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Exploring the Causal Effect of Interpretation Bias on Attachment Expectations

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Attachment theory implies that children's inclination to interpret attachment figures behavior as supportive and available causally influences children's trust in their attachment figure's availability. An experiment was conducted to test whether training children (8–12 years old) to interpret ambiguous interactions with their mothers in a more secure way increases their trust in their mother's availability. Participants (N = 49) were randomly assigned to either a secure condition to train children to interpret their mother's behavior as supportive or a neutral placebo condition, where interpretations were unrelated to maternal support. Results supported the hypothesis: After the secure training, children interpreted maternal behavior more securely and trusted more in her availability. This suggests that attachment-related processing biases causally affect attachment expectations.

Bowlby (1969) assumed that securely attached children, who are children who trust in their parents' availability to provide support, are more likely to interpret later interactions with their parents as a confirmation of their expected availability. Bowlby proposed that such a secure interpretation bias occurs automatically to allow these children to rapidly and efficiently assess interactions with their parents. This, in turn, allows them to assimilate new information in congruence with previous positive experiences (Bowlby, 1973; Dykas & Cassidy, 2011). This means that even when it is objectively unclear whether parental behavior is a sign of availability for support or not, a secure interpretation bias increases the likelihood that children perceive their parents as available (Dykas & Cassidy, 2011). Implied in this theoretical model is the suggestion that a secure interpretation bias has a causal effect on securely attached children's expectation that they can trust in their parents' availability for support. Although this is an important assumption in attachment theory, to date no studies have examined this causal hypothesis. Nevertheless, evidence in favor of this hypothesis could be crucial to understand how children maintain trust in their parents' support. This hypothesis will be tested in middle childhood, because this is a period of important cognitive attachment development (Del Giudice, 2015; Main, Kaplan, & Cassidy, 1985).

In this period, explicit or self-reported trust in parents' support has been demonstrated to play an important role in adaptive attachment development (e.g., Bosmans & Kerns, 2015). Children with more self-reported trust more easily seek parental support during distress (Bosmans, Braet, Heylen, & De Raedt, 2015). This protects them against the detrimental effects of distressing life events on the long-term development of emotional problems (Dujardin et al., 2016). According to Bowlby (1969), children's trust in parental support is an expectation that is linked with children's repeated experiences with parental support that are stored in a mental structure, the internal working model (IWM). This contains information about parents' availability for support and affects the way new attachment-relevant information is processed. Building on these assumptions, Bowlby hypothesized that securely attached children interpret attachment-related information in a positive way and therefore remain securely attached. Similar ideas were expressed when Main et al. (1985) discussed attachment states

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of mind-related information processing and when Bretherton (1985) discussed attachment script-related information processing during parent–child interactions to understand attachment stability. Although all these theories have been pointing to attachment-related interpretation biases as a crucial mechanism to explain how children maintain trust in caregiver support, to date this hypothesis has not been tested.

Recent research showed that children with more trust in maternal support, more frequently interpret ambiguous maternal behavior in a secure manner (De Winter, Vandevivere, Waters, Braet, & Bosmans, 2016). However, this correlational study could not determine the causal direction of this effect. To examine the causal effect of interpretation bias on children's trust, experimental manipulation of interpretation bias is needed. For this purpose, the current study developed a cognitive bias modification (CBM) paradigm based on the work of Mathews and Mackintosh (2000). During CBM, participants are randomly assigned either to a positive interpretation bias training condition during which they are trained to interpret ambiguous scenarios in a positive manner or to a placebo condition during which they have to interpret the same ambiguous scenarios in a manner unrelated to the targeted interpretation bias. Interpretation bias is successfully manipulated if, compared to the placebo, the training increases the speed to solve ambiguous scenarios in congruence with the trained bias and decreases the speed to incongruently solve these scenarios (*interpretation speed*). Moreover, interpretation bias is successfully manipulated when training effects are found on other interpretation bias tasks as well. Such tasks are measured before and after CBM and measure how children spontaneously interpret ambiguous situations. If the training, but not the placebo condition, changes the bias in the expected direction, this is evidence for *generalization* of the manipulation effect. To investigate whether interpretation bias has a causal effect on *expectations*, the latter are measured before and after CBM. If changes in expectations are found in the training, but not the placebo condition, the causal influence of interpretation bias on expectations is demonstrated. Previous studies in other research areas have shown that this paradigm can indeed change interpretation biases and demonstrated the causal effect of interpretation bias on expectations (e.g., Hallion & Ruscio, 2011).

In this study, CBM was used to manipulate children's interpretation of their mother's support-related behavior, because she is the most likely primary attachment figure (Main et al., 1985). Children were trained to interpret maternal behavior in a supportive manner (secure condition) or in a manner unrelated to attachment and support (placebo condition). Because the goal of the current study was to examine Bowlby's claim that a secure interpretation bias explains how securely attached children maintain trust in maternal availability, the study was conducted in a sample of securely attached and emotionally well-functioning children.

Three predictions will be tested. First, secure condition children will be quicker to complete secure interpretations and slower to complete insecure interpretations of ambiguous scenarios compared to the placebo (Hypothesis 1: interpretation speed). Second, secure condition children will spontaneously interpret ambiguous situations in a more secure and less insecure way after CBM compared to the placebo (Hypothesis 2: generalization). Most importantly, secure condition children will show an increase in trust in maternal support after CBM compared to the placebo (Hypothesis 3: expectations). In order to control for possible mood effects, both sad and happy mood states were assessed before and after CBM.

Method

Participants

Parents of 104 children (8–12 years) responded to a flyer about the study distributed at schools (response rate 42.9%). From this group, children were invited when they scored at least 45 of the 60 on the Security Scale (Kerns, Klepac, & Cole, 1996), measuring felt attachment security and did not reach the clinical cutoff (a score of 13 on 54) on the Child Depression Inventory (Kovacs, 1992), measuring emotional problems. Of the 65 children that were eligible for the study, parents of 49 children (27 girls, 22 boys) gave their informed consent to participate. The study started when children gave their informed consent as well (see Table S1, for descriptives).

Procedure

The experiment consisted of (a) a pre-CBM trust questionnaire, (b) a pre-CBM mood assessment, (c) a pre-CBM recognition task, (d) CBM, (e) a post-CBM recognition task, (f) a post-CBM mood assessment, and (g) a post-CBM trust questionnaire. One additional measure was administered but not discussed here (see Appendix S1). A session lasted

approximately 75 min. The procedure was approved by the local university's ethical committee. Data were collected from May 2013 through June 2013.

Materials

CBM

Both conditions (secure and placebo) consisted of trials during which children were instructed to read ambiguous attachment-relevant scenarios. All scenarios were based on interviews with children about situations that require maternal attachment support (Vandevivere, Braet, & Bosmans, 2015) and focused on subcomponents of Waters and Waters' (2006) *secure base script*. A pilot study was conducted ($N = 12$) to ensure that the scenarios were appropriate for the children's reading level. The children were instructed to imagine that these scenarios were really happening, because mental imagery increases CBM effects (Holmes, Lang, & Shah, 2009).

In both conditions, children had to complete six training blocks, each containing seven scenarios, presented on a laptop and with the option to pause in between blocks. Each block consisted of two probe scenarios to test interpretation speed (see below) and five training scenarios. Scenarios consisted of three lines of text. Due to a missing word in the last line, the scenario outcome remained unclear and ambiguous. Next, the missing word was presented as a word fragment. This word fragment missed one letter. Children were instructed to respond as quickly as possible by pressing the spacebar when they knew the missing letter (Figure 1). To encourage children to carefully read each scenario, a yes/no comprehension question was asked after every scenario. Before the next trial, they received feedback about their answer.

Training scenarios were designed to either train a secure interpretation bias (secure condition) or to have no effect on attachment-related interpretations (placebo condition). In the secure condition scenarios, a distressing situation was described and, due

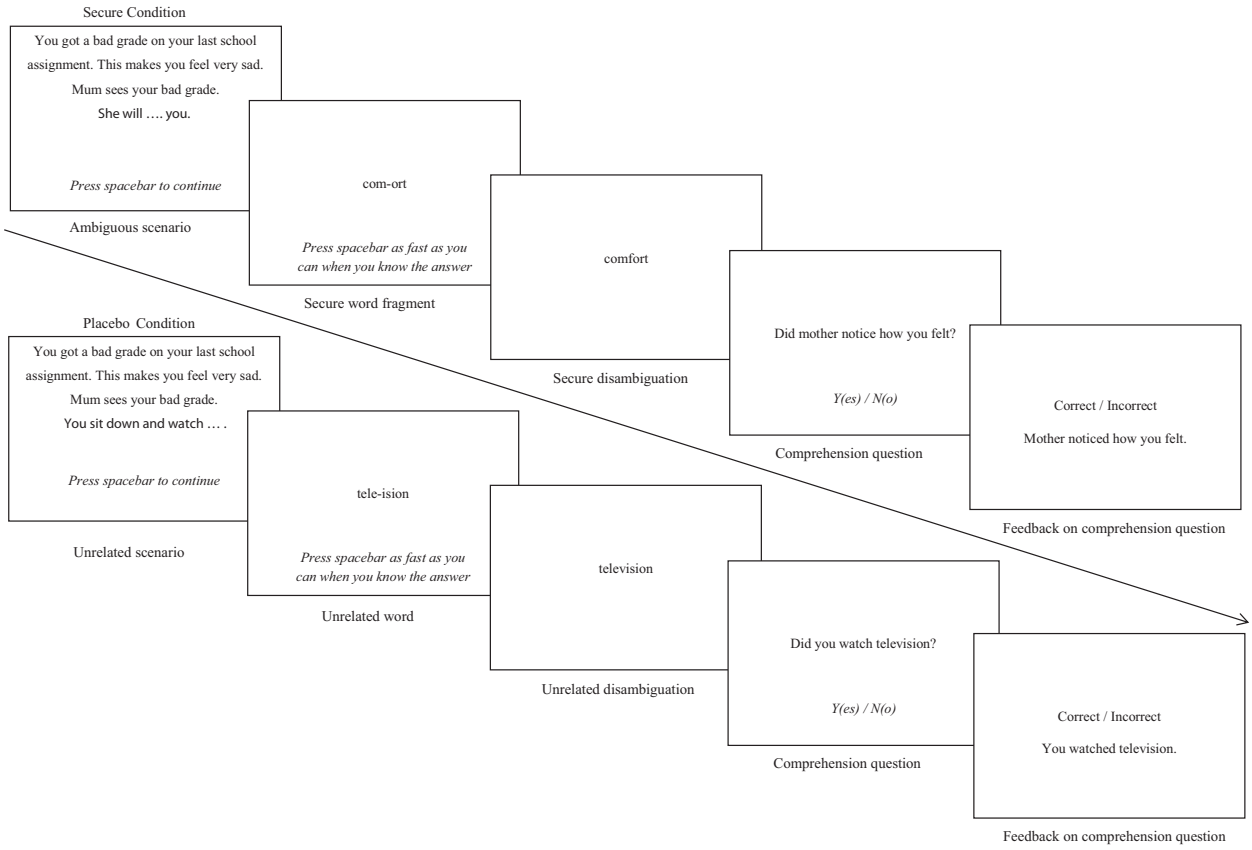

Figure 1. Overview of a trial in the secure condition and placebo condition.

to the missing word, it was unclear whether mother responded in a secure or insecure way. Each scenario was solved with a secure word fragment, thus training children to securely interpret the ambiguous scenario (Figure 1). In contrast, the placebo condition solution ended with a sentence and word fragment that was unrelated to whether or not mother provided support during distress (Figure 1).

Interpretation Speed

In both conditions, six secure and six insecure probe scenarios were included to evaluate whether the secure condition children solved scenarios with a suggested secure word fragment more quickly and scenarios with a suggested insecure word fragment more slowly compared to placebo condition children. The format of probe scenarios was identical to the training scenarios. Within each training block, two probe scenarios (one secure, one insecure) were presented. The probe and training trial presentation order was randomized within each block. The eventual order was kept identical for all participants in all conditions. Interpretation reaction times were analyzed for the secure and insecure probe scenarios separately.

Generalization

To measure generalization of training effects, the recognition task (Mathews & Mackintosh, 2000; Salemink & van den Hout, 2010) was administered pre- and post-CBM. The task measured children's spontaneous interpretation of attachment-related scenarios. Therefore, children had to read seven scenarios. Each scenario had a title, a relevant picture, and consisted of three lines of text. Similar to the training scenarios, a word was missing in the last sentence (Figure 2). This word was presented as a word fragment, which children had to resolve as quickly as possible. Contrary to the CBM training scenarios, the valence of the scenario remained ambiguous after the word fragment was resolved. To encourage children to carefully read each scenario, a yes/no comprehension question was asked about the scenario, followed by feedback. After children read all scenarios, interpretation bias was measured. For each scenario, two events (one secure and one insecure) were described that did not occur during the scenario. For each event, children had to rate on a 4-point Likert scale, ranging from 1 = *completely untrue* to 4 = *completely true*, the extent to which they recognized the events as having occurred during the scenario. As neither event actually occurred, higher scores for the positive event

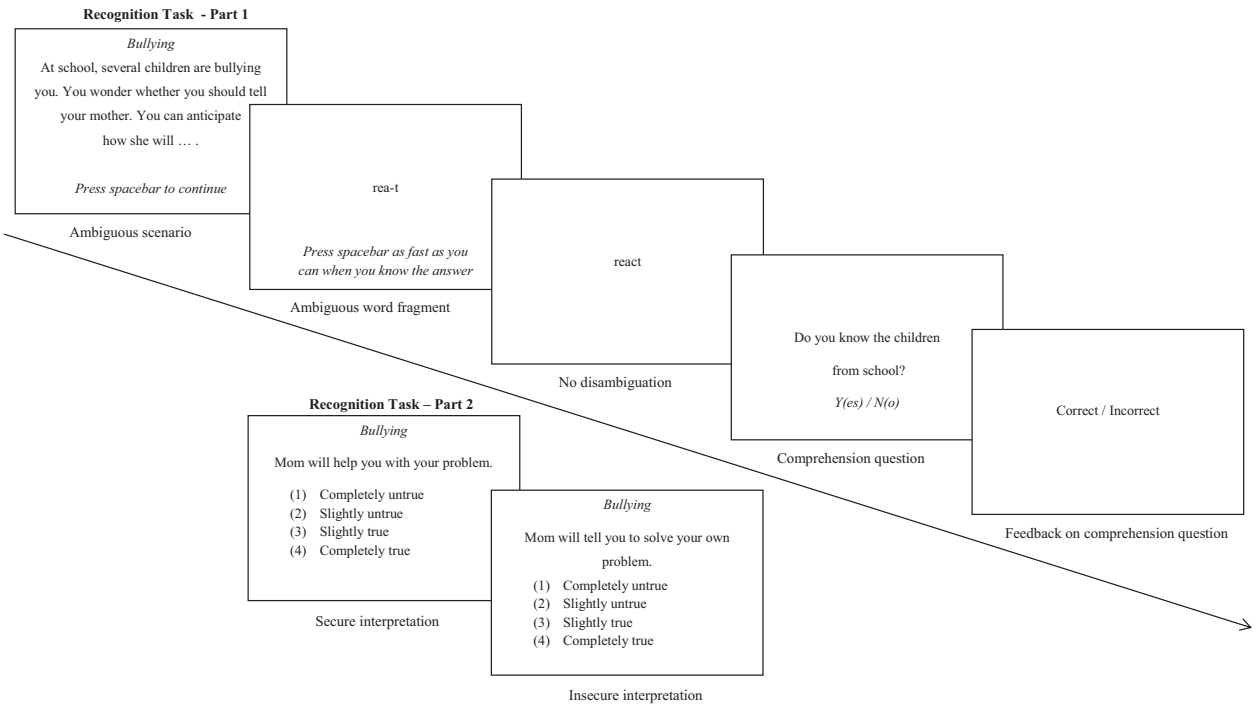

Figure 2. Overview of the recognition task.

reflect a more secure interpretation bias. Higher scores for the negative event reflect a more insecure interpretation bias (Figure 2).

Expectations

Trust in maternal support was measured with the Trust scale of the People In My Life Questionnaire (Ridenour, Greenberg, & Cook, 2006) pre- and post-CBM. Trust is conceptualized as the positive affective/cognitive experiences of trust in the accessibility and responsiveness of attachment figures (10 items, e.g., "I can count on my mother to help me when I have a problem"). Children responded on a 4-point Likert scale ranging from 1 = *almost never true* to 4 = *almost always true*. The questionnaire is reliable and has been validated against children's observed attachment behavior (e.g., Bosmans et al., 2015). Higher scores reflect more trust.

Mood

Two visual analog scales were administered to assess sad and happy mood states pre- and post-CBM. Children were asked to indicate on the laptop on a 10-cm line the extent to which they experienced the specific mood states (far left: completely disagree to far right: completely agree).

Results

Preliminary Analysis

In total, 1.2% of all data was missing completely at random (Little's MCAR test), $\chi^2(245) = 107.36$, $p = 1.0$. Missing data were calculated using expectation maximization. Correlations (Table 1) show that less pretest trust was related to more pretest insecure interpretations but not to pretest secure interpretations. Mood did not change as function of condition ($F_{\text{Sad Mood} \times \text{Condtion}} = 1.77$, $p = .19$; $F_{\text{Happy Mood} \times \text{Condtion}} = .07$, $p = .79$). Gender, $t(47) = 0.13$, $p = .81$, and age, $t(47) = -0.12$, $p = .90$, of the participants did not differ between conditions. No pre-CBM differences between the conditions were found on recognition task bias scores or on trust.

Hypothesis 1

To investigate CBM-related changes in interpretation speed, reaction times on probes were analyzed using a two-way mixed model analysis of variance (ANOVA) with training condition (secure vs. placebo) as a between-subjects factor and probe valence (secure vs. insecure) as a within-subjects factor. The crucial Condition × Valence interaction was significant (Table 2). Only participants in the secure condition responded faster on secure probes and slower on insecure probes (Figure 3). Controlling for mood, age, and gender did not affect the Condition × Valence interaction, $F(1, 43) = 12.60$, $p = .001$, $\eta_p^2 = .22$.

Hypothesis 2

To test generalization of the CBM effect, responses to the recognition task before and after CBM were compared (Table 3). Two 2-way mixed model analyses of variance were performed with training condition (secure vs. placebo) as a between-subjects factor, and time (pretest vs. posttest) as a within-subjects factors for both bias scores separately. The Condition × Time interaction was significant for both bias scores. In the secure condition, secure interpretations increased and insecure interpretations decreased, compared to the placebo condition (Figure 4). Controlling for mood, age, and gender did not affect the Condition × Time interaction for secure, $F(1, 43) = 10.82$, $p < .01$, $\eta_p^2 = .20$, and insecure interpretations, $F(1, 43) = 4.46$, $p < .05$, $\eta_p^2 = .09$.

Table 1
Correlational Analysis of All Main Variables

	M	*SD*	1	2	3	4	5	6
1. Pretest secure interpretations	23.53	3.18	1					
2. Pretest insecure interpretations	15.33	3.29	−0.04	1				
3. Pretest trust	37.69	1.82	0.18	−0.48***	1			
4. Posttest secure interpretations	24.25	2.83	0.47***	0.12	0.14	1		
5. Posttest insecure interpretations	15.25	3.85	0.04	0.29*	0.06	−0.37**	1	
6. Posttest trust	38.25	1.66	0.21	−0.35*	0.72***	0.13	0.09	1

**$p < .01$. ***$p < .001$.

Table 2
Reaction Times on Secure and Insecure Probes

	F	*df*	*p*	η_p^2
Probe valence	13.56	1, 47	.001	.22
Probe valence × Training condition	11.09	1, 47	.002	.19

	Secure probes *M* (*SD*)	Insecure probes *M* (*SD*)	*t*(*df*)	*p*
Placebo condition	2,922 (863)	2,969 (944)	−0.34 (23)	.74
Secure condition	2,470 (925)	3,413 (1026)	−4.18 (24)	.001

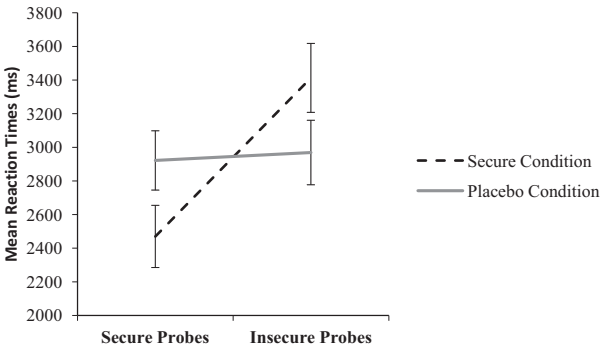

Figure 3. Interpretation speed.

Hypothesis 3

Investigating trust effects, a two-way mixed model ANOVA of trust with training condition (secure vs. placebo condition) as between-subjects factor and time (pretest and posttest) as within-subjects factor found the predicted significant Condition × Time interaction effect (Table 4). No significant effect was found in the placebo condition, although trust significantly increased in the secure condition (Figure 5). Controlling for mood, age, and gender did not affect the Condition × Time interaction $F(1, 43) = 4.23$, $p < .05$, $\eta_p^2 = .09$.

Discussion

This study was designed as a first test of the hypothesis that attachment-related interpretation bias causally explains how securely attached children maintain trust in maternal support. For this purpose, we manipulated attachment-related interpretation bias and examined whether this resulted in changes in trust. Results suggested that children can indeed be trained to interpret interactions with their mother in a more secure way and that this training increases children's trust in their parents' availability. These findings provided the first support for Bowlby's (1973) assumption that interpretation bias is an important factor that needs to be taken into account to understand how securely attached children maintain trust in caregiver support.

This study fundamentally adds to the increasing number of studies showing that attachment-related expectations are related to the way children process attachment-related information (for overviews, see Dykas & Cassidy, 2011; Zimmermann & Iwanski, 2015). First, the study supported De Winter et al.'s (2016) finding that less trust in maternal support is related to more insecure interpretations of ambiguous maternal behavior. Second, this is the first attachment study that demonstrated that attachment-related interpretation bias can be experimentally manipulated. Secure condition children more quickly solved secure than insecure word

Table 3
Recognition Task Secure and Insecure Interpretation Bias

	Secure interpretations		Insecure interpretations	
	F(*df*)	η_p^2	*F*(*df*)	η_p^2
Time	2.92 (1, 47)	.06	0.01 (1, 47)	.00
Time × Training condition	11.33 (1, 47)**	.19	4.56 (1, 47)*	.08

	Pretest secure *M* (*SD*)	Posttest secure *M* (*SD*)	*t*(*df*)	Pretest insecure *M* (*SD*)	Posttest insecure *M* (*SD*)	*t*(*df*)
Placebo condition	3.38 (.54)[a]	3.29 (.39)	1.09 (23)	2.14 (.50)[b]	2.31 (.51)	−1.51 (23)
Secure condition	3.34 (.36)[a]	3.63 (.34)	−3.87 (24)**	2.23 (.44)[b]	2.05 (.56)	1.52 (24)

Pretest condition difference: [a]$t(47) = 0.29$, $p = .77$; [b]$t(47) = -0.68$, $p = 50$. *$p < .05$. **$p < .01$.

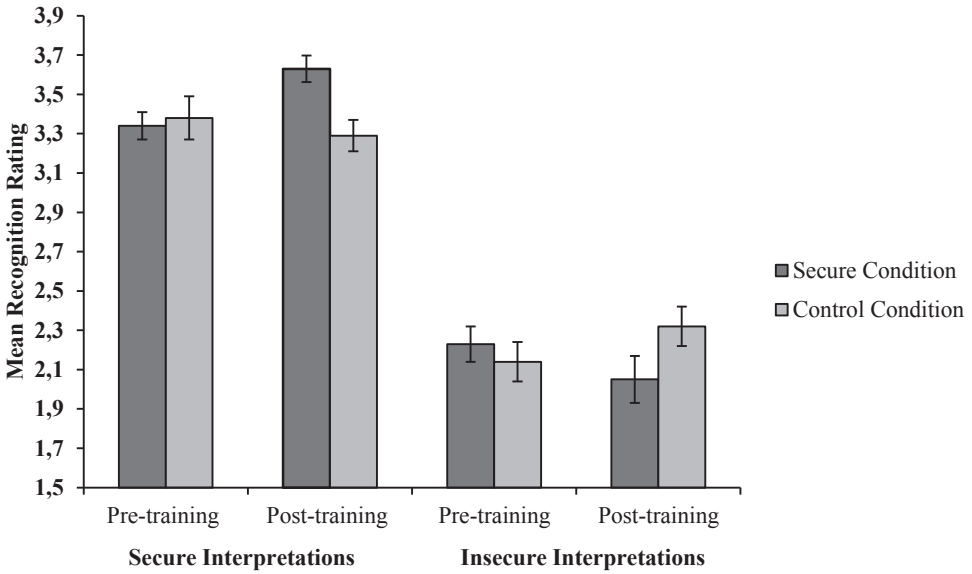

Figure 4. Spontaneous secure and insecure interpretations.

Table 4
Trust in Maternal Support

	F	*df*	*p*	η_p^2
Time	9.27	1, 47	.004	.17
Time × Training Condition	4.13	1, 47	.048	.08

	Pretest trust *M* (*SD*)	Posttest trust *M* (*SD*)	*t*(*df*)	*p*
Placebo condition	37.96 (1.78)[a]	38.14 (1.95)	−.74(23)	.466
Secure condition	37.44 (1.85)[a]	38.36 (1.35)	−3.48(24)	.002

[a]Pre-test condition difference, $t(47) = 1.00$, $p = .32$

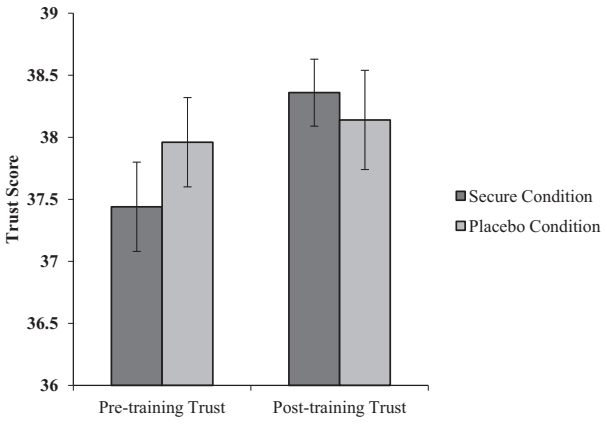

Figure 5. Trust.

fragments. As this effect was not found in the placebo condition, this seems to suggest that the secure condition increased children's secure interpretation bias. Although this is an innovative finding, replication research is needed to rule out alternative explanations. For example, in the secure condition, secure probe trials were congruent with the training trials, whereas insecure probe trials were incongruent. This (in)congruency could have decreased and increased reaction times, although it could not affect responses in the placebo condition. In a similar vein, secure probe trials' reaction times might have been affected by the semantic activation of secure words during preceding secure training trials. Although these remaining issues need to be solved, the crucial finding remains that secure condition children appeared to have learned to resolve the presented situations in a secure manner. Most importantly, these alternative explanations cannot account for training effects on the other outcome levels.

At the level of generalization, after CBM, secure condition children spontaneously interpreted scenarios in a more secure manner during the recognition task. This effect was not found in the placebo condition. Although the probe and the recognition task trials' use of scenarios might create the impression that both measures are similar, the measurement procedure was different (speed during forced interpretations vs. recognition of events that did not actually occur). For insecure interpretation bias, the

interaction effect was replicated. Although none of the insecure interpretation bias effects reached significance within each condition, the direction of effects further supported the study's prediction. Together, the current findings suggest that the CBM effect generalizes to other measures of interpretation bias. Future research should also include alternative attachment-related interpretation bias measures such as a Scrambled Sentence Test (Bowler et al., 2012).

At the level of expectations, the secure condition children, but not the placebo condition children, reported an increase in trust in maternal support after CBM. This suggests that trust is causally influenced by attachment-related interpretation bias. This supports Bowlby's (1969) claim that interpretation bias explains how securely attached children maintain trust in maternal support. One could be concerned that the changes in trust reflect priming effects rather than interpretation bias training effects. However, previous research has demonstrated that CBM effects cannot be explained by priming, as actively interpreting the scenarios is a necessary requirement to find significant CBM effects (Hoppitt, Mathews, Yiend, & Mackintosh, 2010). Nevertheless, as research seems to suggest that attachment states can be manipulated using primes (e.g., Rowe & Carnelley, 2003), it would be worthwhile in future research to use the Hoppitt et al.'s (2010) design to rule out priming effects in trust-related CBM. Finally, secure condition children could have manipulated the results trying to match their questionnaire answers to the training. However, research convincingly showed that CBM participants are on average condition blind and that outcome measures are not affected by condition insight (Salemink, van den Hout, & Kindt, 2007). Nevertheless, this should be ruled out in separate future research.

A second concern could be the design of the placebo trials. The trials ended with a sentence that was unrelated to maternal support to create a placebo control condition. One could argue that using neutral maternal support-related endings instead of unrelated endings would enhance the similarity between both conditions and would allow drawing firmer conclusions about CBM effects. However, when designing the placebo trials, we noticed that neutral maternal behavior in the context of children's support seeking during distress actually appears insensitive or unresponsive. We were concerned that neutral scenarios would train an insecure interpretation bias, which would have been ethically less appropriate. Note that current data give some indication supporting this concern about potential negative effects of neutral endings; the significant Time × Condition interaction effect on insecure interpretation bias (see Table 3) suggests that even the current endings might have increased insecure interpretations somewhat. As the placebo condition effect did not reach significance, we think we designed the most appropriate placebo condition. Nevertheless, as this is the first study ever with this paradigm, it will be necessary to repeat the current study in different samples and with all possible control conditions to investigate the robustness of the findings.

It is important to take into account some limitations. First, the small number of probe trials might have inflated the standard deviations in the reaction time data. This number was based on previous research and aimed to minimize the burden of the procedure but could have affected the power of the test. The fact that the effect size was large in spite of this limitation suggests that the secure interpretation bias training might be highly effective. Nevertheless, future research should investigate whether the current findings can be replicated when more probe trials are added. Second, effects were assessed immediately after CBM. Therefore, the duration of the effects remains unknown. Future research could examine how long CBM effects persist. Third, trust was measured with a self-report measure. Although the current findings are interesting for showing that interpretation bias effects can be found on explicit self-reported attachment-related expectations, future research should test whether similar effects can be found using multiple indicators and methods about which children cannot strategically report (e.g., coherence, scripts, behavior) in order to triangulate these effects. Finally, the current study's selection of securely attached children does not allow drawing conclusions about whether CBM can manipulate insecurely attached children's support-related interpretations.

In spite of these limitations, the current results are important as they provide the first support for Bowlby's (1973) claim that secure attachment expectations are caused by secure information processing biases. In this way, the study contributes to a better understanding of Bowlby's IWM concept that remained too long understudied (Thompson, 2008). Next step would be to test Bowlby's (1969) claim that support-related experiences lead to attachment expectations, which in turn bias attachment-related information processing to maintain expectations. Also, it would be interesting to test the possibility that interpretation biases change expectations and therefore have an effect on the development of

increased trust. This requires conducting CBM research in insecurely attached children and could have important implications for clinical practice.

References

Bosmans, G., Braet, C., Heylen, J., & De Raedt, R. (2015). Children's attentional processing of mother and proximity seeking. *PLoS ONE*, *10*, 1–20. doi:10.1371/journal.pone.0124038

Bosmans, G., & Kerns, K. A. (2015). Attachment in middle childhood: Progress and prospects. In G. Bosmans & K. K. Kerns (Eds.), *Attachment in middle childhood: Theoretical advances and new directions in an emerging field*. *New Directions for Child and Adolescent Development*, *148*, 1–14. doi:10.1002/cad.20100

Bowlby, J. (1969). *Attachment and loss: Vol. 1. Attachment*, New York, NY: Basic Books.

Bowlby, J. (1973). *Attachment and loss: Vol. 2. Separation*, New York, NY: Basic Books.

Bowler, J. O., Mackintosh, B., Dunn, B. D., Mathews, A., Dalgleish, T., & Hoppit, L. (2012). A comparison of cognitive bias modification for interpretation and computerized cognitive behavior therapy: Effects on anxiety, depression, attentional control, and interpretive bias. *Journal of Consulting and Clinical Psychology*, *80*, 1021–1033. doi:10.1037/a0029932

Bretherton, I. (1985). Attachment theory: Retrospect and prospect. *Monographs of the Society for Research in Child Development*, *50*(1–2, Serial No. 209), 3–35. doi:10.2307/3333824

De Winter, S., Vandevivere, E., Waters, T. E. A., Braet, C., & Bosmans, G. (2016). Lack of trust in maternal support is related to negative interpretations of ambiguous maternal behavior. *Journal of Child and Family Studies*, *25*, 146–151. doi:10.1007/s10826-015-0197-4

Del Giudice, M. (2015). Attachment in middle childhood: An evolutionary-developmental perspective. *New Directions for Child and Adolescent Development*, *148*, 15–30. doi:10.1002/cad.20100

Dujardin, A., Santens, T., Braet, C., De Raedt, R., Vos, P., Maes, B., & Bosmans, G. (2016). Middle childhood support-seeking behavior during stress: Links with self-reported attachment and future depressive symptoms. *Child Development*, *87*, 326–340. doi:10.1111/cdev.12491

Dykas, M. J., & Cassidy, J. (2011). Attachment and the processing of social information across the life span: Theory and evidence. *Psychological Bulletin*, *137*, 19–46. doi:10.1037/a0021367

Hallion, L. S., & Ruscio, A. M. (2011). A meta-analysis of the effect of cognitive bias modification on anxiety and depression. *Psychological Bulletin*, *137*, 940. doi:10.1037/a0024355

Holmes, E. A., Lang, T. J., & Shah, D. M. (2009). Developing interpretation bias modification as a "cognitive vaccine" for depressed mood: Imagining positive events makes you feel better than thinking about them verbally. *Journal of Abnormal Psychology*, *118*, 76–88. doi:10.1037/a0012590

Hoppitt, L., Mathews, A., Yiend, J., & Mackintosh, B. (2010). Cognitive mechanisms underlying the emotional effects of bias modification. *Applied Cognitive Psychology*, *24*, 312–325. doi:10.1002/acp.1678

Kerns, K. A., Klepac, L., & Cole, A. (1996). Peer relationships and preadolescents' perceptions of security in the child-mother relationship. *Developmental Psychology*, *32*, 457–466. doi:10.1037/0012-1649.32.3.457

Kovacs, M. (1992). *Children's depression inventory*. New York, NY: Multi-Health Systems.

Main, M., Kaplan, N., & Cassidy, J. (1985). Security in infancy, childhood and adulthood: A move to the level of representation. *Monographs of the Society for Research in Child Development*, *50*(Serial No. 209), 66–104. doi:10.2307/3333827

Mathews, A., & Mackintosh, B. (2000). Induced emotional interpretation bias and anxiety. *Journal of Abnormal Psychology*, *109*, 602–615. doi:10.1037/0021-843X.109.4.602

Ridenour, T. A., Greenberg, M. T., & Cook, E. T. (2006). Structure and validity of people in my life: A self-report measure of attachment in late childhood. *Journal of Youth and Adolescence*, *35*, 1037–1053. doi:10.1007/s10964-006-9070-5

Rowe, A., & Carnelley, K. B. (2003). Attachment style differences in the processing of attachment-relevant information: Primed-style effects on recall, interpersonal expectations, and affect. *Personal Relationships*, *10*, 59–75. doi:10.1111/1475-6811.00036

Salemink, E., & van den Hout, M. (2010). Validation of the "recognition task" used in the training of interpretation biases. *Journal of Behavior Therapy and Experimental Psychiatry*, *41*, 140–144. doi:10.1016/j.jbtep.2009.11.006

Salemink, E., van den Hout, M., & Kindt, M. (2007). Trained interpretive bias and anxiety. *Behaviour Research and Therapy*, *45*, 329–340. doi:10.1016/j.brat.2006.03.011

Thompson, R. A. (2008). Early attachment and later development: Familiar questions, new answers. In J. Cassidy & P. Shaver (Eds.), *Handbook of attachment theory, research, and clinical applications* (pp. 348–365). New York, NY: Guilford.

Vandevivere, E., Braet, C., & Bosmans, G. (2015). Under which conditions do early adolescents need maternal support? *Journal of Early Adolescence*, *35*, 162–169. doi:10.1177/0272431614529364

Waters, H. S., & Waters, E. (2006). The attachment working models concept: Among other things, we build script-like representations of secure base experiences. *Attachment & Human Development*, *8*, 185–197. doi:10.1080/14616730600856016

Zimmermann, P., & Iwanski, A. (2015). Attachment in middle childhood: Associations with information processing. *New Directions for Child and Adolescent Development*, *148*, 47–61. doi:10.1002/cad.20100

Supporting Information

Additional supporting information may be found in the online version of this article at the publisher's website:

Table S1. Summary of the Participant Characteristics for Each Condition Before Training

Table S2. Frequencies for AIT Scores for the Placebo Condition, Secure Condition, and in Total

Appendix S1. The Attachment Interpretation Task