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Temperament and the Development of Conscience: The Moderating Role of Effortful Control

Cynthia A. Stifter, Elizabeth Cipriano, Anne Conway, and Rachael Kelleher
The Pennsylvania State University

Abstract

In this longitudinal study we examined whether two components of effortful control, behavioral control and executive function, moderated the relation between temperament and conscience development. Temperament was assessed when participants were 2 years of age, and three temperament groups were formed; inhibited, exuberant, and low reactive. At 4.5 years of age children's behavioral control and executive function were assessed. Moral behavior, emotionality during an empathy film, and false-belief understanding were measured at 5.5 years of age as components of conscience. Results indicate that inhibited children may benefit most from higher levels of effortful control. Inhibited children with higher levels of behavioral control performed better on false-belief understanding tasks whereas inhibited children who scored higher on executive function tests reported less emotional response to the evocative film. Finally, as a group, inhibited children exhibited more moral behavior than exuberant and low reactive children.

Keywords

temperament; effortful control; conscience development

One important contribution of temperament, or constitutionally-based individual differences in reactivity and regulation (Rothbart & Bates, 2006), is its significant influence on other developmental domains. In particular, temperament has been valuable in understanding individual differences in socio-emotional competence such as attachment, peer relations, and behavioral adjustment. More recently, the role of temperament in the development of conscience has been investigated.

The temperamental predisposition that has received considerable research attention, particularly as it relates to conscience development, is that of behavioral inhibition (Kagan, 1998). Based on their proneness to respond with high arousal to novel and uncertain persons and events, behaviorally inhibited children are hypothesized to internalize rules and standards more easily than fearless/uninhibited children (Kochanska, 1993). That is, behaviorally inhibited children would be more likely to inhibit a desired but prohibited act because they fear the consequences of doing so, whereas behaviorally uninhibited children would be less prone to the discomfort associated with violating rules. Several studies have confirmed this hypothesis. For example, inhibited/fearful children were found to exhibit less cheating behavior (Asendorpf & Nunner-Winkler, 1992), more empathy/guilt (Rothbart, Ahadi, & Hershey, 1994), and more internalization of rules and standards (Kochanska, 1995; Kochanska, Coy, & Murray, 2001). In a study looking specifically at the moral emotion of guilt, Kochanska (Kochanska, Gross, Lin, & Nicholas, 2002) found fearfulness to predict guilt, longitudinally, and that guilt mediated the relation between fearfulness and

moral behavior. This finding suggests that fearful children's proneness to discomfort following transgressions may facilitate the inhibition of behaviors that violate rules.

While not the absolute opposite of behavioral inhibition, exuberance or surgency may also be linked to conscience development. Characterized as low on shyness, and high on social approach, impulsivity, and positive affect (Putnam & Stifter, 2005; Rothbart, Ahadi, Hershey, & Fisher, 2001), surgent/exuberant children may be at risk for delayed internalization of rules and standards because their lack of fearfulness may not produce the level of affective discomfort sufficient to prevent wrongdoing (Kochanska, 1993), and may make them less sensitive to punishment (Dadds & Salmon, 2003). Indeed, surgency or low fearfulness in early childhood has been negatively related to guilt (Rothbart et al., 1994) and internalization (Kochanska, 1995), and positively linked to cheating (Asendorpf & Nunner-Winkler, 1992) and externalizing behaviors (Bruce, Davis, & Gunnar, 2002; Putnam & Stifter, 2005).

Although theory and research strongly indicate a direct relation between fearfulness and conscience, these data are contrasted with studies showing behaviorally inhibited children to score lower on moral orientation (Dunn, Brown, & Maguire, 1995) and empathic concern, particularly toward a stranger (van der Mark, IJzendoorn, & Bakermans-Kranenburg, 2002; Young, Fox, & Zahn-Waxler, 1999). In a recent study (Spinrad & Stifter, 2006), fearful toddlers exhibited more personal distress (high negative affect, comfort-seeking, and self-soothing behaviors) and concerned attention toward a "hurt" person, suggesting that they were struggling between their own distress and that of another person. Taken together, the research, while indicating the importance of temperament to the development of conscience, suggests that this relation may be more complex than hypothesized.

Although certain aspects of temperament have been found to play a significant role in predicting the development of conscience, the pathways are multiply determined. For example, parenting behavior (Kochanska, 1997) has been examined as a moderator of temperament to explain individual differences in conscience and moral emotions. Two temperament dimensions may also interact to predict conscience development such that one temperamental characteristic may moderate or control another (Rothbart & Bates, 1998). One such dimension of temperament that has implications for socio-emotional development is effortful control.

Rothbart (Rothbart & Bates, 1998, 2006) has hypothesized two temperament-related control systems. The first control system is more reactive and according to Rothbart, is motivated by fear, develops early in infancy, and has implications for the development of conscience. The second system is a more active, voluntary control system Rothbart labels "effortful control." Effortful control, or the ability to inhibit a dominant response to perform a subdominant response (Rothbart, 1989), emerges later in infancy, and also has a direct role in the development of conscience. It is believed that children who are able to subvert their own goals and emotions to attend to another's may be better able to internalize rules and standards, as well as, feel and act sympathetically. In support of this hypothesis, several studies examining effortful control in early childhood (Kochanska & Knaack, 2003; Kochanska, Murray, & Coy, 1997; Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996) have found high levels to be related to conscience measured contemporaneously and longitudinally. Similarly, components of effortful control, such as attention focusing and shifting, have been linked to greater self- and other-reported sympathy in preschool and school aged children (Eisenberg, Fabes, Murphy, Karbon, Smith, & Maszk, 1996b; Guthrie, Eisenberg, Fabes, Murphy, Holmgren, Maszk, & Suh, 1997).

Whereas effortful control and fearfulness have been demonstrated to be directly related to conscience development, the interaction of these temperament dimensions may also predict how well children behave morally. For example, if the fear system is not sufficiently aroused to control approach behavior, as may be the case for fearless or exuberant children, effortful control may be necessary to inhibit impulses to transgress. On the other hand, fearfulness and behavioral inhibition have been positively associated with greater effortful control. Under some conditions, however, fearful children may benefit from more voluntary forms of behavioral control (Derryberry & Rothbart, 1997). For example, fearful children who become personally distressed when another person is hurt may require effortful control to assist them in regulating their emotional arousal for the purposes of prosocial behavior (Hastings, Zahn-Waxler, & McShane, 2006). To date, no research has examined the interaction of temperament dimensions to predict conscience development. Recent studies with preschoolers, however, support the examination of temperament $\times$ temperament interactions in predicting socio-emotional functioning. For example, Gunnar (Gunnar, Sebanc, Tout, Donzella, & van Dulmen, 2003) found that highly surgent preschoolers with low effortful control were more likely to be aggressive, whereas Eisenberg (Eisenberg et al., 1996b) found that children who were able to regulate high intensity emotions displayed more empathy-related responding than those who displayed unregulated emotions.

The primary goal of the present study was to investigate the moderating role of effortful control on the relationship between temperament and conscience development. Our study was informed by the theoretical and empirical work of Kochanska (1993, 1997) whose individual differences approach has identified the importance of temperament and parenting toward predicting variations in early conscience. Conscience is a complex, multifaceted concept that refers to the “inner guiding system” that regulates conduct without external control (Kochanska & Aksan, 2006). Recent developmental views of conscience consider it to encompass at least three interrelated components: moral emotions such as guilt and empathy; moral conduct or the ability to abide by rules and standards; and moral cognition, the ability to understand the consequences of violating those standards for oneself and others (Kochanska, Forman, Aksan, & Dunbar, 2005; Kochanska & Thompson, 1997). Although these components emerge at different points in early development, they also demonstrate some coherence. However, in a study examining the organization of conscience (Aksan & Kochanska, 2005), multiple measures of moral emotions and moral conduct were submitted to a confirmatory factor analysis. Two related but distinct latent factors reflecting these two components emerged, suggesting that conscience is not a unitary construct. Thus, investigation of early precursors of conscience would benefit from considering these components separately. It is possible that outcomes of temperament $\times$ temperament interactions vary based on the component of conscience being investigated.

Two aspects of conscience were assessed in the present study; moral emotions in response to an evocative film and moral conduct during two cheating games and a prosocial activity. The third component, moral cognition, was not assessed in the present study. Rather, preschoolers’ theory of mind was measured using a test of false-belief understanding. The ability to understand that others have desires, beliefs and emotions that are different from one’s own, may be a necessary condition for making moral decisions (Turiel, 2006). Indeed, at the same time children develop false-belief understanding they appear to extend it to understanding that others may have different moral beliefs (Flavell, Mumme, Green, & Flavell, 1992). Likewise, Dunn and colleagues (Dunn, Cutting, & Demetriou, 2000; Hughes & Dunn, 2000) have demonstrated false-belief understanding to be linked to moral judgments and justifications. And, although theory of mind has been proposed to be used in immoral ways as in bullying (Sutton, Smith, & Swettenham, 1999a, 1999b), it also has been linked to social competence (Jenkins & Astington, 2000). Based on this evidence we

considered theory of mind to be an important aspect of conscience development worthy of investigation.

In the present study we examined two components of effortful control as moderators of temperament. Our reasoning is based on a recent study (Carlson & Moses, 2001; Carlson, Moses, & Breton, 2002) which revealed two inhibitory control components, one that reflected the ability to delay a prepotent response (delay inhibition) and another which reflected the ability to produce a novel response in the face of a conflicting prepotent response (conflict inhibition). While both components were proposed to require inhibition, conflict tasks require working memory and were better predictors of theory of mind. In the current study, two delay or *behavioral control* tasks were used to assess the delay inhibition component of effortful control, and three *executive function* tasks were used to assess the conflict inhibition component. No studies have examined these components and their direct relation to conscience or the interaction between each of these components and temperament to predict conscience.

The present study is a longitudinal examination of a sample of 2-year-olds for whom temperament clusters representing exuberance (high approach/positive affect), inhibition (low approach/negative affect) and low reactivity (moderate approach/low positive and negative affect) were identified from a series of tasks designed to elicit approach/inhibition (Putnam & Stifter, 2005). In previous analyses we found concurrent and longitudinal relationships between approach/inhibition and parent ratings of problem behavior. In the present study we were interested in more specific outcomes, such as conscience, that are related to future problem behaviors. Other studies have demonstrated that the same predictors of behavior problems in young children were also related to several aspects of conscience (Eisenberg, Spinrad, Fabes, Reiser, Cumberland, Shepard, Losoya, Guthrie, & Thompson, 2004; Kochanska & Knaack, 2003; Murray & Kochanska, 2002).

To summarize, the current study examined whether the relationship between temperament and conscience was moderated by effortful control. Temperament was measured at 2 years of age, whereas two forms of effortful control (behavioral control and executive function) were measured at 4.5 years of age. Moral emotion, moral conduct, and false-belief understanding were assessed at 5.5 years of age.

METHOD

Participants

One hundred and fifty infants (78 females) were enrolled at 2 weeks of age in a longitudinal study to examine the development of emotion regulation across the first two years of life. At 2 years of age, 126 children (63 females) and their parents returned to the laboratory for two visits. A portion of the original sample was re-recruited for a preschool follow-up when children were 4.5 years of age. Of the original sample, 124 families were located, and of these, 72 (34 females) agreed to participate (25 had relocated out of town and 27 declined to participate). Participants were predominantly white, educated, and middle class. At the time of initial recruitment, maternal and paternal age averaged 29.7 years (range 16 to 43) and 31.8 years (range 19 to 46), respectively. Education level for mothers averaged 15.6 years (range 10–26 years) and for fathers averaged 16.3 years (range 10 to 28 years). The majority (32%) of families reported their income to be between \$50,000 and \$75,000. A comparison between those children who returned for the 4.5-year follow-up and those who were unable/chose not to participate revealed no significant differences on the 2 year data used in the present study (see below) suggesting that attrition was random.

Procedures

2-Year Protocol—When children were approximately 2 years of age they took part in two laboratory visits, the first with their mothers and the second, scheduled one month later, with their fathers. The visits were primarily designed to assess the temperamental style of the child.

Temperament Assessment

Procedures: A series of tasks was used to elicit approach/inhibition. In brief, toddlers were 1) introduced to a strange laboratory room; 2) approached by an unfamiliar female; 3) asked to look into a black box; 4) left to play with a “boring” toy; 5) asked to jump off a series of stairs; 6) invited to play “ring around the rosie” with the stranger and parent; 7) given a choice between high intensity and low intensity toys; 8) shown a champagne popper; and 9) exposed to a vacuum cleaner. In addition, electrodes were placed on the child’s chest for the purposes of heart rate recording during one of the visits. Details of each of these tasks can be found in Putnam & Stifter (2005).

Coding: Several behaviors that reflected approach and/or inhibition were coded from the videotapes. Proximity to parent was coded on a continuous scale ranging from 1 (clinging) to 5 (two or more steps away from parent). Reliabilities on 13% of the sample averaged .78 (Cohen’s kappa). The number of spontaneous, nondistressed vocalizations was coded during all situations with the stranger (reliability on 14% of the data with 83% agreement). Activity level was coded during lab entry, boring toy and play with assistant by applying a scale ranging from 0 (completely still) to 4 (running or vigorous movement) every 5 seconds (reliability on 14% with an average kappa of .80).

Several episode-specific ratings were made: 1) willingness to allow electrode placement (5-point scale from strongly avoids to no avoidance); 2) willingness to play ring-around-the-rosie game (5-point scale from actively refuses to immediately and enthusiastically joins in); 3) degree of exploration of the black box (6 point scale from no approach to entire head inside box); 4) willingness to jump from steps (7 point scale from no approach to jumps off prior to prompts); and 5) off task behavior during the boring toy (coded every 5 seconds). Finally, latencies to choose a low or high intensity toy were scored. If the child did not choose a toy, they were assigned a latency score of 20 (seconds). Reliability was performed on 14% of the sample for the above ratings and Cohen’s kappas ranged from .80 to .85. Scoring of latency showed 93% agreement.

For all procedures, positive and negative affect were also rated, based on the child’s facial and vocal expressions, using a global scale ranging from 0 (no affect) to 5 (continuous, high intensity affect). Reliability was calculated on 11% of the visits with kappas at .71 for positive affect and .73 for negative affect.

Group Formation: All the measures from the 2 year visit were subjected to a Confirmatory Factor Analysis that supported a three factor model (details of this analysis can be found in Putnam & Stifter, 2005) consisting of positive affect, negative affect, and approach/inhibition. A two-step cluster analysis, using Ward’s method and K means solution, was then performed to create groups based on these three factors. Three groups were identified – 1) a group that was high in negativity and low in approach (*inhibited*), 2) a group that was high in positive affect and approach (*exuberant*), and 3) a group that was low on both emotion variables but moderate on approach/inhibition (*low reactive*). Gender was equally distributed within each group.

4.5-Year Protocol—Children returned to the laboratory for two visits at 4.5 years of age. Children participated in several tasks to assess emotion regulation, receptive language, behavioral control, parent-child interaction, and executive function. Only the behavioral control tasks and the executive function tasks were used in the present study and are detailed below. All procedures were administered at a child-sized table and videotaped. The parent was in the room during the majority of tasks unless otherwise noted.

Behavioral Control

Procedures: Two tasks were used as measures of behavioral control – delay of gratification and “dinky toys.” During the **Delay of Gratification** task (Mischel & Ebbensen, 1970) children were given the choice between two chocolate candies if they waited or one if they were not able to wait. Children were told the rules and then given a bell to ring if they could not wait. They were then left alone in the room for a maximum of 15 minutes. If the child rang the bell before that time, the experimenter would return and the child would receive one candy. If they did not ring the bell, the experimenter returned after 15 minutes and the child was given the two candies.

In the **Dinky Toys** task (adapted from Goldsmith & Reilly, 1992) a clear, lidded container of small toys was presented to the child. The child was told that (s)he could have one of the toys but should look carefully because once chosen, (s)he could not return the toy for another. The lid was removed and the child was allowed to look and choose but if (s)he touched a toy, that toy was considered to be the child’s choice.

Coding/Data reduction: Latency to wait to ring the bell on the delay of gratification task and latency to choose a dinky toy were coded from the videotapes and calculated using a computer program. Children who waited the entire 15 minutes of the delay of gratification task were given a latency score of 900 seconds. Based on Carlson and Moses’ finding (2001) and a confirmatory factor analysis¹, a variable representing *behavioral control* was created by averaging the z-scores of the two latency variables. See Table 1 for the means and standard deviations for these data.

Executive Function

Procedures: Three tasks designed to assess the child’s ability to inhibit a pre-potent response were administered. The **Three Pegs** task required the child to tap colored pegs according to the experimenter’s instructions for two trials (Balamore & Wozniak, 1984). A wooden board with three differently-colored pegs, ordered red-yellow-green, was presented by the experimenter. A pretest insuring that the child understood the colors was conducted. This was followed by a verbal instruction to the child to tap the pegs in the order – red, green, yellow (first trial). If the child tapped correctly, a second trial was conducted and the task ended. If the child tapped incorrectly then the experimenter demonstrated the task and asked the child to tap the pegs. If the child was correct, a second trial was conducted. If incorrect, the child received a third demonstration after which the child was asked to tap the pegs for two trials.

The **Day/Night** task is a Stroop-like task (Gerstadt, Hong, & Diamond, 1994) that uses a set of cards containing black cards with a picture of a moon and white cards with a picture of a sun. When presented with a black card, children were instructed to say “day” and when

¹Based on Carlson and Moses’ (2001) finding that inhibitory control factors into delay and conflict components, a principal components analysis was used to explore the coherence of the delay of gratification, dinky toys, day/night, tapping, and 3 pegs tasks. The results revealed two factors (eigenvalues = 1.7 and 1.1) with day/night (.66), tapping (.84) and 3 pegs (.53) loading on the first factor and the delay of gratification (.46) and dinky toys (.88) loading on the second factor.

presented with a white card they were instructed to say “night.” After practice trials to test their understanding of the task were administered, 16 cards in a fixed random order were presented to the children and their responses recorded.

The **Tapping** task (Diamond & Taylor, 1996) required the child to learn and apply two rules. When the experimenter tapped the table with a stick once, the child was to tap the table twice, and when the experimenter tapped the table twice, the child was to tap the table once. If the child passed the two practice trials (child performed both rules without a prompt) then the test trials were begun. If the child was incorrect, the rules were re-demonstrated and then the test trials were administered. The 16 test trials were administered in a fixed random order.

Coding/Data reduction: For two of the executive function tasks – day/night and tapping, the percentage of correct responses across all test trials was calculated. In addition, the number of practice trials was recorded. A composite score of the percent correct and number of practice trials (reversed) was calculated, such that higher scores reflected better performance. Because the three pegs task was scored as either pass or fail but had several instruction trials, children were given a 0 if they failed the task, 1 if they required two repeated instructions, 2 if they required one additional instruction, and 3 if they performed the task after the first demonstration. Thus, a high score reflected better performance on the three pegs task. An *executive function* composite was created by averaging the z-scores of the three executive function variables (see Table 1).

Receptive Language Ability: The Peabody Picture Vocabulary Test-Third Edition (PPVT, Dunn & Dunn, 1981) was used to measure the child’s receptive vocabulary. The PPVT was administered according to standardized procedures. A display of four pictures was presented to the child and the experimenter told the child to point to the picture that matched the word she said. Raw scores were converted to age-adjusted standardized scores using published norms (see Table 1 for means, standard deviations and range).

Observed Temperament: To assess child temperament at 4.5 years of age, we created a temperament scale and applied it to the two 4.5-year laboratory visits. Scales (description; scoring range) included: Activity level (amount of gross body movement; 1–9), Reaction to novel persons (social responsiveness to examiners; 1–5), Positive affect (level of happiness/positive mood; 1–9), Shyness/fearfulness (degree of fear of persons, situation; 1–9), and Task persistence (degree of on-task behavior; 1–9). Two observers who had different roles during the lab visits conferred at the end of each visit, came to consensus, and then scored the child on each of the above scales. To simulate conditions under which parents rate their children, observers were minimally trained on the application of the scale prior to its use (for details see Stifter, Willoughby, & Towe-Goodman, in press). For the purposes of the present study the reaction to novel persons scale was subtracted from the shyness/fearfulness scale to represent *temperamental inhibition*.

5.5 Year Protocol—When children were 5.5 years of age, they participated in tasks during two laboratory visits that assessed emotional reactivity and regulation, empathy, transgressions, parent-child interaction, and false-belief understanding. Only the tasks that tapped children’s moral emotion, moral behavior, and false-belief understanding were used in the present study and are described in detail below.

Moral emotion

Procedure: A six minute emotionally evocative film about a young girl who becomes burned in a fire, goes to the hospital, and later has to deal with the reactions of her friends

when she returns to school (Holmgren, Eisenberg, & Fabes, 1998) was shown to the children. The content of the film was explained before beginning the videotape after which the experimenter and parent left the room. The children's facial emotional displays during the film were videotaped.² Immediately after viewing the film, children were interviewed about their emotional reactions to the movie. Children were asked to respond to "how much they felt _____ (bad, happy, upset, scared, worried, sad, mad, concerned for others, sad for somebody else, sorry for others,)" using an intensity board which graphically (using stars and variations in color) scaled the intensity of their responses from 1 representing "not at all" to 4 representing "a whole lot".

Coding/Data reduction: Child self-report data were analyzed using Principal Components Analysis. Three components with eigenvalues greater than 1.0 were generated reflecting general distress (down or bad, upset, scared, unhappy, and worried), sympathy (sadness, feeling concern, sadness or sorrow for others), and feeling good (happy, good). For purposes of analysis, we retained the first two factors, *distress* ($\alpha = .77$) and *sympathy* ($\alpha = .75$). Due to the strong correlation between self-reported distress and sympathy, $r = .65$, $p < .001$, a new composite representing *emotional reactivity* to the evocative video was created by averaging the scores ($\alpha = .79$).³

Moral behavior

Procedures: Three tasks were designed to elicit moral behavior, two during which the child was left alone and required to inhibit a response (don't cheat) and the third for which the child was asked to maintain a behavior for a moral purpose. For two of the tasks (puzzle, card game) the child received tickets that (s)he could cash in at the end of the laboratory visit. All procedures were videotaped for off-line coding.

The **Puzzle Box** task (Eisenberg, Fabes, Guthrie, Murphy, Maszk, Holmgren, & Suh, 1996a) was used to assess whether children could inhibit the temptation to cheat. While seated at a table, the child was presented with a box covered with a black panel on one side and Plexiglas on the other, inside of which was a simple shapes puzzle. The experimenter explained to the child that she wanted to know how fast the child could do the puzzle without looking under the panel. After demonstrating the task, the child was then told (s)he would receive a ticket for every puzzle piece that was placed correctly. The experimenter set a timer for 5 minutes and told the child to ring the bell placed on top of the box if (s)he finished before 5 minutes. Prior to leaving the room the experimenter reminded the child not to look under the panel when doing the puzzle.

A common **Memory Card Game** was also used to assess children's cheating behavior. The experimenter placed twelve cards in three rows face down on a table where the child was seated. The experimenter demonstrated to the child that the game was played by choosing matching cards. If the child found a match then (s)he would receive one ticket. The experimenter and child took turns looking for matches until the child made two matches. When two matches were made, the experimenter left the room. Before leaving, the experimenter reminded the child not to look under the cards "because that would be cheating." The experimenter returned to the room after two minutes.

²As with previous studies on children's empathic reactions, children's displays of specific discrete emotions of happy, sad, anger, fear, and concern were continuously coded for the presence and intensity level (low, moderate, high) using a system adapted from other coding systems (Ekman & Friesen, 1978; Izard, Hembree, & Huebner, 1987). Due to low prevalence of emotional displays, intensity levels were reduced to presence/absence. Despite collapsing the variables, the incidence of emotion expression was too low (< 13 subjects) to consider further.

³The primary analyses were run with sympathy and distress as separate outcome variables. The analyses were identical. The results of the analyses with the emotionality composite as the outcome are reported.

The **Sorting Crayons** task was adapted from a helping task designed to assess moral behavior (Cialdini, Eisenberg, Shell, & McCreath, 1987). The child was asked to sort crayons that were needed by a hospital for boys and girls who are like the young girl (a burn victim) in the video (s)he saw earlier. After explaining how to sort the crayons the experimenter brought in a basket full of toys to the room and told the child (s)he had the choice to either sort the crayons or play with the basket of toys. The child was then left alone in the room for five minutes.

Coding/Data reduction: Latency to the child's first peek under the black panel in the puzzle box task and first card in the memory game was coded from videotaped procedures. Reliability was performed on 15% of the sample with an intra-class correlation of .99 (95.5% agreement) for the puzzle box and on 20% of the sample with an intra-class correlation of 1.0 (99.7% agreement) for the memory game.

The duration of time child spent on-task sorting the crayons was coded from videotape using a computer program. On-task proportion scores (duration of on-task divided by duration of entire task) were then calculated. Reliability was obtained on 17% of the sample with an intra-class correlation of .99 (99.7% agreement).

Intercorrelations revealed latency to peek at the puzzle and the cards to be positively correlated with the time spent sorting crayons, $r = .22, p < .07$; $r = .32, p < .01$, respectively and a near significant relationship between the two latency scores, $r = .20, p < .07$. A composite *moral behavior* variable was computed by creating standardized z-scores of the latency to peek score in the puzzle box and the memory game, and the proportion of time sorting in the sorting crayon task ($\alpha = .48$). The standardized z-scores were then averaged with high scores reflecting more moral behavior.

False-belief understanding

Procedures: Three tests of false-belief understanding were used in the present study. An adaptation of the **Location False Belief** task (Wimmer & Perner, 1983) was administered. Children watched a video of two young children acting out a scenario in which both characters witnessed the placement of cookies in one location. After one of the characters left the room, the second character placed the cookies in a new location and left the room. The first character then returned to the room and announced that she wanted another cookie. Following the end of the scene, children were asked one location false belief test question (Q1: "Where will Molly look for the cookies?"), one justification question (Q2: "Why will she look there?"), and two location reality control questions (Q3: "Where are the cookies really?", and Q4: "Where were the cookies put first of all?").

The **Belief-Desire Reasoning** task (Harris, Johnson, Hutton, Andrews, & Cooke, 1989) required children to predict an emotion from an attributed false belief about the contents of a container. Children watched a videotape of two young children acting out a scenario in which one character played a "mean trick" on the other character by replacing the contents of the first character's can of coke (his favorite drink) with milk (the drink that he already stated that he did not like). Midway through the video, children were asked two emotion questions, each one followed by an emotion reality control question (Q5: "How does Bradley feel when he gets a can of Coke?", Q6: "Why does he feel that way?", Q7: "How would Bradley feel if he got some milk?", Q8: "Why would he feel that way?"). At the end of the video, children were asked one emotion-contingent-on-false-belief question and justification (Q9: "When Bradley first comes back, how does he feel...Happy or not happy?", Q10: "Why is he happy/not happy?"), a contents false belief question (Q11: "What does Bradley think is in the can?"), a contents reality control question (Q12: "What is in the can really?"), an emotion question (Q13: "How will Bradley feel after he has a drink from

the can?”), and a follow-up emotion reality control question (Q14: “Why will he feel that way?”).

In the **Second Order False Belief** task (Perner & Wimmer, 1985), children were asked to attribute second-order beliefs to characters in a story enacted by the experimenter using Lego pieces for the characters and a rug that depicted a neighborhood. Children, seated on the opposite side of the rug from the experimenter, watched as a story about two characters, John and Mary was enacted. At the conclusion of the story, children were asked one second order false belief test question (Q15: “Where does John think that she has gone?”), one justification question (Q16: “Why does he think she has gone there?”), and three reality control questions (Q17: “Does Mary know that the ice-cream truck is at the library?”, Q18: “Does John know that the ice-cream man has talked to Mary?”, and Q19: “Where did Mary go for her ice-cream?”).

Coding/Data reduction: A total of 7 test questions were asked of the children across location false belief, belief-desire reasoning, and second-order false belief tasks (i.e., Q1, Q5, Q7, Q9, Q11, Q13, Q15). Children were rated as correct on each of the test questions if they also responded correctly to that question’s respective reality control question(s). The *false-belief* composite score was created by adding the number of correct test questions for each child.

RESULTS

Preliminary analyses were conducted to test for gender and temperament group differences. Only one significant difference was revealed for gender. Girls ($M = 2.6$) reported greater emotional reactions to the film than boys ($M = 2.2$; $t(65) = -2.01$, $p < .05$). Gender was included as a covariate only in those models predicting moral emotions. No significant differences in behavioral control and executive function were found for the three temperament groups, inhibited ($n = 17$) low reactive ($n = 22$) exuberant ($n = 33$)⁴. However, significant temperament group differences were found for 4.5 year inhibition, $F(2, 69) = 5.79$, $p < .01$, revealing exuberant toddlers to exhibit less inhibited temperament as preschoolers than inhibited or low reactive toddlers. To control for stability in temperament, 4.5 year inhibition was entered into the primary analyses. Means and standard deviations for all the study variables can be found in Table 1.

Correlations among the control (PPVT, 4.5 temperamental inhibition), moderator (behavioral control, executive function) and outcome variables (moral emotion, moral behavior, false-belief understanding) were also examined (see Table 2). As expected, receptive language ability was positively correlated with tasks that required some understanding of rules such as executive function, behavioral control, and theory of mind. In addition, the PPVT was related to higher levels of moral behavior. Executive function was also related to false-belief. Because of these relations the PPVT scores were used as a covariate in the primary analyses. Finally, moral behavior and false-belief understanding were positively correlated.

Behavioral Control as a Moderator of Temperament

To test our hypothesis that behavioral control would moderate the relation between temperament style and conscience, multiple regression analyses were performed. In the first step, the PPVT score and 4.5 year inhibition were entered. In the second step, the predictor

⁴The number of subjects will vary in each analysis as some subjects were unable to complete one or more of the tasks at 4.5 years or did not return for the 5.5 year visit ($n = 4$).

variables (e.g., temperament group, behavioral control) were entered. In the last step, the interaction between behavioral control and temperament group was added. Dummy variables were created for the temperament groups with the exuberant group as the reference. To create the interaction term, predictor variables were centered and then multiplied. The analyses were performed separately for emotional reactivity to the evocative film, moral behavior, and false-belief. As girls were found to exhibit more emotionality to the evocative film, gender was entered into this model as a covariate. Table 3 reports the results for models with behavioral control as the moderator.

Emotional Reactivity—The regression analyses with self-reported emotional reactivity to the empathy video as the outcome variable revealed no significant main or interaction effects for the predictor variables. Only gender was significant.

Moral Behavior—When predicting moral behavior, the model was significant, $F(6, 57) = 3.30, p < .01$, with 31% of the variance explained. In addition to the previously-noted main effect for PPVT, a significant main effect was revealed for temperament group. Inhibited toddlers ($M = .34, SD = .74$) were more likely to exhibit higher levels of moral behavior as preschoolers than exuberant toddlers ($M = .00, SD = .66$). Behavioral control also emerged as a significant predictor of moral behavior, $t(1, 57) = -2.75, p < .05$. Contrary to expectation, children who demonstrated high levels of behavioral control were more likely to cheat and less likely to perform a prosocial task. No significant interaction effects were found.

False-belief understanding—The model for predicting false belief understanding with behavioral control as a moderator was significant, $F(7, 56) = 3.86, p < .001$, with an R^2 of .33. After controlling for the PPVT, a significant interaction effect for temperament group and behavioral control was revealed, $t(1, 58) = 2.43, p < .05$. Figure 1 displays the interaction. We examined the simple effects of behavioral control separately in the three temperament groups at 1 SD above and 1 SD below the mean of behavioral control as recommended by Aiken and West (1991). Analyses showed that inhibited toddlers with more behavioral control had better false-belief understanding ($B = .56, p < .01$) than those with lower control. No relationship between behavioral control and false-belief was revealed for low reactive ($B = .13, p < ns$) and exuberant groups ($B = -.07, p < ns$).

Executive Function as a Moderator of Temperament

Our second set of multiple regression analyses used executive function as a moderator of the relation between temperament and conscience. In the first step, the covariates were entered. In the second step, the predictor variables were entered. In the last step, the interaction between executive control and temperament group was entered into the regression. Gender was used as a covariate for the model predicting emotionality. Separate analyses were performed for each of the conscience measures. The results can be seen in Table 4.

Emotional Reactivity—The regression analysis with executive function as the moderator and self-reported emotional reactivity to the empathy video as the outcome variable revealed a significant interaction effect, $t(1, 57) = -2.18, p < .05$, for the inhibited temperament group. Following recommended post-hoc procedures (Aiken & West, 1991), we examined the simple effects of executive function separately in the three temperament groups at 1 SD above and 1 SD below the mean of executive function. As can be seen in Figure 2 inhibited toddlers who performed better on executive function tasks as preschoolers reported less intense emotional reactions to the empathy video ($B = -.71, p < .05$). The simple slopes were nonsignificant for the low reactive ($B = .23, p < ns$) and exuberant groups ($B = .26, p < ns$).

Moral Behavior—The regression model for moral behavior with executive function as the moderator was marginally significant, $F(7, 57) = 2.02, p < .10$, with 20% of the variance explained. However, after controlling for the significant effect of PPVT scores, neither temperament group, executive function, nor their interaction contributed to the prediction of moral behavior.

False-belief understanding—Main effects were revealed for the model predicting false-belief understanding from executive function and temperament, $F(7, 57) = 3.93, p < .001$, with 33% of the variance explained. After controlling for receptive language ability, children who demonstrated better executive function skills at 4.5 years of age performed better on the false-belief assessment one year later than those with poorer executive function skills, $t(1, 58) = 2.77, p < .01$. No significant interactions were found.

DISCUSSION

Elucidating the differential impact and moderating effects of temperamental processes on the behavioral, cognitive, and emotional components of conscience is critical for understanding its development. Although low levels of conscience confer risk for future externalizing, conduct, and antisocial problems (Kerr, Lopez, Olson, & Sameroff, 2004; Lykken, 1995), high levels of conscience reflected in adherence to rules, knowledge of the difference between what is right and wrong, and remorse following transgressions suggest successful adaptation (Kochanska et al., 2005). In the present study we examined how two forms of effortful control (behavioral control and executive function) moderated temperamental style to predict empathy, moral behavior, and false-belief understanding, a possible precursor to moral cognition. Our findings suggest that inhibited children may benefit most from gains in behavioral control and executive function but in different ways. Furthermore, inhibited children were more likely to act in morally acceptable ways. Contrary to expectations, behavioral control was negatively related to moral behavior.

Inhibited children are proposed to be less likely to cheat and more likely to feel guilt when breaking a rule because they are motivated by the discomfort they would feel if caught transgressing. This increased arousal may, consequently, impede their ability to feel and think about the emotions of others. Indeed, there is evidence to suggest that inhibited children are less empathic and possess lower levels of moral orientation (Dunn et al., 1995; van der Mark et al., 2002). Findings from the present study lend support to this proposal and suggest that executive functioning may operate to reduce the risk of inhibited children's lower empathy. That is, inhibited toddlers in the present study who performed better on the executive function tasks at 4.5 years of age reported less intense emotional reactions to an evocative film.

Preschoolers viewed a film that centered on a young girl who becomes disfigured from a fire and then suffers the rejection of her peers. Previous research using this film found a positive relationship between parent-reported emotional intensity, which measured worry and anxiety, and young children's self report of distress to the film (Guthrie et al., 1997). As a group, inhibited children in the present study did not report greater emotional reactions to the film than their low reactive or exuberant peers. Rather, we found only those inhibited children with low levels of executive functioning to exhibit the highest levels of reported emotionality. On the other hand, it appears that inhibited children may benefit from the development of executive function as those who performed better on these tasks reported the lowest intensity of emotional responding. Perhaps, cognitive control allows these children to regulate their emotions and/or report little or no emotional reaction to the film. Previous research with young children have found those who perform better on executive function

tests are less likely to exhibit or report high levels of emotion (Kochanska & Knaack, 2003; Kochanska, Murray, & Harlan, 2000).

In contrast, our findings revealed behavioral control, not executive function, to act as a moderator in predicting false-belief understanding for inhibited children. Inhibited toddlers who displayed more behavioral control at 4.5 years of age performed better on the false-belief tasks one year later than inhibited toddlers who displayed less behavioral control. Indeed, inhibited children who displayed the ability to delay gratification in two separate tasks appeared to elevate their false-belief performance above that of their low reactive and exuberant peers. But why should behavioral control and not executive function moderate the prediction to false-belief understanding for inhibited children while executive function, not behavioral control, predicts less emotional responding to an evocative film? The answer may be found when considering three pieces of evidence.

First, Carlson and Moses (2001) demonstrated that delay tasks which require inhibitory control were independent of conflict tasks (executive function tasks) which not only require inhibitory control, but also require one to produce a novel response. Thus, these two forms of effortful control are distinct and may interact in different ways to predict the ability to understand that others may have different beliefs. Second, although fearful children have been found to exhibit more effortful control, this relation was mediated by their low impulsivity as assessed with delay tasks (Aksan & Kochanska, 2004). Behavioral control, therefore, may be important in the development of more advanced executive functioning for inhibited children. Third, findings from the present study revealed a main effect for executive function and false-belief understanding supporting recent studies which have identified this link (Carlson, Moses, & Claxton, 2004; Hughes, 1998; Muller, Zelazo, & Imrisek, 2005). Taking this information together, we might conclude that for all children, successful performance on tasks that assess false-belief understanding requires executive function, but that for inhibited children it also requires that they be able to control their behavior. Accordingly, whereas the false-belief tasks necessitated that children be able to understand how another child may think and feel, the evocative film was designed to elicit emotional reactions. Our findings suggest that when inhibited children are confronted with another's plight they may need behavioral control to comprehend it, but more executive effort to control their emotions.

By regulating their emotions, inhibited children may be more inclined to adhere to rules and help others in distress. Indeed, our results confirm earlier studies that inhibited children tend to display more moral behavior (Asendorpf & Nunner-Winkler, 1992; Kochanska et al., 2002). Perhaps, the fear or guilt that inhibited children are more likely to experience at transgressing (Kochanska et al., 2002) keeps them on task. In sum, although inhibited children as a group demonstrated greater moral behavior than their low reactive and exuberant peers, only those inhibited children with better effortful control demonstrated better performance on the false-belief understanding tasks and less intense emotional reactions to an evocative film. These findings suggest that effortful control is particularly important for inhibited children's development of conscience.

Interestingly, effortful control does not appear to contribute to the conscience development of exuberant or low reactive children. Exuberant children, in particular, were expected to require more effortful control as they tend toward impulsive behavior driven by an orientation toward reward. For exuberant children, socialization efforts may play a more prominent role than effortful control in the development of conscience. As Kochanska (1997) has demonstrated, exuberant children engaged in a mutually responsive relationship are more likely to internalize rules and standards. It may be that through this relationship exuberant children assimilate the values of their caregivers that, in turn, guide their moral

emotions and behavior. Future research might consider adding both parenting *and* effortful control to their models of conscience development.

Contrary to expectation, behavioral control was inversely related to moral behavior. Preschoolers who were able to delay gratification were more likely to cheat and less likely to perform a prosocial task. This counterintuitive finding might be explained by the nature of the tasks used to measure behavioral control and prosocial behavior. By delaying gratification (behavioral control) the child is maximizing his/her gain of obtaining two candies or a desired small toy. To maximize gain during the puzzle and memory games, however, the child must cheat as success on these games would result in a greater reward. The only gain in the prosocial task was one of altruism which is much less tangible and more difficult to sustain when there are attractive toys available. Given the different benefits of the moral behavior tasks, it is not surprising then that behavioral control in the present study was negatively related to these behaviors. As the reliability of our measure of moral behavior was modest at best, future research on the impact of temperament on moral behavior might benefit from keeping distinct those behaviors that reflect inhibitory control (cheating) from those that require the child to put aside their own desires to perform a prosocial task.⁵

The present study has several limitations. Although the longitudinal design contributes to our understanding of the temperamental precursors of conscience, sample attrition due to the length of time between temperament assessments and outcomes (2–3 years) limits our ability to confidently conclude that temperament, particularly inhibited temperament, interacts with effortful control to influence the development of conscience. In addition, we were not able to control for earlier measures of effortful control at 2 years of age and conscience development at 4.5 years of age. The small sample size may have also restricted our ability to find moderating effects for the exuberant children, those children who might most benefit from improved effortful control. Second, our sample was primarily white and highly educated thus generalization to the general population is limited. It may be that effortful control will be more relevant to certain temperament types who are more socioeconomically disadvantaged. A larger more diverse sample would address these concerns and confirm that effortful control is important for inhibited children's conscience development. Finally, in the present study, we used performance on false-belief understanding tests rather than a direct measure of moral cognition and found that behavioral control interacted with inhibited temperament to predict better functioning. Future research interested in temperament $\times$ temperament interactions in predicting this aspect of conscience should measure moral cognition more specifically such as assessing how children judge and justify transgressions (Kochanska et al., 2002).

In summary, the results of the present study suggest that effortful control as measured by delay and executive function tasks may be an important moderator of the relations between temperament style and subsequent conscience development. This is particularly important for inhibited toddlers who, although more likely to exhibit moral behavior than other temperament types, present with significantly better conscience outcomes when they possess greater effortful control. These findings contribute to the growing literature on the role of temperament in the development of conscience and underscore the importance of investigating temperament $\times$ temperament interactions in socio-emotional development.

⁵Post hoc analyses with the cheating tasks and the prosocial tasks examined separately revealed no significant main or interaction effects.

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Figure 1.
Behavioral control moderates the relation between temperament and false-belief understanding.

Figure 2.

Executive function moderates the relation between temperament and emotionality to the evocative film.

Table 1

Descriptive statistics for the study variables.

	N	Mean	SD	Range
Covariates				
PPVT ^a	70	110.83	12.69	70 – 139
4.5 yr. Inhibition ^b	70	-.64	2.03	-3.0 – 5.5
Moderators				
Behavioral Control ^c		.62	.77	-.58 – 2.8
1) Delay of gratification ^d	69	665.4	353.2	11.7 – 900
2) Dinky toys ^d	69	31.9	46.5	.47 – 187.6
Executive Function ^c		-.05	1.04	-3.2 – 1.6
1) Day/night ^e	70	.00	1.0	-2.84 – 1.45
2) Tapping ^e	70	.086	.91	-2.28 – 1.05
3) Three pegs ^f	70	1.53	.71	1 – 3
Outcomes				
Emotionality to film ^g		2.39	.90	1.0 – 4.0
1) Personal distress ^g	67	2.28	.96	1.0 – 4.0
2) Sympathy ^g	67	2.5	1.0	1.0 – 4.0
Moral Behavior ^c		.01	.71	-1.3 – 1.4
1) Puzzle ^d	68	108.8	120.7	0.0 – 322.0
2) Matching game ^d	68	95.8	48.9	3.0 – 144.0
3) Sorting crayons ^h	68	.56	.45	0 – 1.0
False-belief understanding ⁱ	68	4.04	1.73	0.0 – 7.0

Note: ^a age-adjusted standardized score;^b *fearfulness/shyness minus reactions to novel persons*;^c average of z scores;^d latency in seconds;^e z score of *percent correct minus number of practice trials*;^f 0 to 3 scale;^g average intensity score;^h proportion of time on-task;ⁱ number of test questions correct.

Table 2

Correlations among the moderator and outcome variables.

	PPVT	Inhibition	BC	EF	Emot	MB	FbU
PPVT ^a		.06	.20 *	.32 **	.06	.34 **	.42 ***
4.5 Year Inhibition			.19	.10	-.13	-.12	-.07
Behavioral Control				.17	.001	-.16	.20
Executive Function					.11	.10	.45 ***
Emotionality ^b						.07	.17
Moral Behavior							.32 **
False-belief understanding							

^aPeabody Picture Vocabulary test;

^bEmotional ratings to the empathy film;

* p < .05;

** p < .01;

*** p < .001.

Table 3

Behavioral control as a moderator of the relation between temperamental style and emotional reactivity, moral behavior, and false-belief understanding.

	B	SE (B)	F	R ²
I. Emotionality^a			.76	.10
PPVT ^b	0.009	0.01	0.12	
4.5 year inhibition	-0.06	0.07	-0.13	
Gender	0.44	0.25	0.24 *	
Low Reactive	0.33	0.30	0.17	
Inhibited	0.18	0.34	0.06	
Behavioral Control	-0.03	0.17	-0.02	
Low Reactive × BC	0.06	0.44	0.02	
Inhibited × BC	-0.07	0.39	-0.03	
II. Moral Behavior			3.53 **	.31
PPVT	0.03	0.01	0.45 **	
4.5 year inhibition	-0.06	0.05	-0.17	
Low Reactive	0.04	0.21	0.02	
Inhibited	0.46	0.22	0.26 *	
Behavioral Control	-0.33	0.12	-0.35 **	
Low Reactive × BC	-0.10	0.29	-0.05	
Inhibited × BC	0.28	0.25	0.14	
III. False-belief Understanding			3.86 **	.33
PPVT	0.06	0.02	0.45 **	
4.5 year inhibition	-0.17	0.11	-0.20	
Low Reactive	0.36	0.50	0.10	
Inhibited	-0.84	0.53	-0.19	
Behavioral Control	0.30	0.28	0.13	
Low Reactive × BC	0.33	0.71	0.06	
Inhibited × BC	1.45	0.60	0.30 *	

^aEmotional ratings to the empathy film;

b Peabody Picture Vocabulary test;
* $p < .05$,
** $p < .01$

Table 4

Executive function as a moderator of the relations between temperamental style and emotional reactivity, moral behavior, and false-belief understanding.

	B	SE (B)	F	R ²
I. Emotionality^a			1.35	.16
PPVT ^b	-.001	0.01	-0.02	
4.5 year inhibition	-0.04	0.07	-0.09	
Gender	0.36	0.24	0.20	
Low Reactive	0.23	0.28	0.12	
Inhibited	0.10	0.33	0.04	
Executive Function	0.04	0.12	0.03	
Low Reactive × EF	-0.01	0.28	0.01	
Inhibited × EF	-0.82	0.38	-0.31 [*]	
II. Moral Behavior			2.02 ⁺	.20
PPVT	0.02	0.01	0.27 ⁺	
4.5 year inhibition	-0.07	0.05	-0.21	
Low Reactive	-0.02	0.21	-0.01	
Inhibited	0.43	0.25	0.24 ⁺	
Executive Function	0.03	0.09	0.05	
Low Reactive × EF	0.16	0.21	0.12	
Inhibited × EF	0.08	0.23	0.05	
III. False-belief Understanding			3.93 ^{**}	.33
PPVT	0.05	0.02	0.33 ^{**}	
4.5 year inhibition	-0.12	0.11	-0.15	
Low Reactive	0.21	0.47	0.06	
Inhibited	-0.41	0.56	-0.10	
Executive Function	0.55	0.20	0.34 ^{**}	
Low Reactive × EF	0.12	0.47	0.04	
Inhibited × EF	-0.02	0.51	-0.01	

^aEmotional ratings to the empathy film;

Peabody Picture Vocabulary test;
 $r = .10$;
 $p < .05$,
**
 $p < .01$