

Early Callous-Unemotional Behavior, Theory-of-Mind, and a Fearful/Inhibited Temperament Predict Externalizing Problems in Middle and Late Childhood

Ju-Hyun Song¹ · Rebecca Waller² · Luke W. Hyde³ · Sheryl L. Olson³

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Abstract Childhood externalizing problems are more likely to be severe and persistent when combined with high levels of callous-unemotional (CU) behavior. A handful of recent studies have shown that CU behavior can also be reliably measured in the early preschool years, which may help to identify young children who are less likely to desist from early externalizing behaviors. The current study extends previous literature by examining the role of CU behavior in very early childhood in the prediction of externalizing problems in both middle and late childhood, and tests whether other relevant child characteristics, including Theory-of-Mind (ToM) and fearful/inhibited temperament moderate these pathways. Multi-method data, including parent reports of child CU behavior and fearful/inhibited temperament, observations of ToM, and teacher-reported externalizing problems were drawn from a prospective, longitudinal study of children assessed at ages 3, 6, and 10 (N = 241; 48 % female). Results demonstrated that high levels of CU behavior predicted externalizing problems at ages 6 and 10 over and above the effect of earlier externalizing problems at age 3, but that these main effects were qualified by two interactions. High CU behavior was related to higher levels of externalizing problems specifically for children with low ToM and a low fearful/inhibited

temperament. The results show that a multitude of child characteristics likely interact across development to increase or buffer risk for child externalizing problems. These findings can inform the development of targeted early prevention and intervention for children with high CU behavior.

Keywords Callous-unemotional behavior · Externalizing problems · Theory-of-mind · Fearful/inhibited temperament

Across the preschool years, children show dramatic increases in their ability to regulate behavior (Shonkoff & Phillips 2000), internalize social norms (Kochanska & Aksan 2006), and develop an awareness of others' desires, beliefs, and emotions (Wellman 2014). By the end of the preschool period, these core developmental milestones help to reduce the normative high levels of aggressive behaviors that are typically shown by children from ages two to four years old (Hay et al. 2004; Tremblay 2000). However, some children show persisting externalizing problems and do not reduce their aggressive behaviors across the transition from the preschool period to the middle- and late-childhood period (NICHD Early Child Care Research Network 2004). These children have been shown to have a wide range of adjustment problems in both social and academic domains across the school-age years (Caspi & Moffitt 1995; Dodge et al. 2008; Morrow et al. 2006). Thus, research has focused on identifying specific developmental and child-level characteristics that predict persisting forms of aggressive and externalizing behavior problems into the early school period (Shaw et al. 2003) in order to more effectively target children at highest risk of poor outcomes via intervention or treatment (i.e., those who are less likely to desist from normatively high initial levels of aggression). The current study examines high callous-unemotional behavior, poor theory-of-mind, and low fearful/inhibited

✉ Ju-Hyun Song
jjhsong@umich.edu

¹ Center for Human Growth and Development, University of Michigan, Ann Arbor, MI, USA

² Department of Psychology, University of Michigan, Ann Arbor, MI, USA

³ Department of Psychology, Center for Human Growth and Development, Institute for Social Research, University of Michigan, Ann Arbor, MI, USA

temperament as potential child-level contributors to the development of externalizing problems across childhood.

Callous-Unemotional (CU) Behavior

One approach that has been adopted in recent years to identify those children at highest risk of persisting externalizing problems has focused on the presence or absence of callous unemotional (CU) behavior (see Frick et al. 2014 for a review). Children with high levels of CU behavior tend to prefer dangerous and novel activities (Frick et al. 2003), exhibit hyporesponsivity to affective cues (Blair 1999; Kimonis et al. 2006), and low levels of empathy and guilt (Frick & White 2008). These characteristics appear to increase the risk of children developing particularly severe and chronic externalizing problems over time (Frick et al. 2014). A growing body of studies suggests that childhood CU behavior adds predictive utility in forecasting the severity of later externalizing behavior, particularly in the late childhood and adolescence period, over and above stability in externalizing behavior in general (Frick et al. 2003). Moreover, these findings have been replicated across different types of samples (e.g., community, clinical, forensic), and different demographic backgrounds (e.g., age, gender, and culture; Frick et al. 2014).

Preschool CU Behavior and Later Externalizing Problems

More recently, studies have begun to examine CU behavior in preschool samples, as increasing evidence demonstrates that CU behavior can be reliably measured as early as at age three (Hyde et al. 2013; Kimonis et al. 2006; Willoughby et al. 2011). Consistent with research findings with older children and adolescents, CU behavior in the preschool years is also associated with severe and persisting externalizing problems across childhood. For example, Willoughby et al. (2014) found that high CU behavior at age three uniquely predicted high and stable teacher-rated aggression from ages six to 12. In the current sample, Waller et al. (2015a) showed that higher CU behavior (mother-reported) at age three predicted teacher-reported externalizing problems concurrently and longitudinally at age six while controlling for earlier ADHD and oppositional behaviors. Taken together, these studies highlight that early CU behavior may represent an important way to identify young children at high risk of severe and persisting externalizing problems across childhood (Hyde et al. 2013; Waller et al. 2015b).

While there appears to be a link between early CU behavior and severe externalizing problems, however, questions continue to surround the developmental processes by which CU behavior affects externalizing outcomes and how those

processes are moderated by other child level factors. A handful of recent studies has pointed to the importance of examining other child features, such as fearlessness or behavioral inhibition, along with CU behavior in order to understand the heterogeneity in developmental pathways to conduct problems (Fanti et al. 2015; Klingzell et al. 2015). Broadly, theory and some empirical evidence suggest that disruptions in affective development may play a role in the development of severe antisocial problems in high-CU children (Frick & Viding 2009). The theoretical premise is that insensitivity to emotional cues in others (e.g., upset parent signaling punishment, crying peer signaling distress) and a fearless or bold temperament may interfere with the development of empathy and guilt (Fowles & Kochanska 2000). Jointly, both affective and cognitive deficits could increase the risk for severe externalizing problems when combined with high levels of CU behavior. In particular, when children are poorly attuned to others and experience fearless and low shy temperaments on top of their high CU characteristics, they may be more likely to show reduced conscience (Dadds & Salmon 2003) and higher aggressive behavior (Blair 1995) across development. Because research on CU behavior among preschoolers is only emerging, not many studies have yet examined the interaction of CU behavior with other cognitive or temperamental characteristics that also predict persisting externalizing problems. The current study thus examined whether links between CU behavior and later externalizing problems were moderated by children's cognitive capabilities related to recognizing or knowing others' perspective, as indexed by Theory-of-Mind (ToM) and their affective propensity towards distress or feeling, as indexed by fearful/inhibited temperament.

Theory-of-Mind (ToM)

During the preschool period, children show a dramatic development in ToM, defined as the ability to understand that others can have desires, beliefs, and emotions that are different from your own, and that mental states influence behavior (Wellman 2014). Although most children show ToM understanding via successful performance on false-belief tasks by the end of preschool years, there are individual differences in the rate of development of ToM (Wellman et al. 1995; Wellman et al. 2001). Evidence from longitudinal research suggests that the consequences of a slower rate of ToM development in real-world social behavior endure long after children have developed ToM (Astington 2001). For example, a number of studies have demonstrated that delays in ToM are related to higher externalizing behavior during childhood (e.g., Hughes et al. 1998; Hughes & Ensor 2006; Lemerise & Arsenio 2000). This may be because poor ToM contributes to biases and difficulties in interpreting social cues, which can result in reactive and aggressive behaviors toward others (Dodge &

Coie 1987). For example, in the current sample, Choe et al. (2013) found that preschoolers who had low levels of ToM showed more hostile attribution biases at age six.

Whereas these studies reported that low ToM is related to more externalizing behavior, this finding has not been consistently replicated across all studies. For instance, no significant link between ToM and aggression was reported in both a cross-sectional (e.g., Hughes et al. 2000), and a longitudinal study (Olson et al. 2011). This inconsistency across findings of previous studies suggests that preschool-aged low levels of ToM alone may not be sufficient to explain increased risk for more externalizing problems (Hughes 2011). In fact, Wellman (2014) argued that competence in ToM understanding does not always translate into competence in social behaviors (e.g., prosocial behavior), and in the same vein, Astington (2003) wrote ToM is “sometimes necessary but never sufficient (p. 13)” to guide children’s social interactions. In other words, low ToM may not independently contribute to later externalizing problems, but could operate to increase risk for later externalizing in conjunction with other child-level characteristics.

In the current study, we examined how individual differences in ToM contribute to the development of externalizing problems conjointly with high CU behavior. As outlined, children with low levels of ToM are thought to be at increased risk for externalizing problems due to difficulties in understanding others’ intention and poor cognitive empathy (Hughes 2011). At the same time, children with high CU behavior are thought to be at risk for externalizing problems because of deficits in affective empathy (Waller et al. 2015a), which seems to underlie difficulties associating their harmful actions toward others with emotions of distress in others (Blair 1995). Together, it is plausible that children who have *dual risk*—lower ToM and higher CU behavior—could show worse externalizing outcomes when compared to children who have low levels of ToM or high levels of CU behavior alone. In other words, high CU children who have high levels of ToM may show less severe externalizing problems compared to those who have low levels of ToM (i.e., protective effect of high ToM). It is noteworthy that previous studies that have examined CU behavior and ToM (i.e., cognitive empathy) have typically assessed older samples of children or adolescents and have focused on how these CU behavior and ToM are *related* to each other (Dadds et al. 2009; Jones et al. 2010). Also, recent studies have begun to investigate the extent of cognitive versus affective empathic deficits in CU behavior versus symptoms of autism spectrum disorder (ASD), suggesting that low affective empathy may be unique to CU behavior whereas cognitive empathy may be more unique to ASD symptoms although some evidence suggests that it is shared by both ASD symptoms and CU behavior (e.g., O’Nions et al. 2014; Pasalich et al. 2014). In the current sample, Waller et al. (2015b) previously reported mother-reported CU behavior

was negatively correlated with ToM concurrently at age three, although this association became non-significant when overlap between ADHD, oppositional, and CU behavior was accounted for. However, we have yet to test whether CU behavior and ToM *interact* with one another to predict more severe externalizing problems in middle and late childhood.

Fearful/Inhibited Temperament

A second child characteristic that is thought to be important to the development of externalizing behavior, particularly CU behavior, is a low fearful or inhibited temperament. A large body of literature suggests that optimal levels of fear and shyness (i.e., an optimal normative level of temperamental anxiety) are conducive to the development of conscience (Kochanska et al. 2002) and the inhibition of aggression (Frick & Viding 2009) due to the discomfort felt after wrongdoing and the modulatory effect of fear on disinhibition associated with externalizing behavior. Thus, normative levels of arousal and anxiety, which could be assessed with temperament measures such as fear and shyness (i.e., behavioral inhibition), could inhibit future aggressive or rule-breaking behavior (Lahey & Waldman 2003; Patrick et al. 2009). Importantly, high levels of CU behavior have been linked to low anxiety in studies assessing the late-childhood period (e.g., Pardini et al. 2007; Waller et al. 2015b) although other studies have reported that high levels of CU behavior are related to higher levels of internalizing problems of anxiety (e.g., Berg et al. 2013; Essau et al. 2006). To address this heterogeneity, Kimonis and colleagues have proposed differentiating between primary versus secondary variants within children who show high CU behavior (see Kimonis et al. 2012; Kimonis et al. 2011). In particular, the primary CU behavior variant is theorized to be defined by low levels of emotional arousal whereas the secondary variant is associated with high levels of emotional sensitivity and anxiety. Importantly, both variants are theorized to show comparable levels of disruptive behavior problems but via different emotional mechanisms; deficits in processing emotional stimuli for the primary variant and emotion dysregulation for the secondary variant (Kimonis et al. 2012). Despite work examining associations between CU behavior and emotional sensitivity and the person-centered approach of describing primary versus secondary variants, few studies have examined main and interactive effects of CU behavior and emotional sensitivity in the prediction of externalizing problems. In particular, it is yet to be established the extent to which high levels of CU behavior versus low levels of temperamental fear and behavioral inhibition (i.e., shyness) in early childhood are related to more externalizing behavior later on, or again whether there is some effect of dual risk whereby low levels of fearful/inhibited temperament combined with high levels of CU behavior may be particularly

problematic leading to increasing externalizing problems across childhood.

Gaps in the Literature

Several gaps characterize this emerging literature that has, to date, linked early childhood CU behavior to greater risk for persisting and chronic externalizing problems across childhood. First, studies are needed that examine long-term developmental consequences of early CU behavior across even longer-follow-up periods. In the current sample, Waller et al. (2015a) have previously reported that CU behavior at age three predicted externalizing problems at the transition to school at age six. However, we have yet to establish whether CU behavior at age three continues to predict externalizing problems at the end of elementary school at age 10. Given that important developmental changes occur during middle childhood (ages five to 10), which likely have long-term implications for persisting externalizing problems across adolescence and into adulthood (Feinstein & Bynner 2006), an examination of whether early childhood CU behavior separately predicts externalizing problems at both ages six and 10 is needed to isolate developmental specificity in the extent of any predictive associations. Second, poor ToM and high CU behavior in the early preschool period have yet to be considered together in terms of how they individually influence or interact to predict the development of more externalizing problems in late childhood. In particular, it is not known whether cognitive components of empathy (e.g., ToM) could buffer or exacerbate the development of more severe externalizing behavior in relation to the key emotional deficits in children with high levels of CU behavior (e.g., low affective empathy; Waller et al. 2015a). Finally, we need a clearer understanding of whether early childhood fearful/inhibited temperament interacts with CU behavior to predict later adjustment, which may shed light on different emotional processes involved in the development of externalizing problems.

Current Study

The overarching goal of this study was to examine the unique contributions of early CU behavior, ToM, and fearful/inhibited temperament at age three to school-aged teacher-reported externalizing problems assessed at ages six and 10, over and above the effects of earlier externalizing problems and relevant covariates. We hypothesized that higher levels of CU behavior, lower ToM, and lower fearful/inhibited temperament at age three would each uniquely predict more externalizing problems in middle (age six) and late (age 10) childhood. Our second goal was to explore interactions between early childhood CU behavior, ToM, and fearful/inhibited

temperament. We hypothesized that high levels of early CU behavior would predict externalizing problems at ages six and 10 more strongly when ToM or fearful/inhibited temperament were low, and less strongly when ToM or fearful/inhibited temperament were high. Examining the joint contributions of these factors has the potential to inform early identifications of multiple developmental pathways of children with high CU behavior, illustrating the developmental multifinality of early CU behavior based on levels of emotional characteristics, with key translational implications.

Method

Participants

Participants were 241 children (118 girls) who were part of a longitudinal study of young children at risk for school-aged conduct problems (Olson et al. 2005). Families were recruited through preschools, advertisements in newspapers, and pediatrician referrals. Once parents indicated interest in participating in the study, a screening questionnaire and a short telephone interview were conducted to explain the longitudinal study procedure and to determine the eligibility of the family. Children with serious health problems, mental retardation, and pervasive developmental disorders were excluded. Participating children represented the full range of externalizing problems severity on the Child Behavior Checklist for ages 2–3 (CBCL 2/3; Achenbach 1992), and children who were in the upper range of the externalizing problem subscale of the CBCL were oversampled for the purpose of the project.

The study consisted of three time points: children were around three years old at T1 ($M = 41.40$, $SD = 2.09$ months), six years old at T2 ($M = 68.90$, $SD = 3.85$ months), and 10 years old at T3 ($M = 125.52$, $SD = 7.20$ months). Families consisted of primarily those self-identifying as European American (85 %), as well as 5 % self-identifying as African American, 8 % biracial, and 2 % other racial-ethnic groups. The majority of mothers (81 %) and fathers (76 %) had completed four years of college and above (e.g., graduate or professional training) and the rest (19 % of mothers and 24 % of fathers) had achieved high school education. The median family income was \$52,000 with the range of \$20,000–\$100,000. Most mothers were married (89 %), 5 % were single, 3 % lived with a partner, and 3 % were divorced.

At T1, mothers and a subsample of fathers (66 %) answered questionnaires about demographic information and child behavior. To test whether participants for whom paternal data were available differed from the participants with mother participation only, a multivariate analysis of variance (MANOVA) was conducted to compare major study variables across the two groups. There were no significant differences between the two subsamples (Kerr et al. 2004). Among the

total sample, 91 % of families continued to participate in the study at T3. Families who left the study did not differ on socio-demographic characteristics except that they reported a lower average annual household income than families who remained in the study, $t(20) = 2.09$, $p < 0.05$. Household income was thus included as a covariate in all analyses. Missing data was handled using multiple imputation (Little & Rubin 2002) in SPSS vs. 22, which creates five imputed data sets. Simulation studies have shown that multiple imputation results in unbiased estimates while preserving sample size and statistical power (Asendorpf et al. 2014; covariance coverage: mother-reported data = 0.97–0.98; father-reported data = 0.62–0.65; teacher-reported data = 0.78–0.80; observed data = 0.93).

Procedures

This study was approved by the Behavioral Sciences IRB at the University of Michigan. Written consent was obtained from parents and teachers and verbal assent was obtained from the children. At T1, children were observed and interviewed during a four-hour Saturday laboratory session at a local preschool while completing a series of cognitive and self-regulatory tasks (Olson et al. 2005). Mothers and fathers completed questionnaires assessing children's behavioral adjustment and temperament in their homes, and were given \$100 for participation. At all three time points, children's teachers were asked to provide ratings of child externalizing behavior at school. Approximately 80 % of teachers at T1, 83 % of teachers at T2, and 83 % of teachers at T3 completed questionnaires. Teachers were given gift certificates for participating.

Measures

CU Behavior (Parent-Report) Mothers and fathers completed the Child Behavior Checklist for ages 2–3 (CBCL/2–3, Achenbach 1992) at T1. The CBCL is a 99-item measure, which is widely used to assess children's behavioral and emotional problems. Items describe behavior of children over the prior two months, using a three-point scale (0 = *not true*; 1 = *somewhat or sometimes true*; 2 = *very true or often true of the child*). The CU behavior score measure comprised five items (e.g., shows lack of guilt after misbehavior, seems unresponsive to affection), previously validated in this sample and shown to factor separately from other dimensions (i.e., opposition and ADHD symptoms) within the broadband externalizing domain (see Waller et al. 2015a for factor analytic modeling). The reliabilities of the CU behavior subscale for mother-report ($\alpha = 0.59$) and father-report ($\alpha = 0.55$) were low, but consistent with previously reported alphas by other studies using the same five CU behavior items ($\alpha = 0.65$, Willoughby et al. 2011; $\alpha = 0.55$, Willoughby et al. 2014) and using a five-item deceitful-calling scale with two

overlapping items ($\alpha = 0.64$, Hyde et al. 2013). Mother and father reports of CU behavior showed moderate convergence ($r = 0.35$, $p < 0.01$) and thus their reports were averaged to utilize multiple informants ($\alpha = 0.66$).

Theory-of-Mind Children's ToM understanding was assessed with the False Belief Prediction and Explanation Tasks-Revised (Bartsch & Wellman 1989) at T1. Children were shown four vignettes where the location of a desired object was switched while the story protagonist was unaware. Experimenters then asked children to predict and explain choices of the protagonists about locations of objects. For each vignette, children answered where the protagonist would look for the object (prediction task) and why the protagonist searched in the wrong place (explanation task). A ToM composite score was computed by summing the number of correct responses, for a maximum score of 8. Based on a random sample of 15 cases, the reliability of scoring was 0.97.

Fearful/Inhibited Temperament Mothers and a subsample of fathers completed an abbreviated 195-item version of Child Behavior Questionnaire (CBQ; Ahadi et al. 1993) to report the child's temperament using a seven-point scale (ranging from 1 = *extremely untrue*, to 7 = *extremely true*) at T1. We created a fearful/inhibited temperament scale by combining items from the Shyness (13 items; $\alpha_s = 0.92$ –0.93; e.g., 'Gets embarrassed when strangers pay a lot of attention to her/him') and Fearfulness subscales of the CBQ (13 items; $\alpha_s = 0.73$; e.g., 'is afraid of loud noises'). As with the CU behavior scale, mother and father reports had a moderately high level of convergence ($r = 0.57$, $p < 0.01$) and thus were averaged.

Externalizing Problems (Teacher-Report) At T1, preschool teachers completed the Caregiver-Teacher Report Form for ages 1.5–5 (CTRF; Achenbach 1997). To control for autoregressive effects in the current analysis, the broadband externalizing problems scale (37 items of the original 40 items that excluded items that overlapped with the CU behavior measure; $\alpha = 0.96$) was used, which consists of the attention problems and aggressive behavior subscales. At T2 and T3, teachers completed the Teacher Report Form for ages 6–18 (TRF/6–18, Achenbach & Rescorla 2001; Achenbach et al. 2002). The broadband externalizing problem scale, which includes the rule-breaking behavior and aggressive behavior subscales (31 of the original 32 items excluded the one overlapping item with the CU behavior measure; $M_\alpha = 0.94$) at T2 and T3, were tested as separate outcome variables in the current study.

Covariates At T1, information on child gender, age, and family income was collected via parent interview, and children's verbal IQ was assessed with the Vocabulary subtest of Wechsler's Preschool and Primary Scale of Intelligence-

Revised (Wechsler 1989). We included these covariates to control for potential effects of these variables on externalizing problems, as well as well-established links between ToM and verbal IQ and between age and ToM.

Results

First, in preliminary analyses, we explored descriptive statistics and zero-order correlations among all study variables (Table 1). Higher levels of CU behavior were associated with more externalizing problems at all three time points. In contrast, lower ToM was associated with more externalizing problems only concurrently at age three. Fearful/inhibited temperament was unrelated to other study variables. We found moderate correlations between teacher reports of externalizing problems from age three, six, to 10, suggesting some stability of externalizing problems across childhood despite the changing informant.

Second, using hierarchical multiple regression analyses, we examined whether age three CU behavior, ToM, or fearful/inhibited temperament uniquely contributed to later child externalizing problems at ages six or 10, controlling for the contributions of child age, gender, verbal IQ, family income, as well as externalizing problems at age three. We also explored the potential moderating effects of ToM and fearful/inhibited temperament on the associations between CU behavior and later externalizing problems. We created interaction terms between CU behavior and ToM and between CU behavior and fearful/inhibited temperament after centering all variables. For each regression model, demographic variables (i.e., child age, gender, verbal IQ, family income) and teacher-reported externalizing problems at age three were entered as covariates in Step 1. Next, CU behavior, ToM, and fearful/inhibited temperament were entered in Step 2. Finally, two-way interactions between CU behavior and the moderators were entered in Step 3. We also tested the three-way interaction among CU behavior, ToM, and fearful/inhibited temperament by entering it in Step 4, but this term was not significant in both regression models predicting age six and 10 externalizing behavior and thus it was subsequently dropped from the final models for parsimony.

Table 2 presents a summary of the multiple regression models. CU behavior significantly predicted increases in externalizing problems from age three to six, and from age three to 10, controlling for age three externalizing problems, and over and above the effects of fearful/inhibited temperament and ToM, as well as demographic covariates. Both ToM and fearful/inhibited temperament moderated links between CU behavior and externalizing problems. The interaction between CU behavior and ToM at age three significantly predicted externalizing problems at both age six and 10. In addition, the interaction between CU behavior and fearful/inhibited

temperament was significant in the prediction of externalizing problems at age six. Although not included in the final model, we also tested all main and interaction effects predicting externalizing problems at age 10 while controlling for externalizing problems at age six. The main effect of CU behavior at age three remained significant and the interaction between CU behavior and ToM showed a trend level significance. Two-way interactions between ToM and fearful/inhibited temperament did not predict externalizing problems at age six and 10.

To explore the significant interactions, we followed the recommendations of Aiken and West (1991) for testing and plotting simple slopes at 1 *SD* below (low) and 1 *SD* above (high) the mean of the moderating variable. We also examined *regions of significance* to provide values of the moderators for which simple slopes were statistically significant (Preacher et al. 2006). In the interaction between CU behavior and ToM, we found that there was a significant effect of age three CU behavior on more externalizing behavior at age six when children had low levels of ToM, $b = 10.30$ (2.16), $t = 4.76$, $p < 0.01$, but not when they had high levels of ToM, $b = 2.36$ (2.81), $t = 0.84$, *ns* (Fig. 1).¹ The region of significance indicated that the slope of age six externalizing problems regressed on CU behavior was significantly different from zero for scores of ToM below 4 (maximum of 8), which included 81 % of the sample. Similarly, age three CU behavior significantly predicted higher externalizing problems at age 10 only when children showed low levels of ToM, $b = 7.44$ (1.68), $t = 4.43$, $p < 0.01$, but not when they showed high levels of ToM, $b = 0.97$ (2.18), $t = 0.45$, *ns* (Fig. 1). The region of significance showed that the slope was significant for scores of ToM below 3, which included 72 % of the sample. Finally, the interaction between CU behavior and fearful/inhibited temperament revealed that high CU behavior at age three predicted more externalizing problems at age six when children displayed low levels of fearful/inhibited temperament, $b = 10.09$ (2.40), $t = 4.20$, $p < 0.001$, but not when they showed high levels of fearful/inhibited temperament, $b = 2.53$ (2.04), $t = 1.24$, *ns* (Fig. 2). The region of significance analysis indicated that the slope was significant for values of

¹ We chose to explore ToM as a moderator of the relationship between CU behavior and later externalizing problems. However, we acknowledge that an alternative conceptualization of these models is to consider CU behavior as the moderator. In this case, when probing the interaction term, we find a trend-level negative effect of ToM at age 3 on later externalizing problems at age 6 only when children had high levels of CU behavior, $b = -0.77$ (0.39), $t = -1.97$, $p < 0.10$, but not when they had low levels of CU behavior, $b = 0.27$ (0.27), $t = 0.99$, *ns*. While interesting to consider CU behavior as a moderator, especially to explain the inconsistent findings that have been reported by studies examining the relationship between ToM and later externalizing problems (Hughes et al. 2000; Olson et al. 2011), we note that our goal was to examine early CU behavior as a predictor and the potential emotional and cognitive moderating factors that influenced the strength of its relationship with later externalizing problems.

Table 1 Descriptive Statistics and Bivariate Correlations between Study Variables

	1	2	3	4	5	6
1 Callous-Unemotional (P, T1)	-					
2 Theory-of-Mind (O, T1)	-0.12 ^a	-				
3 Fearful/Inhibited (P, T1)	0.09	0.03	-			
4 Externalizing (T, T1)	0.11	-0.21 ^{**}	-0.07	-		
5 Externalizing (T, T2)	0.27 ^{***}	-0.13 ^a	-0.10	0.32 ^{***}	-	
6 Externalizing (T, T3)	0.28 ^{***}	-0.08	-0.01	0.33 ^{***}	0.54 ^{***}	-
Range	0–1.6	0–8	3.6–11.7	0–52	0–47	0–29
<i>M</i>	0.29	1.60	7.18	9.31	4.27	3.16
<i>SD</i>	0.27	2.10	1.51	10.27	6.99	5.37

P parent reported, *O* observed, *T* teacher reported

T1 = time 1 (age 3); T2 = time 2 (age 6); T3 = time 3 (age 10)

^a $p < 0.10$, ^{**} $p < 0.01$, ^{***} $p < 0.001$

fearful/inhibited temperament below 8.3 (maximum of 11.72), which included 76 % of the sample.

Discussion

The current study provides further evidence to support a robust association between early childhood CU behavior and externalizing problems in both middle and late childhood, over and above stability in externalizing problems, and across informants and settings. Moreover, the current study demonstrated that the link between CU behavior and externalizing problems appears to be moderated by other, key child-level

characteristics. Specifically, we found that high levels of CU behavior predicted increased externalizing problems when children had low levels of ToM, but not when they had high ToM. The significant interaction between fearful/inhibited temperament and CU behavior also provides preliminary evidence to suggest that high levels of CU behavior may predict externalizing problems more strongly when children have lower temperamental fear and behavioral inhibition. We discuss each of these findings in relation to our main hypotheses and outline implications for identifying heterogeneous pathways to school-aged problems.

First, in line with our hypothesis, higher levels of parent-reported CU behavior at age three predicted more teacher-

Table 2 Parent-reported CU, ToM, and Fearful/Inhibited Temperament at T1 Predicting Teacher-reported Externalizing at T2 and T3

	EXT (T2)			EXT (T3)		
	ΔR^2	<i>b</i> (<i>SE</i>)	β	ΔR^2	<i>b</i> (<i>SE</i>)	β
Step 1: Covariates	0.15 ^{***}			0.17 ^{***}		
EXT		0.19(0.04)	0.27 ^{***}		0.16(0.03)	0.30 ^{***}
Age		-0.10(0.20)	-0.03		-0.19(0.16)	-0.08
Gender		-1.47(0.87)	-0.11 ^a		-1.88(0.68)	-0.18 ^{**}
Income		-0.44(0.15)	-0.19 ^{**}		-0.17(0.12)	-0.10
Vocab		0.15(0.13)	0.07		0.19(0.10)	0.12 [*]
Step 2: Main effects	0.07 ^{***}			0.06 ^{***}		
CU		6.56(1.56)	0.27 ^{***}		4.81(1.25)	0.24 ^{***}
ToM		-0.14(0.21)	-0.04		0.04(0.17)	0.02
Fear/BI		-0.55(0.27)	-0.12 [*]		-0.01(0.22)	-0.004
Step 3: Interaction effects	0.04 ^{**}			0.02 [*]		
CU x ToM		-1.89(0.97)	-0.13 [*]		-1.54(0.78)	-0.14 [*]
CU x Fear/BI		-2.50(1.10)	-0.14 [*]		-0.20(0.88)	-0.02

CU = parent reported callous-unemotional; Fear/BI = parent reported fearful/inhibited temperament; ToM = Observed Theory-of-Mind; EXT = teacher reported externalizing; Gender 0 = boys, 1 = girls. T2 = time 2 (age 6); T3 = time 3 (age 10)

^a $p < 0.10$, ^{*} $p \leq 0.05$, ^{**} $p < 0.01$, ^{***} $p < .001$

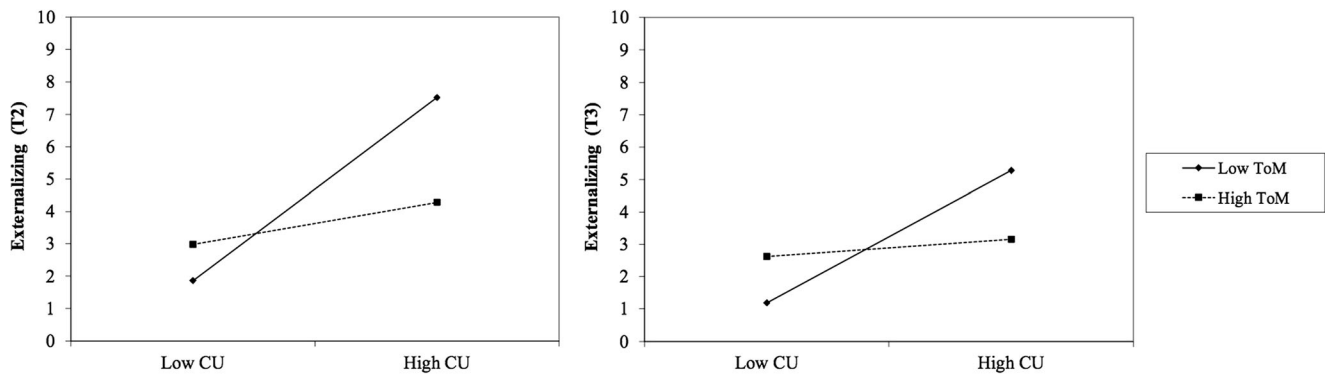


Fig. 1 ToM moderates the association between parent-reported CU behavior at T1 (age 3) and teacher-reported externalizing problems at T2 (age 6) and T3 (age 10). For T2, the slope for low ToM is significantly different from zero, $b = 10.30$ (2.16), $t = 4.76$, $p < 0.01$, but not for high

ToM, $b = 2.36$ (2.81), $t = 0.84$, *ns*. For T3, the slope for low ToM is significantly different from zero, $b = 7.44$ (1.68), $t = 4.43$, $p < 0.01$, but not for high ToM, $b = 0.97$ (2.18), $t = 0.44$, *ns*

reported externalizing problems at both age six and age 10, even when controlling for externalizing problems at age three, and accounting for the effects of ToM and fearful/inhibited temperament. This finding is consistent with other studies that have demonstrated the unique contribution of early preschool-age CU behavior to more externalizing problems in later childhood (e.g., Kimonis et al. 2006; Willoughby et al. 2014) and an earlier study in the current sample (Waller et al. 2015a). These findings highlight the importance of examining early childhood CU behavior as a unique risk factor for particularly severe and persisting externalizing problems throughout childhood, which potentially could be used for targeting preschoolers who require early preventive support (e.g., Dadds et al. 2012; Waller et al. 2013).

Second, consistent with some previous studies (Hughes et al. 2000; Olson et al. 2011), we found that low levels of ToM were not uniquely related to higher externalizing problems when accounting for the effect of early CU behaviors. However, the interaction between CU behavior and ToM did predict more externalizing problems. We corroborated this interaction effect when externalizing problems were assessed at early school-age (age six) and again at the transition to early

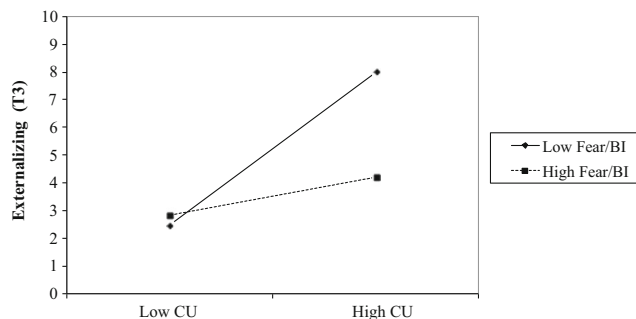


Fig. 2 Fearful/inhibited temperament moderates the association between parent-reported CU at T1 (age 3) and teacher-reported externalizing problems at T2 (age 6). The slope for low fear/inhibited temperament is significantly different from zero, $b = 10.09$ (2.40), $t = 4.20$, $p < 0.01$, but not for high fear/inhibited temperament, $b = 2.53$ (2.04), $t = 1.24$, *ns*

adolescence (age 10; i.e., by different teachers and at different developmentally important ages). Our robust interaction effects across the elementary years supports the notion that low ToM alone may not be sufficient for explaining increased risk for externalizing behaviors, but could have enduring social consequences for children in the context of other behavioral or emotional risk factors (i.e., CU behavior). Thus, particularly within young children with high CU behavior, more mature cognitive empathy (i.e., high levels of ToM) may alleviate risk for developing aggressive or rule-breaking behaviors. Interventions that target cognitive empathy and perspective-taking may therefore help to reduce the likelihood that children with high CU behavior will go on to exhibit persisting externalizing problems. For example, within intervention efforts, one way to foster children's cognitive empathy might be guiding parents to use more inductive reasoning (i.e., using child-centered explanation of the consequences of certain behavior on others) or develop their mind-mindedness (i.e., thinking about and talking to the child in psychological terms), that are reported to be conducive to children's early ToM development (Hughes 2011; Ruffman et al. 2002).

Third, providing some support for our hypothesis, although we did not find that fearful/inhibited temperament independently predicted later externalizing problems, the interaction between fearful/inhibited temperament and CU behavior predicted outcomes at age six but not age 10. Therefore, our results are consistent with the idea that emotional characteristics such as low fear and shyness may moderate pathways to more severe externalizing problems, particularly among children with high CU behavior, but this effect may only last through early school-age. This finding is consistent with a previous study which found that among school-aged children with high CU behavior, a group with high levels of conduct problems displayed lower behavioral inhibition compared to the group with low conduct problems (Fanti et al. 2015). Similar to ToM, low levels of fearful/inhibited temperament could predict increasing externalizing problems only in the presence

of other temperamental characteristics, such as CU behavior. In particular, the finding of a combination of a low fearful/inhibited temperament and high CU behavior leading to higher levels of externalizing problems shows some parallels with the triarchic theory of psychopathy, which proposes that interactions among three core phenotypic components of psychopathy—disinhibition, boldness, and meanness—yield various manifestations of psychopathic traits and antisociality (Patrick et al. 2009). These findings suggest that other child features might shed light on possible moderating mechanisms explaining the multifinality of CU behavior in that why some children with CU behavior engage in more persistent externalizing problems, whereas other children do not.

Strengths and Limitations

The current study had several strengths including the multi-informant methods, observational assessment of ToM, and the prospective longitudinal design utilizing three time points across seven years. Use of observational assessments and mother-, father-, and teacher-reported measures helps to reduce the potential issue of shared method variance. Also, the current study focused on the predictive effects of child characteristics during the early preschool years for externalizing problems across childhood, which has implications for early prevention and intervention. The results from our community-based sample that is enriched for early child externalizing problems and includes both boys and girls contributes to the relatively little research on CU behavior and externalizing problems in non-clinically referred, non-forensic samples. At the same time, however, because the participating families were mostly middle-class white with intact family structure, the generalizability of the findings may be limited to those experiencing low risk. Also, the five-item CU behavior using items drawn from the CBCL can only be considered a home-grown measure that was not originally developed to assess the CU behavior construct. Although its predictive and construct validity has been supported in a previous study in the current sample (Waller et al. 2015a), there may still be a limitation in the range of responses and thus it would be informative to examine whether the convergence of these items and interactions with ToM and temperamental features are stronger in forensic or clinical populations. Finally, the current study did not directly measure children's ASD symptomatology to control for its potential overlap with the CU behavior construct or confounding effects on links between CU behavior and later externalizing problems. Nevertheless, none of participating children were reported to be diagnosed with an ASD, and all models stringently controlled for earlier broadband externalizing problems and verbal IQ, which partly alleviates the concerns about the

robustness of the unique effect of earlier CU behavior on later externalizing problems.

Conclusions and Implications

Our findings suggested that CU behavior in early childhood is an important risk factor for externalizing problems in both middle and late childhood. We also demonstrated that examining other child characteristics could further increase the precision in identifying different developmental pathways to later externalizing problems among children with high levels of CU behavior. In particular, children's cognitive empathy (i.e., ToM) and fearful/inhibited temperament during the preschool period appear to play important moderating roles in the link between early CU behavior and later externalizing problems. When high levels of CU behavior were combined with low levels of ToM or low fearful/inhibited temperament, they were associated with more severe externalizing behavior outcomes later on, whereas higher levels of ToM appeared to reduce the risk that high CU behavior would predict worse outcomes. These findings affirm recent calls for increasingly personalized preventive intervention according to specific child characteristics (see Hyde et al. 2014; Waller et al. 2013).

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

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