INTERGENERATIONAL TRANSMISSION OF PSYCHOSOCIAL RISK: MATERNAL CHILDHOOD ADVERSITY, MOTHER-CHILD ATTACHMENT, AND CHILD TEMPERAMENT

Andrée-Anne Bouvette-Turcot*, Annie Bernier, & Michael J. Meaney

This study investigated the interactive effects of proximal and distal environmental influences on child temperament. Specifically, the relation between mothers’ own early familial experiences, mother-child attachment security, and child temperament was examined. Sixty mothers completed a semi-structured interview pertaining to their childhood attachment experiences with their own parents when children were aged 6 months, and completed a questionnaire on their children’s temperament at 2 years. Mother-child attachment security was also rated at 2 years. Children whose mothers received higher scores of early adverse caregiving experiences displayed poorer temperamental activity level outcomes only when they also showed high concomitant levels of attachment security. The results suggest the transgenerational effect of maternal early life experiences on temperamental characteristics in the offspring, describing a pathway that might contribute to the familial transmission of risk stemming from the early caregiving environment.

Introduction

Epidemiological data and the perinatal programming hypothesis suggest that the effects of a maternal history of early adverse experiences may affect the next generation. It is, however, not clear how early some of these developmental changes are manifested. Moreover, whereas developmental research often assumes that children are equally affected by environmental factors, individual characteristics appear to modulate the influence of early life experiences. Hence, certain factors may influence the magnitude of both favourable and detrimental environmental effects (e.g., Belsky & Pluess, 2011). For instance, the distal risk stemming from a maternal history of childhood adversity may be modulated by more proximal factors such as relational influences.

Although infant temperament has a strong hereditary component (Saudino, 2009), it is also affected by early life experiences (Lang, Gartstein, Rodgers, & Lebeck, 2010). As such, it may be a key variable to consider when
examining the outcomes of transmission processes. Indeed, measures of temperament are potential early markers in the developmental pathway to psychopathology (e.g., Compas, Connor-Smith, & Jaser, 2004). To date, several links between early temperament and later psychopathology have been documented. For instance, high levels of withdrawal in children, which is a sub-component of temperament that refers to the act of pulling oneself out of an unrewarding or uncertain situation (Bijttebier & Roeyers, 2009), are associated with subsequent depression (Holzwarth & Meyer, 2006), eating disorders (Loxton & Dawe, 2001), anxiety (Johnson, Turner, & Iwata, 2003), and alcoholism (Sher & Trull, 1994). In contrast, low levels of withdrawal predict psychopathy in adulthood (Newman, Wallace, Schmitt, & Arnett, 1997). Furthermore, links have been found between high levels of approach, which refers to approach toward and pursuit of incentives or rewards (Bijttebier & Roeyers, 2009), and substance use and abuse (Franken & Muris, 2006), eating disorders (Loxton & Dawe, 2001), and manic episodes (Holzwarth & Meyer, 2006). Low levels of approach, on the other hand, are related to depression (Holzwarth & Meyer, 2006). These associations suggest that significant deviations in temperamental characteristics may be considered as an early milestone in a pathway leading to psychopathology, thus underlining the importance of studying temperament early in life.

**Intergenerational Risk Transmission**

Both typical and maladaptive processes may be familial. For instance, individual differences in parenting appear to be transmitted across generations, as shown in both animal and human literatures (Fleming, O’Day, & Kraemer, 1999; Maestripieri, 1999; Meaney, 2001; Steele & Steele, 1994). On the dark side, a plurality of mental disorders is also known to be familial. For instance, risk for depression and anxiety is known to be transmitted across generations (Eley, 1999) as are risky personality profiles and factors such as neuroticism, behavioural inhibition, and low self-esteem (Burt et al., 2005).

Intergenerational risk transmission also applies to maternal history of early adverse experiences. The results of the Avon Longitudinal Study of Parents and Children (ALSPAC; Collishaw, Dunn, O’Connor, & Golding, 2007), for instance, confirm the need to study intergenerational transmission of maternal history of early adversity. Indeed, this longitudinal study targeted various maternal characteristics and history of early adverse experiences and their impact on offspring adjustment. Researchers found an association between mothers’ ratings of their history of early adverse experiences and their offspring’s adjustment, which suggests that mothers’ perceptions of having experienced early adversity may, in and of itself, be a risk factor that can be transmitted to the next generation. Besides, intergenerational transmis-
sion also applies to other maternal characteristics that do not necessarily entail severe adversity. In fact, maternal attitudes and behaviours vary across populations and individuals are influenced by multifaceted environmental and hereditary factors. Such maternal dispositions are known to affect the next generation. For instance, mothers with a secure attachment state of mind (i.e., displaying a coherent, balanced, and credible discourse when asked to describe their childhood relationships with their caregivers, whether positive or negative) are known to display higher mothering qualities than their insecure counterparts (for a review, see Whipple, Bernier, & Mageau, 2011). In turn, there is a great deal of research demonstrating that parenting quality bears critical importance for several spheres of child development (Borstein, 2002). In short, child development is impacted by the quality of parent-child interactions, which in turn are shaped, in part, by parents’ own early life experiences (e.g., Carter, Garrity-Rokous, Chazan-Cohen, Little, & Briggs-Gowan, 2001; Rubin, Both, Zahn-Waxler, Cummings, & Wilkinson, 1991). Hence, there are many ways in which mothers’ early caregiving experiences may be translated into an experience that will impact their children’s social, emotional, and behavioural outcomes. As such, temperament is a key child outcome to study, as it is embedded in the development of these three domains and is a good early proxy measure of later functioning (Compas et al., 2004). One may therefore expect children whose mother presents a history of early adverse experiences to carry part of this risk, as evidenced in less optimal temperamental characteristics.

However, it is increasingly demonstrated that environmental and family factors do not affect children equally, and rather occur interactively with offspring factors (see Ellis, Boyce, Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2011). One such factor is attachment security, which is a highly reliable predictor of child developmental trajectories (e.g., Fearon, Bakermans-Kranenburg, van IJzendoorn, Lapsey, & Roisman, 2010). Attachment is also a key concept to the study of individual differences in emotional and behavioural regulation, and may function to modulate the effects of maternal early experiences on children’s emotional and behavioural adjustment and, in the present context, child temperament.

Child Attachment

Attachment encompasses the enduring bond between an infant and his or her primary caregivers (Bowlby, 1982) and is a key concept in the study of socio-emotional development, as evidenced in both animal and human literatures (Fox, Kimmerly, & Schafer, 1991; Moss et al., 2011, van IJzendoorn, Bard, Bakermans-Kranenburg, & Ivan, 2009). An attachment relationship is qualified as secure when children are able to balance their needs for protection and
comfort and their needs to explore their environment (Ainsworth, 1985). Numerous studies have shown that secure attachment is a central protective factor for child development, as evidenced for instance by meta-analytic studies showing that securely attached children are less likely to develop emotional, social, and behavioural difficulties (Fearon et al., 2010; Groh, Roisman, van IJzendoorn, Bakermans-Kranenburg, & Fearon, 2012; McGoron et al., 2012). In fact, owing to results from studies focusing on attachment security as a protective factor (e.g., McGoron et al., 2012), it has been argued that fostering secure attachment relationships may be as important in buffering the effects of an adverse environment as diminishing adversity itself (Drury, 2012). The results of a study conducted by Moss et al. (2011) support this idea: the authors found that both internalizing and externalizing symptoms of maltreated children significantly diminished following an intervention program focusing on maternal sensitivity and mother-child attachment. Hence, attachment security can be viewed as a proximal protective factor that may serve as a buffer for the more distal risk stemming from a maternal history of negative early caregiving experiences.

Hypotheses

The purpose of the present study was to investigate whether early child temperament reflects the interactive effects of proximal and distal environmental influences, such that the risk resulting from a maternal history of adverse experiences would be modulated by the more proximal influence of mother-child attachment. It was expected that mother-child attachment security and mothers’ own early familial experiences would interact in the prediction of child temperament.

Method

Participants

Sixty mother-infant dyads living in a large Canadian metropolitan area participated in this study. Families were drawn from random birth lists of the Ministry of Health and Social Services. Criteria for participation were full-term pregnancy and the absence of any known disability or severe delay in the infant. Socio-demographic information was gathered when infants were 6 months old. At that time, mothers were between 22 and 44 years old ($M = 31.1$), had 15.9 years of education on average (varying from 9 to 18 years), and all were living with their child’s father (Refer to Table 1 for demographic information). Out of the 60 children under study, 36 were first-borns, 18 were the second child of their family, 5 were the third child, and 1 was the fourth.
Measures

Maternal history of early adversity. The Adult Attachment Interview (AAI; George, Kaplan, & Main, 1996; French version by Larose & Bernier, 2001) is a semi-structured interview that was administered when children were aged 6 months (T1). Mothers were asked to describe their childhood relationships with each of their parents, to support their general descriptions with specific memories or examples, to report on their parents’ reactions when they were ill, upset or injured, and to reflect on how these experiences affected their development, their personality, and their current parenting behaviours. Mothers were also probed about potential experiences of trauma within or outside the family (e.g., physical or sexual abuse). Both validity and reliability properties of the AAI are well established (Bakermans-Kranenburg & van Ijzendoorn, 1993; Crowell et al., 1996; Sagi et al., 1994; see Hesse, 2008, for a review). Interviews were recorded, transcribed, and rated by certified coders following Main and Goldwyn’s procedure (1998), which yields two sets of scales, namely states of mind and experiences.

In order to address the current research questions, we sought to obtain a reliable composite score constituting a measure of maternal history of early familial experiences. Accordingly, the ten experience scales (Love, Rejection, Role-Reversal, Pressure to Achieve, and Neglect, for each parent) along with the binary score of presence or absence of trauma, were submitted to a principal component analysis. One factor, which depicted maternal history of early adverse experiences and explained 28.63% of the variance of the twelve input variables, was retained. As depicted in Table 2, this factor was similar to those obtained in other studies (e.g., Tarabulsy et al., 2012), representing a history of adverse familial experiences, with high levels of reject and neglect and low levels of love by both parents, along with presence of trauma. Rotat-
Maternal adversity, attachment, and child temperament

The matrix solution did not affect the obtained solution. The resulting factor score was transformed into a regression score and used in all subsequent analyses as the index of maternal history of early adversity.

Child security of attachment. When children were 2 years of age (T2), mother-child attachment security was measured using the Attachment Behaviour Q-Sort (AQS; Waters, 1995). The AQS is comprised of 90 items describing potential child behaviours. Following a one-hour home visit, a trained assistant sorted these items into nine piles according to the degree to which each item was representative of the observed child’s behaviour. Each pile then received a score ranging from 1 (least representative of child) to 9 (most representative of child). The observed scores were then correlated with a prototypical score provided by the authors of the AQS. Hence, attachment security scores can vary from –1 (most insecure) to 1 (prototypically secure). Since the AQS measures attachment on a continuum, it was well suited for our low-risk sample. Inter-rater reliability was conducted for 17.7% of the dyads and yielded an intra-class correlation of .72 between raters’ sorts. Meta-analytic data suggest that the observer-AQS shows excellent construct validity, with attachment scores converging with maternal sensitivity, attachment security assessed with the Strange Situation Procedure (SSP), and child adaptation (van IJzendoorn, Vereijken, Bakermans-Kranenburg, & Riksen-Walraven, 2004). In fact, several studies suggest that the observer-AQS is more closely related to child social and behavioural outcomes than the SSP (van IJzendoorn et al., 2004). The observer-AQS is thus now considered one

Table 2

| Scale relative to experience with mother | Factor Loadings |
|----------------------------------------|-----------------|
| Love                                   | –.84            |
| Rejection                              | .73             |
| Role Reversal                          | .12             |
| Pressure                               | .01             |
| Neglect                                | .62             |

| Scale relative to experience with father | Factor Loadings |
|-----------------------------------------|-----------------|
| Love                                    | –.80            |
| Rejection                               | .59             |
| Role Reversal                           | –.39            |
| Pressure                                | –.13            |
| Neglect                                 | .62             |
| Experienced Trauma                      | .51             |
of the gold-standards of attachment research, and has been used with children aged between 1 and 6 years (van IJzendoorn et al., 2004).

**Child temperament.** At T2, mothers were asked to complete the Toddler Behavioural Assessment Questionnaire (TBAQ; Goldsmith, 1996) assessing their perception of their child’s temperament. This questionnaire assesses temperament in children aged 15 to 36 months. Three dimensions (Activity Level, Social Fearfulness, and Anger Proneness) were derived from the 55 items. Mothers answered on a Likert scale that ranged from 1 (never) to 7 (always). Each subscale has been validated separately on several samples and presents good psychometric properties (Goldsmith, 1996). Internal consistency for the current sample was satisfactory for all three subscales (Activity Level: Cronbach’s alpha = .76; Anger Proneness: Cronbach’s alpha = .84; Social Fearfulness: Cronbach’s alpha = .69). Whereas conceptual implications of both anger proneness and social fearfulness are unequivocal, characteristics associated with activity level vary throughout developmental stages. During infancy and early childhood, high levels of temperamental activity level are associated with developmental maturity (Halverson, Kohnstamm, & Martin, 1994). Higher scores for Activity Level thus indicate favourable temperamental dispositions with the current sample of toddlers.

**Procedure**

Two home visits were conducted at T1 and T2. At T1, mothers completed the AAI, described above. They were also asked to complete a questionnaire gathering socio-demographic information. T2 mainly consisted in the administration of child-centered tasks, along with a structured videotaped mother-child play sequence. Mothers were also asked to complete questionnaires, including the TBAQ described above, while children were not looked after by research assistants. Throughout this home visit, assistants trained following Pederson and Moran’s (1995) guidelines observed child attachment behaviours and subsequently rated them with the AQS.

**Results**

Table 3 presents the bivariate correlations between all study variables. Multiple hierarchical regressions were then performed to assess the interactive effects of maternal history of early adversity and child attachment security on child temperament at 2 years of age. The three dimensions of temperament were submitted to distinct regression equations. In each equation, we controlled for maternal age and education as well as child gender, which are well-documented correlates of several child outcomes and may affect maternal
Maternal adversity, attachment, and child temperament

reports. We thus inserted variables in the following order: Block 1, child gender, maternal age, and maternal education; Block 2, maternal history of early adversity and offspring attachment security; Block 3, the multiplicative interaction term of maternal history of early adversity and offspring attachment security. The results of the three regression models are shown in Tables 4 to 6. None of the demographic variables contributed to variation in child temperament. The analyses revealed a significant interaction effect of maternal history of early adversity and offspring attachment security on offspring temperamental activity level, $\beta = -.70$, $t(6,62) = -2.32$, $p < .05$.

This interaction was explored both statistically, with post-hoc probing of moderation effects (Preacher, Curran, & Bauer, 2006) and graphically (Figure 1). The relation between maternal history of early adversity and child temperamental activity level was tested as a function of child attachment security. Fitted regression lines were plotted at high (+1 SD) and low (–1 SD) values of mother-child attachment security. The results revealed a significant and negative slope for children with relatively higher levels of attachment security ($\beta = -.26$, $SE = .12$, $t = -2.19$, $p < .05$) whereas the slope for those with lower levels of attachment security was not significant ($\beta = .12$, $SE = .12$, $t = 1.04$, ns). This indicates that a maternal history of more severe early adversity was (negatively) related to child temperamental activity level as expected, however only in children presenting relatively higher levels of attachment security. In order to determine specific levels of maternal adversity below which children with higher levels of attachment security showed better temperamental outcomes and above which they showed poorer outcomes than their less securely attached counterparts, analyses of regions of significance were performed. The simple slope for children with high levels of attachment security was significant outside the illustrated bounds (Figure 1). Hence, the

Table 3
Bivariate correlations between all study variables

|       | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|
| 1. Maternal Age | –   | .38** | –.02 | –.13 | –.04 | –.12 | .00  | .03  |
| 2. Maternal Education | –   | –.06 | –.09 | –.15 | –.18 | .00  | .06  |     |
| 3. Child Gender | –   | .04  | .25* | .18  | .14  | .20  |     |     |
| 4. Maternal Adversity | –   | –.11 | –.08 | –.02 | .12  |     |     |     |
| 5. Attachment Security | –   | –.23 | .10  | –.18 |     |     |     |     |
| 6. Child Activity Level | –   | .24  | .35**|     |     |     |     |     |
| 7. Child Social Fearfulness | –   | .31* |     |     |     |     |     |     |
| 8. Child Anger Proneness | –   |     |     |     |     |     |     |     |

*p < .05; **p < .01
regression lines were significantly different from one another for all possible data points when maternal adversity scores were below –2.03 or above .19.

Figure 1
Interactive effects and regions of significance of maternal history of early adversity and mother-child attachment security onto child temperamental activity level

The interaction between maternal history of early adversity and child attachment in the prediction of child social fearfulness was non-significant (Table 5). When predicting child anger proneness, the interaction was in the same direction as that reported above for activity level, although of marginal significance only (see Table 6), and therefore not explored further.
Table 4
Summary of regression analyses for interactive effects of maternal history of early adversity and mother-child attachment security onto child temperamental activity level

| Model and steps          | β     | t  |
|-------------------------|-------|----|
| 1. Maternal Age         | -.01  | -.45|
| 1. Maternal Education   | -.04  | -1.04|
| 1. Child Gender         | .22   | 1.35|
| 2. Maternal Adversity Score (A) | -.10  | -1.28|
| 2. Mother-child Attachment Security (B) | -.81** | -2.76**|
| 3. Interactive Term (AxB) | -.70* | -2.32*|
| R² (adj.)               | .18   |    |
| df                      | (6, 58)|    |

*R p < .05; **p < .01

Table 5
Summary of regression analyses for interactive effects of maternal history of early adversity and mother-child attachment security onto child temperamental social fearfulness

| Model and steps          | β     | t  |
|-------------------------|-------|----|
| 1. Maternal Age         | .00   | .11|
| 1. Maternal Education   | -.01  | -.11|
| 1. Child Gender         | .26   | 1.16|
| 2. Maternal Adversity Score (A) | -.03  | -.27|
| 2. Mother-child Attachment Security (B) | -.49  | -1.15|
| 3. Interactive Term (AxB) | -.07  | -.15|
| R² (adj.)               | .05   |    |
| df                      | (6, 58)|    |

Table 6
Summary of regression analyses for interactive effects of maternal history of early adversity and mother-child attachment security onto child temperamental anger proneness

| Model and steps          | β     | t  |
|-------------------------|-------|----|
| 1. Maternal Age         | .01   | .19|
| 1. Maternal Education   | .01   | .26|
| 1. Child Gender         | .38*  | 1.80*|
| 2. Maternal Adversity Score (A) | .07   | .65|
| 2. Mother-child Attachment Security (B) | -.78* | -1.75*|
| 3. Interactive Term (AxB) | -.74* | -1.76*|
| R² (adj.)               | .07   |    |
| df                      | (6, 58)|    |

*p < .10
Discussion

Aiming to investigate conditions under which intergenerational transmission of risk occurred, we examined whether the relation between maternal history of early negative life experiences and offspring temperament was moderated by child attachment security. The results revealed a significant negative relation between maternal history of early adversity and child temperamental activity level for children presenting high attachment security to their mother. Contrastingly, the relation was not significant for children who displayed low attachment security to their mother. During the first two years of life, high levels of temperamental activity are positively associated with developmental maturity. It is only in later childhood that this temperament component relates to negative outcomes such as hyperactivity and other externalizing behaviours (for a review, see Halverson et al., 1994). Hence, more adverse caregiving experiences during mothers’ own childhood were related to lower degrees of a desirable child outcome, namely early temperament activity level, only for children who were relatively more securely attached to their mother. These results provide preliminary support for transgenerational risk transmission of maternal history of early adverse experiences onto offspring temperament. To determine the exact levels of adversity at which the simple slopes were significantly different from one another, we performed analyses of regions of significance. Rather surprisingly, the regions of significance analysis suggested that in fact, attachment security’s moderating role leaned more toward risk than protection. Indeed, high levels of early adverse experiences were not needed to transmit a negative impact onto children’s temperament (i.e., adversity score ≥ .19), whereas much higher levels of positive experiences (i.e., adversity score ≤ –2.03) were needed for children to display beneficial effects on their temperamental activity level.

Although these results might, at first glance, seem somewhat counter-intuitive and do not concur with both common beliefs and initial hypotheses that attachment security may only serve as a protective factor, they are consistent with a differential-susceptibility model as described by Belsky and Pluess (2009). This theory posits that not only do individuals vary in the degree to which they are vulnerable to adverse environmental conditions, but also in the degree to which they are open to enriched, positive conditions (Pluess & Belsky, 2011). Indeed, children presenting with high attachment security had the lowest temperamental activity level scores at high levels of maternal history of early adversity, but also had the highest temperamental activity level scores at low levels of maternal history of early adversity, compared to counterparts presenting with low levels of attachment security. This suggests that mother-child attachment security may act both as a risk and a protective factor, at both ends of the spectrum of maternal history of early adverse experiences.
Such findings appear to contrast with prevailing views that it is rather risk factors (e.g., risk genes or biological reactivity) which make children more susceptible to environmental influences (see Belsky & Pluess, 2009; Boyce & Ellis, 2005; Mesman et al., 2009; and van Aken, Junger, Verhoeven, van Aken, & Deković, 2007 for reviews), in that attachment security is generally conceptualized as a positive factor that serves only protective functions. However, one may argue that attachment security acts as a susceptibility (rather than necessarily protective) factor in that it allows children to freely explore their environments (Grossmann, Grossman, Kindler, & Zimmerman, 2008; Weinfeld, Sroufe, Egeland, & Carlson, 2008), thus potentially making them more open to both positive and negative environmental influences. Indeed, whereas insecurely attached children are believed to be reluctant to fully dedicate their resources to exploration with the fear that caregivers might not provide adequate support, securely attached children are conceptualized as more open to their environments and may thus be impacted by external factors, either positively or negatively, to a greater extent than their insecure counterparts. Furthermore, given that securely attached children are generally more open to their caregivers’ influences, for instance showing greater responsiveness to them and increased emotional openness (McElwain, Holland, Engle, & Wong, 2012; Moss, Bureau, Cyr, Mongeau, & St-Laurent, 2004), they may show increased sensitivity to maternal care, which could make them more susceptible to their mothers’ history and dispositions. Hence, the hypothesis is that attachment security, while being a very well documented protective factor, may paradoxically in some cases act as a risk factor by making children more open to non-optimal parental influences.

Maternal behaviour may partly account for the link uncovered between maternal history of early adversity and child temperament. There is evidence that maternal mood disorders (one of the well-known consequences of presenting with a history of early life negative experiences; Heim & Nemeroff, 2001) impact the quality of mother-child interactions (Field, 2011; Fleming et al., 2002). For instance, depressed mothers display less sensitivity, less face-to-face interaction, and less vocalizing, imitative, and smiling behaviours (Field, Diego, & Hernandez-Reif, 2006; Murray, Fiori-Cowley, Hooper, & Cooper, 1996). They may also display more intrusive or passive behaviours (Malphurs, Raag, Field, Pickens, & Pelaez-Nogueras, 1996). In turn, such mothering behaviours relate to offspring increased behavioural inhibition, negative emotionality, and social withdrawal (Martins & Gaffan, 2000). Provided that child exploration, in the context of security of attachment, may prompt feelings of fear, suspicion, or distress depending on the faced encounters, maternal behaviour and sensitivity in response to these prompted feelings may play an especially potent role in child emotion regulation (Grossmann & Grossmann, 1991). Hence, it will be important for sub-

psycho.belg.2013_3.book  Page 76  Thursday, June 20, 2013  11:16 AM
sequent investigations to consider the role of parenting behaviour in the relation between maternal history of early adversity and offspring temperamental outcomes.

Another stimulating line of inquiry pertains to the different forms that the links between child temperament and attachment may take. Hence, whereas evidence for the existence of direct links between attachment security and temperament is quite scarce (Vaughn, Bost, & van IJzendoorn, 2008), caregiving environments that facilitate the emergence of a secure mother-child attachment relationship are also associated with the development of neurophysiological components of behavioural inhibition and emotional regulation (Hane & Fox, 2006). The results of the current study suggest one more form of interplay between these two central indicators of child functioning: a secure attachment relationship may provide a facilitating context in which maternal predispositions, positive and negative, are more likely to have an impact on children’s emotional development, as evidenced in their temperamental dispositions.

Recall, however, that a significant interaction was found only when predicting child activity level. It is unclear at this point why anger proneness and social fearfulness did not yield significant results as well. However, one should bear in mind that results were marginally significant for anger proneness and thus that low statistical power may partly explain the inconclusive results, along with the lower reliability of the social fearfulness subscale.

Another limitation to this study is the use of maternal reports of offspring temperament, which increases the risk of shared method variance with self-reported early caregiving experiences. The use of this tool, however, has been associated to strengths not captured by observer reports or laboratory assessments (Rothbart & Hwang, 2002). For instance, maternal reports of offspring temperament allow gathering of information about the child in various contexts and at several points in time, which is challenging to achieve with observational measures. Nonetheless, it would have been interesting to gather objective temperamental data, including from earlier time points to assess the stability of these temperamental outcomes. Besides, it is important to note that the AQS does not provide classifications of insecure attachment as obtained with the SSP. As such, our results cannot discriminate between different types of insecure attachment as potential moderators of the effect of maternal history of early life experiences on child temperament. It is also critical to bear in mind that we only assessed mothers’ retrospective accounts of their early caregiving experiences, which are likely to be tainted by intervening life experiences and memory processes. A very strong design would entail the longitudinal follow-up of children whose early experience would be documented objectively, up until they themselves become parents. Furthermore, our normative sample yielded mother-child attachment security scores that
Maternal adversity, attachment, and child temperament

were slightly above what is generally reported in the literature (e.g., van IJzendoorn et al., 2004). Hence, the same study performed in a high-risk sample could potentially lead to different conclusions, although all normative samples are typically characterized by high mother-child attachment security scores.

Notwithstanding these limitations, this study is one of the first to show that mother-child attachment security may serve as a susceptibility factor that makes children more susceptible to both positive and negative factors. It also provides further support for the use of a dimensional analysis of the AAI to tap into maternal early life experiences. Future research should continue to investigate intergenerational transmission of maternal history of early adverse experiences and the contributing role of mother-child and other attachment relationships (e.g., father-child) to this transmission. Longitudinal studies will be invaluable in investigating the conditions under which such transmission results in actual psychopathology in the offspring, allowing for the development of well-targeted early prevention efforts such as preventive intervention programmes aimed at enhancing parental sensitivity and infant attachment security (for a review, see Bakermans-Kranenburg, van IJzendoorn, & Juffer, 2003).

References

Ainsworth, M.D.S. (1985). Patterns of infant-mother attachments: Antecedents and effects on development. Bulletin of the New York Academy of Medicine, 61, 772-812.

Bakermans-Kranenburg, M.J., & van IJzendoorn, M.H. (1993). A psychometric study of the Adult Attachment Interview: Reliability and discriminant validity. Developmental Psychology, 29, 870-879. doi: 10.1037/0012-1649.29.5.870

Bakermans-Kranenburg, M.J., van IJzendoorn, M.H., & Juffer, F. (2003). Less is more: Meta-analyses of sensitivity and attachment interventions in early childhood. Psychological Bulletin, 129, 195-215. doi: 10.1037/0033-2909.129.2.195

Belsky, J., & Pluess, M. (2009). The nature (and nurture?) of plasticity in early human development. Perspectives on Psychological Science, 4, 345-351. doi: 10.1111/j.1745-6924.2009.01136.x

Bijttebier, P., & Roeyers, H. (2009). Temperament and vulnerability to psychopathology: Introduction to the special section. Journal of Abnormal Child Psychology, 37, 305-308. doi: 10.1007/s10802-009-9308-2

Borstein, M.H. (2002). Handbook of Parenting: Mahwah, NJ: Erlbaum.

Bowlby, J. (1982). Attachment and loss: Attachment (2nd ed., Vol. 1). New York: Basic Books.

Boyce, W.T., & Ellis, B.J. (2005). Biological sensitivity to context: An evolutionary-developmental theory of the origins and functions of stress reactivity. Development and Psychopathology, 17, 271-301.
Burt, K.B., van Dulmen, M.H., Carlivati, J., Egeland, B., Sroufe, L.A., Forman, D.R., & Carlson, E.A. (2005). Mediating links between maternal depression and offspring psychopathology: The importance of independent data. *Journal of Child Psychology and Psychiatry, 46*, 490-499. doi: 10.1111/j.1469-7610.2004.00367.x

Carter, A.S., Garrity-Rokous, F.E., Chazan-Cohen, R., Little, C., & Briggs-Gowan, M.J. (2001). Maternal depression and comorbidity: Predicting early parenting, attachment security, and toddler social-emotional problems and competencies. *Journal of the American Academy of Child and Adolescent Psychiatry, 40*, 18-26. doi: http://dx.doi.org/10.1097/00004583-200101000-00012

Collishaw, S., Dunn, J., O'Connor, T. G., & Golding, J. (2007). Maternal childhood abuse and offspring adjustment over time. *Development and Psychopathology, 19*, 367-383.

Compas, B.E., Connor-Smith, J., & Jaser, S.S. (2004). Temperament, stress reactivity, and coping: Implications for depression in childhood and adolescence. *Journal of Clinical Child and Adolescent Psychology, 33*, 21-31. doi: 10.1207/S15374424JCCP3301_3

Crowell, J.A., Waters, E., Treboux, D., O'Connor, E., Colon-Downs, C., Feider, O., & Posada, G. (1996). Discriminant validity of the Adult Attachment Interview. *Child Development, 67*, 2584-2599. doi: 10.1111/j.1467-8624.1996.tb01876.x

Drury, S.S. (2012). Maternal sensitivity and attachment: Softening the impact of early adversity. *Journal of the American Academy of Child and Adolescent Psychiatry, 51*, 670-672.

Eley, T.C. (1999). Behavioral genetics as a tool for developmental psychology: Anxiety and depression in children and adolescents. *Clinical Child and Family Psychology Review, 2*, 21-36. doi: 10.1023/A:1021863324202

Ellis B.J., Boyce W. T., Belsky J., Bakermans-Kranenburg M.J., & van IJzendoorn M.H. (2011). Differential susceptibility to the environment: An evolutionary-neurodevelopmental theory. *Development and Psychopathology*, 23, 7-28. doi: http://dx.doi.org/10.1017/S0954579410000611

Fearon, R.P., Bakermans-Kranenburg, M.J., van IJzendoorn, M.H., Lapsley, A.M., & Roisman, G.I. (2010). The significance of insecure attachment and disorganization in the development of children’s externalizing behavior: A meta-analytic study. *Child Development, 81*, 435-456. doi: 10.1111/j.1467-8624.2009.01405.x

Field, T. (2011). Prenatal depression effects on early development: A review. *Infant Behavior and Development, 34*, 1-14. doi: http://dx.doi.org/10.1016/j.infbeh.2010.09.008

Field, T., Diego, M., & Hernandez-Reif, M. (2006). Prenatal depression effects on the fetus and newborn: A review. *Infant Behavior and Development, 29*, 445-455. doi: http://dx.doi.org/10.1016/j.infbeh.2006.03.003

Fleming, A.S., Kraemer, G.W., Gonzalez, A., Lovic, V., Rees, S., & Melo, A. (2002). Mothering begets mothering: The transmission of behavior and its neurobiology across generations. *Pharmacology, Biochemistry, and Behavior, 73*, 61-75. doi: 10.1016/s0091-3057(02)00793-1

Fleming, A.S., O’Day, D.H., & Kraemer, G.W. (1999). Neurobiology of mother-infant interactions: Experience and central nervous system plasticity across
Maternal adversity, attachment, and child temperament
development and generations. Neuroscience ND Biobehavioral Reviews, 23, 673-685. doi: http://dx.doi.org/10.1016/S0149-7634(99)00011-1

Fox, N.A., Kimmerly, N.L., & Schafer, W.D. (1991). Attachment to mother/attachment to father: A meta-analysis. Child Development, 62, 210-225. doi: 10.1111/j.1467-8624.1991.tb01526.x

Franken, I.H.A., & Muris, P. (2006). BIS/BAS personality characteristics and college students’ substance use. Personality and Individual Differences, 40, 1497-1503. doi: http://dx.doi.org/10.1016/j.paid.2005.12.005

George, C., Kaplan, N., & Main, M. (1996). Adult Attachment Interview Protocol. University of California at Berkeley.

Goldsmitth, H.H. (1996). Studying temperament via construction of the Toddler Behavior Assessment Questionnaire. Child Development, 67, 218-235. doi: 10.1111/j.1467-8624.1996.tb01730.x

Groh, A.M., Roisman, G.I., van IJzendoorn, M.H., Bakermans-Kranenburg, M.J., & Fearon, R.P. (2012). The significance of insecure and disorganized attachment for children’s internalizing symptoms: A meta-analytic study. Child Development, 83, 591-610. doi: 10.1111/j.1467-8624.2011.01711.x

Grossmann, K.E., & Grossmann, K. (1991). Attachment quality as an organizer of emotional and behavioral responses in a longitudinal perspective. London: Routledge.

Grossmann, K.E., Grossmann, K., Kindler, H., & Zimmermann, P. (2008). A wider view of attachment and exploration: The influence of mothers and fathers on the development of psychological security from infancy to young adulthood. In J. Cassidy & P. Shaver (Eds.), Handbook of attachment: Theory, research, and clinical application (2nd ed.) (pp. 857-879). New York: Guilford.

Halverson, C.H. Jr., Kohnstamm, G.A., & Martin, R.P. (1994). The developing structure of temperament and personality from infancy to adulthood. Hillsdale, NJ: Erlbaum.

Hane, A.A., & Fox, N.A. (2006). Ordinary variations in maternal caregiving influence human infants’ stress reactivity. Psychological Science, 17, 550-556. doi: 10.1111/j.1467-9280.2006.01742.x

Heim, C., & Nemeroff, C.B. (2001). The role of childhood trauma in the neurobiology of mood and anxiety disorders: Preclinical and clinical studies. Society of Biological Psychiatry, 49, 1023-1039. doi: http://dx.doi.org/10.1016/S0006-3223(01)01157-X

Hesse, E. (2008). The Adult Attachment Interview: Protocol, method of analysis, and empirical studies. In J. Cassidy & P.R. Shaver (Eds.), Handbook of attachment: Theory, research, and clinical application (2nd ed.) (pp. 552-598). New York: Guilford Press.

Holzwarth, K., & Meyer, T.D. (2006). The dysregulation of the “Behavioural Activation System”: An independent dimension. Personality and Individual Differences, 41, 319-328. doi: dx.doi.org/10.1016/j.paid.2005.12.020

Johnson, S.L., Turner, R.J., & Iwata, N. (2003). BIS/BAS levels and psychiatric disorder: An epidemiological study. Journal of Psychopathology and Behavioural Assessment, 25, 25-36.
Lang, A.J., Gartstein, M.A., Rodgers, C.S., & Lebeck, M.M. (2010). The impact of maternal childhood abuse on parenting and infant temperament. *Journal of Child and Adolescent Psychiatric Nursing, 23*, 100-110. doi: 10.1111/j.1744-6171.2010.00229.x

Larose, S., & Bernier, A. (2001). Social support processes: Mediators of attachment state of mind and adjustment in late adolescence. *Attachment and Human Development, 3*, 96-120. doi: 10.1080/14616730010024762

Loxton, N.J., & Dawe, S. (2001). Alcohol abuse and dysfunctional eating in adolescent girls: The influence of individual differences in sensitivity to reward and punishment. *The International Journal of Eating Disorders, 29*, 455-462. doi: 10.1002/eat.1042

Maestripieri, D. (1999). The biology of human parenting: Insights from nonhuman primates. *Neuroscience and Biobehavioral Reviews, 23*, 411-422. doi: http://dx.doi.org/10.1016/S0149-7634(98)00042-6

Main, M., & Goldwyn, R. (1998). *Adult attachment scoring and classification system*. University of California at Berkeley.

Malphurs, J.E., Raag, T., Field, T., Pickens, J., & Pelaez-Nogueras, M. (1996). Touch by intrusive and withdrawn mothers with depressive symptoms. *Early Development and Parenting, 5*, 111-115. doi: 10.1002/(SICI)1099-0917(199606)5:2<111::AID-EDP122>3.0.CO;2-

Martins, C., & Gaffan, E.A. (2000). Effects of early maternal depression on patterns of infant-mother attachment: A meta-analytic investigation. *Journal of Child Psychology and Psychiatry, 41*, 737-746. doi: 0.1111/1469-7610.00661

McElwain, N.L., Holland, A.S., Engle, J.M., & Wong, M.S. (2012). Child anger proneness moderates associations between child-mother attachment security and child behavior with mothers at 33 months. *Journal of Family Psychology, 26*, 76-86. doi: 10.1037/a0026454

McGoron, L., Gleason, M.M., Smyke, A.T., Drury, S.S., Nelson, I., Charles, A., Gergas, M.C., ... Zeanah, C.H. (2012). Recovering from early deprivation: Attachment mediates effects of caregiving on psychopathology. *Journal of the American Academy of Child and Adolescent Psychiatry, 51*, 683-693. doi: http://dx.doi.org/10.1016/j.jaac.2012.05.004

Meaney, M.J. (2001). Maternal care, gene expression, and the transmission of individual differences in stress reactivity across generations. *Annual Review in Neuroscience, 24*, 1161-1192. doi: 10.1146/annurev.neuro.24.1.1161

Mesman, J., Stoel, R., Bakermans-Kranenburg, M.J., van Ijzendoorn, M.H., Juffer, F., Koot, H.M., & Alink, L.R.A. (2009). Predicting growth curves of early childhood externalizing problems: Differential susceptibility of children with difficult temperament. *Journal of Abnormal Child Psychology, 37*, 625-636.

Moss, E., Bureau, J.F., Cyr, C., Mongeau, C., & St-Laurent, D. (2004). Correlates of attachment at age 3: Construct validity of the preschool attachment classification system. *Developmental Psychology, 40*, 323-334. doi: 10.1037/0012-1649.40.3.323
Moss, E., Dubois-Comtois, K., Cyr, C., Tarabulsy, G.M., St-Laurent, D., & Bernier, A. (2011). Efficacy of a home-visiting intervention aimed at improving maternal sensitivity, child attachment, and behavioral outcomes for maltreated children: A randomized control trial. *Development and Psychopathology, 23*, 195-210. doi: http://dx.doi.org/10.1017/S0954579410000738

Murray, L., Fiori-Cowley, A., Hooper, R., & Cooper, P. (1996). The impact of postnatal depression and associated adversity on early mother-infant interactions and later infant outcome. *Child Development, 67*, 2512-2526. doi: 10.1111/j.1467-8624.1996.tb01871.x

Newman, J.P., Wallace, J.F., Schmitt, W.A., & Arnett, P.A. (1997). Behavioral inhibition system functioning in anxious, impulsive and psychopathic individuals. *Personality and Individual Differences, 23*, 583-592. doi: http://dx.doi.org/10.1016/S0191-8869(97)00078-0

Pederson, D.R., & Moran, G. (1995). A categorical description of infant-mother relationships in the home and its relation to Q-sort measures of infant-mother interaction. In E. Waters, et al. (Eds.), *New Growing Points of Attachment Theory and Research*. Monographs of the Society for Research in Child Development, 60 (Serial no. 244, pp.111-132).

Pluess, M., & Belsky, J. (2011). Prenatal programming of postnatal plasticity? *Development and Psychopathology, 23*, 29-38. doi:10.1017/S0954579410000623

Preacher, K.J., Curran, P.J., & Bauer, D.J. (2006). Probing interactions in multiple linear regression, latent curve analysis, and hierarchical linear modeling: Interactive calculation tools for simple intercepts, simple slopes, and regions of significance. http://www.quantpsy.org

Rothbart, M.K., & Hwang, J. (2002). Measuring infant temperament. *Infant Behavior and Development, 25*, 113-116. doi: http://dx.doi.org/10.1016/S0163-6383(02)00109-1

Rubin, K.H., Both, L., Zahn-Waxler, C., Cummings, E.M., & Wilkinson, M. (1991). The dyadic play behaviors of preschoolers with depressed versus well mothers. *Development and Psychopathology, 3*, 243-251. doi: http://dx.doi.org/10.1017/S0954579400005289

Sagi, A., van IJzendoorn, M.H., Scharf, M., Koren-Karie, N., Joels, T., & Mayselss, O. (1994). Stability and discriminant validity of the Adult Attachment Interview: A psychometric study in young Israeli adults. *Developmental Psychology, 30*, 771-777. doi: 10.1037/0012-1649.30.5.771

Saudino, K.J. (2009). The development of temperament from a behavioral genetics perspective. *Advances in Child Development and Behavior, 37*, 201-231.

Sher, K.J., & Trull, T.J. (1994). Personality and disinhibitory psychopathology: Alcoholism and antisocial personality disorder. *Journal of Abnormal Psychology, 103*, 92-102. doi: 10.1037/0021-843X.103.1.92

Steele, H., & Steele, M. (1994). Intergenerational patterns of attachment. In K. Bartholomew & D. Perlman. *Intergenerational patterns of attachment. Attachment Processes in Adulthood* (pp. 93-120). London, England: Jessica Kingsley Publishers.

Tarabulsy, G.M., Larose, S., Bernier, A., Trottier-Sylvain, K., Girard, D., Vargas, M., & Noël, C. (2012). Attachment states of mind in late adolescence and the quality
and course of romantic relationships in adulthood. *Attachment and Human Development, 14*, 621-643. doi: 10.1080/14616734.2012.728358

van Aken, C., Junger, M., Verhoeven, M., van Aken, M.A.G., & Dekovic, M. (2007). The interactive effects of temperament and maternal parenting on toddlers’ externalizing behaviours. *Infant and Child Development, 16*, 553-572.

van IJzendoorn, M.H., Bard, K.A., Bakermans-Kranenburg, M.J., & Ivan, K. (2009). Enhancement of attachment and cognitive development of young nursery-reared chimpanzees in responsive versus standard care. *Developmental Psychobiology, 51*, 173-185. doi: 10.1002/dev.20356

van IJzendoorn, M.H., Vereijken, C.M.J.L., Bakermans-Kranenburg, M.J., & Riksen-Walraven, J.M. (2004). Assessing attachment security with the Attachment Q-Sort: Meta-analytic evidence for the validity of the observer AQS. *Child Development, 75*, 1188-1213. doi: 10.1111/j.1467-8624.2004.00733.x

Vaughn, B.E., Bost, K.K., & van IJzendoorn, M.H. (2008). Attachment and temperament: Additive and interactive influences on behavior, affect, and cognition during infancy and childhood. In J. Cassidy & P.R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical application (2nd ed.)* (pp. 192-216). New York: Guilford Press.

Waters, E. (1995). Appendix A: The Attachment Q-SET (Version 3.0). *Monographs of the Society for Research in Child Development, 60*, 234-246.

Whipple, N., Bernier, A., & Mageau, G.A. (2011). A dimensional approach to maternal attachment state of mind: Relations to maternal sensitivity and maternal autonomy-support. *Developmental Psychology, 47*, 396-403. doi: 10.1037/a0021310

Received: 30 January 2013
Revision Received: 11 March 2013
Accepted: 2 May 2013