

The Development of Anxiety Disorders: Considering the Contributions of Attachment and Emotion Regulation

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Abstract Anxiety disorders are among the most common psychiatric disorders in childhood. Nonetheless, theoretical knowledge of the development and maintenance of childhood anxiety disorders is still in its infancy. Recently, research has begun to investigate the influence of emotion regulation on anxiety disorders. Although a relation between anxiety disorders and emotion regulation difficulties has been demonstrated, little attention has been given to the question of why anxious individuals have difficulties regulating their emotions. The present review examines the evidence of the link between emotion regulation and anxiety. It also explores the unique contributions of attachment style and dysfunctional emotion regulation to the development of anxiety disorders.

Keywords Emotion regulation · Attachment · Child · Anxiety

Introduction

Although anxiety disorders are among the most common childhood and adolescent psychiatric disorders (Kessler et al. 2005; Muris 2007; Vasey and Ollendick 2000), our understanding of the developmental pathways of anxiety

disorders is still limited. Studies that have investigated childhood anxiety, as well as its accompanying symptoms, have focused on a panoply of factors. These include a temperamental style of behavioral inhibition (Weems and Silverman 2006), difficulties with emotion regulation (e.g., Calkins and Hill 2007; Hannesdottir and Ollendick 2007; Suveg et al. 2007), and information-processing and attention biases (Hadwin et al. 2006; Reinholdt-Dunne et al. 2011). Other studies have focused on the contribution of family factors, such as rearing style, marital conflict, and parental beliefs about the child (e.g., Bögels et al. 2006; McLeod et al. 2011), as well as insecure attachment (e.g., Colonesi et al. 2011), parenting practices (Ginsburg et al. 2004), and heredity (Angold et al. 1999; Bögels et al. 2006; Schreier et al. 2008; Weems and Silverman 2008). All of these factors have been found to relate to childhood anxiety disorders. Although models integrating some of these factors have been put forth (e.g., Murray et al. 2009; Manassis and Bradley 1994; Ginsburg et al. 2004), further understanding of how the different child and parent factors contribute to the development and maintenance of anxiety in childhood remains warranted (Cartwright-Hatton et al. 2006).

Our limited understanding of the development of childhood anxiety may explain why many children suffering from anxiety disorders go unrecognized and untreated (Emslie 2008; Esbjørn et al. 2010). This, in turn, may increase the risk of adverse developments later in life (Stein and Stein 2008). An improved understanding of the developmental pathways of childhood anxiety disorders may also improve our ability to identify children at risk of developing anxiety disorders and help prevent such an undesired developmental outcome.

The ability to regulate emotions is generally considered to play a fundamental role in child functioning and

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well-being, as well as in the development of psychopathology (Calkins and Hill 2007; Suveg et al. 2007). The absence of effective emotion regulation skills may be a specific risk factor in the development and maintenance of childhood anxiety, as anxious children typically exhibit marked difficulties regulating their emotions efficiently (Eisenberg and Spinrad 2004). Given the importance of early experiences and interactions to children's development of emotion regulation abilities, parent–child attachment relationships may be an important precursor to the onset of emotion regulation difficulties and subsequent childhood anxiety (Thompson 2001). For example, it is conceivable that children whose parents provide inconsistent emotional availability, as seen in insecure attachment relationships, may acquire more inconsistent emotion regulation abilities than children with parents who are readily available to soothe their children when distressed, as evident in secure attachment relationships (Cassidy 1994). Indeed, recent findings suggest that attachment theory can be viewed as a theory of affect regulation (Schore and Schore 2008), in that the primary relationship with caretakers and the dyadic regulation of emotions that takes place in this relationship are the foundations for the development of self-regulation of emotions (Weinfeld et al. 2008). In line with this, acquiring a better understanding of the development of emotion regulation skills, and the relations between emotion regulation and early attachment relationships, as well as the possible mechanisms through which they operate, may be of importance in our understanding of childhood anxiety disorders. The focus of the present review therefore lies within emotion regulation and attachment processes, in relation to the development of childhood anxiety.

The literature within the field at present provides conceptual discussions of how attachment, emotion regulation, and anxiety are linked. The different models suggest a synergistic effect between the concepts on a theoretical level (e.g., Cassidy 1994; Mikulincer et al. 2003; Thompson 2001). Empirical studies and comprehensive reviews on the links between either two of the three constructs also exist (e.g., Bögels et al. 2006; Brumariu and Kerns 2010; Colonesi et al. 2011; Hannesdottir and Ollendick 2007). However, to the best of our knowledge, the interrelations between all three concepts have not yet been reviewed with regard to the empirical data substantiating their relations with one another. The present paper reviews empirical data on these three constructs (attachment, emotion regulation, and anxiety) and their interrelations. It also synthesizes these data into an integrative model of the development of anxiety disorders in childhood. This model merges the latest knowledge from two research traditions: attachment theory and social learning theory.

Review Method

A search in PsycINFO and PubMed was conducted using all the search terms *attachment*, *emotion regulation* and *anxiety*. The first search was limited to children aged 0–18 with anxiety disorders. As there was a shortage of studies using these criteria, studies investigating non-pathological levels of anxiety were also included in a second search. In a third search, the terms were combined two at a time and finally adult studies were also examined. When reviews were available, these were incorporated in the present study. Titles and abstracts were used to select studies that corresponded to the aims of the present review. The presentation of results is guided by a developmental psychopathology perspective with a focus on the interaction of attachment and emotion regulation as well as their individual contribution to the development of anxiety disorders in children. Although a meta-analysis would have strengthened our conclusions, it was not deemed appropriate due to substantial methodological variation in selected input and output data and to differences in the assessment measures used in the selected papers. Instead, an analysis of effect size in the studies was carried out to assess the strength of the findings (Cohen 1992).

Emotion Regulation: Theoretical Understanding

An understanding of the role of emotion regulation abilities in the development and maintenance of childhood anxiety disorders requires a shared set of definitions. However, the concept of emotion regulation is itself a fairly recent one and, as is typical for new constructs, the literature is replete with definitional issues (e.g., Campos et al. 2004; Cole et al. 2004; Eisenberg and Spinrad 2004; Gross and Thompson 2007). Further complicating this matter is the fact that there is no universally accepted definition of “emotions” at this time (Cole et al. 2004). This lack of shared definitions complicates the gathering of relevant information concerning the parameters of emotion regulation. Several definitions of emotion regulation have been proposed, such as the one offered by Eisenberg and Spinrad (2004) who defined emotion regulation as: “the process of initiating, avoiding, inhibiting, maintaining, or modulating the occurrence, form, intensity, or duration of internal feeling states, emotion-related physiological, attentional processes, motivational states, and/or the behavioral concomitants of emotion in the services of accomplishing affect related biological or social adaptation or achieving individual goals” (p. 338). Some authors argue that emotion regulation is best understood by a two-factor approach, where generation of the emotion is followed by regulation of the emotion (Cole et al. 2004). Thus, the emotion may

regulate actions, but may also be regulated itself in turn. Contrary to this two-factor approach, others have proposed a unitary model wherein emotion and emotion regulation are inextricably linked and indistinguishable from one another. This is supported by the notion that emotions can simultaneously occur with the regulation of the same emotion, thus the two become inseparable (Campos et al. 2004). Furthermore, Gross and Thompson (2007) suggest that we view emotion regulation as a set of processes that operate on a continuum from automatic, effortless, and unconscious to controlled, effortful, and conscious processes. These definitions illustrate the possible complexity of emotion regulation as a construct, as well as the diversity of processes, which can be labeled as regulation of emotions. In their model of emotion, Gross and Thompson (2007) conceptualize emotions as a person–situation transaction that compels attention, gives rise to a response, and has meaning to an individual (see Fig. 1).

According to this view, emotions determine not only how a person feels but also which environments or situations a person will engage in as well as the conditions under which she or he will do so. For instance, anxious individuals may avoid situations which they deem to be anxiety-provoking, thereby maintaining their beliefs about these situations and reinforcing their anxiety. Alternatively, they may modify the anxiety-provoking situation in some way, which may lead them to believe that they are capable of dealing with this altered version of the situation, even if still incapable of entering into the unmodified, original situation. In other instances, they may deploy selective attention, leading them to focus only on information that confirms their anxious feelings about a given situation; still others may distract themselves in a way that will not allow them to confront their fears and anticipated anxiety. Finally, other individuals may challenge their anxiety by directly engaging in the given situation, being attentive to the anxiety-provoking stimuli, and via a process of cognitive appraisal change their beliefs about that situation. This may lead to changes in emotional and behavioral responses in future situations accompanied by altered

cognitive appraisals of the situations themselves. Thus, according to Gross and Thompson's model (2007), our emotions steer the way in which we think about and engage in various situations and environments. Although the model is persuasive in describing what happens in a specific situation, certain questions remain unanswered in the case of emotion regulation in anxious children. First, it does not incorporate how and through which mechanisms parents may influence children's ongoing emotion regulation in a given situation. Second, one wonders how the early parent–child interactions known to contribute to the child's emotion regulation abilities may be integrated into the model or if it is even possible. At present, these questions remain unanswered, although the present paper provides some suggestive answers to them.

Emotional Regulation and Anxiety Disorders in Adults

The adult studies have generally found that emotion regulation is less developed in anxious individuals (see Amstadter 2008 for a recent review). Higher levels of anxious arousal and worry have been shown to be associated with the use of suppression as a regulatory mechanism (Campbell-Sills et al. 2006), a limited access to emotion regulation strategies, and a general non-acceptance of emotions (Kashdan et al. 2008). These results are echoed by research assessing clinically referred anxious individuals, where severity of symptoms has been shown to be correlated with emotion regulation difficulties (Salters-Pedneault et al. 2006; Tull 2006).

One of the emotion regulation difficulties associated with generalized anxiety disorder (GAD) has been uncovered by another line of research, namely an examination of information-processing biases. Results show that individuals with GAD are more likely to devote their attention to threat-related rather than neutral stimuli (see Bar-Haim et al. 2007, for a review). Keeping with the model of emotion regulation proposed by Gross and Thompson (2007), attention to and appraisal of a given situation may be viewed as the cognitive components of an individual's effort to regulate the elicited emotion. This suggestion is corroborated by studies reporting individual differences in coping strategies and information processing of threatening information. Persons who are high in intolerance of emotional arousal are characterized by initial attention to threat, followed by disengagement with reduced delayed recall of anxious information (avoidance). In contrast, persons who are high in intolerance of uncertainty and feelings of apprehension are characterized by a continued attention to threat, including an increase in delayed recall of anxious information (vigilance; see Krohne and Hock 2011). The way in which information is attended to and processed by the individual is thus an important component of emotion

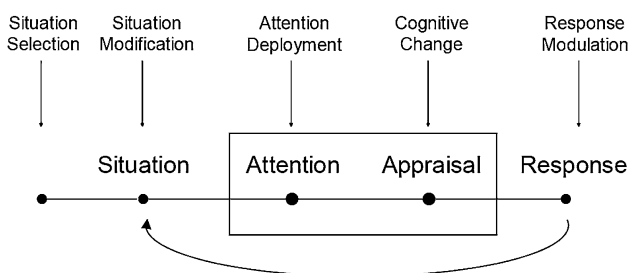


Fig. 1 The process model of emotion regulation. Gross and Thompson (2007, p. 10)

regulation. Despite promising results with this line of research, the lack of longitudinal studies of clinically anxious individuals before and after treatment and reliance on self-report measures warrants caution regarding the conclusions of the role of emotion regulation in anxious individuals (Amstadter 2008).

Emotion Regulation and Anxiety in Child and Adolescent Samples

Weems et al. (2005) investigated a community sample of children and adolescents aged 6–17 years in a procedure using a film designed to invoke a mildly dog-phobic reaction. The reactions to the film were measured physiologically (heart rate). In this study, high- and low-anxiety groups were based on child and parent ratings of the child's anxiety symptoms. Results indicated that youth high in anxiety symptoms reacted with significantly higher heart rates to the film compared to the low-anxiety group. Weems et al. also found that heart rate responses correlated better with youth than parent reports of anxiety symptoms. However, the authors argue that this may not be the case for parental reports of parents who seek treatment for their anxious children, as they may be better aware of the anxiety symptoms in their children. Therefore, research should also examine clinically referred children before firm conclusions regarding the correlations between parents' ratings and physiological responses in children can be drawn.

A longitudinal study by Hannesdottir et al. (2010) investigated the association between frontal EEG measures at 4½ years of age and physiological measures of emotion regulation, as well as self- and parent-reported anxiety symptoms at 9 years of age in 20 normally developing children. A significant association was found between right frontal asymmetry in early childhood and higher physiological arousal, decreased ability to regulate emotions, and increased levels of anxiety in middle childhood. Although the data provided on emotion regulation abilities and anxiety symptoms were all assessed at age 9, and were therefore cross-sectional in nature, the study is one of few that provide physiological evidence for the relation between decreased emotion regulation abilities and elevated levels of anxiety.

The only other two longitudinal studies on emotion regulation and anxiety disorders in children come from the Minnesota Study (Bosquet and Egeland 2006; Sroufe 2005), which included 155 children from high-risk families. "High risk" was defined as low economic status, low level of parental education, chaotic living conditions, significant life stress, and a lack of social support. Children were assessed extensively at nine different intervals from birth to 17.5 years of age and were observed at 13 different time points in different contexts. Of importance, parents

had been interviewed prior to the birth of their child as well. Of special interest to this review is that participants were assessed with regard to emotion regulation and anxiety symptoms in childhood and preadolescence, as well as anxiety disorders in adolescence. Also, to the best of our knowledge, the Minnesota Study was the only study assessing both emotion regulation abilities and attachment classifications in children in relation to anxiety. Bosquet and Egeland (2006) found that insecure attachment predicted a unique proportion of emotion regulation difficulties experienced in the preschool years and that these emotion regulation difficulties, in turn, predicted childhood anxiety symptoms. They found that this pathway was specific for anxiety symptoms and that the anxiety symptoms were moderately stable during childhood and adolescence. Furthermore, Sroufe (2005) analyzed the children with insecure-ambivalent attachments and found that this pattern of attachment predicted both developmental immaturity and dysfunctional emotion regulation.

The link between emotion regulation difficulties and childhood anxiety has also become apparent in research conducted with clinical populations. For example, Suveg and Zeman (2004) investigated emotion management skills in a small group of children aged 8–12 years who met diagnostic criteria for an anxiety disorder and compared them to a control group of children with no psychopathology. Their results resembled those found in adult studies. The study showed that children with an anxiety disorder reported significantly lower perceptions of self-efficacy with regard to emotion regulation as well as higher intensity in their experience of worry and anger than controls, as well as a less constructive way of managing these emotions. These findings were supported by another study of children aged 8–13 years with anxiety disorders that reported anxious children to be five times as likely to indicate use of maladaptive emotion regulation strategies compared to non-anxious youth (Suveg et al. 2008). The authors suggest that deficits in emotional skills may be most evident in the actual enactment of emotion regulation in anxious children. An additional study of youth aged 7–15 referred for treatment to a specialized clinic also showed a correlation between emotion regulation skill deficits and anxiety, and that an improved ability to regulate worry predicted reduced levels of anxiety after CBT treatment (Suveg et al. 2009). In a very recent study, youth aged 10–17 diagnosed with anxiety were also reported to exhibit negative emotional hyper-reactivity and deficits with emotional regulation in a computerized task involving ambiguous everyday situations (Carthy et al. 2010).

Finally, similar to research with adults, children suffering from anxiety have also shown information-processing biases. For instance, several studies have reported an attentional bias for threat-related words or facial

expressions in clinically anxious children relative to non-anxious children (e.g., Taghavi et al. 1999, 2003; Vasey et al. 1995), as well as in young children with high and low levels of trait anxiety (e.g., Reinholdt-Dunne et al. 2011).

The studies reviewed above indicate that children, adolescents, and adults who exhibit elevated levels of anxiety symptoms or suffer from anxiety disorders have emotion regulation difficulties. These difficulties include problems with emotional awareness, strategies for dealing with emotions, and attentional and cognitive biases. Anxious adults are also reported to have less access to emotion regulation strategies in general. Whether this finding is true for children is uncertain at this time since this has not yet been investigated empirically, although findings indicate that the strategies employed by anxious children are less effective than those utilized by children in normal control groups.

In general, the emotion regulation difficulties exhibited by children suffering from anxiety are found in the same areas as the ones displayed by anxious adults. Also, the effect sizes reported in studies or calculated based on the reported results (Cohen 1992) are generally in the low medium to large range. One has to keep in mind, however, that most of the current studies have not assessed children's emotion regulation capacities prior to the onset of their anxiety, which leaves questions regarding the causal relations between the two constructs. The Minnesota Study, as the prospective study allows direct information on this linkage, showed that type of children's attachment preceded emotion regulation difficulties, which, in turn, predicted children's level of anxiety symptoms.

Attachment Theory and Emotion Regulation

Prior to considering additional evidence of a relationship between attachment and anxiety, the application of the concept of emotion regulation within an attachment theoretical framework is addressed. In attachment theory, proximity to, and availability of, the primary attachment figure is key to the development of attachment security. However, further efforts have been made to tease out the underlying mechanisms in the transmission of attachment style. It has been suggested that contingent responsiveness and mirroring of the child's affective state on the part of the primary caregiver alongside with the infant's temperament will contribute to the development of a basic generalized emotion regulatory style. It is thought to develop via (1) internal representations of emotional states in the infant and (2) interactions involving emotion-relevant behaviors (DeOliveira et al. 2004). Another mechanism that has proven fruitful in understanding the transmission from parent to child is the concept of mentalization and

“Reflective Functioning” (RF). RF is an operationalization of mentalization, which is defined as the individual's capacity to understand oneself and others as motivated by internal mental states (Fonagy et al. 1991, 1998). Mentalization and RF are also developed in an attachment relationship with the primary caregiver mirroring the child's expression of basic emotions in an appropriate and contingent way (Fonagy et al. 2002). Based on the caregiver's ongoing verbal and non-verbal feedback of their understanding of the child's internal states and emotional expressions, the child gradually develops the ability to represent her or his own mental states and to relate to, differentiate, and regulate emotions. In normally developing children, this ability is attained at approximately 4–5 years of age (Fonagy et al. 2002). The ability to mentalize is context dependent and is theoretically described to be especially vulnerable in attachment contexts and/or in situations eliciting high levels of stress (e.g., anxiety-provoking situations in anxious individuals).

Within attachment theory, RF is regarded as a proxy measure for emotion regulation ability. Several studies have found high levels of parental RF to be significantly correlated with secure attachment classification in the offspring (Fonagy et al. 1991; Slade et al. 2005), highlighting the impact of parental emotion regulation abilities on the psychic development of the child. Securely attached children are described as being able to employ competent and flexible strategies to reduce negative emotions and regulate emotionally distressing experiences, such as seeking support from others (Belsky 2002). This strategy is considered to be the primary, security-based affect regulation strategy. Infants who are insecurely attached are less able to use this primary strategy and will have to apply secondary emotion regulation strategies, such as distancing themselves from attachment-related cues (deactivating strategies) or displaying hypervigilance regarding attachment cues (hyperactivating strategies; for a review, see Mikulincer et al. 2003).

Within an emotion regulation framework, proximity-seeking behavior in infants and children is considered an appropriate and effective strategy to lessen distress and fear. By modifying the situation (i.e., seeking proximity to a caretaker), children are able to calm themselves and increase feelings of safety. Infants or children who are insecurely attached, on the other hand, have difficulty making use of this primary strategy, as their experiences with the primary caregiver have reinforced the idea that proximity-seeking will not alleviate their distress. They may instead employ a secondary emotion regulation strategy, such as selectively shifting attention to a toy or some object instead of the mother, as a means of facilitating suppression of the elicited emotion. This emotion regulation strategy is consistent with an avoidant coping strategy,

where attention is shifted away from a possible threat once it is detected (Krohne and Hock 2011). Another commonly observed behavior is to cling to the mother to prevent her from leaving. Both of these examples can be considered an adaptive form of response modulation and self-regulation.

Within the attachment paradigm, attachment quality relates to emotion regulation via mental representations of the self and of significant others. The individual is thought to have certain preferred behaviors or responses to the immediate situation, and emotions are thought to be central in the control of behavior (Ainsworth et al. 1978). Within the attachment theory literature (e.g., Fonagy and Target 2002), emotions are defined as evaluative or appraising and related to the infant's goals, and in this way, they are hypothesized to motivate and organize the infant's behavior. The development of emotion regulation from infancy through childhood is subsequently dependent on other directed regulatory behaviors (Tronick 1989). It is in the repeated experiences of interaction between a caretaker and infant, and their emotional communication, disruptions, and repair that a basic emotion regulatory system is established. As proposed in the theoretical model presented in this paper, the basic emotion regulatory system is regarded as an ongoing, inner basis from which the child may engage in a specific situation, which requires specific emotion regulation. An anxious child with insecure attachment will thus enter a specific anxiety-provoking situation with poorer emotion regulatory skills than an anxious child with a secure attachment. This renders the insecure child at greater risk of maladaptive emotion regulation in the situation compared to the secure child, regardless of the learning history of how to regulate oneself in the specific situation.

Cassidy (1994) also theorized that the differences in attachment between the infant and parent, categorized as secure or insecure, accounts for differences in infants' ability to regulate emotions. She argues that children in insecure relationships, characterized by avoidance or ambivalence, have caretakers who are inconsistent in their availability. Avoidant children have parents who tend to turn away from their children when they display attachment behaviors meant to bring the parent closer, whereas ambivalent children tend to have parents who seek to keep the child close at all times, thereby not calming the child when she or he is in distress. The child will thus learn to continually seek out possible danger in the environment and to engage in attachment behavior when such may not be called for (Cassidy 1994). As discussed, directing attention toward or away from a threatening situation may be regarded as part of the emotion regulation repertoire. According to attachment theory, insecure-avoidant individuals should direct their attention away from threatening information, whereas insecure-ambivalent individuals

should direct their attention toward the information. Both children and adults who are insecurely attached have been found to direct their attention away from threatening information; however, there was no overall difference between the two insecure groups (Dewitte et al. 2007; Kirsh and Cassidy 1997). This may be due to the methodological approach of the studies. Because they do not test changes over time in attention direction, a primary direction toward the threatening information may not be found. In as much as persons high on vigilance display a continued attention to threat (Krohne and Hock 2011), this methodological issue may not provide the full explanation.

Beebe et al. (2005) have shown that interactions between parent and infant affect both emotion regulatory strategies and attachment classification of the child. In their *Midrange Model of Emotion Regulation*, they propose that an optimal degree of interpersonal matching provides children with a secure attachment and a flexible strategy of regulating emotions, whereby they can rely on both external regulation by the parent and self-regulation. Overly involved parents, who excessively monitor the infant during their interactions, tend to produce children who are insecurely attached. These children have limited experience with self-regulation of emotions and have learned to rely solely on others in order to regulate their emotions. At the other end of the scale, infants who have parents who withdraw from interaction and who experience very little matching of their emotional states by significant others also tend to become insecurely attached and are forced to rely on an internal regulation of emotions. This phenomenon is also observed in dyads between depressed mothers and their infants (Beebe et al. 2005). Both types of insecure regulation are shown to be less effective in the development of emotion regulation than that associated with secure regulation.

Diener et al. (2002) also found that infants with an insecure attachment more often than securely attached infants use emotion regulation strategies that are not parent-oriented. In this study, however, the authors did not analyze the results for separate categories of insecure attachment. Furthermore, Kochanska (2001) studied individual differences in the emotional development of infants and toddlers from 9 to 33 months with regard to the development of fear, anger, and joy in relation to attachment quality. Her findings also indicated that there was a difference in the emotional development of securely and insecurely attached children, in terms of their development and expression of emotion. Large differences between the attachment groups were found regarding the development of fear. Not only did the insecure-ambivalent children react with more fear in situations constructed to elicit a fear response, they also expressed more distress than both secure- and insecure-avoidant children in situations

constructed to elicit joy. In insecure-ambivalent children, fear was found to be the strongest emotion at 33 months when compared to both anger and joy. This finding is supported by findings from the Minnesota Study (e.g., Sroufe 2005). The study of the ambivalent pattern of attachment is highly relevant with regard to the development of anxiety disorders, as ambivalently attached children are thought to lack confidence in the primary caregiver's availability. They therefore avoid exploration of the environment, are socially withdrawn, and consistently anxious even when no danger is present. In a recent study by Gentzler et al. (2010), college students who were classified as having an anxious/ambivalent attachment were also found to engage in more rumination and intense negative emotions when engaging in a negative situation than persons who had a secure and avoidant attachment. These forms of behavior resemble that seen as core symptoms of various childhood anxiety disorders (Manassis 2001). Attachment theory thus suggests that anxiety in children has its roots in insecure attachment (Bowlby 1973), and many studies, among them the studies included below, investigate and support this hypothesis.

Attachment and Anxiety Symptoms

The following review includes 22 studies investigating the relationship between attachment quality and anxiety symptoms in children, of which 9 are longitudinal in nature. Three studies were conducted with adults from a clinical sample, whereas all but one of the childhood studies are based on community samples. It also includes a meta-analysis of 46 childhood studies, including both community and clinical samples.

Attachment and Non-Clinical Levels of Anxiety

Dallaire and Weinraub (2005) found insecure attachment patterns at 1 year to be associated with increased levels of separation anxiety at 6 years of age compared to children who were securely attached. The insecure-ambivalent children evidenced the highest levels of separation anxiety. In a subsequent study, attachment insecurity alone did not predict higher levels of anxiety in 4.5- to 5-year-old children. Rather, they found an interactive effect when including a measure of negative life events (NLE; Dallaire and Weinraub 2007). NLE and attachment insecurity interacted to predict higher levels of anxiety at 4.5 years of age; that is, only those children with combined high levels of negative life events and attachment insecurity showed higher levels of anxiety. They also found that this was specific for anxiety and not aggression. Bohlin et al. (2000) found that children who were rated as insecure (avoidant or

ambivalent) at 15 months on the Strange Situation Procedure reported a higher level of social anxiety at 8–9 years of age and that this association was mediated by the children's current attachment security. In another study, Costa and Weems (2005) found a significant association between anxious/ambivalent attachment beliefs in the mother and maternal and child anxiety in the total sample of children aged 6–17 years. However, avoidant attachment beliefs in the mother were only significantly correlated to maternal and child anxiety for boys. They also found a significant negative correlation between child's attachment beliefs and the child's levels of anxiety.

In a study of 9- to 11-year-old children, Brumariu and Kerns (2008) also showed that an insecure-ambivalent attachment pattern was associated with higher levels of social anxiety. They found that this was specific for anxiety and not for other types of psychopathology. The two insecure attachment patterns were found to differ in this study as insecure-avoidant children did not have the same levels of social anxiety symptoms as insecure-ambivalent children. Brumariu and Kerns (2008) suggest that this difference between the two insecure attachment patterns may be important in relation to the ambivalent child's ability to establish peer relationships as only the ambivalently attached children had higher levels of generalized social avoidance and a fear of negative evaluation.

Studies of adolescent samples using a self-report questionnaire (Inventory of Parent and Peer Attachment; Armsden and Greenberg 1987) have reported a negative correlation between attachment security and anxiety symptoms (Papini et al. 1991; Papini and Roggman 1992), whereas another study did not find this association (Laible et al. 2000). Muris and colleagues investigated the relation between anxiety and attachment in a series of studies with non-clinical children. In one study, insecure attachment was related to elevated levels of anxiety in 12-year-old children (Muris et al. 2000). This study also showed that insecure-ambivalent children had higher levels of anxiety than insecure-avoidant children with secure children showing the lowest levels of anxiety (Muris et al. 2001). In an additional study, Muris and Meesters (2002) investigated the impact of behavioral inhibition on anxiety symptoms. Behavioral inhibition (BI) is a term used to describe a highly reactive temperamental trait in children. These children respond with fear in unfamiliar and new situations, even if non-threatening (Kagan 1997). Although the observed reactions to novel situations change as the child develops, behavioral inhibition is reported to be fairly stable from early to late childhood (Muris and Meesters 2002). The study sample in the Muris and Meesters study consisted of adolescents aged 11–15 years. They found that attachment style and BI were independently related to higher levels of anxiety symptoms—both accounted for a

unique proportion of the variance. They also found a positive correlation between insecure attachment and BI in that the percentage of children who reported a secure attachment declined with increasing levels of BI. Insecurely attached children reported higher levels of anxiety symptoms than securely attached children. They found a significant effect of attachment on all anxiety subscales of the Revised Child Anxiety and Depression Scales (RCADS; Chorpita et al. 2000) except for social phobia, which was significantly related to BI. However, when removing social phobia symptoms from the total anxiety score, attachment style and BI still accounted for independent proportions of the variance. As behavioral inhibition has consistently been shown to constitute an increased risk of developing childhood anxiety disorders (Murray et al. 2009; Ollendick and Hirshfeld-Becker 2002), this finding is not surprising. However, the results are important in that they provide evidence for the unique contribution of insecure attachment style to the development of anxiety in children, even when controlling for BI.

Van Brakell et al. (2006) also investigated the reciprocal connections between different risk factors and the development of anxiety symptoms and anxiety disorders in youth aged 11–15 years. They found that each risk factor investigated accounted for a unique portion of the variance. The authors argue that these findings underscore that although BI and insecure attachment represent independent constructs, they demonstrate some common variance. In light of the integrative framework proposed by DeOliveira et al. (2004), it may be that the common variance is provided by a basic emotion regulatory style. In the theoretical model proposed in the present study, it is suggested that such basic emotion regulation skills may mediate the child's development of more specific emotion regulation skills connected to the specific anxiety-provoking situations.

In a large ($N = 350$) 4-wave prospective assessment of the impact of attachment security and dysfunctional attitudes on anxiety symptoms in adolescents aged 11–17 years, anxious/ambivalent but not avoidant attachment was found to predict dysfunctional attitudes, which again predicted the presence of self-reported anxiety symptoms (Lee and Hankin 2009). Also, Bar-Haim et al. (2007) investigated the development of anxiety symptoms in children with regard to possible differences between securely and insecurely ambivalently attached children in a longitudinal design. Attachment status was assessed using the Strange Situation Procedure when the child was 12 months old. By 11 years of age, the children were followed up and anxiety symptoms were assessed. At the time of this second assessment, none of the children had developed an anxiety disorder; however, results indicated that children with an insecure-ambivalent attachment had

higher levels of anxiety symptoms than children with a secure attachment pattern. Although they did not establish a causal relationship between the two factors, the study provided limited but important evidence for the connection between attachment security and level of anxiety. An important methodological problem in this study, however, was that only 136 out of the original sample of 758 children and their parents participated in the follow-up. This substantial dropout rate may be due to the fact that dropout families were having the most difficulties. It is therefore possible that children with more severe psychopathology were not included, thereby possibly explaining why the study found an association between attachment security and non-pathological anxiety but not with anxiety disorders.

A very recent meta-analysis by Colonnese et al. (2011) including 8,907 children reported a significant medium effect size, which indicates a moderate relationship between insecure attachment and anxiety in childhood. This finding was unrelated to clinical status of the child as well as to the type of anxiety experienced by the child. Rather, effect sizes were generally lower in children as compared to adolescents. Furthermore, studies applying observational measures as opposed to self-report measures reported lower effect sizes; however, these findings may be related in that observational measures are primarily applied to younger children. Analyses of subtypes of attachment security revealed stronger associations between ambivalent attachment and anxiety ($r = .37$) than between anxiety and an overall category of attachment security ($r = .24$). In line with findings from the Minnesota Study (Warren et al. 1997), this study provides strong evidence that ambivalent attachment provides a unique contribution to the development of anxiety disorders (Colonnese et al. 2011).

Taken together, these findings suggest that insecure attachment especially insecure-ambivalent attachments increase vulnerability for anxious behavior in children especially when combined with other risk factors. Although insecure attachment may not predict the development of anxiety in itself, it increases the risk of anxiety; however, the presence of other risk factors (i.e., negative life events) may be necessary for the anxiety to progress to a pathological level.

Attachment and Clinical Levels of Anxiety

One study investigated attachment relations in a sample of 64 children and adolescents diagnosed with principal anxiety disorders. The most commonly occurring disorders were obsessive–compulsive disorder (20%), generalized anxiety disorder (12.3%), social phobia (9.4%), and separation anxiety disorder (6.2%; Brown and Whiteside 2008). Attachment was assessed using a self-report questionnaire

where participants chose the most applicable of three available statements describing personal preferences in attachment-related situations. The statements were designed to assess the secure, ambivalent, and avoidant attachment categories. Children who classified themselves as ambivalently attached had higher levels of worry than children with secure or avoidant attachment. Insecure-ambivalent attachment in this clinical group mediated the level of worry in children and adolescents with an anxiety disorder. Such results have also been found in an earlier study by Eng et al. (2001), who investigated a clinical group of adults with social anxiety disorder. The study found that retrospectively reported insecure attachment patterns predicted higher levels of social anxiety and a higher prevalence of comorbid depressive disorder. Adult separation anxiety disorder has since been linked to ambivalent rather than avoidant attachment styles (Manicavasagar et al. 2009). Further analyses of the relationship between attachment styles and anxiety disorders have been conducted in Cassidy et al. (2009) study of adults with generalized anxiety disorder (GAD). The findings showed that GAD in adults was associated not only with childhood attachment experiences but also with current state of mind regarding attachment, the latter being the better predictor of diagnostic group status (Cassidy et al. 2009). However, this study was retrospective in nature. Quite obviously, childhood attachment classifications in such studies could be biased by the current state of mind, making it difficult to draw firm conclusions regarding the findings.

Shamir-Essakow et al. (2005) investigated anxiety disorders in two groups of 3- to 4-year-old children: one group of behaviorally inhibited children and one control group of uninhibited children. A total of 67% of the children were diagnosed with at least one anxiety disorder. Insecure attachment and BI were both independently associated with anxiety disorder even after controlling for the effect of maternal anxiety. This finding partially supported the Minnesota Study findings (Warren et al. 1997) wherein one of two similar temperament measures lost significance in predicting diagnostic status when controlling for ambivalent attachment classification. The measures of emotion regulation ability in this study were nurses' ratings of reactivity in the infants before discharge from hospital after birth (using a 3-point rating scale) and the Neonatal Behavioral Assessment Scale (NBAS; Brazelton 1973) habituation cluster (e.g., how fast the child inhibited a startle response). Only the NBAS cluster "range of state," which refers to general arousal level and arousability of the child, remained significant when controlling for ambivalent attachment classification in this study. The authors suggested that temperamental characteristics may be related to attachment behaviors, but not directly to specific

attachment classifications. They also stressed that more children with anxiety disorders were classified as ambivalent as compared to children with other psychiatric diagnoses who were more often classified as avoidant. In fact, being insecurely ambivalently attached doubled the risk of developing an anxiety disorder (Warren et al. 1997). Still, it should be noted that this finding was based on a high-risk sample with a follow-up rate of 64% from infancy to adolescence; moreover, only nine children had an anxiety disorder and an ambivalent attachment, making results somewhat less conclusive.

Overall analyses of the effect sizes of the papers included in the present section of our review ranged from small to very large (Cohen 1992). However; the effect sizes of studies reporting significant findings were generally in the range from lower medium to large effect sizes. This finding is in line with that reported by Brumariu and Kerns (2010) and Colonesi et al. (2011).

Attachment, Anxiety, and Emotion Regulation

Thompson (1994) stresses that the careful management and guidance of the infant's emotional experiences result in high emotion regulation and that the parent-child relationship is an important factor in this development. As we have noted above, both theory and research suggest that the development of basic emotion regulation skills occurs within the infant-parent attachment relationship (Cassidy 1994; Diener et al. 2002; Fonagy and Target 2002), via the child's repeated experiences of dyadic regulation during infancy and childhood (Tronick 1989; Weinfeld et al. 2008). Also, attachment classifications may predict the level of negative emotionality in children in terms of increased expression of fear in equivocal situations (Kochanska 2001). Assuming that the inability to regulate emotions is related to an overall increased level of negative affect, these findings may provide evidence for the assumption that insecure attachment may act as a mediator for the development of anxiety disorders in childhood. Our theoretical model suggests that attachment and the associated construct of reflective functioning provide an emotion regulatory basis with which the child enters into specific learning situations (ambiguous or anxiety-provoking situations). Insecure attachment thus raises the overall risk of failure to develop appropriate emotion regulation skills for dealing with specific anxiety-provoking situations. This assumption is supported by the results presented by Bosquet and Egeland (2006), who assessed attachment classifications at an earlier point in time than emotion regulation abilities, indicating that insecure attachment precedes emotion regulation difficulties in later life.

In relation to the development of anxiety disorders, this review has attempted to show that both insecure attachment (e.g., Brumariu and Kerns 2010; Colonesi et al. 2011) and emotion regulation abilities (e.g., Suveg and Zeman 2004) are key factors. While this contributes to our understanding of the development of childhood anxiety, we must conclude that the majority of studies have examined the relations between only two of these three constructs in any one study (Shamir-Essakow et al. 2005; Suveg et al. 2008, 2009).

An exception to the above conclusion is the Minnesota Study (Bosquet and Egeland 2006; Sroufe 2005) that provides us with prospective longitudinal data on the interrelations between all three constructs (i.e., attachment, emotion regulation, and anxiety in childhood). These authors found that insecure attachment predicted preschool emotion regulation difficulties and that these difficulties in turn predicted childhood anxiety. However, this pathway was specific for anxiety symptoms only and not for anxiety disorders (Bosquet and Egeland 2006). However, Sroufe (2005) reported that attachment in itself was not the best predictor for childhood psychopathology when the quality of parental care was included in predictive analyses. Still, as pointed out earlier, different aspects of parental care, such as maternal emotional support, are strongly associated with attachment quality (De Wolff and van Ijzendoorn 1997). The overlap between these two constructs may thus explain the lack of significant predictions by attachment quality alone in this study. This is also in line with our theoretical model that proposes parental behaviors such as overprotectiveness and intrusiveness are partially affected by basic emotion regulatory skills via attachment security and reflective functioning. The latter assumption is supported by findings from a longitudinal study, reporting parental reflective functioning to be significantly related to the mental health of their children (Steele and Steele 2008).

Methodological Limitations in Existing Studies

The above-mentioned theories and empirical studies provide a reasonably strong case for the connection between attachment classification, emotion regulation, and the development of anxiety disorders. We would propose that insecurely attached children—especially insecure ambivalently attached and behaviorally inhibited children—have an increased risk of developing difficulties in emotion regulation skills, and thereby an increased risk of developing an anxiety disorder. Despite these findings, we caution against drawing firm conclusions at present as some of the obtained results may be affected by methodological limitations. Cross-sectional study designs, use of groups with small age spans, and a diversity of assessment

measures limit these studies and warrant the need for methodologically sound studies that provide a firmer theoretical base as well as empirical data to examine these relations. Also, some studies report on levels of anxiety symptoms, whereas others report on anxiety disorders—another issue that may lead to different results.

In several studies (Bar-Haim et al. 2007; Bosquet and Egeland 2006; Shamir-Essakow et al. 2005), infants categorized as having a disorganized pattern of attachment were included in a combined insecure group with ambivalent and avoidant attachment. This also poses difficulties for the investigation of the relations between specific attachment patterns and later psychopathology. Disorganized patterns of attachment are often found in high-risk samples and tied to the development of severe psychopathology (Hesse and Main 2000). Thus, including them in the insecure group would presumably increase the prevalence of psychopathology. In the study by Bosquet and Egeland (2006), for example, an unusually large proportion (30%) of children with a disorganized attachment pattern was found. These children were included in the insecure attachment group. The results obtained in the study can therefore not be used alone to make specific predictions about the different insecure attachment groups. This is unfortunate as it is one of the largest and one of only a few studies to employ a longitudinal design.

Despite these methodological limitations, we generally found medium to large effect sizes in the individual studies, which provide support for the validity of the individual relations between attachment, emotion regulation, and anxiety reported in these studies. The studies thus provide considerable evidence that insecure attachment places children at an increased risk of developing anxiety, although not necessarily pathological anxiety. It may be the case that there is primarily an effect of attachment style in high-risk samples or in combination with other risk factors (e.g., Bosquet and Egeland 2006; Dallaire and Weinraub 2007; Sroufe 2005). Further research should address this question. Another important issue is that several studies found evidence that insecure attachment was specifically related to anxiety symptoms (Bosquet and Egeland 2006; Dallaire and Weinraub 2007; Sroufe 2005) and not psychopathology in general. However, as previously mentioned, it is too early to draw firm conclusions as to whether it is insecure attachment, or more specifically insecure-*ambivalent* attachment, that is a risk factor for the development of anxiety disorders in childhood (Brown and Whiteside 2008; Warren et al. 1997). Although insecure attachment was not always found to be predictive of anxious psychopathology in itself, it was found to be a precursor for dysfunctional emotional regulation abilities and other developmental difficulties, which again may predict the development of anxiety disorders. It may therefore be

concluded that attachment style is a promising area for further research. An exploration of its role in parents and children for the development of dysfunctional emotion regulation and anxiety disorders in childhood should be productive in advancing our understanding of the onset and course of the anxiety disorders in children.

It should also be noted that only four studies (Bosquet and Egeland 2006; Hannesdottir et al. 2010; Sroufe 2005; Weems et al. 2005) employed physiological measures of emotion regulation. However, the physiological measure in the Minnesota Study consisted of the Neonatal Behavioral Assessment Scale (NBAS), an observational assessment of newborn infants. The NBAS was conducted when the infants were 7–10 days of age, and the scale's summary scores reflected problems with physiological and state regulation. Despite the measure's incorporation of subscales of physiological response to stress and habituation to sensory stimuli, it does not provide a true objective, physiological measure of emotional regulation of the infants. Although all scores are based on observations by trained observers, one can still question the direct comparability with physiological measures such as heart rate, heart rate variability, and galvanic skin responses. The remaining studies used self-report measures exclusively. Cole et al. (2004) emphasized the need for studies to apply different measures of emotion regulation because emotions and emotion regulation skills are complex constructs, which may be vulnerable to individual differences not assessed via self-report instruments (see also Amstadter 2008). Future research should thus employ a multimodal assessment of emotion and emotion regulation, including self-report and physiological measures, as well as observations. This may provide us with a more reliable index of participant affect and emotion regulation compared to measures of emotion regulation that rely solely on self-report.

Implications for Further Research

The hypothesis presented in this review is supported, at least partially, by both empirical studies and theoretical work on attachment classification and emotion regulation in relation to childhood anxiety disorders. However, future research is needed in order to address the different relations between these three constructs. Suggestions for such research are made in the following: first, a theoretical framework should be included in the studies of the associations among attachment, emotion regulation, and the development and maintenance of childhood anxiety disorders. Through the application of theories, one can begin to test the implicit hypotheses regarding childhood anxiety disorders empirically. During the last few decades, a

developmental psychopathological approach has provided insight into the complexity of normal and abnormal child development vis-a-vis the anxiety disorders (Lease and Ollendick 1993; Ollendick 2009). In light of this knowledge, the next step for the field of childhood anxiety disorders is to start merging existing areas of knowledge. For instance, attachment and emotion regulation theory should be investigated not only on a conceptual level but also on an empirical level in prospective designs. Building on these findings from the attachment and emotion regulation literature, we propose a theoretical model of the development of anxiety disorders in childhood (see Fig. 2).

Drawn from our review and other extant reviews, our model proposes that parental anxiety poses a genetic risk to the offspring, largely through a behaviorally inhibited temperament. Parental anxiety, as well as attachment security and reflective functioning, influences the behaviors of the parents in their interactions with their infant. Parents who are highly anxious and/or have very low reflective functioning skills are less likely to attend to and/or understand and correctly mirror the emotional states of their infant. Infants who are behaviorally inhibited will put greater demands on parents in their interactions as they are easily aroused and more difficult to calm than other children. Continued experiences with mismatching between the infant and parents will lead to an insecure attachment style in the infant. Subsequently, attachment style and temperament both contribute to the development of a basic emotion regulatory style, which in turn contributes to confirming an ongoing attachment security. These mechanisms provide for basic emotion regulation styles in parents and children that follow them through life. As a specific situation arises (e.g., a situation that may be perceived as anxiety-provoking by either the parent or the child), the basic emotion regulatory styles will form the basis from which specific emotion regulation skills are developed. The specific emotion regulation skills may consist of avoidance, safety behaviors, attention to/or away from threat, negative appraisal of the situation, and anxious responses. In infancy, the more complex of these mechanisms will primarily be elicited by the parents. However, avoidance may be seen also in infants who attempt to regulate negative emotions. Over the years, the basic emotion regulatory skills elicited and mutually affected by the attachment style and reflective functioning abilities of the parents are retained and brought forward. This is also assumed to be the case for parenting behaviors, as they remain fairly stable over the years. On basis of the attachment experiences of the child, reflective functioning is gradually developed. Also the child's basic emotion regulatory style is carried forward. The emotion regulatory learning that occurs in the specific anxiety-provoking situations will influence the ongoing parental behavior as well as the

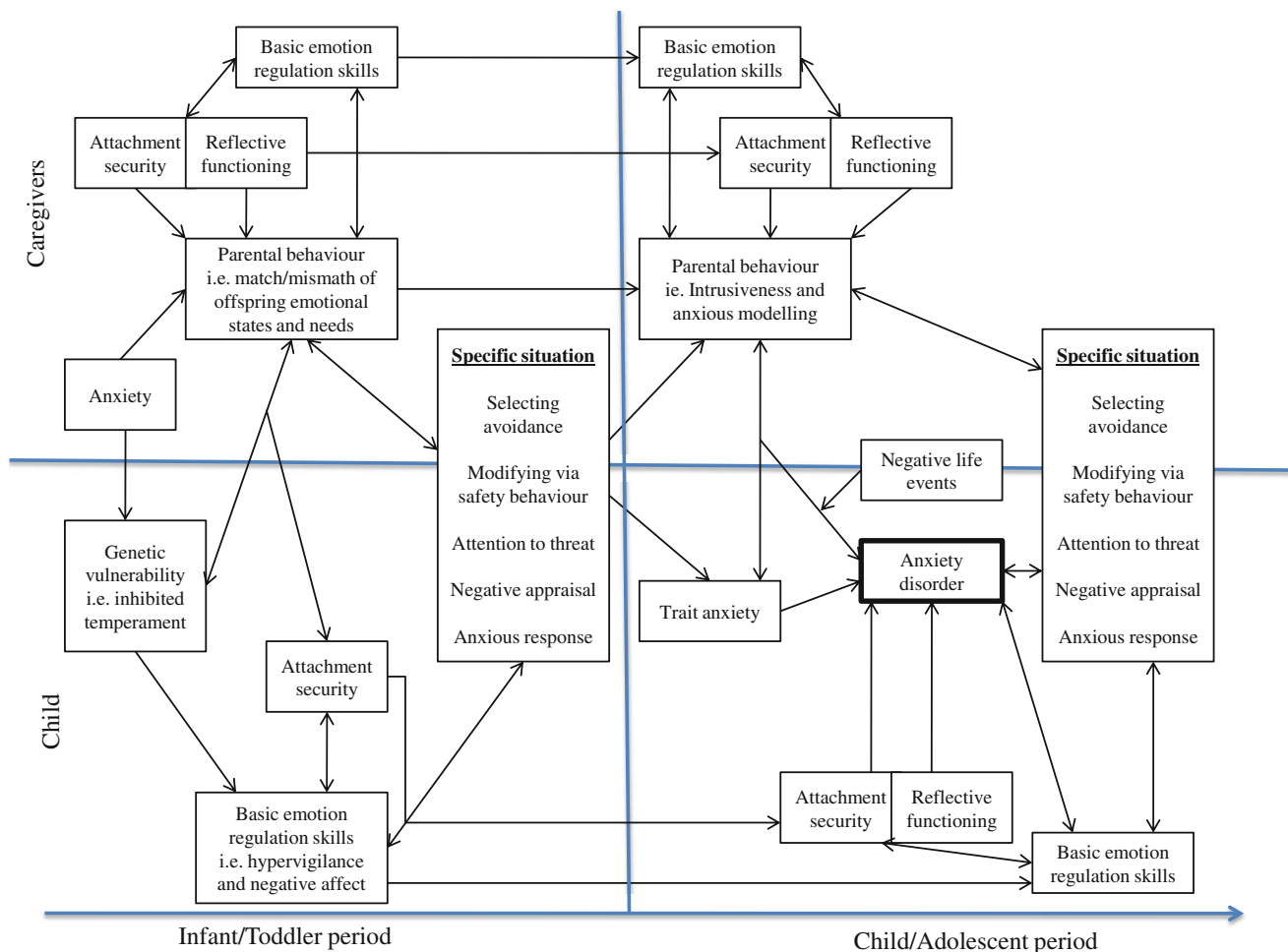


Fig. 2 The role of attachment and emotion regulation on the development of childhood anxiety disorders

anxiousness of the child. These will then interact and potentially lead to the development of anxiety disorders in the child via moderating negative life events, or an ongoing reinforcement of the anxiousness of the child. Attachment style, reflective functioning, and basic emotion regulatory style will affect the level of anxiety experiences by the child. Anxiety in the child will then again affect and be affected by the learning of specific emotion regulation skills obtained in specific anxiety-provoking situations. As during infancy the parental behavior will affect the learning in specific situations via intrusiveness and anxious modeling. These will come through as an increased selecting of avoidance and use of safety behaviors, attention to and discussion of threat, explicit negative appraisals and reinforcements of anxious avoidant responses to the situations. The mechanisms may be elicited by either the child or the parents. The model builds on an understanding of bidirectionality and interactions among the proposed elements. However, a basic emotion regulation style closely connected to the attachment style of the child and parents is proposed to mediate the remaining effects. Future research

will be needed to provide an empirical test of the presented model.

A second issue for future research is the application of longitudinal designs rather than a reliance on cross-sectional studies. Longitudinal designs should be employed in order to account for the quality of primary attachment relationships as these may change throughout the course of childhood. Furthermore, as childhood anxiety disorders are related to emotional dysregulation, longitudinal designs would allow for more accurate information regarding the onset of children's emotion regulation difficulties. This would provide us with more detailed information regarding the causal relations between attachment classification, emotional dysregulation, and childhood anxiety. Another way of establishing this type of design would be by assessing attachment classification and emotion regulation before and after treatment of an anxiety disorder. Investigations of these mechanisms and their individual and related changes throughout the course of treatment would provide the possibility for assessing the relations between these factors as well.

Finally, many studies rely solely on self-report measures of emotion regulation. Such measures may not adequately reflect children's ability to regulate their emotions as children may be unaware of their actual strategies, and their strategies may be insufficient in relation to their level of affect. Likewise, in the adult literature, studies of emotion regulation are severely limited by reliance on self-report measures that are retrospective in nature (Amstadter 2008). Cole et al. (2004) thus argue that in order to investigate an individual's ability to regulate emotions, studies must be longitudinal in nature and include physiological measures, as well as behavioral observations and self-report instruments.

Conclusion

Both theory and evidence suggest that there may be an association between dysfunctional emotion regulation abilities and childhood anxiety disorders. Attachment theory proposes that emotion dysregulation in children may result from inadequate relations between the child and its primary caretaker. An examination of the existing empirical data on this hypothesis revealed that an insecure attachment style, especially an insecure-ambivalent attachment style, was associated with the development of ineffective emotion regulation strategies and anxiety disorders. A theoretical model is proposed to capture these relationships. However, due to the paucity of studies and methodological limitations, firm conclusions regarding the exact contribution of attachment styles to the development of dysfunctional emotion regulation and anxiety disorders in childhood cannot be made with confidence. Further research should focus on addressing these various limitations.

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