

Development and Aging

From trust in caregivers' support to exploration: The role of openness to negative affect and self-regulation

JOKE HEYLEN,¹ RUDI DE RAEDT,² MATTHEW D. ROCKLAGE,³ RUSSELL H. FAZIO,⁴ MICHAEL W. VASEY⁴ and GUY BOSMANS¹

¹Parenting and Special Education Research Group, KU Leuven, Belgium

²Department of Experimental Clinical and Health Psychology, Ghent University, Belgium

³Kellogg School of Management, Northwestern University, USA

⁴Department of Psychology, Ohio State University, USA

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Attachment theory assumes that trust in caregivers' support and exploration are closely related. Little research tried to investigate this link, nor focuses on mechanisms that might explain this association. The present studies examined whether trust is related to exploration through a serial indirect effect of openness to negative affect and self-regulation. In Study 1, 212 children, aged 8–13, completed questionnaires assessing trust, openness to negative affect, self-regulation and exploration. The results showed that trust predicted exploration, but only to the extent to which openness to negative affect and self-regulation were involved too. Study 2 refined these findings ($n = 59$, aged 9–12) using a behavioral measure of openness to negative affect and exploration, and with mother-reported self-regulation. Replicating this serial indirect effect of openness to negative affect and self-regulation with multiple informants and methods, the present studies advance our understanding of how trust might foster exploration in preadolescence.

Key words: Attachment, exploration, openness to negative affect, self-regulation, preadolescence.

Joke Heylen, Parenting and Special Education Research Group, KU Leuven, Leopold Vanderkelenstraat 32 – bus 3765, Leuven, 3000, Belgium. Tel: 0016 37 30 69; Fax: 0032 16 32 59 33; e-mail: joke.heylen1@kuleuven.be

INTRODUCTION

Exploration is an essential precursor of adaptive development (Kashdan, Gallagher, Silvia *et al.*, 2009; Voss & Keller, 1983). According to Ainsworth (1972) exploration arises in children who have trust in caregivers' support, which develops in the context of secure attachment relationships. From the onset of attachment theory, Ainsworth (1972) claimed that children's attachment security can only be fully understood in the balance between their need for support, and their need to explore the environment. While several researchers have demonstrated that children who have more trust in caregivers' support more easily use their caregivers as a safe haven to seek support from in times of distress (e.g., Ainsworth, Bell & Stayton, 1972; Bosmans, Braet, Heylen & De Raedt, 2015; Dujardin, Santens, Braet *et al.*, 2016), less is known about how trust in caregivers' support allows children to use their caregivers as a secure base from which to explore (Ainsworth, 1963; Grossmann, Grossmann, Kindler & Zimmermann, 2008). Therefore, Grossmann *et al.* (2008) stressed the importance of attending to the exploration side of the attachment-exploration balance. Studying the association between trust in caregivers' support and exploration seems to be especially relevant in preadolescence. At this age, the principal developmental task is to build a sense of cognitive and social competence (Erikson, 1950), which requires that children are willing to explore their academic and social environment. Hence, more research is needed to better understand how trust in caregivers' support can foster exploration in preadolescence.

Grossmann *et al.* (2008) predicted that exploration arises from children's ability to organize their emotions open-mindedly, and

from their ability to regulate their attention and behavior flexibly. As both abilities are assumed to be developed in the context of a secure attachment relationship (Bowlby, 1988; Fonagy & Target, 2002), and as both abilities are assumed to be closely linked (Inzlicht & Legault, 2014), in the present research, we outlined a model that examines a serial indirect effect linking trust in caregivers' support to exploration first through openness to negative affect and then through self-regulation (see Fig. 1). Specifically, in two different studies we investigated the prediction that children who have more trust in caregivers' support would be more open to negative affect, that more openness to negative affect would be related to children's ability to regulate their attention and behavior, and that this ability in turn further would contribute to children's willingness to explore the world. The following paragraphs briefly describe theory and data supporting each of these hypothesized links.

Trust in caregivers' support and exploration

A central tenet of attachment theory is that children's repeated experiences with caregivers' support during proximity-seeking and exploration translate in trust about caregivers' availability and support (Bowlby, 1969) or the belief that caregivers will be available if needed. According to attachment theory, trust plays an important role in future adaptive development (Bosmans & Kerns, 2015), because it stimulates children to seek caregiver support during distress (Bosmans, Dujardin, Field, Saleminck & Vasey, 2015; Main & Cassidy, 1988), but also because it stimulates children to more freely explore new information in their

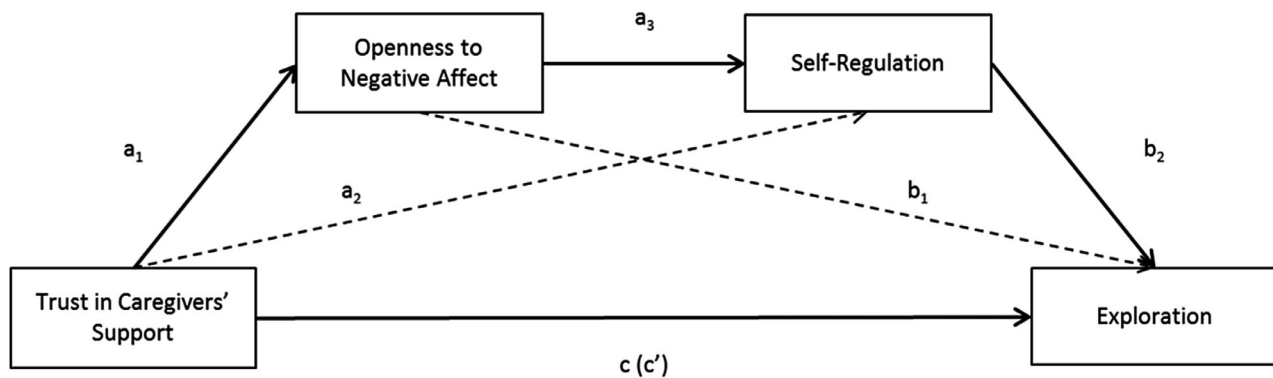


Fig. 1. Theoretical model depicting the serial indirect effect between trust in caregivers' support and exploration through openness to negative affect and self-regulation (the solid lines reflect the serial indirect effect of interest).

environment (Bosmans, Dujardin, Bosmans, De Raedt & Braet, 2015; Dujardin *et al.*, 2015; Feeney & Van Vleet, 2010). Trust fosters exploration (Bowlby, 1969) because children who have trust in caregivers' support believe that when exploration leads to elevated levels of distress as a consequence of getting hurt, scared or sad, their caregivers will be there for them to provide proximity and support (Bowlby, 1973; Grossmann *et al.*, 2008). Therefore, in the serial indirect effect model outlined in the current studies, trust in caregivers' support is expected to be linked with enhanced exploration in preadolescence (see Fig. 1, c -path).

Exploration has been described as a multidimensional construct (Spielberger & Starr, 1994), comprising both the willingness to embrace and seek out knowledge and new experiences, also known as curiosity (Kashdan *et al.*, 2009), and the behavioral manifestation of exploration reflected in the investigation of novel stimuli and environments (Bijou, 1998). As both aspects of exploration have been linked with a wide range of adaptive developmental outcomes (Kashdan *et al.*, 2009; Voss & Keller, 1983), the current studies focused on both the link between trust and exploration operationalized as curiosity (Study 1) and the link between trust and a component of the behavioral manifestation of exploration (Study 2) to test whether children's openness to negative affect and capacity for self-regulation could explain the link between trust in caregivers' support and enhanced exploration.

Trust in caregivers' support and openness to negative affect

With regard to the link between trust in caregivers' support and openness to negative affect (see Fig. 1, a_1 -path), Bowlby (1980, 1988) proposed that children who have more trust are better able to acknowledge and accept sensations of distress open-mindedly. According to attachment theory, children high in trust are less likely to experience negative information as a threat, but rather as an opportunity to learn (Shaver & Mikulincer, 2007). Children who lack trust are less open to negative information. Instead, they are more likely to defensively exclude this information. This means that they avoid the cognitive processing of negative information to avoid (re)experiencing psychological pain (Bowlby, 1988; Dykas & Cassidy, 2011).

Two lines of research offered evidence for such a link between trust in caregivers' support and openness to negative affect. On

the one hand, experimental studies showed that trust is related to a more open cognitive processing of negative affect-laden material in both (young) adulthood (Dewitte & De Houwer, 2008; Zeijlmans van Emmichoven, van Ijzendoorn, de Rooter & Brosschot, 2003), and preadolescence (Vandevivere, Braet, Bosmans, Mueller & De Raedt, 2014b). On the other hand, research with adults demonstrated that trust is associated with more mindfulness, a stance of non-judgmental, present-moment awareness (e.g., Pepping, O'Donovan & Davis, 2014; Shaver, Lavy, Saron & Mikulincer, 2007). Mindfulness has been linked in previous research with a more open and accepting stance toward emotions and material with a negative content (e.g., Arch & Craske, 2006; Kumar, Feldman & Hayes, 2008). Taken together, these results support the current studies' prediction that trust in caregivers' support is linked with openness to negative affect. Hence, in the current studies we focused on the link between trust and both self-reported mindfulness (Study 1) and the open cognitive processing of negative material in a behavioral paradigm (Study 2).

Openness to negative affect and self-regulation

With regard to the current studies' prediction that openness to negative affect is linked with self-regulation (see Fig. 1, a_2 -path), Inzlicht and Legault (2014) have conjectured that openness to negative affect can be considered an essential precursor of self-regulation, the ability to regulate attention and behavior (Carver & Scheier, 2011). From a temperament framework, self-regulation has been studied as effortful control, the capacity to override a dominant response in order to perform a more adaptive subdominant response (Rothbart, 1989). Individual differences in effortful control are commonly assessed by questionnaires (Ellis & Rothbart, n.d.; Lonigan & Phillips, 2002), which have the advantage of taking into account self- or other's perception of an individual's self-regulation abilities. As perceived effortful control is an important predictor of later (mal)adjustment (Eisenberg, Spinrad & Eggum, 2010), in the current studies self-regulation was operationalized as child-reported (Study 1) and mother-reported (Study 2) effortful control.

According to Inzlicht and Legault (2014) self-regulation is instigated whenever there is a conflict between intended and actual behavior (Inzlicht, Bartholow & Hirsh, 2015). Noticing that a current state deviates from what is ideal, is not affectively

neutral (Carver & Scheier, 2011), rather it is associated with an experience of negative affect. Inzlicht and Legault (2014) proposed that this negative affective experience will recruit self-regulation in order to reach a desired goal because people are naturally motivated to avoid negative affect (Elliot, 2008). However, whether or not negative affect recruits self-regulation depends on whether people are able to acknowledge and accept the sensation of distress open-mindedly. Thus, people who experience their affective states, especially the aversive ones, with an attitude of openness and acceptance, may be more sensitive and alert to when self-regulation is needed. However, when one approaches negative affect with defense, judgment and suppression, this may hamper successful self-regulation. Therefore, Inzlicht and Legault (2014) predicted that a stance of openness to negative affect strengthens the capacity to regulate the self.

Several studies in adults supported this prediction. For example, people who were more open to negative feedback in order to learn and grow, were more successful self-regulators both on experimental tasks (e.g., Legault & Inzlicht, 2013; Plaks & Chasteen, 2013) and in real life situations (Mukhopadhyay & Johar, 2005; Teixeira *et al.*, 2010). Furthermore, mindful individuals demonstrated enhanced self-regulation on several experimental tasks (Wenk-Sormaz, 2005). Likewise, trait mindfulness was related to self-regulation behavior as measured with a self-report questionnaire (Lakey, Campbell, Brown & Goodie, 2007). To date, however, research on preadolescence on the link between openness to negative affect and self-regulation is still sparse. Nevertheless, preliminary cross-sectional (de Bruin, Zijlstra & Bögels, 2014) and intervention (van der Oord, Bögels & Peijnenburg, 2012; Schonert-Reichl, Oberle, Lawlor, Abbott, Thomson & Diamond, 2015) studies, suggested that, also at this age, more mindfulness is linked with a stronger ability to regulate attention and behavior. Taken together, these studies support our prediction that children who show more openness to negative affect would be better able to regulate themselves.

Self-regulation and exploration

With regard to the predicted link between self-regulation and exploration (see Fig. 1, b_2 -path), Kashdan, Rose and Fincham (2004) proposed that the deployment of self-regulatory resources is an essential prerequisite for exploration. Childhood research offered some support for this link. For example, Arend, Gove and Sroufe (1979) showed that preschoolers' ability to regulate their behavior flexibly was related to their willingness to approach and manipulate new objects in an experimental task. Also, in a questionnaire study Nota, Ginevra and Soresi (2012) found that adolescents' self-regulation was associated with their propensity to explore the environment. Additional support comes from neurocognitive research demonstrating that exploration involves stronger activation of brain regions associated with attentional and behavioral regulation (e.g., Daw, O'Doherty, Dayan, Seymour & Dolan, 2006; Laureiro-Martínez, Brusoni, Canessa & Zollo, 2015). Taken together, these results provide initial evidence for the current studies' prediction that self-regulation would be related to exploration.

A serial indirect effect of openness to negative affect and self-regulation in the link between trust and exploration

Although this overview suggests that previous research supports each separate predicted association between the variables of the currently tested serial indirect effect, the present paper aimed to provide the first test of the hypothesis that combining these separate associations could be helpful to explain the link between trust and exploration (see Fig. 1). More specifically, building on attachment theory and Grossmann *et al.* (2008) view on exploration, we outlined a model in which trust in caregivers' support would be related to exploration through a serial indirect effect of openness to negative affect and self-regulation. In two separate studies we tested the hypothesis that children who had more trust in caregivers' support would be more eager to explore the world because more trust would foster openness to negative affect, which in turn would be related to increased self-regulation, further contributing to children's willingness to explore (see Fig. 1).

Both studies aimed to investigate the current hypothesis in a preadolescent general population sample with a well-validated self-report measure of trust in caregivers' support. We focused on trust in the availability and support of mother as for most children mother remains the primary attachment figure in this age period (Cassidy, 2008; Kerns, Tomich & Kim, 2006). In Study 1, openness to negative affect was operationalized with a mindfulness questionnaire. Furthermore, children reported about their self-regulation with an effortful control questionnaire and about their exploration with a curiosity scale. In Study 2, openness to negative affect was assessed using a behavioral measure to grasp children's open cognitive processing of negative material. The same behavioral task was used to investigate a component of the behavioral manifestation of exploration, and self-regulation was again operationalized as effortful control, this time reported by mother.

STUDY 1: METHOD

Participants

The sample consisted of 212 children (112 boys) with ages ranging from 8 to 13 years old ($M = 9.99$, $SD = 0.97$). In this urban community sample 172 (81.1%) children lived together with both biological parents, 24 (11.3%) children had divorced parents, five (2.4%) children had a deceased father, and three (1.4%) children lived in a different family structure (information on family structure was missing for eight (3.8%) children). Furthermore, all children reported attachment toward their biological mother, except for two (0.9%) children who reported attachment toward their stepmother, and two (0.9%) children who reported attachment toward their foster parents (information on the nature of the relationship with their mother was missing for 13 (6.1%) children). No data on maternal education were available.

Measures

Trust in caregivers' support. Trust in caregivers' support was assessed using the trust subscale of the People in My Life Questionnaire (PIML; Ridenour, Greenberg & Cook, 2006). The PIML is a self-report questionnaire designed to assess children's internal representations of their relationships with their attachment

figures. It is a child friendly version of the Inventory of Parent and Peer Attachment (IPPA; Armsden & Greenberg, 1987), adapted for administration to children from 10 to 12 years old. This measure has been widely used, has good psychometrics (Allen, in press), and has shown convergent and concurrent validity (e.g., Armsden & Greenberg, 1987). In the present study, only the questions of the trust subscale regarding mother were used. Trust in maternal support is conceptualized as the positive affective or cognitive experiences of trust in the availability and responsiveness of mother. Children responded to 10 items (e.g., “I can count on my mother to help me when I have a problem”) on a four-point Likert-scale ranging from 1 (*almost never true*) to 4 (*almost always true*). The total trust score ranged from 10 to 40, with higher scores reflecting more trust in maternal support. The trust scale has shown good internal consistency and concurrent and convergent validity have been demonstrated by links with parenting behaviors, support seeking behavior in distressed children and the attentional processing of mother (Bosmans *et al.*, 2015; Bosmans, Braet, Koster & De Raedt, 2009; Dujardin *et al.*, 2016). In the current study, the trust scale was found to have good reliability (Cronbach’s alpha = 0.84).

Openness to negative affect. Openness to negative affect was operationalized with the Child and Adolescent Mindfulness Measure (CAMM; Greco, Baer & Smith, 2011). The CAMM is a self-report questionnaire designed to assess present-moment awareness and non-judgmental, non-avoidant responses to thoughts and feelings in children and adolescents from 10 to 16 years old. The items of the CAMM are originally derived from the Kentucky Inventory of Mindfulness Skills for adults (Baer, Smith & Allen, 2004) to be able to measure the multidimensional concept of mindfulness in children. The CAMM consists of 10 items (e.g., “I keep myself busy so I don’t notice my thoughts or feelings”). [R], which the respondents answered using a five-point Likert-scale ranging from 0 (*never true*) to 4 (*always true*). In order to obtain a total CAMM-score, all item scores were reverse coded and summed up. The minimum score was 0 and the maximum score was 40, with higher scores reflecting higher tendencies to be mindful in everyday life. The CAMM (de Bruin *et al.*, 2014; Greco *et al.*, 2011; Kuby, McLean & Allen, 2015) has shown good internal consistency, and satisfactory construct and incremental validity. Reliability of the CAMM in the current study was acceptable (Cronbach’s alpha = 0.70).

Self-regulation. Self-regulation was assessed with the Effortful Control Scale (ECS; Lonigan & Phillips, 2002). The ECS is a self-report questionnaire designed to assess the behavioral and attentional component of self-regulation in children from 8 to 17 year old. The ECS consists of 24 self-report items, which are rated on a 5-point scale ranging from 1 (*not at all like me*) to 5 (*very much like me*) with regard to how much each item describes the individual most of the time. The items tap persistence/lack of distractibility (e.g., “I start many things that I don’t finish”). [R] and “Even little things distract me”. [R] and lack of impulsivity (e.g., “I can easily stop an activity when told to do so”). The items can be adequately summed in a total effortful control score ranging from 24 to 120 (e.g., Verstraeten, Vasey, Raes & Bijttebier, 2010), with higher scores indicating more effortful

control. Research shows the ECS has excellent internal consistency and convergent validity of the ECS is suggested for example by strong correlations with parent-report measures of child effortful control (Verstraeten, Vasey, Claes & Bijttebier, 2010). In the current study, the reliability of the ECS was good (Cronbach’s alpha = 0.75).

Exploration. Exploration was measured with the Curiosity and Exploration Inventory-II (CEI-II; Kashdan *et al.*, 2009). The CEI-II is a self-report questionnaire designed to assess curiosity defined as recognizing, embracing and seeking out challenging and novel experiences. The original items of the CEI-II were piloted in a group of five 9-year-old children who were asked to explain the items and to identify words that were difficult to understand. Five items contained words that were either too abstract (e.g., to grow as a person) or too difficult (e.g., unfamiliar). Together with these children, the researcher looked for alternative formulations that allowed the children to better understand the meaning of the items. The final questionnaire includes 10 items tapping: (1) stretching, the motivation to seek out knowledge and new experiences (e.g., “I am at my best when doing something that is complex or challenging”); and (2) embracing, the willingness to embrace the novel, uncertain, and unpredictable nature of everyday life (e.g., “Everywhere I go, I am out looking for new things or experiences”). Children had to indicate for each item how much the item reflects the way they generally feel and behave on a five-point Likert-scale ranging from 0 (*very slightly*) to 4 (*extremely*). A composite score was constructed by summing up all items. The total CEI-II score ranged from 0 to 40, with higher scores indicating more curiosity. The CEI-II has shown sufficient internal consistency and construct validity in both adult and adolescent samples (Jovanovic & Brdaric, 2012; Kashdan *et al.*, 2009). In the current study, the child friendly version of the CEI-II had good reliability (Cronbach’s alpha = 0.75).

Procedure. Using a letter distributed in the classrooms of the fourth, fifth, and sixth grades of urban elementary schools. At the fourth grade, children have mastered sufficient reading and comprehension skills to read and understand the questionnaire questions. Children were invited to participate in a questionnaire study on self-regulation and the parent-child relationship. The letter informed children and their parents about the content and procedure of the study and asked for written parental permission. Children for whom informed consent was obtained, answered the questionnaires collectively during regular school hours. The researcher monitored the children while they filled out the measures and gave children the opportunity to ask for clarifications whenever necessary. Data from two children were removed from the analyses because during the collective administration of the questionnaires we observed that these children arbitrarily filled out the questionnaires within an unrealistically short period of time. Including these cases in the analyzes did not substantially alter any of the results. The current study was approved by the university’s ethical committee.

Data-analytic strategy. All the analyses were carried out with the statistical package for social sciences (IBM SPSS Statistics 23). Descriptive statistics were checked and zero-order correlations

were calculated among all the main variables of the study. To test the hypothesis (see Fig. 1) that children who have more trust in caregivers' support would be more eager to explore the world because more trust would foster openness to negative affect (mindfulness; a_1 -path), which in turn would be related to increased self-regulation (effortful control; a_3 -path), further contributing to children's willingness to explore (curiosity; b_2 -path), the SPSS Macro provided by Preacher and Hayes (2004) was used. According to the guidelines of MacKinnon, Lockwood and Williams (2004) the significance of and the serial indirect effect of interest ($a_1a_3b_2$ -path) was computed with a non-parametric resampling method (bias-corrected bootstrap; Preacher & Hayes, 2008). This approach has better control on Type I error, and does not rely on the assumption of normal distribution of the indirect effect, in contrast to the causal steps approach of Baron and Kenny (1986) and the Sobel test (Sobel, 1982). From the original sample, 10,000 resamples were drawn with replacement to derive a point estimate ($a_1a_3b_2$ -path) and the 95% confidence interval (CI) for the serial indirect effect. If the confidence interval did not contain zero, the serial indirect effect was considered significant. The main hypothesis of the current study concerned the serial indirect effect ($a_1a_3b_2$ -path). Therefore, in accordance with the recommendations of Mathieu and Taylor (2006), we first tested the significance of the main indirect effect of interest. Next, the single indirect effects belonging to the same statistical model (a_1b_1 -path; a_2b_2 -path) were also estimated using the non-parametric resampling method. Finally, the point estimates of the total (c-path) and direct (c'-path) were computed.

Results and discussion

Preliminary analyses. Overall, less than 3% of the data at the scale level of the total dataset were missing. As these data were missing completely at random (Little's MCAR test was not significant, $\chi^2(627) = 667.09$, $p = 0.130$), we used the expectation maximization method to estimate the missing data, resulting in $n = 210$ for all subsequent analyses. Furthermore, pairwise deletion of missing data did not substantially alter the results. ANOVAs revealed no associations between gender and the variables of interest, $F(1, 209)s < 1.94$, $p > 0.165$.

Descriptive statistics and correlational analyses. Means and standard deviations of, and correlations between the key variables under study are shown in Table 1. Contrary to the prediction, the correlation between trust and curiosity was not significant. However, in line with the hypothesis, trust was significantly positively correlated with mindfulness. Furthermore, a significant positive correlation emerged between mindfulness and effortful control¹, and also effortful control and curiosity were significantly positively correlated.

Mediation analyses. According to the recommendations of Mathieu and Taylor (2006), we first tested the significance of the serial indirect effect of interest, namely that trust would explain curiosity through mindfulness and effortful control ($a_1a_3b_2$ -path, Fig. 2). Fig. 2 depicts the unstandardized regression coefficients for the different paths of the model, and the point estimates and the bias corrected 95% CIs for the indirect effects are summarized

Table 1. Correlations, means, and standard deviations: Study 1

Measure	1	2	3	4
1. Trust in caregivers' support	1			
2. Mindfulness	0.23***	1		
3. Effortful control	0.26***	0.24***	1	
4. Curiosity	0.08	-0.23***	0.28***	1
<i>M</i>	35.49	23.62	85.44	25.04
<i>SD</i>	4.19	5.96	9.87	5.85

Note: *** $p < 0.001$.

in Table 2. In line with the hypothesis, the results demonstrated a significant serial indirect effect between trust and curiosity through mindfulness and effortful control. Moreover, all the single paths of this effect were in the expected direction. Trust significantly positively predicted mindfulness (a_1 -path), which in turn, was significantly related to increased effortful control (a_3 -path), significantly contributing to more curiosity (b_2 -path) (see Footnote 1).

In contrast to what was expected, neither the total (c-path, Fig. 2), nor the direct (c'-path, Fig. 2) effect between trust and curiosity was significant. Moreover, the simpler single indirect effects of the serial indirect effect model were also significant. On the one hand, effortful control significantly indirectly linked trust to curiosity, whereby trust positively predicted effortful control, which was significantly related to more curiosity (a_2 - and b_2 -path). This finding in line with a recent study of Heylen, Vasey, Dujardin *et al.* (2017) suggesting that trust enhances children's effortful control in preadolescence. On the other hand the results indicated a significant indirect effect of mindfulness on the relationship between trust and curiosity, with trust predicting more mindfulness, which in turn, negatively predicted curiosity (a_1 - and b_1 -path). The latter finding is somewhat surprising, as the only study to our knowledge that explored the link between mindfulness and curiosity, did not find a significant association between those variables (Kashdan *et al.*, 2009). However, one explanation might be that mindfulness as such, by fostering a general stance of non-judgmental, present-moment awareness, does not per se direct a person to seek out knowledge and experiences beyond the present moment, potentially running counter to a curious attitude toward the world.

In sum, according to the recommendations of Mathieu and Taylor (2006), a serial indirect effect model was supported. In line with the prediction, trust was linked with curiosity through a serial indirect effect of mindfulness and effortful control. Also, the simpler indirect effects reached significance, indicating a need for additional research to further refine the relationships in this serial indirect effect model, and to better understand how trust in caregivers' support can foster exploration in preadolescence. Furthermore, an important limitation reduces the interpretability of the findings. Specifically, because all variables were measured with self-report questionnaires the results could have been inflated due to reporter bias (Paulhus, 1991) or shared method variance (Podsakoff, MacKenzie, Lee & Podsakoff, 2003). In an attempt to overcome this limitation, and in order to replicate and further refine the serial effect model, a second study was conducted with a multi-informant, multi-method approach using mother-reported

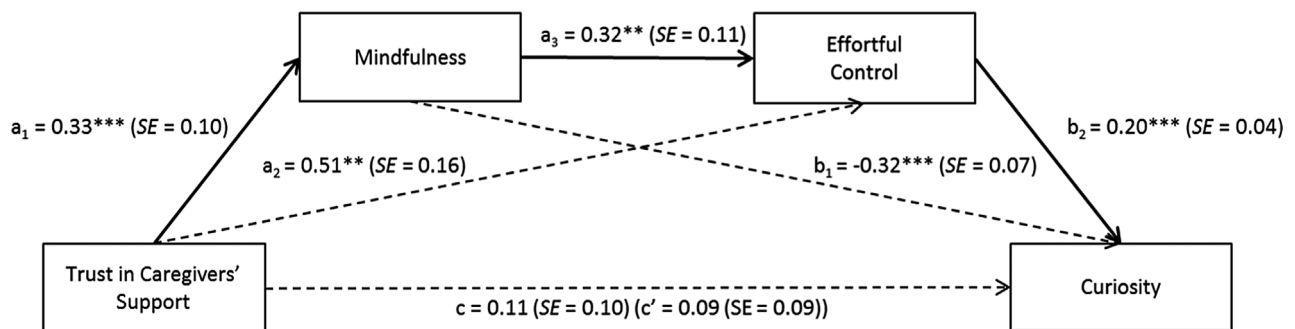


Fig. 2. Unstandardized regression coefficients for the different paths of the mediational analysis of the links between trust in caregivers' support and curiosity through mindfulness and effortful control in Study 1.

Table 2. Unstandardized point estimates of the indirect effects of the mediation analysis of the link between trust in caregivers' support and curiosity in Study 1

	Point estimate indirect effect	Boot standard error	Bias corrected 95% CI of indirect effect
a_1b_1	-0.1046	0.0381	[-0.1949; -0.0439]
a_2b_2	0.1011	0.0451	[0.0310; 0.2098]
$a_1a_3b_2$	0.0207	0.0114	[0.0053; 0.0532]

Note: a_1b_1 , Trust → Mindfulness → Curiosity; a_2b_2 , Trust → Effortful Control → Curiosity; $a_1a_3b_2$, Trust → Mindfulness → Effortful Control → Curiosity.

self-regulation and a behavioral measure for the operationalization of openness to negative affect and exploration.

STUDY 2: METHOD

Participants

The sample consisted of 59 children (27 boys) with ages ranging from 9 to 12 years old ($M = 10.39$, $SD = 0.95$). In this urban community sample 46 (78.0%) children lived together with both biological parents, 11 (18.6%) children had divorced parents, one (1.7%) child had a deceased father, and one (1.7%) child lived in a different family structure. Furthermore, all children reported attachment toward their biological mother. Regarding maternal level of education, one (1.7%) mother had an elementary school degree, eight (13.6%) mothers had a high school degree, 29 (49.2%) mothers had a post high school technical training or a technical bachelor's degree, and 21 (35.6%) had a master's degree.

Measures

Trust in caregivers' support. Like in Study 1, children's trust in maternal support was assessed using the trust-subscale of the PIML (Ridenour et al., 2006). In the current study, the trust-scale was found to have sufficient reliability (Cronbach's $\alpha = 0.71$).

Self-regulation. Self-regulation was assessed through parent-reports on the Early Adolescent Temperament Questionnaire – Revised (EATQ-R; L. K. Ellis & Rothbart, 2001). The EATQ-R is designed to measure temperament in children and adolescents from 9 to 15 years of age. It is a revised and updated version of the Early Adolescent Temperament Questionnaire (EATQ; Capaldi & Rothbart, 1992). For the current study, only the 18 items of the effortful control factor were used, which tap activation control (e.g., "If my child has a hard assignment to do, he gets started right away"), attentional control (e.g., "It is easy for my child to

really concentrate on homework problems"), and inhibitory control (e.g., "When someone tells my child to stop doing something, it is easy for him/her to stop"). Mothers responded to the items on a 5-point Likert-scale ranging from 1 (*almost never true*) to 5 (*almost always true*). Items were reverse scored when necessary, and a total mean score was calculated, with higher scores indicating more effortful control. The effortful control scale of the EATQ-R has demonstrated sufficient reliability (Ellis & Rothbart, n.d.; Oldehinkel, Hartman, De Winter, Veenstra & Ormel, 2004) and predictive validity (Ellis, 2002; Muris & Meesters, 2009) in several studies. The convergent validity of the effortful control scale has been suggested by links with child-reported and performance based measures of effortful control (Verstraeten, Braet, Bosmans, et al., 2010). In the current study, the effortful control factor had good reliability (Cronbach's $\alpha = 0.85$).

Openness to negative affect and exploration. Openness to negative affect and exploration were both measured with the BeanFest Task for Children (Pietri, Fazio & Shook, 2012, 2013). This is an adapted version of the BeanFest Task of Fazio, Eiser and Shook (2004), a behavioral paradigm designed to investigate individuals' processing of positive and negative information with a focus on attitude formation and generalization to novel objects.

The BeanFest Task is a computer game in which participants try to get as many points as possible by approaching and avoiding positive and negative stimuli, respectively. Participants can accumulate points by accepting stimuli having a positive valence (approach) and rejecting those having a negative valence (avoid). The stimuli are depictions of beans, which visually differ from each other in two ways, by shape (ranging from circle to oblong) and number of speckles (ranging from 1 to 10). Combining these properties results in a 10 by 10 matrix of 100 different beans. In the current study the simplified matrix employed in the second study of Pietri et al. (2012) was used to ensure that children would learn the value of the beans sufficiently (see Fig. 3). By using 10 beans from each of the four corners of the matrix, with the beans of each corner assigned either a +10 or -10 value, it is possible for the participants to learn simple associations to remember which beans have a positive and which have a negative value. Based on the instructions at the start of the task, the training phase, and by playing the game in the learning phase participants can learn the specific value of each of these 40 game beans.

At the start of the task, all relevant instructions were projected on a 19" CRT-computer screen and read aloud by the experimenter. In the current study, a simple, but comprehensive explanation about the goal of the game and the value of the game beans was given to the children, in order to ensure that they would learn the value of the beans sufficiently. Children were encouraged to ask questions to foster their understanding of the task. Next, the training phase started in which six trials were included to familiarize the children with the procedure. When the procedure was clear for the child, the learning phase began.

During the learning phase, the 40 game beans were sequentially presented. On each trial a bean appeared in the center of the screen. Within a time limit of 5s, children had to decide whether they would approach or avoid the bean by pressing on the k- or the d-key,

respectively on an azerty keyboard. If children did not respond, the avoidant response was automatically selected. Approaching a positive bean increased the points of the participants (+10). Approaching a negative bean lead to a decrease in points (-10). If the bean was rejected, the points of the children remained the same. Children started the learning phase with 50 points and won the game when their score reached 100 points. A game was lost when the score reached 0 points. In each case, a new game begun and children again started with 50 points. The number of games could thus differ across children. However, all children completed the same number of trials and saw all of the same beans. For each child, the learning phase consisted of three blocks of 40 trials, which gave the children three opportunities to learn each of the 40 game beans. In the current study, we used the full-feedback version of the BeanFest Task (Pietri *et al.*, 2012, 2013). Thus, children always received information about the valence of the bean, regardless of whether they approached or avoided it. This allowed us to measure individual differences in children's general tendencies to learn from positively and negatively valenced information, which in this case was neither a function of prior learning history (as the participants have no relevant a priori knowledge about the beans), nor contingent on children's willingness to take the risk to approach the beans.

After the learning phase, the instructions regarding the test phase were presented on the computer screen. During the test phase, the 40 beans from the learning phase were presented along with the remaining 60 unfamiliar beans from the matrix. Again, children had to decide whether the valence of the beans was positive or negative, and thus whether they would approach or avoid them. However, in contrast to the learning phase, children did not receive feedback about the valence of the bean and their score was, although calculated, not presented on the screen.

In the present study, openness to negative affect was assessed via the proportion of negative beans first presented in the learning phase, that were correctly classified during the final test phase. This was based on the assumption that learning about negative stimuli reflects children's openness to negative information. In addition, to assess exploration, a residual approach (see the data-analytic strategy section for a detailed description) was applied to estimate a valence weighting bias, reflecting interindividual differences in the extent to which participants classified novel beans in the test phase as more likely to be positive or negative than was to be expected on the basis of their learning of the positive and negative game beans. To explore effectively an individual always has to weight the potential positive outcome of encountering something good versus the potential negative outcome of encountering something bad. Research suggests that giving greater weight to the possibility of encountering something good is related to more engagement with and exploration of a novel environment. This has been demonstrated in several studies showing that such a positive weighting bias (namely classifying novel beans in the test phase as more likely to be positive than is to be expected on the basis of one's learning pattern) has been related to a

variety of exploratory judgments and behaviors toward novel stimuli in the environment, including threat assessment, neophobia, and hypothetical and actual risk behavior (for an overview see Fazio, Pietri, Rocklage & Shook, 2015).

Procedure. Using a letter distributed in the classrooms of the fourth, fifth, and sixth grades of urban elementary schools, children were invited to participate in an experimental study on the parent-child relationship and exploratory behavior. The letter informed children and their parents about the content and procedure of the study. Those who were interested could return the flyer to the school with their personal contact information. Subsequently they were contacted by the experimenter, who personally informed them about the specific procedure of the study and about their right to refuse participation. All those who initially expressed interest ultimately chose to participate and gave their written informed consent. Data were collected while mother and child visited one of two research locations. Arriving at the research location, they were seated in two different rooms and engaged in a two-hour test procedure designed to investigate several distinct research questions. With regard to the parts of the procedure relevant for the current hypothesis, mothers filled out a demographic form and several questionnaires, while the child completed a set of questionnaires followed by the Beanfest Task. The researcher monitored the children while they filled out the measures and gave children the opportunity to ask for clarifications whenever necessary. The entire study was approved by the university's ethical committee.

Data-analytic strategy. Again, all analyses were carried out with the statistical package for social sciences (IBM SPSS Statistics 23). Prior to the main analyses two-one-sample t-tests with learning of negative information (the proportion of negative beans correctly classified in the test phase) and learning of positive information (the proportion of positive beans correctly classified in the test phase) as dependent variables were calculated in order to identify any children who responded randomly on the negative and positive beans during the test phase. Subsequently, the residual approach was used to calculate children's weighting bias. Following Pietri *et al.* (2012, 2013) a regression equation was carried out to predict the average response to the novel beans in the test phase based on the proportion of positive and negative game beans children had correctly learned (and thus correctly classified during the test phase): Average response to novel beans = $b_1 * (\text{proportion of positive beans correct}) - b_2 * (\text{proportion of negative beans correct}) + a$. Children's average response to novel beans is the average of children's responses over the 60 novel beans which are coded +1 if children classified a novel bean as positive, and -1 if children classified a novel bean as negative. Although the relation between the average response to novel beans and individual's past learning is generally very strong (Pietri *et al.*, 2012, 2013; Rocklage & Fazio, 2014), naturally there is variability around this trend. This difference from what one would expect based on a child's pattern of learning, is captured in the residual of the regression equation, which can be used as an estimation of individuals' weighting bias. The residual of this regression equation namely reflects the degree to which an individual's response to novel beans is a function of the extent to which individuals weight resemblance to positive and resemblance to negative beans over and above what they have learned before about these beans. Specifically, a more positive (or negative) weighting bias reflects a tendency to give more weight to positive (or negative) learned information relative to what one would expect given the individual's learning pattern.

Descriptive statistics were checked and zero-order correlations were calculated among all the main variables of the study. To test the hypothesis (see Fig. 1) that more trust in caregivers' support would be linked with more exploration (a more positive weighting bias) through openness to negative affect (learning of negative information) and self-regulation (effortful control), the SPSS Macro provided by Preacher and Hayes (2004) was used following the same steps as in Study 1. In addition, to ensure that the investigated links with learning of negative information reflected relationships with openness to negative affect specifically and not with a broader willingness to engage with both

	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
X1	10	10	10	10			-10	-10	-10	-10
X2	10	10	10					-10	-10	-10
X3	10	10							-10	-10
X4	10									-10
X5										
X6										
X7	-10									10
X8	-10	-10							10	10
X9	-10	-10	-10					10	10	10
X10	-10	-10	-10	-10			10	10	10	10

Fig. 3. Simplified bean matrix. X = shape from oval (1) to oblong (10). Y = number of speckles from 1 to 10. The cells with a point value present the beans presented during the game (Pietri *et al.*, 2013).

positive and negative information in general, we repeated the main analyses with learning of negative information controlling for learning of positive information.

Results and discussion

Preliminary analyses. Overall, less than 1% of the data at the scale level of the total dataset were missing. As these data were missing completely at random (Little's MCAR test was not significant, $\chi^2(335) = 329.81$, $p = 0.570$), we used the expectation maximization method to estimate the missing data, resulting in $n = 59$ for all subsequent analyses. Pairwise deletion of missing data did not substantially alter the results.

Learning of negative information (proportion of negative beans correctly classified in the test phase = 0.86), and learning of positive information (proportion of positive beans correctly classified in the test phase = 0.82) respectively were well above the chance level of 0.50, $t(58) = 21.19$, $p < 0.001$, and $t(58) = 19.64$, $p < 0.001$, indicating that the children were engaged during the BeanFest Task, and did not simply guess the value of the negative and positive beans. The residual of the following regression equation was used to estimate the weighting bias: average response to novel beans in the test phase = $0.72 * (\text{proportion of positive beans correctly classified in the test phase}) - 1.33 * (\text{proportion of negative beans correctly classified in the test phase}) + 0.44$. In the current sample, the proportion of negative beans correctly classified and the proportion of positive beans correctly classified together accounted for 42% of the variance in the average response to the novel beans, $F(2,56) = 20.11$, $p < 0.001$, which is in line with the results in previous samples (e.g., Pietri *et al.*, 2013). Both regression weights were significant: $\beta = 0.42$, $t(58) = 3.32$, $p = 0.002$, for the positive beans correctly classified, and $\beta = -0.80$, $t(58) = -6.32$, $p < 0.001$ for the negative beans correctly classified. ANOVAs revealed no associations between gender and the variables of interest, $F(1, 58) < 2.01$, $p > 0.162$.

Descriptive statistics and correlational analyses. Means and standard deviations of the key variables under study are shown in Table 3. Contrary to the prediction, the correlation between trust and the weighting bias was not significant. However, in line with the predictions, trust was significantly positively correlated with learning of negative information, learning of negative information was significantly positively correlated with effortful control, and effortful control was significantly positively correlated with the weighting bias. Furthermore, partial correlations controlling for learning of positive information did not significantly alter the

relationship between trust and learning of negative information, $r = 0.40$, $p = 0.002$, and learning of negative information and effortful control, $r = 0.29$, $p = 0.030$.

Mediation analyses. Again, we first tested the significance of the serial indirect effect of interest, namely that trust was indirectly linked with the weighting bias through learning of negative information and effortful control ($a_1a_3b_2$ -path, Fig. 4). Figure 4 depicts the unstandardized regression coefficients for the different paths of the mediation model, and the point estimates and the bias corrected 95% CI for the indirect effects are summarized in Table 4. Study 2 replicated the findings of Study 1. Specifically, in line with the hypothesis, the results demonstrated a serial indirect effect between trust and the weighting bias through learning of negative information and effortful control. Again, all the single paths of the serial indirect effect were in the expected direction. Trust was significantly related to increased learning of negative information (a_1 -path), which in turn, significantly positively predicted effortful control (a_3 -path), significantly contributing to a more positive weighting bias (b_2 -path). Furthermore, this serial indirect effect remained significant when controlling for learning of positive information, $a_1a_3b_2$ -path = 0.0036, boot 95% CI = [0.0012; 0.0104]. Again, neither the total (c -path), nor the direct (c' -path) effect between trust and the weighting bias was found significant. Furthermore, in contrast to the findings of Study 1, none of the simpler single indirect effects reached significance (a_1b_1 -path and a_2b_2 -path).

In line with the findings of Study 1, the hypothesized serial indirect effect model was supported. As predicted, trust was linked with the weighting bias through a serial indirect effect of learning of negative information and effortful control. Moreover, adding to the findings of Study 1, this serial indirect effect was found with a multi-informant and multi-method approach. Furthermore, as, in contrast to the findings of Study 2, the simpler indirect paths were both not significant, the serial indirect effect through learning of negative information and effortful control was parsimonious because simpler models did not explain the link between trust and the weighting bias.

GENERAL DISCUSSION

Answering Grossmann *et al.*'s (2008) call to attend to the exploration side of the attachment-exploration balance, the main goal of the current studies was to examine whether trust in caregivers' support would be linked with exploration through a serial indirect effect involving openness to negative affect and self-regulation. The results supported this hypothesis. Specifically, trust in caregivers' support predicted exploration, but only to the extent to which openness to negative affect and self-regulation were involved too. In other words, when children report more trust in caregivers' support, they tend to be more open to negative affect, which in turn is related to a stronger ability to regulate their attention and behavior, further contributing to their willingness to explore. Although the interpretation of these findings warrants caution because of the cross-sectional research design, replicating this serial-indirect effect in two independent samples with multiple informants and multiple methods, adds to the reliability of the results.

Table 3. Correlations, means, and standard deviations Study 2

Measure	1	2	3	4
1. Trust in caregivers' support	1			
2. Learning of negative information	0.48***	1		
3. Effortful control	0.06	0.32*	1	
4. Weighting bias	0.03	0.00	0.36**	1
<i>M</i>	37.34	0.86	3.58	0.00
<i>SD</i>	2.56	0.13	0.52	0.17

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

The current paper demonstrated in two preadolescent samples that trust in caregivers' support was linked with exploration through a serial indirect effect involving openness to negative affect and self-regulation. This finding is in line with theory and research showing that openness to negative affect develops in the context of a secure attachment relationship (e.g., Bowlby, 1988; Vandevivere, Braet & Bosmans, 2014a). Furthermore the results support the theoretical model of Inzlicht and Legault (2014) postulating that people who are more open to negative affect will be more sensitive to when their intended and actual behavior is in conflict, which will instigate them to regulate their attention and behavior (e.g., Wenk-Sormaz, 2005). Finally, this finding is in consonance with several studies indicating that self-regulation is linked with more exploration (e.g., Kashdan *et al.*, 2004; Laureiro-Martínez *et al.*, 2015). However, while previous research only focused on these single paths of the serial indirect effect of interest (de Bruin *et al.*, 2014; Laureiro-Martínez *et al.*, 2015; Vandevivere *et al.*, 2014a; Wenk-Sormaz, 2005), the present studies add to the literature by suggesting that these single relationships can be captured in a more integrative indirect effect model. Consequently, the current studies provide the first direct evidence in support of Grossmann *et al.*'s (2008) prediction that on top of children's trust in caregivers' support, exploration rests on children's ability to organize their emotions open-mindedly, and their ability to regulate their attention and behavior flexibly.

Although the existing research puts forward several hypotheses about why children who have more trust in caregivers' support are more eager to explore (Grossmann *et al.*, 2008), few of these hypotheses have been tested. Up to now attachment research merely investigated parental behaviors to better understand the trust-exploration link (Grossman, Scheuerer-Englisch & Loher, 1991; Whipple, Bernier & Mageau, 2011). Therefore, the present studies' focus on mechanisms within the child that might explain how trust can breed exploration complements the current knowledge base. As Nolen-Hoeksema and Watkins (2011) argued that the determination of such mediating within-person factors is important for a deeper understanding of how the environmental context can explain (mal)adjustment, a better understanding of the interplay between trust, openness to negative affect and self-regulation might prove crucial to apprehend adaptive exploration in cognitive and social development in preadolescence.

Table 4. Unstandardized point estimates of the indirect effects of the mediation analysis of the link between trust in caregivers' support and the weighting bias in Study 2

	Point estimate indirect effect	Boot standard error	Bias corrected 95% CI of indirect effect
a_1b_1	-0.0053	0.0065	[-0.0218; 0.0047]
a_2b_2	-0.0029	0.0043	[-0.0118; 0.0052]
$a_1a_3b_2$	0.0046	0.0023	[0.0015; 0.0127]

Note: a_1b_1 , Trust → Learning of negative information → Weighting bias; a_2b_2 , Trust → Effortful Control → Weighting bias; $a_1a_3b_2$, Trust → Learning of negative information → Effortful Control → Weighting bias.

Surprisingly, the current studies failed to reveal a direct association between child-reported trust in caregivers' support and the exploration measures. This might be explained by the way in which the trust – exploration balance has been investigated in previous research. Most research postulating that there is a link between trust and exploration made use of Ainsworth's Strange Situation Procedure (e.g., Arend *et al.*, 1979; Lütkenhaus, Grossmann & Grossmann, 1985; Oppenheim, Sagi & Lamb, 1988). While in the current studies trust, as indicator of attachment, was assessed with items probing merely the confidence children have that their caregiver will support them in times of distress, the Strange Situation Procedure not only takes into account children's support-seeking behavior, but also the amount of exploration children show during the observation procedure (Ainsworth, Blehar, Waters & Wall, 1978). That the attachment classification resulting from the Strange Situation Procedure also contains aspects of exploratory behavior might have confounded the attachment–exploration link found in previous studies. However, despite the lack of a total effect between trust and exploration in the current studies, the association could be explained by a meaningful serial indirect effect of openness to negative affect and self-regulation. This is in line with the recommendations of Rucker, Preacher, Tormala and Petty (2011) that researchers should test theoretically relevant indirect effects irrespective of the presence of a significant total effect.

Traditionally, attachment research has mainly focused on the maladaptive outcomes of a lack of trust in caregivers' reports (Deklyen & Greenberg, 2008; Dozier, Stovall-McClough & Albus, 2008). Instead, the current studies, in line with the contemporary view of positive psychology (Lopez & Snyder,

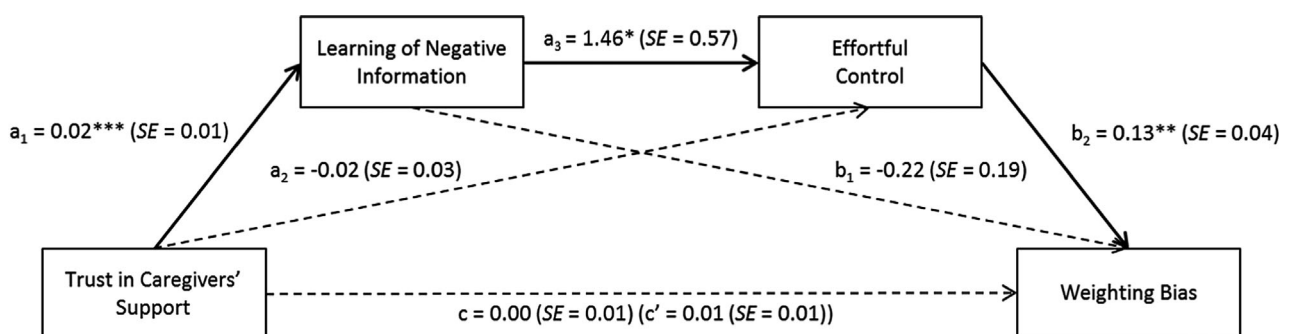


Fig. 4. Unstandardized regression coefficients for the different paths of the mediational analysis of the links between trust in caregivers' support and the weighting bias through learning of negative information and effortful control in Study 2.

2009) focused on trust in caregivers' support as a precursor of personal growth through a series of adaptive processes (openness to negative affect, self-regulation, exploration). However, one might wonder whether these processes are adaptive in each and every context. According to conditional adaptation theory (Boyce & Ellis, 2005) individuals develop cognitive, emotional and behavioral tendencies that increase the chance of survival based on early experiences in their developmental context. Whereas the general assumption is that openness to negative affect, self-regulation and exploration will allow adaptive development (Brown & Ryan, 2003; Moffitt, Arseneault, Belsky *et al.*, 2011; Voss & Keller, 1983), this might be true only in conditions of relative safety, for example in contexts in which individuals experience repeatedly that their caregiver is available in times of distress. In contexts which are continuously stressful and uncertain because individuals do not experience that their caregiver is available if needed, it might be harmful to be open to negative affect as the experienced negative affect might be overwhelming (Fisher, 2012; Shapiro, 1992). Furthermore, in continuously stressful contexts it might be detrimental to regulate the self in order to obtain long-term goals instead of focusing on short-term rewards, or to explore the environment with unknown, but potentially punishing consequences, as the risk is too big that eventually you will not be rewarded for this behavior. Instead, in such contexts, in which children will not develop trust in caregivers' support, a lack of openness to negative affect, low self-regulation and little exploration might be the most adaptive strategy to enhance the likelihood of survival (Humphreys, Lee, Telzer *et al.*, 2014). Hence, focusing on the context-specific adaptiveness of the processes covered in the current study, can strengthen our understanding of why trust, openness to negative affect, self-regulation and exploration are interrelated.

Although this paper adds to the literature by demonstrating in two independent samples a serial indirect effect of openness to negative affect and self-regulation between trust in caregivers' support and exploration, there are several issues that need consideration. First of all, a major limitation of the present studies is the cross-sectional and non-experimental design, which does not allow us to formulate conclusions about directionality in the interplay between trust, openness to negative affect and self-regulation in their association with exploration. In order to further validate this model, future longitudinal and experimental research is needed to establish how the interrelationships between trust, openness to negative affect, self-regulation, and exploration develop and so that cause-effect claims can be made.

Second, concerns can be raised about using questionnaires as a measurement strategy in 8/9-year-old children because reading ability and comprehension might have introduced error in the statistical analyses. In contrast to such concerns, several arguments support the reliability of the results. Most importantly, Cronbach's alphas were good, suggesting that there was consistency in how children responded to the items. Also, in country of origin is Belgium, where the studies were conducted, children at fourth grade have mastered a good reading and comprehension level. The idea that their skills were adequate, was illustrated by the fact that children did not need much assistance from the researcher who was constantly available to help. This observation is consistent with a host of studies in which the same

research procedure with similar measures have been used in this age-group (for an overview of attachment questionnaire studies in this age-group, see Kerns & Brumariu, 2016). Additionally, the 8-year-old children skipped a grade, so they were more than averagely intelligent, and their number was low (seven children in Study 1, one child in Study 2). Finally, the fact that the pattern of results could be replicated in Study 2 in which three out of four variables were measured relying on different strategies (self-regulation was reported by mother, while openness to negative affect and exploration was measured with a behavioral task), further suggests that the results might not have been strongly affected by problems in reading and comprehension-related issues.

Additionally, trust in caregivers' support was assessed using a self-report questionnaire. Attachment researchers have often argued that self-report is a less valid approach to measure attachment as it might not grasp attachment-related affect and cognitions which operate outside of conscious awareness and it would over identify secure attachment due to social desirability (Ainsworth, 1985). Nevertheless, for preadolescence, several recent psychometric studies suggest a significant overlap between self-reported attachment security and narrative and interview measures of attachment expectations (Kerns, Brumariu & Seibert, 2011; Psouni & Apetroaia, 2014). Moreover, more recently attachment researchers have argued that the main question should not be which attachment measure is superior to the other measures, but rather which measure captures best which aspect of the attachment construct (Bosmans & Kerns, 2015; Steele, 2015). In this line, the current paper at least suggests that children's explicit beliefs in whether or not their caregiver will be available if needed are linked with exploration through a serial indirect effect of openness to negative affect and self-regulation. However, future research on these associations including narrative (e.g., Waters & Waters, 2006) and interview measures (e.g., Shmueli-Goetz, Target, Fonagy & Datta, 2008) of attachment could contribute to a more profound understanding of the proposed interplay between these variables.

A further limitation is that we only focused on children's attachment to their mother. Although this decision is in line with a host of studies suggesting that the mother remains the primary attachment figure in middle childhood and preadolescence (Bosmans & Kerns, 2015), it would be interesting to also test these relationships for trust in paternal support. This would allow observing whether the same pattern of effects emerge or whether effects are stronger for attachment to one of both parents. Also, it is important to acknowledge that we might have selected a well-functioning sample. For example, 11–18% of the children had divorced parents. Although concrete data are missing, it might be that our samples underrepresent divorced families. Therefore, it would be interesting to investigate in future research whether the same pattern of effects can be found in samples that are more at risk.

A next issue that deserves some attention is the way openness to negative affect was operationalized in the current studies. In line with the existing literature about the link between trust and openness to negative affect (Pepping *et al.*, 2014; Vandevivere *et al.*, 2014a) we used a measure to capture both the non-

judgmental present moment awareness and the open cognitive processing of negative material components of openness to negative affect. Both the questionnaire (CAMM; Greco *et al.*, 2011) and the behavioral paradigm (BeanFest Task Pietri *et al.*, 2012, 2013) used to assess this components of openness to negative affect have been validated in previous research (de Bruin *et al.*, 2014; Rocklage & Fazio, 2014). However, as openness to negative affect is a broad concept, one can wonder whether both measures used in the current studies really capture a similar process. Therefore, research is needed to develop a more profound understanding of openness to negative affect as a psychological construct and to how different components of openness to negative affect are interrelated.

Finally, the question remains whether the exploration measures used in the current studies can reveal ecologically valid processes. Neither the questionnaire, nor the behavioral paradigm have yet been linked with observations of individuals' exploratory behavior in naturalistic environments. Nevertheless, the CEI-II already has been associated with several indicators of personal and social well-being (Kashdan *et al.*, 2009). Moreover, Kashdan, Sherman, Yarbro and Funder (2013) showed that there is a high convergence among self-, friend-, parent-reports of curiosity, and observer-rated behavioral correlates of curiosity, suggesting that individuals' self-reported curiosity reflects something of their curious behavior in the real world. Furthermore, also the weighting bias of the BeanFest Task has been related to a variety of exploratory judgments and behaviors toward novel stimuli in the environment (e.g., hypothetical and actual risk behavior; Pietri *et al.*, 2013; Rocklage & Fazio, 2014). Nonetheless, investigating the hypothesis of the current studies in more naturalistic settings, with for example, experience sampling approaches of exploratory behavior, might be of particular importance to better understand the implications of the present findings for real life.

Conclusion

To summarize, despite their limitations, the present studies provide an important first step to advance our understanding of how trust in caregivers' support can foster exploration in preadolescence. Whereas previous research merely investigated parental behaviors to better comprehend this link, the current findings showed that also mechanisms within the child might explain how trust can breed exploration. Our findings confirm Grossmann *et al.*'s (2008) prediction that on top of children's trust in caregivers' support, exploration arises from children's ability to organize their emotions open-mindedly, and from their ability to regulate their attention and behavior flexibly.

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NOTE

¹ To ensure that the main analyses with mindfulness reflected relationships with openness to negative affect, we repeated these analyses with an openness to negative affect factor retrieved from the five most negatively oriented items of the CAMM (item 1, 5, 8, 9, 10; e.g., "I push away thoughts that I don't like"). Trust was again significantly positively

correlated with this openness to negative affect factor, $r = 0.22$, $p = 0.001$, and this factor was also significantly positively correlated with effortful control, $r = 0.21$, $p = 0.002$. Furthermore, also the serial indirect effect of interest remained significant when mindfulness was replaced with this openness to negative affect factor, $a_1a_3b_2$ -path = 0.0156, boot 95% CI = [0.0024; 0.0449].

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