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Early Behavioral Inhibition and Emotion Regulation: Pathways Toward Social Competence in Middle Childhood

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Abstract

This study examined emotion regulation (ER) as a mediator in the relation between early behavioral inhibition (BI) and later social competence (*N*= 257), and whether this mediation varied depending on BI levels. Maternal-report and observational measures were used to assess BI (ages 2 and 3). Children's ER strategies (age 5) and social competence with an unfamiliar peer (age 7) were measured using observational measures. Results showed that BI predicted less engaged ER strategies during a disappointment task, and engaged ER predicted higher social competence. Engaged ER mediated the effect of BI on social competence, but only for highly inhibited children. Findings elucidate developmental trajectories of risk and resilience and suggest targeting regulatory strategies in early prevention efforts with highly inhibited children.

Keywords

temperament; emotion regulation; social competence

Social competence in middle childhood has important implications for future socio-emotional outcomes. This complex construct entails specific skills (e.g., communication and perspective-taking), as well as the ability to balance autonomy and connectedness to others (Rose-Krasnor, 1997). Generally defined as "effectiveness in interaction" (Rose-Krasnor, 1997, p. 112), social competence protects against internalizing and externalizing problems in childhood (Burt & Roisman, 2010; Wichstrøm, Belsky & Berg-Nielsen, 2013), supports academic performance (Ladd, 1990), and supports healthy adjustment in adulthood (e.g., Parker & Asher, 1987). Reactive and regulatory aspects of temperament also demonstrate independent and joint influences on later socio-emotional adjustment (Rothbart & Bates, 2006); however, past studies have focused primarily on the relations among approach reactions, regulation in frustration-eliciting contexts, and externalizing problems (e.g., Degnan, Calkins, Keane & Hill-Soderlund, 2008). In contrast, the focus of the current study was to examine early behavioral inhibition (BI) in relation to emotion regulation (ER)

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strategies and social competence. We examined ER strategies in a socially unfamiliar and ambiguous context because such contexts may specifically challenge the ER abilities of highly inhibited children (Walker, Henderson, Degnan, Penela, & Fox, 2014).

BI in early childhood is associated with displays of social withdrawal and reticence with peers (Rubin, Bukowski, & Parker, 2006; Rubin, Burgess, & Hastings, 2002), whereas the ability to competently regulate emotions predicts social competence with peers (Diener & Kim, 2004) and protects against internalizing and externalizing symptomatology (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Thus, both BI and ER skills influence social development, but little is known about the specific regulatory challenges of highly inhibited children and whether these challenges predict heightened risk for future socio-emotional problems. Although past studies have documented concurrent relations between temperament, regulation, and social outcomes (e.g., Blair, Denham, Kochanoff, & Whipple, 2004), reliance on parent report and lack of longitudinal designs make it difficult to isolate the developmental mechanisms linking these constructs. The current study fills an important gap in the literature by using behavioral observations to measure and examine their associations in a large sample followed longitudinally. Specifically, we examined the interrelations among BI at ages 2 and 3, ER strategies used in an unfamiliar and ambiguous social context (i.e., the disappointing paradigm) at age 5, and observed social competence with an unfamiliar peer at age 7. We hypothesized that engaged ER strategies would mediate the association between early BI and future social competence, particularly for children with a history of high BI. To test this hypothesis, we examined a specific moderated mediation model (Preacher, Rucker, & Hayes, 2007; pp. 193 – 196, Model 1). We expected children with a history of high BI to demonstrate the greatest deficits in social competence due to their difficulties with using engaged ER strategies.

Temperament Influences on Social Competence

Temperament refers to individual differences in how children respond to and interact with their environment (Rothbart & Bates, 2006). Reactivity is the speed, strength, and valence of an individual's physiological and behavioral responses to changes in the external or internal environment (Rothbart & Bates, 2006). Researchers propose that negative reactivity in response to novelty is an antecedent to the development of BI, a tendency toward withdrawal in the face of novel stimuli (Kagan, Snidman, & Arcus, 1998). In toddlerhood, markers of BI (e.g., facial expressions and vocalizations of distress, motor quieting, attention vigilance) are observed when children confront unfamiliar people or stimuli (Garcia-Coll, Kagan, & Reznick, 1984). Physiological correlates of BI include elevated baseline cortisol, right frontal electroencephalogram (EEG) asymmetry, and increased heart rate during challenging tasks (Calkins, Fox, & Marshall, 1996). These behavioral and physiological responses are associated with hypervigilance and attention bias to threat (Perez-Edgar et al., 2010), which are related to the functions of the amygdala and its interactions with other neural regions (Scherf, Smyth, & Delgado, 2013).

High BI places children at risk for future social difficulties, such as social withdrawal and anxiety problems (Sanson, Hemphill, & Smart, 2004). For example, early BI predicts wariness and reticent behavior with peers in unfamiliar social contexts (Degnan et al., 2014;

Rubin et al., 2002). Results of longitudinal studies also indicate that high BI across early childhood is a significant risk factor for the onset of anxiety disorders, particularly social anxiety disorder in middle to late adolescence (Chronis-Tuscano et al., 2009; Clauss & Blackford, 2012). Links between early BI and future social difficulties are well documented, but because these difficulties do not reach clinical significance amongst most highly inhibited children, we examined early BI in relation to a continuous index of social competence in the current study. Examining variations in social competence during middle childhood is particularly important because peers play an important role in shaping social and emotional development during this period (Parker, Rubin, Erath, Wojslawowicz, & Buskirk, 2006). The current study integrated maternal questionnaires and observational measures of BI at ages 2 and 3 to longitudinally predict observed social competence with an unfamiliar peer at age 7. We hypothesized that children with a history of high BI would display less social competence with an unfamiliar peer.

The regulation aspect of temperament also relates to social competence (Calkins, Gill, Johnson, & Smith, 1999). Regulation entails differences in attentional and motoric control systems that emerge in early development and function to modulate reactivity (Rothbart & Bates, 2006). ER involves intrinsic or extrinsic processes used to change arousal levels, especially with regard to their intensive and temporal features (Kopp, 1989; Thompson, 1994). As cognitive, motor, and socio-emotional development matures, children expand their repertoire for managing their emotions. In infancy, ER relies heavily on the support of the primary caregiver (Crockenberg & Leerkes, 2004), but as children develop a sense of agency and become increasingly aware of causes of distress in the toddler years, they behave in ways that can alter the situation (Kopp, 1989).

In previous studies, three specific kinds of ER strategies frequently examined include active, passive, and disruptive strategies. Seeking social support and problem solving are types of active ER strategies because they entail active attempts toward changing the situation to reduce distress. Passive ER strategies, however, involve disengaging from the environment (e.g., self-soothing behavior, passive tolerance) to cope with the distressing situation, (e.g., Feng et al., 2008, Walker et al., 2014). Lastly, disruptive ER strategies entail physically or verbally aggressive responses to the environment and are associated with observed conflict with peers (e.g., Calkins et al., 1999). In the current study, we examined children's ER strategy repertoire; in other words, the kinds of strategies they used most often. By assessing the frequency of specific and observable active, passive, and disruptive ER strategies, we gained a better understanding of children's overall use of engaged and disengaged forms of ER. Engaged ER entails engaging with the emotion-eliciting stimulus to work toward changing the situation. In contrast, disengaged ER involves avoidance of coping with the source of distress.

Although passive strategies are adaptive for the short-term goal of avoiding negative affect, repeated use of strategies that entail avoidance can lead to long-term negative effects on social development (Aldao et al., 2010). Among adults, research shows that active regulation strategies in anger- and anxiety-eliciting situations lead to reduced negative emotion (Gross, 1998), whereas repeated use of avoidant strategies predict increased depressive and anxiety symptoms (Aldao et al., 2010). To parallel work done in previous studies, we coded active,

passive, and disruptive ER strategies in a laboratory-based disappointment task at age five, an age when children independently use various ER strategies. We examined engaged ER strategies, as indexed by higher use of active strategies and lower use of passive strategies. We expected engaged ER strategies observed in a disappointment context to predict greater social competence with an unfamiliar peer.

Emotion Regulation as a Mechanism Linking Temperament and Social Functioning

To better understand why highly inhibited children are predisposed toward social difficulties, such as hesitancy to approach peer interactions (Degnan et al., 2014, Sanson et al., 2004), we investigated children's ER strategies as one possible mechanism linking BI and social functioning. Thus, we first examined how early BI related to the use of engaged ER during a disappointing laboratory task. Evidence of longitudinal relations between temperamental characteristics and observed regulatory behaviors is limited and has mostly focused on these mechanisms in frustration-eliciting contexts in infancy (e.g., Braungart-Rieker & Stifter, 1996). Other studies have focused on child global negative affect, rather than BI specifically. These studies show that maternal-reported child global negative affect is concurrently (Santucci et al., 2008) and longitudinally related to the use of maladaptive ER strategies (e.g., focusing on the source of distress) in early childhood (Rodriguez et al., 2005). In relation to BI, a recent study shows that early BI predicts less assertiveness and more withdrawn strategies in a social exclusion task during middle childhood (Walker et al., 2014). Therefore, in the current study, we examined whether BI in toddlerhood predicted ER strategy use, and focused specifically on examining ER in a socially unfamiliar and ambiguous context (i.e., the disappointment task). We believed that most children would find the disappointment task aversive and upsetting (Cole, Zahn-Waxler & Smith, 1994), but hypothesized that children with a history of high BI would have more difficulty using engaged ER strategies in this context. This hypothesis is supported by previous studies showing that an inhibited temperament in toddlerhood relates to a heightened awareness and understanding of others' thoughts and beliefs (e.g., Mink, Henning, & Aschersleben, 2014; Wellman, Lane, LaBounty, & Olson, 2011). We expected that these affective and social cognitive biases would increase the probability that children with a history of high BI would feel uneasy when faced with an ambiguous situation while in the presence of an unfamiliar adult. Therefore, highly inhibited children may be less likely to use engaged ER in this context (e.g., more passive strategies, fewer active strategies).

Next, we examined the mediating role of ER in the relation between early BI and social competence in middle childhood for several reasons. First, BI and ER are independently and directly associated to social competence. Further, BI is expressed early in toddlerhood, whereas the development of ER begins in infancy and becomes increasingly complex throughout childhood. The developmental sequence of these constructs suggests that ER may function as a mediating construct. Second, highly inhibited children seem inclined to use disengaged ER strategies (Walker et al., 2014), which are linked to negative effects on social development (Aldao et al., 2010). The documented associations amongst these constructs and their developmental time course provide justification for examining the

mediating role of engaged ER between early BI and later observed social behavior with peers. Previous studies examining the role of ER in the association between temperament and social outcomes are mostly cross-sectional and focused on externalizing outcomes (e.g., Dollar & Stifter, 2012). To-date, however, no known studies have investigated how ER strategies in a disappointment context mediate the relation between BI and observed social competence using longitudinal data. The portion of the disappointment task in which the research assistant is present is an important context to examine because it provides an opportunity to observe ER in a novel and socially ambiguous situation, which may have important consequences for future social behavior, particularly among highly inhibited children.

Summary and Hypotheses

Previous studies conducted in early and middle childhood show that children who are predisposed to the experience of negative affect, and therefore at risk for social-emotional problems, appear to benefit from the use of appropriate regulation strategies. However, these studies measure ER broadly, rather than in a specific affective context, and use cross-sectional data, and/or maternal- and teacher-report across constructs, thereby limiting the understanding of the processes through which early BI influences later social functioning. In a large-scale longitudinal study that used observational measures for each construct, the current study extends the existing literature by examining the associations between BI (ages 2 and 3), ER strategies in a disappointing context (age 5), and social competence with an unfamiliar peer (age 7). We proposed that lower levels of engaged ER strategies is one mechanism through which early BI leads to later deficits in social competence.

Specifically, we hypothesized that high BI would be associated with lower levels of engaged strategies during a disappointing, socially unfamiliar situation at age five. Further, we expected that the use of engaged ER strategies in this context would positively predict social competence with an unfamiliar peer at age seven. Finally, we hypothesized that engaged ER would mediate the relation between BI and social competence, particularly at high levels of BI. Specifically, we expected the strength of the mediation effect to vary at different levels of BI, such that this effect would only reach significance among highly inhibited children. In other words, we predicted that highly behaviorally inhibited children would particularly benefit from the use of engaged ER strategies in their ability to develop socially competent behavior with peers. To test this hypothesis, we analyzed a moderated mediation model to examine whether the indirect effect (i.e., whether BI influences later social competence through its effect on ER) is significant at low, moderate, and high levels of BI (Preacher et al., 2007).

Method

Participants

The current study included 257 children (135 girls), who were primarily Caucasian (67% Caucasian, 13% African-American, 3% Hispanic, 2% Asian-American, 15% mixed race). Mothers were highly educated: 16% graduated from high school, 43% from college, 37% from graduate school, and 4% from other educational programs. Data were collected at ages

2 (M = 2.19 years, SD = .22 years), 3 (M = 3.03 years, SD = .10 years), 5 (M = 5.23 years, SD = .35 years), and 7 (M = 7.66 years, SD = .24 years) years. Participants were recruited for participation in a larger, longitudinal study of temperament and social development using commercially available mailing lists, which targeted households with very young infants (Hane, Fox, Henderson, & Marshall, 2008).

At four months of age, 779 infants were brought to the laboratory and observed during a temperament screening to assess their reactions to novel auditory and visual stimuli. Of these children, 291 were selected to participate in the larger study based on displays of positive and negative affect and motor reactivity to the stimuli (see Hane et al., 2008). Of the 291 participants, 34 children were missing data on all constructs of interest to the current study, and thus were not included in the study sample. Children with complete or partial data (N = 257) were included in all analyses in M*plus* 6.12, which uses full information maximum likelihood (FIML) to estimate parameters (Muthén & Muthén, 1998–2010). Children with missing data on all variables (n = 34) were compared to children with complete or partial data (n = 257). No differences were found between the groups on gender, χ^2 (1, N = 291) = 1.03, p = .310, child ethnicity, χ^2 (1, N = 291) = 14.46, p = .209, or maternal education, χ^2 (1, N = 289) = 2.52, p = .11.

Procedure

To measure BI at ages 2 and 3, maternal-report questionnaires were completed and children's behavior when presented with novel social and nonsocial stimuli was observed in the laboratory. At age 5, children returned to the laboratory to complete the disappointment task, during which ER strategies were coded. At age 7, children participated in an unstructured free play task with an unfamiliar peer, who was not part of the current analyses. Trained research assistants later coded these videotaped tasks and double coded a proportion of the tasks to measure inter-rater reliability. For BI coding, observers overlapped on 19% of observations at age 2, and 11% at age 3. For ER strategies used at age 5, observers overlapped on 25% of cases, and for social competence at age 7, observers overlapped on 38% of cases. Research assistants double-coded a higher proportion of the social competence task because this was a new coding scheme developed by the authors of this manuscript. Separate sets of research assistants coded each of the tasks to reduce the risk of bias related to previous impressions of the children.

Measures

Temperament—BI was assessed at ages 2 and 3 using behavioral observations of children's response to unfamiliar stimuli (see Calkins et al., 1996; Kagan, Reznick & Snidman, 1987). The unfamiliar stimuli presented to the children included an adult stranger, a robot, and an inflatable tunnel. The adult stranger sat quietly for one minute, played with a truck for one minute, and then (if the child had not yet approached) invited the child to join her for play for one minute. The 18-inch tall battery-operated robot made loud noises, had flashing lights, and moved unpredictably around the room. Finally, an inflatable tunnel was presented to the child and a research assistant encouraged the child to crawl through it. For each task, children received a score (in seconds) for: (1) latency to vocalize, (2) latency to approach/touch the stimuli, and (3) duration of time spent in proximity to mother. A

composite measure of inhibition was computed by summing standardized scores for each task at each age. Both composite measures (i.e., BI at age 2 and BI at age 3) were used as indicators of the BI latent variable. The internal consistency estimates (alpha) for the composite BI score in the current sample was .65 at age 2 and .67 at age 3. Inter-rater reliability (average Intraclass Correlations; ICCs) across the variables used in the composite was .87 (ranging from .72 to .98) at age 2 and .98 (ranging from .93 to 1.00) at age 3.

The Toddler Behavior Assessment Questionnaire (TBAQ) was also used to measure BI at ages 2 and 3. The TBAQ is a valid and reliable questionnaire for use with 16- to 36-month-old children (Goldsmith, 1996). Using 7-point Likert scales, mothers rated their child on six dimensions of temperament. Of interest to the current study was the social fearfulness subscale, which measures inhibition, distress, and shyness in novel situations. Scores at ages 2 and 3 were used as indicators of the BI latent variable. The internal consistency estimate (alpha) for social fearfulness in the current sample was .78 at age 2 and .85 at age 3.

Emotion Regulation Strategies—ER strategies were measured at age 5 using behavioral observations during the Disappointment Paradigm, a task initially designed to examine display rules in young children (Cole, 1986), and later used to assess regulatory strategies among young children (Cole, Martin, & Dennis 2004). During this task, a research assistant presented eight toys to the child. Four toys were flawed and described as such to the child (e.g., “This is a pair of sunglasses, but they are broken and cannot be fixed.”). The remaining four toys were in good condition and described as such (e.g., “This is a bouncy ball with different colors on it.”). Children rank-ordered all eight toys on a tray. Following a separate 15-minute task regarding perceived self-concept, another experimenter placed the child’s lowest-ranked toy on the table, and said, “Here is your prize. Thanks for all your hard work.” This experimenter stayed in the room for one minute, and repeated back to the child any statements that he/she made. Afterward, this research assistant explained to the child that he/she accidentally picked up the incorrect toy, and the child received the prize he/she initially selected.

Children’s ER strategies were coded in 10-second epochs, beginning when the toy was placed on the table, for a total of 6 epochs. ER strategies were coded as one of three types: (1) Active regulation (e.g., trying to fix broken toy, asking the research assistant for correct toy), (2) Passive toleration (e.g., staring at toy), and (3) Disruptive behavior (e.g., breaking or throwing toy). The presence or absence of each strategy was coded in each epoch, and multiple strategies could be coded within one epoch. Proportion scores were created that reflected the proportion of epochs in which a particular strategy was used, thus creating three continuous scores ranging from zero to one that represented children’s use of each strategy type. The ICC for the number of active, passive, and disruptive ER strategies was .82, .87, and .79, respectively. Due to the low frequency of disruptive strategies (i.e., only used by 7% of children; $M = .02$, $SD = .08$), this variable was dropped from further analyses. To assess children’s repertoires of ER strategy use, the highly negatively correlated proportion scores for active and passive ER were used as indicators of the engaged ER latent variable.

Social Competence—Social competence was assessed at age 7 during a six-minute unstructured free play session with an unfamiliar, same-sex, same-age peer. Children's play initiations, types of responses received to their initiations, and level of play sophistication were coded. Therefore, this construct measured individual differences in the implementation of social skills; specifically, engaging in social play and executing an appropriate initiation requires good communication and perspective-taking skills. This construct also measured how peers responded, which reflects the child's ability to connect to others. Taken together, these skills are thought to capture effectiveness in social interactions (Rose-Krasnor, 1997).

Social initiations: The initiation and response coding scheme was based on an observational measure used in past research (Hauck, Fein, Waterhouse & Feinstein, 1995). Play initiations were defined as the originating observable social behavior that attempts to begin an interaction. Appropriate attempts to initiate or prolong social interaction with the peer (e.g., greeting peer, calling peer's attention to an activity) were coded as positive initiations. Passive attempts to engage the peer (e.g., looking at the peer for an extended period of time, imitating the peer without verbal initiation) were coded as low-level initiations. Finally, improper attempts to engage the peer (e.g., commanding peer to play, physical aggression toward peer or peer's toy) were coded as inappropriate initiations. Proportion scores were calculated to reflect use of each type of initiation (e.g., number of positive initiations divided by total number of initiations). Inter-rater reliability (ICCs) for the proportions of positive, low-level, and inappropriate initiations were .86, .85, and .79, respectively. Proportion of positive initiations was used as an indicator of the social competence latent variable.

Response to initiations: Response coding reflected observable behaviors of the peer immediately following the target child's social initiation, with regard to the goal of the initiation. Each response to an initiation was coded as successful, ignored, or rejected. Responses were coded as successful if the peer provided a positive verbal or nonverbal response to the initiation, ignored if the peer did not acknowledge the initiation, and rejected if the peer refused or criticized the child's initiation. Proportion scores were calculated to reflect use of each response type (e.g., number of successful responses divided by total number of responses). Inter-rater reliability (ICCs) for the proportion of successful, ignored, and rejected responses were .71, .75, and .81, respectively. The proportion of successful responses received was used as an indicator of the social competence latent variable.

Level of play: Lastly, the target child's play behavior during the free play task was coded using a modified version of Rubin's (2001) Play Observation Scale. The amount of time each child spent in non-play, independent play, and social play, was coded in seconds. Non-play included unoccupied behavior (i.e., lack of focus) and hovering/on-looker behavior (i.e., focus on the peer without talking) without attempts to engage the peer. Independent play included solitary play and parallel play (i.e., focus on one's play, but with regular acknowledgment of the peer). Social play included cooperative play (i.e., reciprocal social interaction with a shared goal) and turn-taking conversation. Shared laughing and actively planning a shared play activity (e.g., who would take the first turn during a game of basketball), was also coded as social play behavior. Time spent making positive social initiations (e.g., making a play suggestion), regardless of peer's response, was also included

in social play. Inter-rater reliability (ICCs) for the proportion of time spent in non-play, independent play, and social play were .89, .82, and .84, respectively. Proportion of time in social play was an indicator of the social competence latent variable.

Analytic Strategy

Analyses were conducted using structural equation modeling (SEM) using M*plus* version 6.12 (Muthén & Muthén, 1998–2010). Latent variables of BI, ER, and social competence were created based on maternal report and observations. We first examined a simple mediation model with the BI latent variable as the predictor, the ER latent variable as the mediator, and the social competence latent variable as the outcome. Model fit was examined by reviewing indices for good model fit, such as χ^2, root mean square error of approximation (RMSEA) < .06, standardized root mean square residual (SRMR) < .08, and comparitive fit index (CFI) > .95 (Bollen, 1989; Kline, 2005). Next, to test whether the indirect effect was conditional on the level of BI, a second model was tested integrating moderation and mediation. Preacher et al. (2007) illustrated this analysis in Model 1 of their paper, where the independent variable is also the moderator. Using this model, the BI latent variable was examined as a moderator of the mediation hypothesis (i.e., examined whether the indirect effect of BI on social competence through ER varies at different levels of BI). To understand the nature of the moderated-mediation effect, the mediation effect was examined at one standard deviation above the mean, one standard deviation below the mean, and at the mean of BI (Preacher et al., 2007). That is, we examined whether the indirect effect of BI on social competence through ER was significant at low, average, and high levels of BI. Using an interactive online tool for calculating Monte Carlo confidence intervals for the indirect effect (Preacher & Selig, 2012; Selig & Preacher, 2008), confidence intervals were examined for the simple indirect effect and the moderated-mediation follow-up indirect effects.

Results

Descriptive Statistics and Preliminary Analyses

Table 1 shows descriptive statistics for all study variables. Examination of skewness and kurtosis values showed that all variables were normally distributed, including the ER proportion data. For active ER, skewness was −1.89 (*SE* = .17) and kurtosis was 2.32 (*SE* = .34); for passive ER, skewness was .92 (*SE* = .17) and kurtosis was −.63 (*SE* = .34). These skewness and kurtosis values do not significantly violate assumptions of normality for SEM analyses (Kline, 2005). Prior to statistical analyses, multivariate analyses of variance were used to examine differences on study variables related to ethnicity and maternal education, and results revealed no significant differences (*p*'s all > .05).

Next, independent samples *t*-tests were conducted to examine sex differences on BI, ER, and social competence variables. Results showed that sex did not relate to BI or social competence (*p*'s all > .05). However, boys used a higher proportion of active ER strategies compared to girls, $t(204) = 3.22$, $p = .002$, whereas girls used a higher proportion of passive ER strategies compared to boys, $t(204) = -3.33$, $p = .001$. Therefore, sex was included as a covariate in all analyses.

Correlations between age at each visit and all variables measured at the same time point showed that child's age (in months) at the age 7 visit was positively correlated with the proportion of successful responses received, $r(175) = .20$, $p = .01$. Thus, child's age at the 7-year visit was also added as a covariate in all analyses. Correlations among study variables are presented in Table 2. Results showed moderate stability in BI across ages and consistency across measurement sources. As expected, the active and passive ER indicators were negatively correlated with each other and social competence indicators were positively correlated with each other.

Structural Equation Modeling

Measurement Model—Three latent variables were created using questionnaire and behavior observation data across ages 2, 3, 5, and 7 (see Figure 1). The following fit indices provided evidence for good model fit: χ^2 (24) = 20.02, $p = .70$, CFI = 1.00, RMSEA = .00, and SRMR = .04. The BI latent variable included composite scores of BI observations and the TBAQ social fearfulness scores at ages 2 and 3. The errors of the TBAQ social fearfulness scores were correlated due to shared method variance, $r = .24$, $p < .001$. The mediating latent variable, engaged ER, included the proportion of active and passive strategies used during a disappointing situation at age 5. The proportion of passive strategies was reverse-scored, such that higher scores reflected lower levels of passive regulation, to have all positive loadings on this latent variable. The dependent latent variable indexed social competence with an unfamiliar peer at age seven. Unstandardized loadings of all the indicators are shown in Figure 1 (p's ≤ .001).

Simple Mediation—Due to the results of preliminary analyses, age during the 7-year assessment and sex were included as covariates in the model; however, neither was significantly related to social competence (age: $b = .05$, $SE = .07$, $p = .46$; sex: $b = -.01$, $SE = .04$, $p = .87$). The first goal of the study was to examine the direct effects among key study variables. BI was unrelated to social competence ($b = -.01$, $SE = .10$, $p = .92$). Conversely, greater BI predicted less engaged ER ($b = -.24$, $SE = .09$, $p = .005$) and higher engaged ER predicted more social competence ($b = .21$, $SE = .09$, $p = .014$). For the indirect effect of BI on social competence through ER, we found a trend-level indirect effect ($b = -.05$, $SE = .03$, $p = .07$, 95% CI [−.12, −.00]). Fit indices provided evidence of good model fit: χ^2 (40) = 44.79, $p = .27$, CFI = .99, RMSEA = .02, and SRMR = .06.

Moderated Mediation—The second goal of the study was to examine whether the indirect effect of BI on social competence through ER varied as a function of the level of BI. Thus, a moderated mediation model was analyzed (Preacher et al., 2007) in which an interaction term was added to the simple mediation model above to examine whether different levels of BI moderated the indirect effect of BI on social competence through engaged ER. Age and sex were included as covariates in the model, but neither was significantly related to social competence (age: $b = .07$, $SE = .07$, $p = .29$; sex: $b = -.01$, $SE = .04$, $p = .80$). Results revealed a significant interaction between BI and ER predicting the indirect effect of BI on social competence through engaged ER ($b = .72$, $SE = .24$, $p = .003$). Follow-up analyses and Montecarlo confidence intervals (see Table 3) indicated a significant indirect effect of BI on social competence through engaged ER at one standard deviation

above the mean of BI ($p = .01$), a non-significant trend for the indirect effect at the mean of BI ($p = .08$), and no indirect effect at one standard deviation below the mean of BI ($p = .90$). These results support our hypothesis of moderated mediation; specifically, ER mediates the relation between BI and social competence, but only among children showing high levels of BI.

Discussion

The results of this study extend past literature to demonstrate the important role of ER strategies in mediating the association between early inhibition and future social competence, and reveal that this ER mechanism is particularly strong for children with a history of high BI. Study findings identified specific regulatory skills that can enhance or mitigate risk, particularly among highly inhibited children. Given the distinct developmental courses of BI and ER, the use of a longitudinal design is a notable strength of the current study. BI characteristics demonstrate moderate stability throughout toddlerhood (Kagan et al., 1987), whereas the ability to independently execute sophisticated active ER strategies, such as cognitive restructuring, begins at about age 5 (Stegge & Meerum Terwogt, 2007). Thus, the longitudinal design used in this study provides unique insight into how early BI and children's autonomous use of regulatory strategies in childhood contribute to socially competent behavior in middle childhood. Overall, study findings highlight the nature of the relations among BI, ER, and social competence across early and middle childhood and can inform the development of prevention and intervention programs designed to strengthen social-emotional skills (Fraser et al., 2005).

Development of Social Competence

Our hypothesis that early BI would directly relate to later social competence was not supported, which might be partially due to the large span of time between the measurement of BI (ages 2 and 3) and the measurement of social competence (age 7). Over this span of time, the effects of temperament likely diminish and the effects of potential moderators and mediators (e.g., emotion regulation, parenting styles) likely gradually increase. In addition, we assessed social competence during a dyadic free play task with an unfamiliar peer, but by the age of 7, this situation may not be as challenging as other, less familiar social contexts (e.g., entry to unfamiliar peer group). Thus, a stronger association between early BI and variations in social competence during middle childhood may exist when examining behavior in more challenging social situations.

Importantly, results showed that more engaged regulation (i.e., higher levels of active strategies, lower levels of passive strategies) at age 5 predicted greater social competence with an unfamiliar peer two years later. These findings are consistent with literature showing that ER abilities in childhood and adulthood are associated with various socio-emotional outcomes (Rivers, Brackett, Katulak, & Salovey, 2007). For example, poor anger regulation predicts increased externalizing symptoms (e.g., Degnan et al., 2008), as well as child-reported depressive symptoms (Bowie, 2010), and parent-reported sadness regulation concurrently predicts higher levels of parent-reported social withdrawal amongst 4- to 8-year-old children (Eisenberg et al., 2001). The current study extended these findings to show

that engaged regulation strategies in a socially unfamiliar and ambiguous context (i.e., the disappointment task) directly related to social competence, a particularly relevant outcome for behaviorally inhibited children. Given that most children who show high BI in early childhood do not develop clinically significant disorders, it is important to identify and understand predictors of variation in social competence. Our study findings suggest that disengaged regulatory strategies may over time lead to passivity in social situations with peers, such that children engage in fewer initiations and appear socially reticent during play with unfamiliar peers, possibly to avoid the risk of peer rejection.

BI and emotion regulation—Study findings also indicate that BI in toddlerhood predicts the use of more disengaged ER strategies in a disappointment context at age 5. Specifically, high BI in toddlerhood was associated with more disengaged regulatory strategies (e.g., more passive and fewer active strategies). These findings are consistent with and extend past literature in two important ways. First, research in infancy has shown that reactivity in a fear-eliciting situation is concurrently related to more passive regulation and less attention regulation during a social interaction with a stranger (Braungart-Reiker, Hill-Soderlund, & Karrass, 2010), and longitudinally related to avoidance behavior at 9 months of age (Hane et al., 2008). The current study findings indicated that after infancy, BI in toddlerhood longitudinally predicts similarly passive-natured strategies in a disappointing situation. Second, studies have shown that maternal-reported negative affect as a broad factor is related to the use of passive regulatory strategies in frustration-eliciting situations, such as delay of gratification tasks (Rodriguez et al., 2005; Santucci et al., 2008). The current study extended past work to show that BI in toddlerhood predicts future regulatory strategies used in a socially unfamiliar and ambiguous situation. The context in which regulatory strategies were measured is particularly important because the presence of an unfamiliar adult may have led children to perceive social threat, especially among those with a history of high BI. Past research shows that highly behaviorally inhibited children tend to exhibit overgeneralized orienting reactions in contexts that do not require them (for a review, see Henderson, Pine, & Fox, 2015). Thus, during the ER task in the current study, highly behaviorally inhibited children may have experienced difficulty appropriately allocating their attention, which may have negatively impacted their ability to engage in flexible and competent regulation strategies.

Moderated mediation—Results also supported the hypothesis that engaged ER mediates the association between early inhibition and future social competence with an unfamiliar peer, but the strength of this mediation varied depending on the child’s level of early BI. At high levels of early BI, engaged ER significantly mediated the relation between early BI and future social competence. At average levels of BI, the mediation reached trend-level significance, and there was no mediation at low levels of early BI. Thus, study results indicated that engaged ER among highly behaviorally inhibited children can mitigate risk for poor social competence. In contrast to past studies focusing on children’s responses frustration-eliciting contexts and related behavioral outcomes, our findings suggest that engaged ER in a socially unfamiliar and ambiguous context seems particularly salient for behaviorally inhibited children.

Consistent with a theoretical model proposed by Rothbart and Bates (2006), our findings indicate that adjustment outcomes for children of temperamental extremes can be substantially altered by regulatory abilities. Our results suggest that general apprehension to interacting with unfamiliarity, which characterizes behaviorally inhibited toddlers (Garcia-Coll et al., 1984), may initially interfere with their ability to implement engaged regulation strategies and to interact competently with peers in early childhood (Rubin et al., 2002). If highly inhibited children learn to implement engaged ER strategies over time, however, they may overcome this apprehension and develop greater social competence. These findings are consistent with past literature showing that high emotionality combined with optimal behavioral regulation predicts greater teacher-reported socially appropriate behavior (Eisenberg, Fabes, Guthrie, & Reiser, 2000), and lower parent and teacher-reported problem behavior in early elementary school (Eisenberg et al., 1996). The current study extends past findings by showing that it is specifically among children with high BI that engaged regulatory strategies in a socially unfamiliar task can help facilitate the development of social competence. Further, no known previous studies have examined the longitudinal relations among these constructs beginning in early childhood and using observational measures across all time points.

Limitations and Future Directions

The current study revealed important findings about regulatory strategies that support the development of social competence for highly inhibited young children, but contained several limitations that should be addressed in future research. First, moment to moment affect coding during an ER task (i.e., distinguishing between different kinds of negative affect, such as sadness and fear) would help to clarify whether and how specific regulatory strategies produce changes in children's affective expression. In addition, should passive and active strategies not be strongly correlated in other affective contexts, it would be helpful to examine how each construct independently predicts socio-emotional outcomes. In our study, however, loading the regulation variables onto a single latent variable, given their high correlation, helped convey a more complete and rich conceptual understanding of the developmental mechanisms taking place over time. Specifically, our model demonstrates that low levels of engaged regulation can lead to increased risk for difficulties with social competence amongst behaviorally inhibited children. The inclusion of socialization measures should also be considered in future studies, given past research showing that specific parenting behaviors influence the development of ER (Morris, Silk, Steinberg, Myers, & Robinson, 2007) and various aspects of children's social development (for a review, see Davidov & Grusec, 2006). Further, the current study examined social competence at age 7 as the main outcome because peers play an important role in shaping social development during this time (Parker et al., 2006). Examining whether similar social patterns persist in adolescence would also be informative. Lastly, this sample was comprised mostly of Caucasian children with highly educated mothers; future studies should examine whether our findings generalize to more diverse samples.

Implications and Conclusions

Identifying predictors of social competence has important implications, given past research showing that deficits in social competence relate to higher levels of self-reported depression

and anxiety in adolescence (Uhrlass, Schofield, Coles, & Gibb, 2009). Study findings suggest that early BI was associated with the use of disengaged ER strategies, and yet, it is precisely the use of *engaged* strategies that can help highly behaviorally inhibited children achieve higher levels of social competence. The implications of these findings are significant. Specifically, early prevention programs should provide highly inhibited children with practice in identifying and using alternatives to passive regulatory strategies (e.g., problem solving, cognitive restructuring) when faced with challenging situations. Children and parents should also receive psycho-education regarding short- and long-term consequences of passive regulatory strategies; whereas passive strategies may feel easier in the moment, repeated use can lead to maladaptive outcomes. To summarize, though past literature has widely documented risk for internalizing disorders associated with high BI, results provide evidence for engaged ER as a protective factor in the association between early BI and poor social competence, particularly among highly inhibited children. Study findings have significant clinical implications for the prevention of social difficulties in middle childhood and provide support for the importance of intervention programs in early childhood targeting the development of engaged ER strategies.

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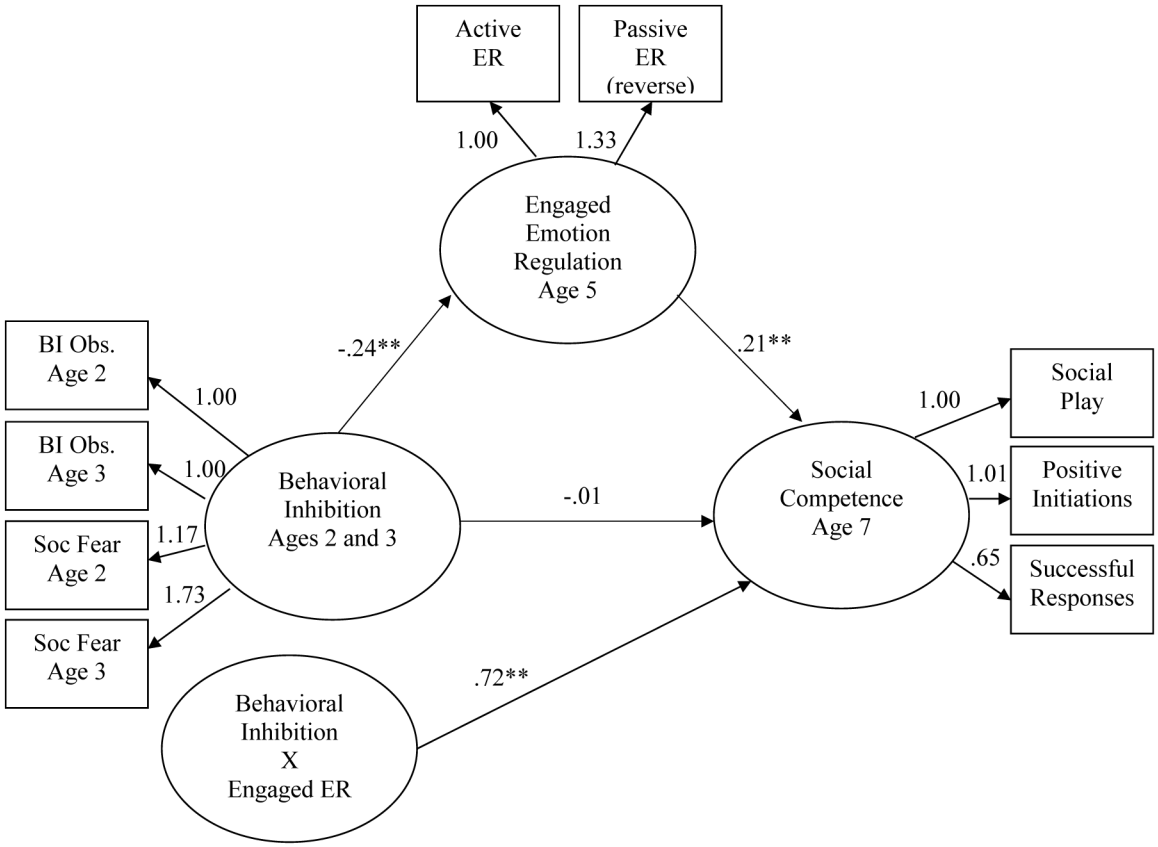

Figure 1.

Unstandardized results of regression analyses for the moderated mediation analysis. Results showed that behavioral inhibition (BI) was not directly associated with social competence, however, BI predicted lower engaged emotion regulation (ER) strategies and engaged ER predicted greater social competence. Though the overall indirect effect was not significant, there was a significant interaction between BI and ER on the indirect effect. Follow-up analyses indicated that ER is a mechanism through which BI influences social competence, but only for highly inhibited children. $^{**}p < .01$.

Note: Soc Fear = social fearfulness; BI = behavioral inhibition.

Table 1

Descriptive Statistics and N per Measure

	Age	*N*	Min	Max	*M*	*SD*
Behavioral Inhibition						
BI Observations	2	238	−.74	1.31	0	0.41
BI Observations	3	210	−.96	1.63	0	0.48
Social Fearfulness (TBAQ)	2	261	1.89	6.42	3.81	0.83
Social Fearfulness (TBAQ)	3	243	1.30	6.42	3.44	0.96
ER Strategies	5	206				
Proportion of active strategies			0	1	0.85	0.28
Proportion of passive strategies			0	1	0.30	0.36
Social Competence	7	175				
Proportion of time in social play			0	1	0.36	0.27
Proportion of positive initiations			0	1	0.64	0.28
Proportion of successful responses			0	1	0.57	0.26

Note: BI = behavioral inhibition; TBAQ = Toddler Behavior Assessment Questionnaire; ER = emotion regulation.

Table 2

Correlation Between Indicators of BI, Emotion Regulation, and Social Competence Latent Variables

	1	2	3	4	5	6	7	8
1. BI obs age 2								
2. BI obs age 3	.32**							
3. TBAQ Social Fear age 2	.29**	.20**						
4. TBAQ Social Fear age 3	.35**	.33**	.56**					
5. ER active age 5	−.21**	−.08	−.12	−.12				
6. ER passive age 5	.23**	.05	.09	.13	−.83**			
7. Social play age 7	.07	−.08	.07	−.02	.19*	−.21**		
8. Positive initiations age 7	.01	−.13	−.09	−.08	.17*	−.18*	.49**	
9. Successful responses age 7	.04	−.07	−.06	−.17	.13	−.10	.34**	.34**

** $p < .01$;

* $p < .05$

Note: BI = behavioral inhibition; obs = observations; TBAQ = Toddler Behavior Assessment Questionnaire; ER = emotion regulation.

Table 3

Results of the Follow-up Interactions Analyses for the Indirect Effect of Behavioral Inhibition on Social Competence Through Engaged ER at Different Levels of Behavioral Inhibition

Behavioral Inhibition	*b*	*SE*	95% CI
High BI (+ 1SD)	−.07*	.03	−.14, −.02
Mean BI	−.04*t*	.02	−.08, .00
Low BI (− 1SD)	.01	.02	−.05, .06

* p=.012,

t p =.08.

Note: ER = emotion regulation; BI = behavioral inhibition; 95% CI = 95% Monte Carlo confidence intervals.