

Disorganized Attachment and Inhibitory Capacity: Predicting Externalizing Problem Behaviors

Gunilla Bohlin · Lilianne Eninger ·
Karin Cecilia Brocki · Lisa B. Thorell

Published online: 27 September 2011
© Springer Science+Business Media, LLC 2011

Abstract The aim of the present study was to investigate whether attachment insecurity, focusing on disorganized attachment, and the executive function (EF) component of inhibition, assessed at age 5, were longitudinally related to general externalizing problem behaviors as well as to specific symptoms of ADHD and Autism spectrum disorder (ASD), and callous-unemotional (CU) traits. General externalizing problem behaviors were also measured at age 5 to allow for a developmental analysis. Outcome variables were rated by parents and teachers. The sample consisted of 65 children with an oversampling of children with high levels of externalizing behaviors. Attachment was evaluated using a story stem attachment doll play procedure. Inhibition was measured using four different tasks. The results showed that both disorganized attachment and poor inhibition were longitudinally related to all outcome variables. Controlling for initial level of externalizing problem behavior, poor inhibition predicted ADHD symptoms and externalizing problem behaviors, independent of

disorganized attachment, whereas for ASD symptoms no predictive relations remained. Disorganized attachment independently predicted CU traits.

Keywords Attachment · Inhibition · Executive functions · Externalizing problems · ADHD · Asperger syndrome · Callous-unemotional traits

General externalizing behaviors such as impulsivity, aggression, and oppositional defiance are common behavioral problems among pre-school and young school-aged children (Loeber et al. 2000). There is general agreement in the literature that these problems are multifactorial with regard to causal factors and that they constitute a risk developmentally for a number of specific psychopathological conditions (e.g., Dodge and Pettit 2003; Frick and Dickens 2006). We used two different theoretical perspectives that rarely have been studied together: a cognitive-behavioral, executive function (EF) perspective and a relational, parent–child attachment perspective to predict general externalizing behaviors as well as specific psychopathological symptoms of Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorder (ASD) and Callous-unemotional traits (CU), which in adults constitute an aspect of psychopathy. In that children with early-onset problem behaviors are at greater risk of developing severe patterns of externalizing problem behaviors (see Dandreaux and Frick 2009), early identification of the factors at work should be imperative and important for the planning of interventions.

Uniting the EF and attachment perspectives in the same study should be interesting and informative in that these perspectives may be differentially longitudinally relevant to general externalizing problem behaviors and to the more specific symptoms areas. As outlined below in the literature

This research was supported by a grant from The Swedish Council for Working Life and Social Research to Gunilla Bohlin.

¹Data for inhibition (although not using all four variables) in relation to ADHD symptoms have been reported by Brocki et al. (2007).

G. Bohlin (✉) · K. C. Brocki
Department of Psychology, Uppsala University,
Box 1225, SE 751 42, Uppsala, Sweden
e-mail: gunilla.bohlin@psyk.uu.se

L. Eninger
Department of Psychology, Stockholm University,
Stockholm, Sweden

L. B. Thorell
Section of Psychology, Department of Clinical Neurosciences,
Karolinska Institutet,
Stockholm, Sweden

review, there is a fair amount of research about general externalizing problems from both the EF and the attachment perspectives. Much less is known about how EF and attachment quality relate to specific psychopathological behaviors. Symptoms of ADHD, denoting inattention, hyperactivity, and impulsiveness (APA 2000), are often viewed as reflecting cognitive dysfunctions and have frequently been studied in relation to EF. Poor interpersonal skills and empathic understanding, which should be of particular relevance for the attachment perspective, are common to symptoms of ASD (social and communicative impairments, stereotypical behaviors, and poor behavioral flexibility; APA 2000) and callous-unemotional traits (failure to show empathy, constricted display of emotion, and absence of guilt; Barry et al. 2000). In addition to showing possible independent relations from attachment and EF variables to all outcomes, we aim to demonstrate whether predictions are specific (i.e., not shared with early general externalizing behavior) to symptoms of ADHD, ASD, and CU traits.

Poor Inhibition and General Externalizing Problem Behaviors

Inhibition (the ability to inhibit prepotent responses and to suppress irrelevant information) is a core EF process, that is, it belongs to the functions that control behavior in accordance with the situational demands of everyday life (Welsh 2002). In numerous studies of developmental neurocognitive disorders it has been shown that poor inhibitory capacity is associated with general externalizing problem behaviors in both preschool and school-age children (Gagne et al. 2011; Nigg et al. 1999; Olson et al. 2011). Young et al. (2009) found poor inhibition to be more closely related to broadly defined externalizing problem behavior than were deficits in other executive function components, such as working memory updating and set shifting.

The Attachment Relationship and General Externalizing Problem Behaviors

Attachment theory proposes that early experiences in the interaction with caregivers constitute the foundation for the child's socio-emotional development. Based on experiences in such interactions, internal working models develop that regulate the child's views on the self and others throughout life (e.g., Bretherton and Munholland 2008). Empirically, it has been shown that attachment security in infancy is predictive of later adjustment (Weinfield et al. 2008). Concerning the prediction of externalizing problem behav-

ior, the specific insecure category referred to as disorganized attachment has been shown to be especially important (see metaanalysis by Van IJzendoorn et al. 1999). Disorganized attachment in infancy observed in the Strange Situation (Ainsworth et al. 1978) is identified by behavior signifying that the child lacks a coherent strategy for using the caregiver in stressful situations. Beyond infancy, the attachment relationship is most often assessed through the mental representations thought to be rooted in early experiences of interactions with caregivers. Several methods to assess such representations have been developed, often employing story stem procedures (e.g., George and Solomon 2000; Goldwyn et al. 2000). Attachment insecurity, especially disorganized attachment, has been found to be associated with externalizing problem behavior also when using such representational methods (Green et al. 2007; Moss et al. 2009).

Poor Inhibition and the Attachment Relationship in relation to ADHD, ASD Symptoms and CU Traits

There is a vast amount of research showing associations between ADHD symptoms and EF deficits, as evidenced in several metaanalyses on school-aged children (e.g., Martinussen et al. 2005; Willcutt et al. 2005). These studies show that both inhibition and working memory are important, but it has been argued that inhibition is the most valid indicator (Wodka et al. 2007), and particularly so for young children (e.g. Brocki and Bohlin 2006). The latter notion was supported in a recent metaanalysis on preschoolers, where it was shown that concurrent and subsequent ADHD symptoms had a stronger association (mean effect size) with inhibition than with working memory (Pauli-Pott and Becker 2011).

Compared to ADHD, much less is known about EF deficits in relation to ASD behaviors and CU traits. For ASD behaviors, EF deficits have been demonstrated in a study on clinical samples comparing ADHD and ASD (Happé et al. 2006). While both types of clinical problems were associated with EF deficits, they were more pronounced for the ADHD group, particularly with regard to inhibition. As for CU traits, Blair (2005) concluded, in a review of the limited existent evidence, that there seems to be no association between CU traits and inhibitory processes as indexed by go/no-go and stop tasks.

Turning to the attachment relationship and ADHD, Clarke et al. (2002) pointed to the fact that children with ADHD and insecurely attached children share many features, such as poor self-regulation, disorganization, impulsiveness, and problematic social relations. Clarke and colleagues (2002) also reported empirical findings showing that children diagnosed with ADHD more often

had insecure attachment representations compared to children in a comparison group. Although the method for assessing attachment did not allow the distinction between different insecure categories, the authors interpreted the findings to mean that it was primarily the disorganized and insecure ambivalent types of insecurity that were represented in the ADHD group. This interpretation fits with the findings of Green et al. (2007), who, in a clinical sample of children with oppositional defiant or conduct disorder, found an association between disorganized attachment assessed as mental representations and ADHD diagnosis. Thorell et al. (2010) found that mental representations of attachment disorganization assessed at age 8½ were significantly associated with symptoms of ADHD over a 1-year period in a non-clinical sample, and that this was independent of both executive functioning and conduct problem behaviors. As to infant disorganized attachment observed in the Strange Situation Procedure (Ainsworth et al. 1978), a prospective relation was found to ADHD scores rated by teachers at child age 7 (Pinto et al. 2006). In sum, there is strong support in previous literature for an association between ADHD behaviors and poor inhibition, and also some recent support for an association to disorganized attachment relations. However, in the cases of a demonstrated relation between ADHD behaviors and attachment variables, we know of only our own study (Thorell et al. 2010) that has tested whether these occurred independently of poor inhibition.

Because a secure attachment relationship should foster a capacity to make affectional bonds and show empathic understanding (Ellicker et al. 1992; Weinfield et al. 2008), the attachment perspective may be of particular relevance for CU traits and ASD behaviors. Although there are studies showing that the parent–child relationship for children with ASD behaviors often is problematic, as evidenced by high levels of parenting stress (Epstein et al. 2008), we have found no study that directly related ASD symptoms to attachment variables. Similarly, we know of no study that has investigated CU traits in relation to attachment security or disorganized attachment. Concerning parenting more generally, Viding and Larsson (2007) concluded that what little evidence there is indicates that children with antisocial behavior in combination with CU traits experience negative parenting that seems to be child driven, that is, is explained by early child effects on parenting. They also state, however, that existing results do not rule out direct effects of parenting.

The Present Study

The aim of the present study was to investigate whether attachment insecurity, focusing on disorganized attachment,

and the EF component poor inhibition, are longitudinally related to general externalizing problem behaviors and more specifically to behaviors characteristic of the specific profiles of ADHD and ASD symptoms as well as CU traits. The developmental perspective was further strengthened by using general externalizing problem behaviors measured at age 5 as a control variable to allow conclusions about relations not shared with general externalizing problems in predicting the symptom profiles. We predicted that both disorganized attachment and poor inhibition studied at the age of 5 years would be positively associated with all outcomes 5 years later. Based on the strong evidence for inhibitory deficits in ADHD, we hypothesized that the predictive relation would survive control for initial externalizing problem behaviors, so that poor inhibition would be positively predictive of ADHD symptoms even when we controlled for initial externalizing behavior. For the remaining outcomes, we made no *a priori* hypotheses as to independent contributions of attachment disorganization and poor inhibition, nor as to the specificity of longitudinal relations when controlling for initial level of externalizing problem behaviors.

Method

Participants and Procedures

The sample has been described by Brocki et al. (2007). In the present study, the 65 children who had data on all predictors were included (54 boys, 11 girls). Twenty children had been identified by child psychologists as being at high risk for various types of disruptive behaviors. The rest of the sample consisted of children recruited through the local birth register of Uppsala County, Sweden. Informed consent was obtained by all participating parents.

At the first round of assessments (T1), all 65 children (child age $M=5$ years, 5 months; $SD=.70$) were seen individually on two different occasions over a period of 1 to 2 weeks. The children performed a number of cognitive tasks on both occasions, and a story stem procedure for the assessment of attachment security was given at the end of the second session. Each session lasted approximately 1 h with a break half way through. At the end of each session the children received a gift. Questionnaires measuring symptoms of general externalizing problem behaviors were filled out by both parents and teachers (the questionnaires are described in detail below).

At follow-up (T2), which took place approximately 2 years after the initial assessment, 60 families participated (longitudinal gap $M=2$ years, 2 months; $SD=0.28$; Age: $M=7$ years, 6 months; $SD=.47$). At T2, the data collection consisted of parents and teachers filling out questionnaires, which, in addition to general externalizing problems,

included items about ADHD and ASD symptoms as well as CU traits. Reasons for attrition were that the family had moved out of the area ($n=2$) or that the family no longer wished to participate ($n=3$). For one child, parents did not give consent for us to contact the teacher.

The study has been evaluated to conform to the ethical standards of The Swedish Research Council and as declared in the Declaration of Helsinki.

Measures

Inhibition Prepotent response inhibition was measured with a computerized go/no-go task, consisting of a blue square, a blue triangle, a red square, and a red triangle, each object being presented one at a time on a computer screen. During the first part of the task, the children were instructed to press a key (“go”) when a frequent stimulus (a blue figure) appeared on the screen, but to make no response (“no-go”) when an infrequent stimulus (a red figure) appeared. The same stimuli were used for the second part of the task, but the children were then instructed to press a key every time they saw a square, and to inhibit their response every time they saw a triangle, irrespective of color. Altogether the task included 60 stimuli, with a duration of 800 ms and an interstimulus interval of 2,500 ms. The “go-rate” was 77%, and thus prepotency within the task was provided by the majority of the stimuli being “go-targets” (Berlin and Bohlin 2002). The disinhibition score derived from the task was the number of commission errors (pressing the key when a “no-go” target was presented) over the two parts of the task. A test-retest reliability of .62 for this task over a 2 week period was presented by Thorell (2007).

Another measure of response disinhibition was obtained from a computerized child version of the Continuous Performance Task (CPT; Rosvold et al. 1956). The children were instructed to respond as quickly as possible by pressing a key each time a go stimulus (a filled blue circle with a black spot in the middle; designed to look like an eye) was presented on the computer screen and not to press when a no-go stimulus (a filled blue circle without a black spot in the middle) appeared. The instructions emphasized both speed and accuracy. The stimulus duration was 600 ms, and the interstimulus interval was 2,500 ms. The task consisted of a total of 120 trials, with a “go-rate” of 15%. The number of commissions was obtained as a measure of disinhibition on this task.

Interference control was studied using a Stroop-like task that did not require reading skills (Berlin and Bohlin 2002). This task was derived from the Day–Night Stroop task (Gerstadt et al. 1994), in which conflict was provided by asking the children to say the opposite to what is shown in the picture (i.e., to say “night” when the picture “day” is

shown on the screen). In this study, the two picture pairs, day–night and boy–girl, were used for 48 trials altogether. The number of correct responses was reversed and used to measure poor inhibitory control of a verbal response. This task has also been used by Thorell and Wahlstedt (2006), who reported adequate test-retest reliability, $r=.84$, $p<.0001$, on a sample of 4–5-year-olds, tested 2 weeks apart.

The Knock and Tap subtest from the Developmental Neuropsychological Assessment Battery (NEPSY; Korkman et al. 1998/2000) was used as another task to assess interference control, here with a motor response. The child is first instructed to knock on the table when the examiner taps on the table, and to tap on the table when the examiner knocks on the table. In a second part, the child is to tap with the side of the fist when the examiner knocks with the knuckles and vice versa, and not to respond at all when the examiner taps with the palm. The score was the total number of correct responses, which was reversed to reflect poor inhibition. Split-half reliability for the Knock and Tap subtest based on Swedish children is .88 (Korkman et al. 1998/2000).

Ratings of Behavioral Symptoms Externalizing problem behavior was assessed at T1 and T2 by both parents and teachers. The scale was composed of 12 items from the Preschool Behavior Questionnaire (Behar and Stringfield 1974) and the Child Behavior Questionnaire (Rutter et al. 1970), both capturing aggressive and norm-breaking behavior. The two instruments have been used on Swedish children (Berlin and Bohlin 2002; Hagekull and Bohlin 1992; 1994). Examples of items are “often gets into fights”, “destructive”, “lies”. Ratings were made on a 5-point scale.

At follow-up (i.e., at T2) items about ADHD and ASD symptoms as well as CU traits were added to the questionnaire. A questionnaire with items representing symptoms of ADHD (DSM-IV criteria; APA 2000) was used, with nine items composed to assess inattention, six items measuring hyperactivity, and three items measuring impulsivity. Each item on the ADHD scales was scored on a 4-point scale ranging from 0 (never/seldom occurring) to 3 (very frequently occurring). This measure has been well validated and is frequently used in ADHD research (e.g., DuPaul et al. 1998). Symptoms of ASD were covered by eight items from the Autism Spectrum Screening Questionnaire (ASSQ; Ehlers et al. 1999), which is an instrument for screening high-functioning ASD among children in community samples (Ehlers and Gillberg 1993). Examples of items are “wants to be sociable, but fails to make friends”, “can be with other children, but only on his/her terms”, “uses language freely, but fails to make adjustments to fit social contexts and the needs of different listeners”, “has special routines: insists on no change”. Ehlers et al. (1999) report

concurrent validity of the ASSQ in that mean total scores of parent and teacher ratings significantly differentiated children with ASD from those with Attention Deficit Disorder and disruptive behavioral disorder. Further, there were significant correlations between parent ratings of the ASSQ and parent and teacher ratings of externalizing problems. Test-retest reliability for parent and teacher ASSQ total scores over a 2 week period was highly significant.

Finally, CU traits were measured using eight items from a Swedish measure of child psychopathic traits (“The Child Problematic Traits Inventory”; CPTI; Andershed 2009), Using items in line with the recommendations by Johnstone and Cooke (2004) as to what could reasonably be assessed in children, Andershed (2009) showed that the same three-dimensional structure for psychopathic personality as found in adults and adolescents also applies to Swedish preschool children. The items belonging to the CU factor captured poor empathy, lack of guilt, and unemotionality, giving an item content that is very similar to that in other CU scales (Frick et al. 2000; Viding et al. 2005). Teacher ratings of the CPTI correlated significantly with both teacher and parent ratings of Oppositional Defiant Disorder (ODD) and Conduct Disorder (CD) symptoms from the DSM-IV criteria (APA 2000). In the present study the items were rated on 5-point scales (1–5), as were the ASD items. Examples of CU items are “never expresses feelings of guilt”, “does not seem to care about the feelings of others”, “does not seem to be upset when others get hurt”.

All behavior measures represent averages across items and across parent and teacher ratings. All measures of internal consistency (Cronbach’s alpha) were above .80 and correlations between parent and teacher ratings ranged between .58 and .97, the lowest obtained for CU traits.

Assessment of Attachment Representations

The story stem procedure Attachment Doll play Classification System, developed by George and Solomon (2000), was used to assess mental representations of attachment security and disorganized attachment. Like most story stem systems, the stories are told using doll material in order to engage the children, who are then asked to complete the story both orally and by using the material themselves. Three different stories commonly used in several other story stem methods (e.g., Bretherton et al. 2003; Green et al. 2000) were employed: The Hurt Knee, Monster in the Bedroom, and Separation-Reunion. The stories are chosen to gradually increase activation of the attachment system so that the session starts with The Hurt Knee and ends with Separation-Reunion. The classification makes use of all three stories, which are scored independently to belong to one of the four attachment categories (see below). However, the last one weighs heavily in the final classification, so that a Separation-Reunion story

scored secure cannot give an overall insecure classification, even if the other two stories are scored insecure (George and Solomon 2000). The first two stories are mainly used to help decide which of the two organized insecure attachment categories should be scored in those cases when the Separation-Reunion story is scored insecure, but not disorganized. Validation of the classification method has been obtained by comparison with concurrent reunion behavior after separation (Solomon et al. 1995).

The situation was videotaped and transcribed verbatim together with notes on handling of the doll material. To obtain a secure classification, the child had to describe a prompt and adequate response from the parent with a solution to the problem. For disorganized attachment, the stories are characterized by either a) poor coherence, chaos, violence, and scary events without solution to the attachment problem or b) mental blocking and freezing shown by refusal to tell a story, comments like “I don’t know”, “Nothing happens”. Insecure avoidant attachment is characterized by deactivation of the attachment system, with the child conveying that care and protection from the parent is not necessary (e.g., solving the problem without the help of the parent or denial of injury). Insecure ambivalent attachment is characterized by cognitive disconnection, whereby the child acknowledges the attachment problem although he/she actively tries to direct attention away from the source of the distress and effective ways of coping with it (e.g., character is involved in busy activity not related to the attachment problem). In the analyses of disorganization versus organization, we categorized stories in accordance with the categorization used in the metaanalysis by van IJzendoorn and colleagues (1999), that is, stories were determined to be organized either if they were secure or if they were insecure but not disorganized (see also Green et al. 2007). In the analysis of insecurity versus security, disorganized stories were treated as insecure. Thus, attachment representations were assessed using two dichotomous measures, attachment insecurity (ambivalent, avoidant and disorganized vs secure stories) and attachment disorganization (disorganized vs secure, ambivalent, and avoidant stories). All stories were coded independently by two coders (GB and LT). Agreement on classification was kappa .88 for security and .71 for the disorganized category. Disagreements were discussed and a consensus classification was reached for all cases. The final coding resulted in 40 children being classified as secure and 25 as insecure. With regard to disorganization, 54 children were classified as organized and 11 as disorganized.

Statistical Analyses

All data were screened for extreme values (>3 sd). For three of the inhibition variables, such values were identified

and replaced with the value which was the next most extreme (Tabachnick and Fidell 2001). We used an aggregated measure of poor inhibition constituted by standardized and averaged scores for the four inhibitory tasks, tapping prepotent response inhibition as well as interference control. The internal consistency (Cronbachs alpha) of the inhibitory tasks described above was .63. A factor analysis showed that the inhibition variables loaded on one factor with an eigenvalue >1 , with loadings ranging from .41 to .68. Analyses of univariate normality showed that all variables were acceptable (Kline 2011), with skewness ranging from .77 to 1.12, and kurtosis from $-.49$ to .47.

Longitudinal relations were analyzed using correlations (with bivariate predictors scored 0 and 1) and multiple regression analyses establishing independence of predictive effects for attachment and inhibition variables. In order to evaluate whether the inhibition and attachment variables would contribute beyond the predictive effect of externalizing problem behavior at age 5, the incremental effect was assessed by hierarchical regression, entering initial externalizing problem behavior in a step before attachment disorganization or disinhibition. In that neither age nor sex influenced the associations between predictors and outcomes, we did not control for these variables in the analyses.

Results

Table 1 shows descriptive data for the behavioral variables. Intercorrelations between the predictors are presented in the upper half of Table 2. Disorganized attachment was significantly associated with poor inhibition, whereas attachment insecurity was not. Concurrent relations between externalizing problem behavior and the variables designated as predictors, that is, poor inhibition, attachment insecurity, and disorganization, are also shown in Table 2. All concurrent associations with externalizing problem behavior, except that for attachment insecurity, were significant.

Longitudinal Relations of Disinhibition and Attachment Variables to Outcomes 2 Years Later

Relations between predictor variables and outcome variables are presented in the lower half of Table 2. Disorganized attachment was significantly associated with all outcome variables, meaning that the level of each of the outcome variables was higher among the children classified as disorganized compared to those classified as organized. For attachment insecurity, the associations were all nonsignificant and this variable will therefore not be further analyzed. The measure of poor inhibition was significantly related to all outcome variables, with poorer inhibitory control being associated with higher levels of problem behaviors. When poor inhibition and disorganization were entered simultaneously into the regression analysis, poor inhibition contributed independently, $p < .01$, to all outcome variables, sr^2 ranging from .10 for CU behaviors to .26 for ADHD behaviors. The independent effect of disorganization was significant for CU traits, $sr^2 = .14$, $p < .01$, ADHD behaviors, $sr^2 = .06$, $p < .05$, and for externalizing problem behavior, $sr^2 = .08$, $p < .05$, whereas it was nonsignificant for ASD behaviors, $sr^2 = .03$, $p > .10$.

Longitudinal Relations Controlling for Initial Level of Externalizing Problem Behavior

Because of the concurrent associations between the predictor variables and externalizing problem behavior, it was interesting to evaluate whether inhibitory control and/or disorganized attachment contributed beyond what could be predicted from externalizing problem behavior at the age of 5 years. Hierarchical regression analyses were performed with externalizing problem behavior at T1 entered in the first step. In the next step, either poor inhibition or disorganized attachment was entered. The results are presented in Table 3, where it can first be seen that externalizing problem behavior at age 5 acted as a strong predictor of all outcome variables. Second, it is seen that, when poor inhibition was entered in the second step, it added explanatory value in predicting ADHD and exter-

Table 1 Descriptive data for the behavioral variables (at T1 $n=65$; at T2 $n=60$)

Variables	M	SD	Min-max	Range
Poor inhibition T1 ^a	-0.00	0.62	-.92-1.60	
Externalizing behavior T1	2.15	0.80	1.10-4.40	1-5
Externalizing behavior T2	1.87	0.69	1.0-3.66	1-5
ADHD symptoms T2	0.78	0.68	0.08-2.64	0-3
ASD symptoms T2	1.77	0.75	1.00-3.80	1-5
Callous-unemotional traits T2	1.90	0.76	1.00-3.70	1-5

^aThis variable is an aggregate of four standardized variables

Table 2 Upper half: Concurrent relations between predictors at age 5 ($n=65$). Lower half: predictive relations

	Disinhibition	Insecure attachment	Disorganized attachment	Externalizing behavior
Predictors T1				
Disinhibition		0.09	0.38**	0.43**
Insecure attachment ^{a, b}			0.37**	0.17
Disorganized attachment ^b				0.37 **
Outcomes T2				
Externalizing behavior	0.54***	0.16	0.44**	0.78***
ADHD symptoms	0.63***	0.24	0.42**	0.72***
ASD symptoms	0.46***	0.19	0.30*	0.70***
CU traits	0.48***	0.17	0.50**	0.77***

^aNote that insecure attachment overlaps with disorganization in that insecurity encompasses disorganization together with ambivalence and avoidance

^bInsecure attachment and disorganized attachment were both coded dichotomously

* $p < .05$, ** $p < .01$, *** $p < .001$

nalizing behaviors. When disorganized attachment instead was entered in the second step, it contributed significantly to externalizing problem behavior as well as to CU traits. ASD behaviors were neither specifically predicted by poor inhibition nor by attachment disorganization.

In a final analysis, the effect of disorganized attachment was further evaluated by entering it last after externalizing problem behavior, and poor inhibition. The results showed that the effect was significant for CU traits, $sr^2 = .04$, $p < .05$; for the other outcomes $sr^2 < .02$, $p > .10$. When the same procedure was used for poor inhibition, a contribution independent of both T1 externalizing problem behavior and disorganized attachment was found in predicting externalizing problem behavior and ADHD symptoms.

Discussion

In the present study we combined precursors from two distinct theoretical perspectives (i.e., EF and attachment) in studying common and independent relations to general externalizing problems as well as to behaviors characteristic of specific psychopathological syndromes. A premise of the

study was that general externalizing behaviors by themselves are developmentally related to ADHD and ASD symptoms as well as to CU traits, which was supported by the strong predictive relations from externalizing problem behaviors to all outcome variables. In accordance with predictions, all outcome variables were positively longitudinally related to disorganized attachment and poor inhibitory control. Also in line with predictions, poor inhibition contributed beyond that of the initial level of general externalizing behaviors in the explanation of ADHD symptoms. Although not predicted, the same was true for poor inhibition in relation to externalizing problem behaviors at T2. Only for CU traits did disorganized attachment contribute over and above both initial externalizing behaviors and poor inhibition.

Attachment Variables as Predictors

It should first be noted that it was disorganized attachment rather than attachment insecurity that was associated with the outcomes. This is in general agreement with the view of disorganized attachment as a more specific precursor of general externalizing problem behavior (van IJzendoorn et

Table 3 Results of hierarchical regression in the prediction of behaviors at age 7. *Step 1* shows the contribution (squared semi-partial correlations) of externalizing behavior at age 5. *Step 2* shows

the contribution of poor inhibition (2 A) and disorganized attachment (2 B) independent of externalizing problem behavior at age 5

	Preschool predictors (T1)	Externalizing problem behaviors (T2)	ADHD Symptoms (T2)	ASD symptoms (T2)	Callous-unemotional traits (T2)
Step 1	Externalizing problem behaviors	0.60***	52.***	0.49***	0.59***
Step 2A	Disinhibition	0.04*	0.11***	0.02	0.02
Step 2B	Disorganized attachment	0.03*	0.03	0.00	0.05**

* $p < .05$, ** $p < .01$, *** $p < .001$

al. 1999). As for ASD symptoms and CU traits, however, insecurity could be assumed to be more relevant because a secure relationship should foster trust, mutuality and the ability to take the perspective of others (e.g., Weineland et al., 2008), which should be core problem areas in these phenomena. Although the relation to attachment insecurity was positive as expected, it was not significant for either ASD or CU traits. Further, the predictive relation from disorganized attachment to ASD symptoms turned out to be unspecific in that it did not survive controlling for the initial level of general externalizing problem behavior, nor for poor inhibitory capacity. Thus, it seems to be the overlap with externalizing problem behavior (and associated inhibitory deficits), rather than the specific aspects related to poor social understanding, that accounts for the association between ASD symptoms and disorganized attachment. For CU traits the pattern of results is different, as discussed below.

The fact that disorganization contributed to the prediction of CU traits, as well as to general externalizing problem behavior, beyond the initial level of externalizing problem behavior, points to the relevance of understanding the specific role of disorganization in the development of socio-emotional functioning. From the perspective of attachment theory, this finding could be explained as a function of a dysfunctional parent–child relationship that contributes to an exacerbation of problems over time (c.f. “the coercive circle”; Patterson et al. 1992). This could be true even if the initial problem level were better explained by other factors. The mechanisms of this process could include transactional effects, that is, problem behaviors of the children that affect parenting, in turn impairing child adjustment and behaviors.

It is worth noting that attachment disorganization and poor inhibition were significantly related and that their predictive effects, to a certain extent, covaried. The covariation can be interpreted to suggest that children with poor inhibition, or perhaps poor executive functioning more generally, tend to produce histories that are coded as disorganized (e.g., low coherence as an aspect of disorganization; for a similar discussion, see Green and Goldwyn 2002).

Poor Inhibition as Predictor

All outcome variables were significantly predicted by poor inhibition, and relations beyond those from initial level of externalizing problem behavior were found for externalizing problem behaviors themselves and ADHD behaviors. These effects suggest that poor inhibitory control is involved in the progressive development of externalizing problem behaviors and contributes specifically to ADHD behaviors. One explanation for the contribution to problems over time may be that poor inhibitory control makes it difficult for children to regulate behavior, a requirement

which increases with age. A similar interpretation was made by Hughes and Ensor (2008) with regard to their finding that deficits in age-3 EF predicted increases in problem behavior over a 1-year period. As to ADHD behaviors, the result strengthens previous conclusions about the importance of poor inhibition in relation to these problem behaviors (e.g., Wodka et al. 2007).

As to ASD, our findings contribute to understanding the association between poor inhibition and ASD, which has been inconsistent in previous studies (O’Hearn et al. 2008). Our results indicate that it is to a large extent the variance shared with general externalizing problem behaviors that accounts for the association. For CU traits our results support the conclusion by Blair (2005) of no specific relation to poor inhibition.

CU Traits—A Special Case

The pattern of predictions was different for CU traits, compared to that for general externalizing problem behaviors and symptoms of ADHD and ASD. CU traits were the only outcome for which poor inhibition did not contribute over and above disorganized attachment, whereas disorganized attachment showed a unique contribution, not only beyond poor inhibition, but also beyond initial externalizing problem behavior. These results suggest that a process related to emotional, and possibly relational, aspects are more important in the development of CU traits than is the case for the other outcomes. This reasoning is in line with Knafo et al.’s (2008) conclusion that compassion in young children is a multifactorial phenomenon including affective, cognitive, and behavioral components.

Because inclusion of negative affective story material, such as scary and violent parts, is scored as disorganization, it is interesting to relate the present findings to those of Dunn and Hughes (2001). They showed that themes of violence in fantasy play at 4 years were concurrently associated with antisocial behavior and also, and more importantly, with poor empathic sensitivity 2 years later, a relation that was independent of 4-year antisocial behavior. They also reported that the use of violent and scary material in pretend play was associated with poor interactions with friends and thus a sign to be taken seriously (see also Moss et al. 2009). Our findings support this contention and further suggest that a disorganized attachment relation may be one factor underlying the predisposition to invoke violent and scary material in storytelling and pretend play.

Conclusions

Two perspectives, representing different theoretical and research traditions were brought together in a way that has

rarely been done before. A new and important finding was that disorganized attachment, as evaluated by stories that presumably activate the attachment system, was predictive of general externalizing problem behavior, as well as of ADHD behaviors and CU traits, even when controlling for poor inhibitory capacity. Further, our control for general externalizing problem behaviors at T1 allowed conclusions about specific developmental associations, that is, those not shared with early externalizing problem behaviors. This led to a second important finding, namely that only CU traits were specifically predicted by disorganized attachment when both poor inhibition and early general externalizing behaviors were controlled. We acknowledge that all contributions independent of early externalizing problems were rather small and need to be replicated. Aside from such replication, future studies should make it possible to control also for initial levels of the specific problem categories. Nonetheless our results point to the importance of studying common as well as specific longitudinal relations to understand the interplay of different processes in the development of problem behaviors.

References

- Ainsworth, M. D. S., Blehar, M., Waters, E., & Wall, S. (1978). *Patterns of attachment*. Hillsdale: Erlbaum. American Psychiatric Association.
- American Psychiatric Association (APA). (2000). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington: American Psychiatric Association.
- Andershed, H. (2009). *Can psychopathic traits be meaningfully measured in preschool children? Initial tests of a new assessment tool*. Paper presented at the 31st Congress of the International Academy of Law and Mental Health (IALMH), New York.
- Barry, C. T., Frick, P. J., Grooms, T., McCoy, M. G., Ellis, M. L., & Loney, B. R. (2000). The importance of callous-unemotional traits for extending the concept of psychopathy to children. *Journal of Abnormal Psychology, 109*, 335–340.
- Behar, L., & Stringfield, S. (1974). A behavior rating scale for the preschool child. *Developmental Psychology, 10*, 601–610.
- Berlin, L., & Bohlin, G. (2002). Response inhibition, hyperactivity, and conduct problems among preschool children. *Journal of Clinical Child Psychology, 31*, 242–251.
- Blair, R. J. R. (2005). Applying a cognitive neuroscience perspective to the disorder of psychopathy. *Development and Psychopathology, 17*, 865–891.
- Bretherton, I., & Munholland, K. A. (2008). Internal working models in attachment relationships. Elaborating a central construct in attachment theory. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment* (2nd ed., pp. 102–130). New York: Guilford.
- Bretherton, I., Oppenheim, D., Emde, R. N., & The MacArthur Narrative Working Group. (2003). The MacArthur Story Stem Battery. In R. N. Emde, D. P. Wolf, & D. Oppenheim (Eds.), *Revealing the inner worlds of young children: The MacArthur story stem battery and parent – child narratives* (pp. 381–396). New York: Oxford University Press.
- Brocki, K., & Bohlin, G. (2006). Developmental change on the relation between executive functioning and ADHD- symptoms in normal school-aged children. *Infant and Child Development, 15*, 19–40.
- Brocki, K. C., Nyberg, L., Thorell, L. B., & Bohlin, G. (2007). Early concurrent and longitudinal symptoms of ADHD and ODD: relations to different types of inhibitory control and working memory. *Journal of Child Psychology and Psychiatry, 48*, 1033–1041.
- Clarke, L., Ungerer, J., Chahoud, K., Johnson, S., & Stiefel, I. (2002). Attention deficit hyperactivity disorder is associated with attachment insecurity. *Clinical Child Psychology and Psychiatry, 7*(2), 179–198.
- Dandreaux, D. M., & Frick, P. J. (2009). Developmental pathways to conduct problems: a further test of the childhood and adolescent-onset distinction. *Journal of Abnormal Child Psychology, 37*, 375–385.
- Dodge, K. A., & Pettit, G. S. (2003). A biopsychosocial model of the development of chronic conduct problems in adolescence. *Developmental Psychology, 39*, 349–371.
- Dunn, J., & Hughes, C. (2001). “I got some swords and you’re dead!”: violent fantasy, antisocial behavior, friendship, and moral sensibility in young children. *Child Development, 72*, 491–505.
- DuPaul, G. J., Power, T. J., Anastopoulos, A. D., & Reid, R. (1998). *ADHD rating scale IV. checklists, norms, and clinical interpretation*. New York: Guilford Press.
- Ehlers, S., & Gillberg, C. (1993). The epidemiology of asperger asyndrome. a total population study. *Journal of Child Psychology and Psychiatry, 34*, 1327–1350.
- Ehlers, S., Gillberg, C., & Wing, L. (1999). The development of a screening questionnaire for asperger syndrome and other high-functioning autism spectrum disorders in school age children. *Journal of Autism and Developmental Disorders, 29*, 129–141.
- Ellicker, J., Englund, M., & Sroufe, L. A. (1992). Predicting peer competence and peer relationships in childhood from early parent–child relationships. In R. Parke & G. W. Ladd (Eds.), *Family and peer relationships: Modes of linkage* (pp. 77–106). Hillsdale: Erlbaum.
- Epstein, T. J., Saltzman-Benaiah, J., O’Hare, A., Goll, J. C., & Tuck, S. (2008). Associated features of asperger syndrome and their relationship to parenting stress. *Child: Care, Health and Development, 34*, 503–511.
- Frick, P. J., & Dickens, C. (2006). Current perspectives on conduct disorder. *Current Psychiatry Reports, 8*, 59–72.
- Frick, P. J., Bodin, S. D., & Barry, C. T. (2000). Psychopathic traits and conduct problems in community and clinic-referred samples of children: further development of the psychopathy screening device. *Psychological Assessment, 12*, 382–393.
- Gagne, J. R., Saudino, K. J., & Asherson, P. (2011). *Journal of Child Psychology and Psychiatry*. doi:1111/j.1469-7610.2011.02420.
- George, C., & Solomon, J. (2000). Six-Year Attachment Doll Play Classification System. In *Unpublished classification manual*. Oakland: Mills College.
- Gerstadt, C. L., Hong, Y. J., & Diamond, A. (1994). The relationship between cognition and action: performance of children 3 1/2–7 years old on a Stroop-like daynight test. *Cognition, 53*, 129–153.
- Goldwyn, R., Stanley, C., Smith, V., & Green, J. (2000). The manchester child attachment story task: relationship with parental AAI, SAT and child behavior. *Attachment & Human Development, 2*, 71–84.
- Green, J., & Goldwyn, R. (2002). Annotation: attachment disorganization and psychopathology: new findings in attachment research and their potential implications for developmental psychopathology in childhood. *Journal of Child Psychology and Psychiatry, 43*, 835–846.
- Green, J. M., Stanley, C., Smith, V., & Goldwyn, R. (2000). A new method of evaluating attachment representations on young school

- age children—the manchester child attachment story task. *Attachment & Human Development*, 2, 42–64.
- Green, J., Stanley, C., & Peters, S. (2007). Disorganized attachment representation and atypical parenting in young school age children with externalizing disorder. *Attachment & Human Development*, 9, 207–222.
- Hagekull, B., & Bohlin, G. (1992). Prevalence of problem behaviors in four-year-olds. *Scandinavian Journal of Psychology*, 33, 359–369.
- Hagekull, B., & Bohlin, G. (1994). Behavioral problems and competences in four-year-olds: dimensions and relationships. *International Journal of Behavioral Development*, 17, 311–327.
- Happé, F., Booth, R., Charlton, R., & Hughes, C. (2006). Executive function deficits in autism spectrum disorders and attention-deficit/hyperactivity disorder: examining profiles across domains and ages. *Brain and Cognition*, 61, 25–39.
- Hughes, C., & Ensor, R. (2008). Does executive function matter for preschoolers' problem behaviors? *Journal of Abnormal Child Psychology*, 36, 1–14.
- Johnstone, B. A., & Cooke, D. J. (2004). Psychopathic-like traits in childhood: conceptual and measurement concerns. *Behavioral Sciences & the Law*, 22, 103–125.
- Kline, R. B. (2011). *Principles and practice of structural equation modeling* (3rd ed.). New York: Guilford Press.
- Knafo, A., Zahn-Waxler, C., Van Hulle, C., Robinson, J. A. L., & Rhee, S. H. (2008). The developmental origins of a disposition toward empathy: genetic and environmental contributions. *Emotion*, 8, 737–752.
- Korkman, M., Kemp, S.L., & Kirk, U. (1998/2000). *NEPSY – A developmental neuropsychological assessment manual*. San Antonio, TX: psychological corporation (Psykologiförlaget AB, Stockholm).
- Loeber, R., Burke, J. D., Lahey, B. B., Winters, A., & Zera, M. (2000). Oppositional defiant and conduct disorder: a review of the past 10 years, part I. *Journal of the American Academy of Child and Adolescent Psychiatry*, 39, 1468–1484.
- Martinussen, R., Hayden, J., Hogg-Johnson, S., & Tannock, R. (2005). A meta-analysis of working memory impairments in children with attention-deficit hyperactivity disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, 44, 377–384.
- Moss, E., Bureau, J.-F., Béliveau, M.-J., Zdebik, M., & Lépine, S. (2009). Links between children's attachment behavior at early school-age, their attachment-related representations, and behavior problems in middle childhood. *International Journal of Behavioral Development*, 33, 155–166.
- Nigg, J. T., Quamma, J. P., Greenberg, M. T., & Kusche, C. A. (1999). A two-year longitudinal study of neuropsychological and cognitive performance in relation to behavioral problems and competencies in elementary school children. *Journal of Abnormal Child Psychology*, 27, 51–63.
- O'Hearn, K., Asato, M., Ordaz, S., & Luna, B. (2008). Neurodevelopment and executive function in autism. *Development and Psychopathology*, 20, 1103–1132.
- Olson, S. L., Tardif, T. Z., Miler, A., Felt, B., Grabell, A. S., Kessler, D., et al. (2011). Inhibitory control and harsh discipline as predictors of externalizing problems in young children: a comparative study of U.S., Chinese, and Japanese preschoolers. *Journal of Abnormal Child Psychology*. doi:10.1007/s10802-011-9531-5.
- Patterson, G. R., Reid, J. B., & Dishion, T. J. (1992). *A social learning approach. IV. AntiWodkasocial boys*. Eugene: Castalia.
- Pauli-Pott, U., & Becker, K. (2011). Neuropsychological basic deficits in preschoolers at risk for ADHD: a meta-analysis. *Clinical Psychology Review*, 31, 626–637.
- Pinto, C., Turton, P., Hughes, P., White, S., & Gillberg, C. (2006). ADHD and infant disorganized attachment a prospective study of children next-born after stillbirth. *Journal of Attention Disorders*, 10, 83–91.
- Rosvold, H. E., Mirsky, A. F., Sarason, I., Bransome, E. D., & Beck, L. H. (1956). A continuous performance test of brain damage. *Journal of Consulting Psychology*, 20, 343–350.
- Rutter, M., Tizard, J., & Whitmore, K. (1970). *Education, health and behavior*. London: Longman Group Ltd.
- Solomon, J., George, C., & DeJong, A. (1995). Children classified as controlling at age six: evidence for disorganized representational strategies and aggression at home and at school. *Development and Psychopathology*, 7, 447–463.
- Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4th ed.). Needham Heights: Allyn & Bacon.
- Thorell, L. B. (2007). Do delay aversion and executive function deficits make distinct contributions to the functional impact of ADHD symptoms? a study of early academic skill deficits. *Journal of Child Psychology and Psychiatry*, 48, 1061–1070.
- Thorell, L. B., & Wahlstedt, C. (2006). Executive functioning deficits in relation to symptoms of ADHD and/or ODD in preschool children. *Infant and Child Development*, 15, 503–518.
- Thorell, L., Rydell, A.-M., & Bohlin, G. (2010). *Parent-child attachment and executive functioning in relation to ADHD symptoms in middle childhood*. Manuscript submitted for publication.
- Van IJzendoorn, M. H., Schuengel, C., & Bakermans-Kranenburg, M. J. (1999). Disorganized attachment in early childhood: meta-analysis of precursors, concomitants, and sequelae. *Development and Psychopathology*, 11, 225–249.
- Viding, E., & Larsson, H. (2007). Aetiology of antisocial behavior. *International Congress Series*, 1304, 121–132.
- Viding, E., Blair, R. J. R., Moffitt, T. E., & Plomin, R. (2005). Evidence for substantial genetic risk for psychopathy in 7-year-olds. *Journal of Child Psychology and Psychiatry*, 46, 592–597.
- Weinfield, N. S., Sroufe, L. A., Egeland, B., & Carlson, E. (2008). Individual differences in infant-caregiver attachment. In I. J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment. theory, research and clinical applications*. New York: Guilford Press.
- Welsh, M. C. (2002). Developmental and clinical variations in executive functions. In D. L. Molfese & V. J. Molfese (Eds.), *Developmental variations in learning* (pp. 139–185). Mahwah: Lawrence Erlbaum Associates, Inc.
- Willcutt, E. G., Doyle, A. E., Nigg, J. T., Faraone, S. V., & Pennington, B. F. (2005). Validity of the executive function theory of Attention-deficit/hyperactivity disorder: a meta-analytic review. *Biological Psychiatry*, 57, 1336–1346.
- Wodka, E. L., Mahone, E. M., Blankner, J. G., Larson, J. C. G., Fotedar, S., Denckla, M. B., Mostotsky, S. H., et al. (2007). Evidence that response inhibition is a primary deficit in ADHD. *Journal of Clinical and Experimental Neuropsychology*, 29, 345–356.
- Young, S. E., Friedman, N. P., Miyake, A., Willcutt, E. G., Corley, R. P., Haberstick, B. C., et al. (2009). Behavioral disinhibition: liability for externalizing spectrum disorders and its genetic and environmental relation to response inhibition across adolescence. *Journal of Abnormal Psychology*, 118, 117–130.