothers, M = 6.99, SD = 3.76, range 0-24, fathers, M = 6.29, SD = 3.21, range 0-17) and Child Disorder, CD, 15 items (mothers, M = 1.37, SD = 2.18, range 0-11, fathers, M = 1.04, SD = 1.70, range 0-12).

ICU (Frick, 2003; Frick et al., 2000; Frick & White, 2008) captures callousness, disregard for others, and absence of concern for rules and standards of behavior. We computed the means of all 24 items, rated from 0 (not at all true), to 3 (definitely true): mothers, alpha = .84, M = .80, SD = .32, range .13 - 1.63, fathers, alpha = .87, M = .80, SD = .32, range .13 - 1.63.

HBQ (Boyce et al., 2002; Essex et al., 2002) assesses children's problems and competencies. We selected four overt aggression items (e.g., taunts, teases, hits, bites other children), each rated from 1 (never) to 3 (often), and averaged them. For mothers, alpha was .64, M = 1.35, SD = .35, range 1.00 – 2.50, and for fathers, alpha = .55, M = 1.33, SD = .30, range 1.00 – 2.50.

For each parent, the four scores (ODD, CD, ICU, and HBQ overt aggression) were standardized and aggregated into a disruptive behavior score, given that they were inter-correlated (average inter-item correlation for mothers, .46, for fathers, .39; mothers, M = .00, SD = .77, range -1.40 -2.52, fathers, M = .00, SD = .73, range -1.35 - 4.00). The two parents' scores also correlated, $r(88) = .46$, $p < .001$, and they were further averaged into the overall composite of disruptive, externalizing behavior at 67 months, M = .01, SD = .66, range -1.03 - 2.94, alpha = .80.

Results and Discussion

Prediction of children's disruptive conduct at 52 months

The analyses paralleled Study 1. In a hierarchical multiple regression, we examined children's gender (the covariate), entered in Step 1, the guilt score at 38 months, and the effortful control composite of the scores at 25 and 38 months, entered together in Step 2, and the interaction of guilt and effortful control, entered in Step 3, as the predictors of the informants' ratings of children's disruptive conduct at 52 months. The guilt and effortful control scores correlated, $r(99) = .28$, $p < .01$. The analysis is presented in Table 2.

There was a main effect of gender, but it did not remain significant with all the predictors in the equation. Both guilt at 38 months and effortful control at 25-38 months were significant negative predictors of disruptive conduct, and remained so in the complete equation. These effects, however, need to be qualified by the significant predicted interaction effect between guilt and effortful control.

We then probed the interaction effect using the simple slopes procedure (Aiken & West, 1991), following the same approach as in Study 1. Again, as in Study 1, guilt moderated the effects of effortful control on disruptive outcomes rated at 52 months by multiple informants. For children who were highly guilt prone, differences in effortful control were not associated with future disruptive behavior, simple slope b = -.03, SE = .06, *ns*. In contrast, for children who were unlikely to experience guilt, differences in effortful control

were significantly associated with disruptive behavior, simple slope b = -.21, SE = .05, $p < .001$. In this group, children with low effortful control had the highest disruptive conduct scores, and those with high effortful control had the scores comparable to guilt-prone children. Figure 2 depicts the effects.

Again, following the same strategy as in Study 1, we conducted additional re-analyses of three rather than two groups to further determine whether the effects were different for children with medium versus low guilt (recall that there was no effect for children with high guilt). Note that these analyses are *not* depicted in Figure 2.

We estimated the simple slope for children with medium guilt, and compared it with the simple slope for children with low guilt. The results paralleled those in Study 1. For children with medium guilt, effortful control was significantly associated with disruptive behavior, simple slope b = -.12, SE = .04, $p < .01$. The magnitude of this effect in children with low guilt was marginally stronger compared to children with medium guilt, $t(96) = 1.44$, $p < .10$, again suggesting that, as in Study 1, as children's guilt-proneness weakens, the protective role of effortful control becomes progressively stronger.

To assure that the interaction effect would remain significant with the 52-month measures of guilt and effortful control (concurrent to the antisocial behavior outcome) controlled, we conducted the analysis where those two scores were added to Step 1. The interaction effect remained significant, $F(1,92) = 5.65$, Beta = .21, $p < .025$.

Prediction of children's disruptive conduct at 67 months

Again, in an analogous hierarchical multiple regression, we entered children's gender (the covariate) in Step 1, the composite of the guilt scores at 38 and 52 months, and the effortful control composite of the scores at 25, 38, and 52 months, all in Step 2, and the interaction of guilt and effortful control in Step 3, as the predictors of the composite of parents' ratings of children's disruptive behavior at 67 months. The guilt and effortful control scores correlated, $r(92) = .36$, $p < .01$. The analysis is presented in Table 3.

Child gender had a significant main effect, but that effect dropped to not significant in the final equation. Effortful control, but not guilt, had a negative main effect on antisocial behavior at 67 months that remained significant; however, the significant interaction of guilt and effortful control qualified that main effect. The simple slopes tests probing the interaction are depicted in Figure 3.

Again, the association between effortful control and antisocial outcome was significant only for children who were not guilt prone, simple slope b = -.81, SE = .14, $p < .001$. For children who were highly prone to guilt, there was no significant relation between effortful control and antisocial behavior at 67 months, simple slope b = -.22, SE = .19, *ns*.

Again, we conducted additional re-analyses (not depicted in Figure 3), using three groups, to examine the effect in children with medium and low guilt (recall there was no effect for high guilt-prone children). The simple slope estimate for the effect of effortful control for children with medium guilt was significant, simple slope b = -.51, SE = .17, $p < .01$. The magnitude of the effect of effortful control for children with low guilt was significantly greater $t(96) = 1.98$, $p < .05$, compared with children with medium guilt.

It is notable that the interaction effect remained significant even when guilt assessed at 67 months, concurrently to the disruptive outcomes, was covaried in Step 1 in an additional regression, $F(1,85) = 10.38$, Beta = .30, $p < .01$. It also remained significant when effortful control assessed at 67 months was covaried, $F(1,84) = 8.47$, Beta = .28, $p < .01$.

Furthermore, we also added the composite of mothers', fathers', and teachers' PBQ ratings of children's disruptive behavior at 52 months to Step 1 as a covariate. Unsurprisingly, that 52-month composite robustly predicted the parents' ratings at 67 months, obtained using related clinical and developmental instruments (CSI-4, ICU, HBQ), $F(1,89) = 39.58$, Beta = .55, $p < .0001$. But even so, the interaction of guilt and effortful control remained significant, $F(1,86) = 4.01$, Beta = .16, $p < .05$.

In summary, Study 2, using a much larger sample and outcomes at two points in time, fully converged with Study 1 in supporting the posited model. Guilt proneness moderates the effects of effortful control: Again, for children who were highly predisposed to becoming distressed and uncomfortable following a transgression, individual differences in effortful control had no effect on disruptive outcomes, whether assessed by parents and teachers, or by parents only, and across several well-established report measures. The effect remained significant even when measures of guilt and effortful control that were concurrent to the outcomes were controlled, and even when the earlier disruptive outcomes were covaried when predicting later parallel outcomes. Again, consistent with Study 1, the preliminary and exploratory analyses of the role of effortful control for children who were very low in guilt and moderate in guilt (thus, for whom effortful control mattered) suggested that as guilt proneness weakens, the role of deliberate regulation of behavior increases.

General Discussion

We examined simultaneously guilt and effortful control, two broadly accepted developmental mechanisms that prevent wrongdoing and, over time, protect children from embarking on disruptive, antisocial trajectories. When compromised, both of those inner regulatory mechanisms correlate with and lead to antisocial outcomes, disruptive behavior disorders, and potentially, in extreme cases, to later psychopathy. Despite large bodies of research on both, to our knowledge, the two mechanisms have rarely, if ever, been examined jointly.

The strengths of this research include a multi-method, multi-trait, multi-assessment, and multi-informant approach adopted in both studies. In particular, the measures of guilt and effortful control were all observational, and the measures of disruptive outcomes were all based on informants' reports. Consequently, the findings are not subject to concerns about the shared method variance. Longitudinal designs covered the age range from toddler to early school period. In Study 2, where the relevant measures were available, several additional analyses controlled for earlier and concurrent variables that may have been potential confounds, strengthening the inferences.

Study 1, due to the small sample size, should be treated as exploratory. Nevertheless, the findings from both studies converged fully. We expected, and confirmed, that guilt and effortful control function together in an interactive fashion. The two studies support the conceptual model articulated in this work. That model assumes that for highly guilt-prone children, affective, “visceral” memories of past wrongdoing (Damasio, 1996) activate intensely unpleasant emotions and serve as automatic “brakes” on prohibited behavior, effectively shielding the child from embarking on an antisocial pathway. For children who are unlikely to respond with discomfort, an alternative protective mechanism may be available -- a more deliberate capacity to voluntarily suppress undesirable conduct.

Furthermore, we conducted exploratory analyses to describe the effects of effortful control on disruptive outcomes in children with high, medium, and low levels of guilt-proneness. Although this inference is admittedly preliminary, both studies appeared to suggest that the

role of effortful control becomes progressively more important as guilt proneness diminishes.

This research extends into a new direction the large body of work on temperament × temperament, or trait × trait interactions (Rothbart & Bates, 2006). Notably, several of such studies show interactions between effortful control and negative emotionality, in predicting developmental outcomes, including disruptive, externalizing problems.

Typical measures have included informants' ratings about children's propensity to become negatively emotionally aroused and affectively dysregulated, emotional intensity, reactivity to stress, explosiveness, anger proneness (Eisenberg et al., 2000 a, b; Eisenberg & Fabes, 1992), or observed distress and crying in response to the stress of separation (Belsky et al., 2001). That work cumulatively has shown that children with high levels of such temperamental traits are at risk for a broad range of adjustment problems *unless* they are *also* well-regulated. Thus, whereas high negative emotionality is a developmental risk factor, that risk may be offset by high effortful control.

However, recent work on psychopathy (Blair et al., 2006; Frick & Morris, 2004) suggests that, when it comes to risks and protective factors regarding specifically antisocial outcomes, a more complex form of the model needs to be considered. Negative emotional reactivity that underlies children's predisposition to experience guilt may be, in fact, a *protective factor* against callous-unemotional forms of conduct problems (Kagan, 2005; Kochanska et al., 2002). Across multiple studies and populations, Frick and colleagues have convincingly shown that children whose affective response following transgressions is *shallow and lacking in adequate intensity* are at a strong risk for callous-unemotional traits and antisocial trajectories.

That view of very low guilt as a risk factor dovetails with the current findings. Both our studies show that for children who are very highly guilt prone, effortful control capacities are unrelated to future disruptive, antisocial conduct problems. One interpretation is that for those children, somatically marked negative emotions associated with past transgressions are so intensely unpleasant that when triggered in future situations of making behavioral choices, those emotions involuntarily and rapidly inhibit rule violations (Damasio, 1996). This process may happen regardless of the child's capacity for deliberate effortful control. For children who are not guilt prone and who do not experience sufficient distress, deliberate effortful control is an alternative inner regulatory mechanism that prevents transgressions. Our analyses of the children for whom effortful control was significant further raise an intriguing possibility that such deliberate mechanism becomes *increasingly consequential* as the child's disposition to experience guilt weakens.

Consequently, we suggest a potential reformulation of the existing research in terms of a more general model. Sometimes, a particularly *high* intensity of affective response predicts developmental risk (Belsky et al., 2001; Eisenberg & Fabes, 1992; Eisenberg at al., 2000 a, b), but at other times, a particularly *low* intensity of affective response predicts high risk (Blair et al., 2006; Frick & Morris, 2004; Frick & White, 2008). Under both conditions, however, for children who are at high risk, levels of effortful control have substantial implications for developmental outcomes. For those children, high effortful control capacity serves as a significant protective factor that can offset the risk. Furthermore, a combination of high risk due to the affective disposition (either toward too intense *or* too shallow a response) and low effortful control leads to the most detrimental developmental outcomes.

In this study, we assessed children's reactions to transgressions as an empirically coherent blend of observed responses that included, among others, negative emotion and arousal, multiple signs of tension, sadness, avoidance, and overall sense of distress. One important

future research enterprise would be to distinguish two self-conscious emotions, guilt and shame. Extensive adult research has shown broad differences between the two emotions (Tangney & Fischer, 1995; Tangney, Stuewig, & Mashek, 2007); the emerging developmental evidence is also promising (Barrett, 1998, 2005).

Another important future question concerns the specificity of children's self-conscious response to transgressions versus their non-specific response to any stressful or emotionally aversive experience. To the extent that mishaps are stressful events that in the past have led to unpleasant consequences, the child's broad temperamental disposition to experience negative affective states certainly contributes to the intensity of his or her discomfort in the aftermath of a transgression. It would therefore be useful to rule out an alternative explanation that children's negative emotionality can account for the effects.

Because multiple measures of children's fearful, angry, and sad emotional responses to other standardized laboratory episodes were available in Study 2, we created composite measures of those responses for the same assessment times as the guilt measures. We then conducted exploratory analyses where those composite measures of children's negative emotional responses were added to the regressions in Tables 3 and 4. The findings remained unchanged, increasing our confidence in the reported effects.

Several caveats are in order. The model tested here is far from complete, as guilt and effortful control are only some of developmental mechanisms involved in the evolving disruptive and antisocial pathways. In particular, parent-child relationship is strongly linked to prosocial and antisocial outcomes. Positive socialization forces such as love, attachment bonds, and mutually responsive and affectively positive interactions, and negative forces such as power assertion, rejection, and insecurity all play critical roles, serving as protective and risk factors (Deater-Deckard & Petrill, 2004; Kochanska, 2002; Shaw, 2003; Thompson, 2006). As well, the parent-child relationship may predict developmental outcomes directly or indirectly, by influencing both guilt and effortful control (Kochanska, Aksan, Prisco, & Adams, 2008). Genetic and ecological factors also play important roles.

Although both studies presented here yielded highly coherent data, they are subject to limited generalizability. Both studies involved relatively low-risk community samples. Nevertheless, the frequencies of children's disruptive outcomes resembled those reported in general population. Although in the current analyses we used the continuous measures of symptom severity, derived from CSI-4, we also created alternative measures -- the symptom count. In the latter approach, a symptom (item) is considered clinically relevant if it is rated as 1 (often/very often). When the symptom count summary score for a certain category is equal or greater to the number of symptoms required by DSM-IV for a specific diagnosis, the child receives a screening cutoff score of “yes” for that diagnosis. Using this strategy, 8% of children met criteria for ODD; 7% met criteria for CD (by mothers' report). According to Gadow and Sprafkin's screening and norm manual (2002), the respective prevalence rates are, for ODD, 2%-16% and for CD, 2% - 16% (the latter higher for males than females). Thus, our sample appears to be a fair representation of the general population. Nevertheless, future research should replicate the reported effects in high-risk samples and across a wider developmental window, given that children in this study were younger than the age of onset of significant conduct problems, which occurs typically in middle childhood and adolescence (APA, Diagnostic and Statistical Manual of Mental Disorders, DSM-IV-TR, 2000).

Although diverse in terms of education and income, and ethnically representative of the Midwest, the samples had a limited number of minority families. Future research should target more ethnically diverse samples. Given the social and individual costs of disruptive

and antisocial developmental pathways, a better understanding of protective factors is a worthwhile enterprise.

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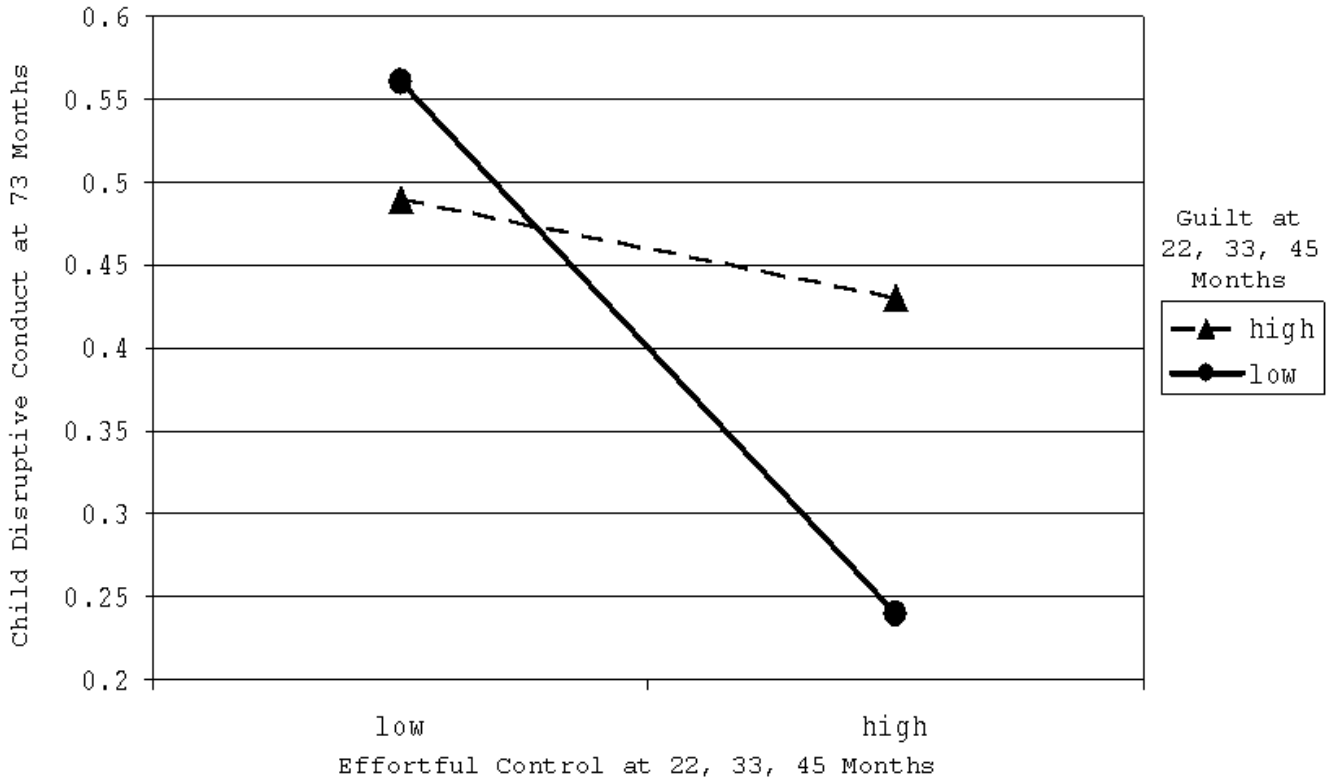

Figure 1.
Guilt Proneness Moderates the Effect of Effortful Control on Disruptive Conduct at 73 Months, Study 1.
Although not depicted in the model, child gender was a covariate.

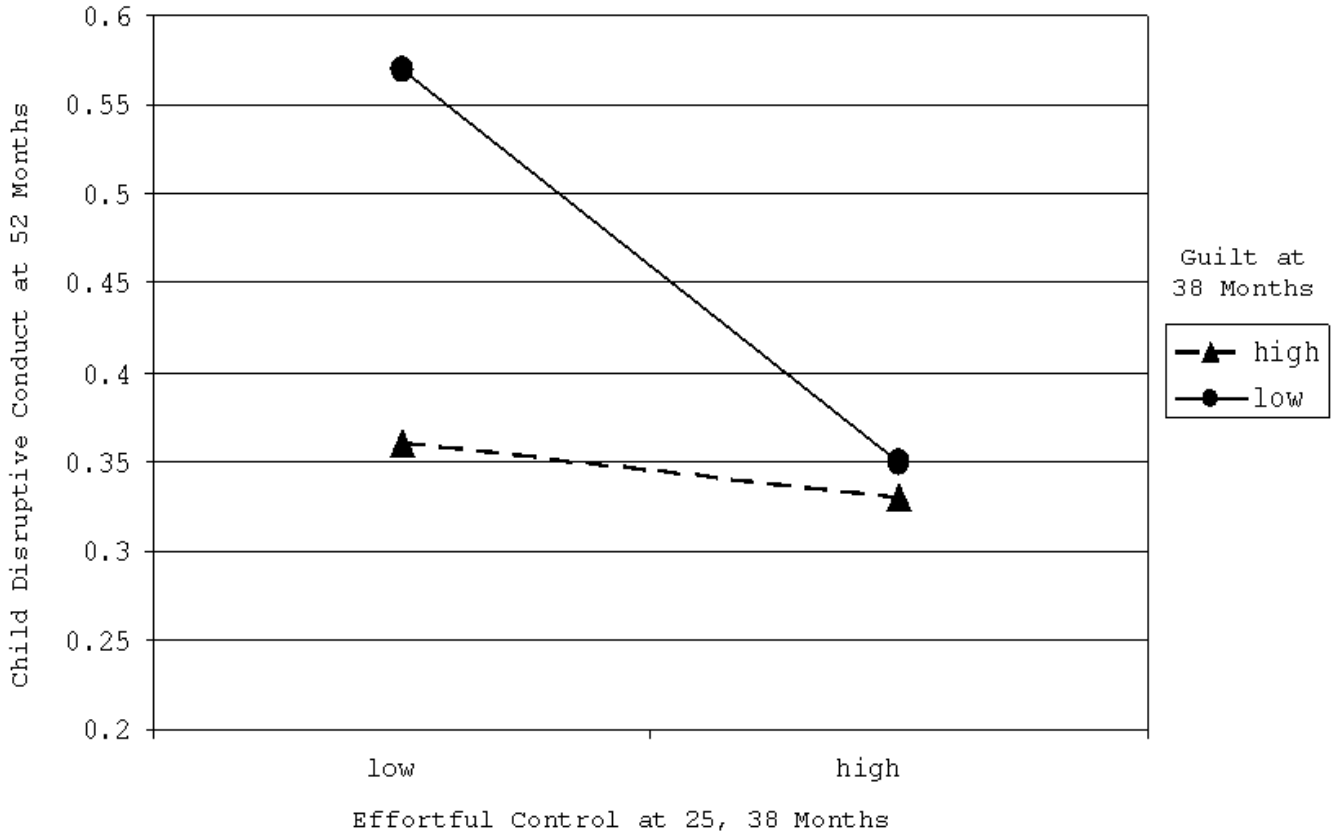

Figure 2.
Guilt Proneness Moderates the Effect of Effortful Control on Disruptive Conduct at 52 Months, Study 2.
Although not depicted in the model, child gender was a covariate.

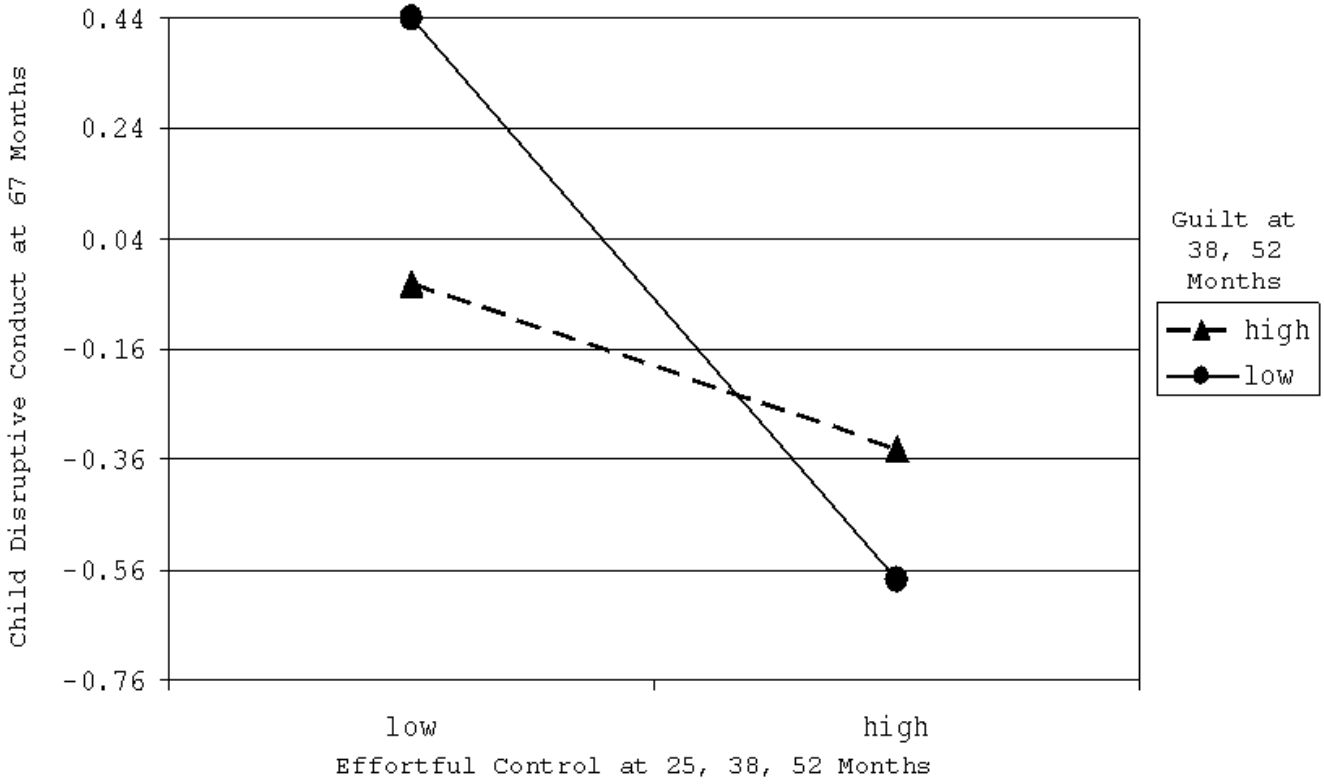

Figure 3.
Guilt Proneness Moderates the Effect of Effortful Control on Disruptive Conduct at 67 Months, Study 2.
Although not depicted in the model, child gender was a covariate.
Solid lines represent significant simple slopes; dashed lines represent non-significant simple slopes.

Table 1

Overview of Measures in Study 1 and Study 2

	Study 1				*Study 2*			
Assessments (Ages in Months):	**22**	**33**	**45**	**73**	**25**	**38**	**52**	**67**
***N*:**	**106**	**104**	**101**	**57**	**100**	**100**	**99**	**92**
Predictors								
Guilt, Observed	x	x	x			x	x	
Effortful Control, Observed	x	x	x		x	x	x	
Outcomes								
Disruptive Conduct, Informant-Rated								
PBQ								
Mother				x				
Mother, Father, Teacher							x	
CSI-4, ICU, HBQ								
Mother, Father								x

Note: Measures used only as covariates are not included.

PBQ: Preschool Behavior Questionnaire, CSI-4: Child Symptom Inventory, ICU: Inventory of Callous-Unemotional Traits, HBQ: MacArthur Health Behavior Questionnaire.

Table 2

Study 1: Children's Guilt and Effortful Control at 22-45 Months and Their Interaction as Predictors of Mothers' Ratings of Children's Disruptive Conduct at 73 Months

Outcome: Mothers' Ratings of Children's Disruptive Conduct[a]						
	Step 1		***Step 2***		***Step 3***	
Predictor(s)	***F***	***Beta***	***F***	***Beta***	***F***	***Beta***
Gender[b]	1.26	.15	< 1	.13	< 1	.06
R^2 = .02, $F_{ch}(1,52)$ = 1.26						
Guilt[c]			4.79*	.34	< 1	.11
Effortful Control[d]			8.32**	−.44	5.12*	−.35
R^2 = .17, $F_{ch}(2,52)$ = 4.64*						
Guilt × Effortful Control					4.04*	.31
R^2 = .23, $F_{ch}(1,52)$ = 4.04*						
$F(4,52)$ = 3.84**						

[a] Behar's Preschool Behavior Questionnaire at 73 months.

[b] 0=Girls, 1=Boys.

[c] Composite of child guilt at 22, 33, and 45 months.

[d] Composite of child effortful control at 22, 33, and 45 months.

+ $p < .10$.

* $p < .05$.

** $p < .01$.

Table 3

Study 2: Children's Guilt at 38 Months and Effortful Control at 25-38 Months and Their Interaction as Predictors of Mothers', Fathers', and Teachers' Ratings of Children's Disruptive Conduct at 52 Months

Outcome: Parents' and Teachers' Ratings of Children's Disruptive Conduct[a]						
	Step 1		***Step 2***		***Step 3***	
Predictor(s)	***F***	***Beta***	***F***	***Beta***	***F***	***Beta***
Gender[b]	10.63**	.31	3.42+	.17	2.51	.15
R^2 = .10, $F_{ch}(1,94)$ = 10.63**						
Guilt[c]			5.88*	−.23	6.30*	−.23
Effortful Control[d]			9.10**	−.29	7.83**	−.26
R^2 = .25, $F_{ch}(2,94$ = 9.61***						
Guilt × Effortful Control					6.78**	.23
R^2 = .30, $F_{ch}(1,94)$ = 6.78**						
			$F(4,94)$ = 10.11***			

[a] Composite of mothers', fathers', and teachers' ratings, Behar's Preschool Behavior Questionnaire at 52 months.

[b] 0=Girls, 1=Boys.

[c] Child guilt at 38 months.

[d] Composite of child effortful control at 25 and 38 months.

+ $p < .10$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 4

Study 2: Children's Guilt at 38-52 Months and Effortful Control at 25-52 Months and Their Interaction as Predictors of Mothers' and Fathers' Ratings of Children's Disruptive Conduct at 67 Months

Outcome: Parents' Ratings of Children's Disruptive Conduct[a]						
	Step 1		***Step 2***		***Step 3***	
Predictor(s)	***F***	***Beta***	***F***	***Beta***	***F***	***Beta***
Gender[b]	8.96**	.30	1.62	.12	< 1	.09
R^2 = .09, $F_{ch}(1,87)$ = 8.96***						
Guilt[c]			< 1	−.06	1.70	−.12
Effortful Control[d]			21.98***	−.44	13.71***	−.36
R^2 = .30, $F_{ch}(2,87)$ = 12.87***						
Guilt × Effortful Control					11.19**	.30
R^2 = .38, $F_{ch}(1,87)$ = 11.19***						
			$F(4,87)$ = 13.14***			

[a] Composite of mothers' and fathers' ratings of children's ODD and CD (CSI-4), callous-unemotional traits (ICU), and overt aggression (HBQ) at 67 months.

[b] 0=Girls, 1=Boys.

[c] Composite of child guilt at 38 and 52 months.

[d] Composite of child effortful control at 25, 38, and 52 months.

+ $p < .10$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.