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CHAPTER 1

Exposure to parents’ negative emotions as a developmental pathway in the family aggregation of depression and anxiety in the first year of life

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ABSTRACT

Background: Depression and anxiety run in families. A developmental psychopathology perspective highlights the diversity in developmental pathways that lead to parent-to-child transmission of depression and anxiety. The current study aims to consolidate the developmental psychopathology perspective by providing a review on the effects of exposure to parents’ depression and anxiety in the first year as an early developmental pathway in the intergenerational transmission. We address the continuity between normative and maladaptive development by addressing exposure effects in typically developing infants and in infants of depressed and/or anxious parents. Methods: To discuss how exposure to parents’ negative emotions may alter infants’ socio-emotional development and contribute to the family aggregation of depression and/or anxiety, we focus on infants’ expressions of emotion, and reactions to novelty in their early interactions with parents, and on their attention to others’ expressions of emotion as early markers of psychopathology. We first review the evidence on the associations between infants’ and parents’ emotional expressions in dyadic parent-infant interactions, and between infants’ and parents’ reactions to novelty in triadic parent-infant-object interactions. Next, we review evidence on the associations between infants’ exposure to parents’ emotional expressions, and attention to others’ emotional facial expressions in dyadic person-infant and triadic person-infant-object contexts. Results: Infants’ emotional expressions and behavioral reactions to novelty echo parents’ expressions and reactions in dyadic and triadic interactions. Moreover, infants exposed to high levels of negative emotions from the parent seem to attend less to negative emotions in others’ facial expressions. The associations hold across community and clinically depressed and/or anxious parent samples, and with mothers and fathers. Conclusions: Early exposure to parental depression and anxiety is linked to alterations in infants’ socio-emotional development, and may be related to later psychological outcomes in infants of parents with depression and anxiety.
INTRODUCTION

Depression and anxiety disorders are among the most prevalent psychopathology in children (Kashani & Orvaschel, 1990) and adults (Bijl, Ravelli, & Van Zessen; 1998; Jacobi et al., 2004; Kessler, Chiu, Demler, & Walters, 2005). Anxiety and depression aggregate in families, thus parents’ depression and anxiety disorders constitute risk for the development of depression and anxiety in the offspring (Beardslee, Gladstone, & O’Connor, 2011; Beidel & Turner, 1997; Goodman & Gotlib, 1999; Turner, Beidel, & Costello, 1987). Infants born to depressed or anxious parents not only inherit a significant genetic vulnerability (Hettema, Neale, & Kendler, 2001; Tsuang & Faraone, 1990) that predisposes them to depression and anxiety but they also grow in socio-emotional environments marked by alterations in exposure to parents’ emotional expressions during daily interactions (Goodman & Gotlib, 1999; Murray, Creswell, & Cooper, 2009). Despite the significant family loading, and the associated risk for the development of psychopathology in the offspring, some of children with depressed/anxious parents never develop depression/anxiety, and for those who do, there is a high variability in the outcomes. A developmental psychopathology (DP) perspective on the intergenerational transmission of depression and anxiety embraces the diversity in the developmental pathways that lead to parent-to-offspring transmission of depression and anxiety (Cicchetti & Toth, 1998; Vasey & Dadds, 2001). Differently from previous work that aimed to address the diversity of the developmental pathways that may contribute to the intergenerational transmission of depression and anxiety (Creswell & Waite, 2015; Goodman & Gotlib, 1999; Murray et al., 2009), the current review aims to consolidate the developmental psychopathology perspective by specifically focusing on exposure to parents’ negative emotions as an early developmental pathway in the intergenerational transmission of depression and anxiety. We attempt to answer the question of how exposure to parental negative emotions in the first year of life may alter offspring’s socio-emotional development in infancy and be related to subsequent psychopathology.

From a developmental psychopathology perspective, both adaptation and maladaptation arise from complex and dynamic transactions across psychological, biological, and social mechanisms that operate both at the intrapersonal, and the interpersonal levels (Cicchetti & Dawson, 2002; Rutter & Sroufe, 2000; Sroufe 1990; Sroufe & Rutter, 1984). The biological mechanisms that received attention in the context of intergenerational transmission include inherited genetic dispositions for depression and anxiety, and innate dysfunction in early neuro-regulatory systems in the offspring of depressed and anxious parents (Goodman & Gotlib, 1999). Environmental mechanisms include other stressors and difficulties in family and couple functioning that relate to parents’ psychopathology, together with exposure to parents’ negative affect, cognition and behavior. It is therefore important to keep in mind that exposure effects that constitute the main scope of the current
review are only one among many developmental pathways that contribute to the development of depression and anxiety. Isolated consideration of exposure effects can therefore not be sufficient to explain the variation in the outcomes, or emergence of psychopathology in the offspring of depressed and anxious parents. Instead, a better understanding of the intergenerational transmission of depression and anxiety requires the consideration of how multiple transactions between infants’ exposure to parental depression and anxiety and other characteristics of the parents and the infant, and of the early parent-infant environment dynamically determine the range of outcomes in the offspring (Goodman & Gotlib, 1999; Murray et al., 2009).

The developmental models of parent-to-child transmission of depression (Goodman & Gotlib, 1999) and anxiety (Murray et al., 2009) propose that children’s repeated exposure to parents’ depressed and anxious moods is a potential mechanism that contribute to risk for the development of psychopathology. Goodman and Gotlib (1999) suggested five inter-related components in the exposure effects in the intergenerational transmission of maternal depression. We suggest that these components can be extended to anxiety disorders and to fathers. First, depression and anxiety in parents are defined by heightened duration, frequency and intensity of negative emotions, moods and behaviors (see American Psychiatric Association [APA], 2013). Depressed parents experience increased levels of flat and negative affect (sadness, irritability, anger, and guilt) in their interactions in everyday life. Anxious parents experience and express excessive fear, anxiety and worry that may remain specific to certain situations (e.g., in the case of social anxiety and specific phobias), or generalize across situations (in the case of generalized anxiety disorder). Second, due to their negative behaviors and moods, depressed and anxious parents are less than optimal social partners, and they may not be able to provide the optimal interpersonal environment for children’s emotional and social development. Third, the lack of an optimal interpersonal environment will adversely affect children’s emotional and social development. Fourth, as a result of these adverse effects, children will acquire negative behaviors and moods that look similar to negative behaviors and moods of depressed parents. Finally, acquisition of these negative behaviors and moods will put infants at risk for the development of anxiety and depression. In their review, Goodman & Gotlib (1999) provide an overview of evidence supporting these components in children, and highlight the importance of considering the specific characteristics of the developmental stages at which exposure effects take place in childhood. The current review aims to address the role of exposure to parental negative emotions on infants’ early socio-emotional development and functioning in depth as a developmental pathway underlying the intergenerational transmission of depression and anxiety in the first postnatal year.
Why is it important to specifically focus on the early years of life to discuss exposure as a developmental mechanism? High prevalence of depression and anxiety disorders in the postnatal period reveals that early years of parenthood may be a vulnerable period for the development, maintenance or relapse of depression and anxiety in parents (Matthey, Barnett, Howie, & Kavanagh, 2003; O’Hara & Swain, 1996; Ross & McLean, 2006). On the other hand, the rapid experience-dependent development of emotional brain systems in the first year of life seems to make infants particularly vulnerable to the effects of exposure to parental depression and anxiety (Leppänen, 2011; Leppänen & Nelson, 2009). Goodman and Gotlib (1999) suggest that the time of exposure to parents’ depression and anxiety determines the strength of the associations on child outcomes, with early years of life constituting the most vulnerable period in development. Exposure to emotional expressions most often takes place within the immediate family environment with parents in early years. Findings from exposure effects in the non-emotional aspects of face processing in typically developing infants illustrate the important role that extensive exposure to primary caregivers’ faces may have on shaping infants’ attention (Slater et al., 2010). For example, as a result of exposure to mothers’ faces, infants who are cared for by mothers show enhanced attention to mothers’ (vs. stranger) neutral faces (3-to-6 months, De Haan & Nelson, 1997; De Haan & Nelson, 1999; Montague & Walker-Andrews, 2002). Moreover, infants’ exposure to mothers’ faces seems to shape their attention to strangers’ faces. For example, 3-month-old infants look longer to stranger faces if the gender of the stranger matches the gender of their primary caregiver (Quinn & Slater, 2003; Quinn, Yahr, Kuhn, Slater, & Pascalis, 2002). Thus, exposure to parents’ faces seems to tune infants’ attention towards caregiving parents’ faces, and towards strangers that look like parents, ensuring enhanced processing of the most relevant and most frequently encountered stimuli in the environment. Leppänen and colleagues suggest that exposure to parents’ expressions of emotion during daily parent-infant interactions plays an essential role in the neural fine-tuning of infants’ attention to emotional stimuli in typical development in early years (Leppänen, 2011; Leppänen & Nelson, 2009). They therefore predict that the influence of an atypical emotional environment provided by depressed and/or anxious parents in the early years would be ‘especially detrimental’ for later development of emotion processing abilities (Leppänen, 2011, p. 185).

Evidence on the effects of parental depression and anxiety in the postnatal year on later psychopathology in childhood and beyond has only started to accumulate in the last decades. Although research in this area is limited by a number of issues (such as reliance on mothers’ report of infants’ functioning, and lack of control for prenatal or concurrent depression), it provides preliminary support for the idea that parents’ depression and anxiety may have prolonged effects on offsprings’ functioning and psychopathology. For example, longitudinal positive associations have been found
between mothers’ depressive symptoms in the first year and child behavioral and/or emotional problems at 2 (Avan, Richter, Ramchandani, Norris, & Stein, 2010), and 5 (Murray, Sinclair, Cooper, Ducournau, & Turner; 1999) years of age. Evidence also demonstrates a significant overall increase in the risk of psychopathology at the age of 11 in children of postnatally depressed mothers (Pawlby, Sharp, Hay, & O’Keane, 2008), as well as a more specific increase in depression and anxiety diagnoses at the age of 13 (Halligan, Murray, Martins, & Cooper, 2007) and 16 (Murray et al., 2011).

More recent research sheds light on the effects of fathers’ depression. Similar to maternal depression, paternal depression is linked to an increase in behavioral and emotional problems in later childhood (Ramchandani et al., 2008; Ramchandani & Psychogiou, 2009). Moreover, there is also some evidence suggesting that paternal depression may have effects on child outcomes that are specific and independent of mothers’ depression (Ramchandani, Stein, Evans, & O’Connor, 2005). The available evidence on effects of postnatal maternal anxiety reveals similar links to negative psychological outcomes in childhood (Glasheen, Richardson, & Fabio, 2010) and adolescence (Glasheen et al., 2013), while the effects of exposure to paternal anxiety on later child outcomes remain to be investigated. Despite the preliminary evidence on a longitudinal link between parents’ depression and anxiety in the postnatal year and offsprings’ later functioning and psychopathology, we know little about how specific developmental pathways contribute to the emergence of psychopathology in the offspring at specific stages of development. For the time being, it is difficult to delineate the separate and joint contributions of the diverse developmental pathways -including exposure to parental negative emotions and other genetic and environmental factors- to maladaptive child outcomes.

From a developmental psychopathology perspective, failures of adaptation in certain developmental processes precede the emergence of psychopathology, and serve as early markers that are probabilistically linked to the development and course of psychopathology (Sroufe, 1990). In our current discussion on the early effects of exposure to parental depression and anxiety, we focus on three aspects of infants’ socio-emotional development as developmental processes that may potentially serve as early markers of psychopathology in preverbal infants. These are infants’ expressions of emotion, emotional and behavioral reactions in their early interactions with parents and their attention to facial expressions of emotion. Infants’ early interactions with parents, and their attention to emotional stimuli are not only important indices of preverbal infants’ socio-emotional functioning, but they also correspond to the core aspects of dysfunction in depression and anxiety. Depression and anxiety disorders by definition imply alterations in emotional expressions, and emotional and behavioral reactions in daily interactions of affected individuals (APA, 2013). Infants’ emotional expressions, and emotional and behavioral reactions in early interactions with parents are an important early outcome that may improve
Parents’ negative emotions and infants’ socio-emotional development

our understanding of early effects of exposure on infants’ adaptation. Attention to emotional stimuli is another important aspect of early socio-emotional functioning with potential links to the later attention biases characterizing depression and anxiety. Information processing in depression and anxiety is marked by enhanced attention/vigilance to negative emotion in children and adults (Leppänen, 2006; Van Bockstaele et al., 2014). Attention biases have been assigned an important role in cognitive theories on the development and maintenance of depression and anxiety disorders (e.g., Beck & Clark, 1988; Beck & Perkins, 2001). Behavioral and physiological indices of infants’ attention allocation may therefore constitute an important early outcome in preverbal infants that may be useful in detecting early effects of exposure and risk for later psychopathology.

There are two milestones in infants’ socio-emotional development in the first year of life that are important to consider for a discussion on the effects of exposure to parental negative emotions (Striano & Reid, 2006). The first milestone is the onset of dyadic parent-infant face-to-face interactions following the emergence of infants’ social smile and gaze following abilities (D’Entremont, Hains, & Muir, 1997; Messinger & Fogel, 2007). Mothers’ positive affect and contingent responding to infants’ expressions of emotion in these early face-to-face interactions are essential for infants’ expression and regulation of emotions in the interpersonal domain (Als, Tronick, & Brazelton, 1979; Cohn & Tronick, 1987; Tronick, 1989). The second milestone is the onset of triadic parent-infant-object interactions where the parent and infant communicate affective states regarding an external object, person, situation or event in the environment (i.e., joint attention in the second half of the first year; Carpenter, Nagell, Tomasello, Butterworth, & Moore, 1998). Between 10 and 14 months, infants start to actively use adults’ -most frequently parents’- emotional signals to regulate their behavioral reactions to ambiguous/novel aspects of the environment (so called social referencing [SR]; Feinman, 1982; Feinman, Roberts, Hsieh, Sawyer, & Swanson, 1992). Parents’ emotional expression in dyadic parent-infant interactions and triadic parent-infant-object interactions are important in the current discussion as they serve as a basis for infants’ expression and regulation of emotions.

Infants show a negativity bias in SR situations, that is, they change their reactions more strongly when the referee expresses negative as compared to positive emotions (for a review see Vaish, Grossmann, & Woodward, 2008). A negativity bias also emerges in infants’ attention to emotional facial expressions in the second half of the first year. Studies investigating behavioral and physiological correlates of infants’ attention to emotional expressions consistently reveal a negativity bias in 7-month-old infants’ attention to emotional expressions (e.g., De Haan, Belsky, Reid, Volein, & Johnson, 2004; Geangu, Hauf, Bhardwaj, & Bentz, 2011; Hoehl, Palumbo, Heinisch, & Striano, 2008; Kotsoni, De Haan, & Johnson, 2001; Peltola, Hietanen, Forssman, & Leppänen, 2013). Infants’ enhanced processing of negative emotional expressions is functional
in this period as it increases the survival chances of crawling/walking infants who may come across potential dangers while exploring the distant environment (Bertenthal & Campos, 1990; Boyer & Bergstrom, 2011; Campos et al., 2000; Leppânen, 2011). However, repeated exposure and enhanced attention to depressed and/or anxious parents’ negative emotions may at the same time influence emerging negativity bias (Vaish et al., 2008), and constitute risk for parent-to-infant transmission of negative emotions in this period. Vaish et al. (2008) suggested that early exposure to positive facial expressions in the first year may be necessary to skew the distribution of infants’ exposure to faces towards the positive end to ensure that negative faces are perceived as more novel and more salient in the second half of the first year, where infants shift their attention from positive to negative expressions. Thus, changes in exposure to parents’ positive and negative affect in the first year may influence the distribution of infants’ overall exposure to positive and negative emotions, and later negativity bias in infants’ attention and behavior.

The current discussion incorporates child temperamental dispositions in the discussion of early exposure effects to parental anxiety and depression. Child temperamental predispositions constitute a biologically determined source of individual variation in infants’ emotional reactivity, expressions and arousal. Infants with a negative temperamental predisposition (also referred to as negative reactivity in infancy or behavioral inhibition [BI] from toddlerhood onwards) are more likely to react to change or novelty in the environment with fearful, withdrawn, shy and avoidant responses than infants without such a predisposition (Fox, Henderson, Marshall, Nichols, & Ghera, 2005; Kagan & Snidman, 1999; Rothbart, 2007). Children of depressed and anxious parents are more likely to be behaviorally inhibited than children of reference parents, and behaviorally inhibited children are more likely to develop depression and anxiety (Biederman, Rosenbaum, Chaloff, & Kagan, 1995; Bruder-Costello et al., 2007; Rosenbaum et al., 1993). Furthermore, infants’ temperamental characteristics may determine the impact of early environmental adversity on current and later outcomes. Diathesis-stress (Zuckerman, 1999) and vulnerability-stress (Ingram & Luxton, 2005; Nigg, 2006) models suggest that negative temperamental traits may constitute a predisposition to the effects of environmental adversity. A recent extension of these models, i.e., the “differential susceptibility to environmental influences hypothesis” (Belsky, Bakermans-Kranenburg, & Van Ijzendoorn, 2007; Belsky & Pluess, 2009) suggests that highly inhibited children are not only more susceptible to adversity, but they also benefit more from adaptive rearing environments. Thus behavioral inhibition would make them more open to the effects of the environment “for better and for worse”. These models predict that infants with negative temperamental dispositions may be more vulnerable to the effects of exposure to depression and anxiety from parents, while differential susceptibility to environmental influences hypothesis additionally stresses the buffering role of an adaptive rearing environment for infants at risk for psychopathology.
Our discussion on exposure effects focuses on the evidence on infants’ exposure to emotional expressions from mothers and fathers as the most commonly exposed figures in infants’ environment. In line with a developmental psychopathology perspective, current discussion on the effects of exposure encompasses the expression of negative emotions in clinically depressed and/or anxious, and non-clinical parent samples to address the continuity between normative development and deviations from it. In line with the multi-component model of exposure effects by Goodman and Gotlib (1999), we review evidence on the depression- and anxiety-related alterations in parents’ expressions of negative emotion in early parent-infant interactions, together with links of these alterations to infants’ emotional expressions, emotional and behavioral reactions, and attention to others’ emotional expressions. In the first section, we review evidence on the links between infants’ exposure to parents’ facial expressions of emotion, and infants’ facial expressions of emotion during their face-to-face interactions with their parents. In the second section, we review the evidence on the links between exposure to parental emotional expressions in triadic parent-infant-object interactions and infants’ emotional and behavioral reactions to novel stimuli (e.g., objects or a stranger). In the third section, we review evidence on the associations between infants’ overall exposure to parents’ emotional facial expressions and infants’ attention to others’ emotional facial expressions in dyadic person-infant and triadic person-infant-object contexts. The review finishes with a discussion on potential links between exposure to parental depression and/or anxiety in the first postnatal year and later psychopathology in the offspring, followed by a discussion of mechanisms, future directions and clinical implications.

EXPOSURE TO PARENTS’ FACIAL EXPRESSIONS, AND INFANTS’ FACIAL EXPRESSIONS IN DYADIC PARENT-INFANT INTERACTIONS

Typically Developing Infants

Observations of mother-infant face-to-face interactions reveal that mothers’ facial expressions are predominantly positive, and rarely negative in face-to-face interactions (e.g., Kaye & Fogel, 1980; Malatesta & Haviland, 1982). Available evidence on fathers’ expressions of affect, and on infants’ facial expressions with fathers revealed that mothers are more positive than fathers, and that infants are more positive with their mother than with their father dyadic parent-infant face-to-face interactions (Belsky, Gilstrap, & Rovine, 1984; Forbes, Cohn, Allen, & Lewinsohn, 2004). One study reported similar positive associations between infants’ and mothers’, and infants’ and fathers’ positive affect at 6 months. This finding shows that the differences in infants’ expressions of positive affect in the interactions with mother (vs. father) can be accounted for by higher levels of exposure to positive affect from mothers, rather than qualitative differences related to parents’ gender (Forbes et al., 2004). Thus, it seems that infants’ expressions of positive affect in dyadic face-to-face interactions
get tuned to the moment-to-moment differences in mothers' and fathers' interactive styles. In line with this, experimental manipulations of naturalistic face-to-face situations where parents are asked to switch to a depressive interactive style by maintaining a neutral facial expression for a few minutes (i.e., still-face; Tronick, Als, Adamson, Wise, & Brazelton, 1978) before switching back to regular interactions, reveal that infants experience stress, and decrease positive affect in response to such decreases in mothers' and fathers' positive affect expressions (Braungart-Rieker, Garwood, Powers, & Notaro, 1998).

Infants of Depressed and Anxious Parents
The evidence from observational studies investigating depressed parents' expressions of emotions in dyadic face-to-face situations reveals that maternal depression interferes with mothers' expressions of positive affect to their infant, and is associated with an increase in flat and negative facial expressions (Beck, 1995; Murray, Haligan, & Cooper; 2010; Stanley, Murray, & Stein, 2004). Like their depressed mothers who are overall less positive and more negative in their affect than non-depressed mothers, infants of mothers with depression express less positive and more negative emotion in dyadic face-to-face interactions with the mother than infants of non-depressed mothers (e.g., Campbell, Cohn, & Meyers, 1995; Cohn, Campbell, Matias, & Hopkins, 1990; Cohn & Tronick, 1987; Field, 1984). Thus, in line with findings from community samples showing significant associations between parents' and infants' expressions of positive affect, infants of mothers with depression tune in their mothers' depressed interactive style by becoming less positive and more negative like their mother in dyadic parent-infant interactions.

To what extent do infants generalize depressed interactive patterns acquired from depressed parents to the other parent or other adults? Findings from two studies on infants' expressions of positive affect in dyadic interactions with their depressed (vs. non-depressed) mothers vs. non-depressed fathers revealed that infants of depressed mothers are more positive while interacting with their non-depressed fathers than with their depressed mothers. Edhborg, Lundh, Seimyr, and Widström (2003) compared mother-infant and father-infant interactions when children were 15-to-18-months old, in families with mothers with high levels of depressive symptoms (measured at 2-months postpartum). They reported more positive interactions in non-depressed fathers and infants dyads of mothers with post-partum depression. Likewise, Hossain and colleagues (1994) found that 3-to-6-month-old infants of depressed mothers interact better with their non-depressed fathers. Non-depressed fathers also received better interaction ratings than depressed mothers. In contrast, another study by Chabrol, Bron, & Le Camus (1996) observing mother-infant and father-infant face-to-face interactions in families with mothers experiencing moderate levels of depression (vs. without depression) did not find any significant differences between depressed mother-infant and non-depressed father-infant interactions, suggesting that...
Parents’ negative emotions and infants’ socio-emotional development

depressed interactive styles may extend to father-infant interactions in some cases. Moreover, in contrast to findings revealing more positivity in dyadic interactions with fathers, another study by Goodman (2008) revealed that mothers’ depression in the post-partum period was related to more depression in fathers, and less optimal interactions with their 2-to-3-month-old infants during dyadic interactions (Goodman et al., 2008). Thus mothers’ depression may in some cases adversely affect fathers’ psychological functioning and interactions with their infant.

One study investigating infants’ interactions with other partners reported an increase in positive affect expressions of infants during interactions with their nursery teachers (Peláez-Nogueras, Field, Cigales, Gonzalez, & Clasky, 1994), who were more positive than depressed mothers during the interaction. In contrast, another study by Field and colleagues (1988) investigating 3-to-6-month-old infants of depressed vs. non-depressed mothers in interaction with their mothers vs. non-depressed female strangers revealed no differences in infants’ positive affect, or activity level during their interactions with the strangers (vs. mothers). Note that no significant differences were found also between the positive affect of depressed mothers and non-depressed strangers in this study.

Taken together, it seems that infants show more positive affect in dyadic interactions with other familiar partners such as fathers and teachers. This occurs in the context of fathers and teachers expressing more positive affect than the depressed mother. In this sense, fathers and other familiar figures may compensate for the depression of the mother by giving the child the opportunity to interact in a more positive manner during early face-to-face interactions on a regular basis. However, the results also reveal that fathers who have a partner with depression are themselves more likely to be depressed. Thus, maternal depression may interfere with fathers’ ability to compensate for mothers’ depression in face-to-face interactions via its positive association with paternal depression. As a result, depressed interaction styles in mother-infant interactions may generalize to father-infant interactions, and to infants’ interaction with strangers who are not more positive than depressed mothers during the interaction.

Studies testing reactions to parents’ still-face in infants of depressed parents reveal significant alterations in infants’ reactions to still-face, while the findings concerning exact direction of the effect are mixed. Similar to the effects reported in typically developing samples, Forbes et al. (2004) reported more negative and less positive affect in infants of parents with (vs. without) depression during both mothers’ and fathers’ still-face. In contrast, other studies found that infants of mothers with depression respond to the mothers’ still-face with more positive and less negative affect, and less stress compared to infants of mothers without depression (Field, 1984; Field et al., 2007; Peláez-Nogueras, Field, Hossain, & Pickens, 1996). Field explains the results
based on familiarity: Infants of depressed parents may be relatively more familiar to parents’ still-face and therefore react with less negative affect to parents’ still-face in the lab. In contrast to still-face interactions, no studies investigated whether the effects of parental depression on parents’ and infants’ emotional expressions differ for mothers vs. fathers in naturalistic face-to-face interactions.

Compared to parental depression, we also know less about how parental anxiety disorder affects parents’ and infants’ emotional expressions in early dyadic face-to-face interactions. Moreover, the majority of the available evidence comes from parents with comorbid depression and anxiety. For example, depressed mothers with high trait anxiety were found to be less positive than depressed mothers with low trait anxiety, and infants of depressed mothers with high trait anxiety were less positive and more negative than infants of non-depressed mothers (Field et al., 2005). Thus, high trait anxiety may be linked to a further decrease in depressed mothers’ and infants’ expressions of positive affect. There is also some evidence showing a decrease in mothers’ facial, vocal and bodily expressions of positive affect when they have high (vs. low) trait anxiety (independent of their depression) in face-to-face play interactions with their 10 and 14-month-olds (Nicol-Harper, Harvey, & Stein, 2007). Due to high comorbidity of anxiety disorder and depression in studied samples, the available evidence revealing more severe alterations in affect expressions of depressed mother-infant dyads cannot disentangle the distinct influences of parents’ depression and anxiety disorder on emotional expressions. Furthermore, because comorbid anxiety diagnosis is linked to greater symptom severity in depressed individuals (Fava et al., 2004; Lamers et al., 2011), it is unclear whether a more pronounced decrease in mothers’ positive affect is specifically related to high trait anxiety, or to overall greater depression symptom severity. In a sample of anxious mothers with low rates of depression diagnoses, Murray, Cooper, Creswell, Schofield, and Sack (2007) observed mothers with social anxiety disorder (SAD) and generalized anxiety disorder (GAD) and their infants in face-to-face interactions. Mothers with SAD were less positively engaged, and more anxious during their interactions, while the effect of maternal GAD was not significant. Infants of mothers with GAD and SAD did not differ from infants of mothers without anxiety disorder.

To our knowledge, three observational studies investigated the effects of maternal anxiety without comorbid depression on infants’ and parents’ facial expressions of emotion during dyadic face-to-face interactions. In a study investigating the effects of maternal panic disorder without comorbid depression, and maternal depression in a still-face paradigm (a still-face interaction preceded and followed by regular face-to-face interactions), no effects of parental panic disorder nor depression were found on parents’ and 3-month-old infants’ expressions of affect (Weinberg, Beeghly, Olson, & Tronick, 2008). In another study investigating the effects of maternal anxiety disorder without comorbid depression on 6-month-old infants’ facial expressions
Parents’ negative emotions and infants’ socio-emotional development during dyadic interactions (free play, teaching and caregiving episodes), infants of anxious mothers were not less positive than their peers during the regular face-to-face interactions, and the duration of matched positive affect in the dyads did not differ between healthy and anxious mother-infant dyads (Kaitz, Maytal, Devor, Bergman, & Mankuta, 2010). On the other hand, the findings revealed an overall increase in intensity and frequency of gaze, positive affect, verbalizations and acknowledgements of anxious (vs. reference) mothers, referred to as exaggerated behavior. Similar to the results reported by Field (1984) and by Peláez-Nogueras et al. (1996) in infants of depressed mothers, infants of anxious parents less often reacted with negative affect to mothers’ still-face in this study. This suggests that infants of anxious mothers protest less when the mother stops responding.

Taken together, preliminary evidence from these first observational studies on anxiety disorders without comorbid depression does not support an effect of maternal anxiety disorder on mothers’ and infants’ expressions of affect in naturalistic face-to-face interactions, while infants seem to react less negatively when mothers stop responding in still-face interactions. The effects of paternal anxiety disorder remain to be investigated in parents’ and infants’ emotional expressions during dyadic parent-infant interactions.

**Section Summary and Conclusions**

Evidence on the effects of exposure to parents’ facial expressions in the first postnatal year in typically developing infants’ expressions of emotion in dyadic parent-infant interactions reveals a direct association between infants’ and parents’ expressions of emotions, highlighting the crucial role that exposure to parental positive emotions play in the regulation of infants’ expressions and communication of affect in their face-to-face interactions (e.g., Cohn & Tronick, 1987; Forbes et al., 2004; Malatesta & Haviland, 1982). Surprisingly, studies focusing on the associations between infants’ and parents’ emotional expressions in early dyadic interactions in community samples did not consider the role of infants’ temperamental predispositions, which are known to explain variance in infants’ expressions of emotion (Izard, Libero, Putnam, & Haynes, 1993). Parallel associations between infants’ and mothers’, and infants’ and fathers’ expressions of positive affect in typical development reveal that infants’ expressions of positive affect adapt to the differences in mothers’ vs. fathers’ moment-to-moment expressions of positive affect in dyadic face-to-face interactions (Forbes et al., 2004). In line with the findings suggesting that parents’ expressions of positive affect in this period have a direct influence on typically developing infants’ expressions of positive affect (Braungart-Rieker et al., 1998; Forbes et al., 2004), infants of mothers with clinical depression seem to copy their depressed mother’s dysphoric interaction style, and become less positive, more flat and more negative in dyadic interactions with their mother (Beck, 1995; Campbell et al., 1995; Cohn et al., 1990; Murray et al., 2010; Stanley et al., 2004). In turn, the effect of fathers’ depression on fathers’
and infants’ facial expressions remains to be addressed in future studies. Available evidence comparing mother-infant and father-infant face-to-face interactions in families where the mother is depressed reveals that infants are more positive in their interactions with fathers, and with familiar figures when the partner expresses more positive affect than the depressed mother. The fathers, and other familiar figures may thus compensate for mothers’ depression in face-to-face interactions (Edhborg et al., 2003; Hossain et al., 1994; Peláez-Nogueras et al., 1994) and provide the infant with a more positive early interactive environment. However, findings also reveal that due to its positive association with paternal depression, maternal depression may in some cases interfere with father-infant interactions and fathers’ ability to compensate for mothers’ depression in face-to-face interactions (Chabrol et al., 1996; Goodman, 2008).

The available evidence on the affect expressions of parents with depression suggests that the alterations in parents’ positive affect expressions in early dyadic interactions are more pronounced in the case of comorbid anxiety disorders (Field et al., 2005), while the findings from mothers with anxiety disorders and without comorbid depression suggest that anxiety disorders alone do not alter parents’ and infants’ expressions of positive affect in everyday face-to-face interactions, even in the case of generalized anxiety disorder (Kaitz et al., 2010; Murray et al., 2007; Weinberg et al., 2008). Thus, the increase in the expressions of negative emotions in the case of maternal anxiety disorders may not be visible in everyday dyadic parent-infant interactions, and be rather specific to certain anxiety-provoking objects/events/persons in triadic parent-infant-object interactions (like being videotaped in interaction with a stranger in the case of maternal SAD, Murray et al., 2007; 2008). To our knowledge, no studies investigated how paternal anxiety alters fathers’ expressions of affect, and infants’ expressions of affect with fathers in early face-to-face interactions.

EXPOSURE TO PARENTS’ EMOTIONAL EXPRESSIONS, AND INFANTS’ REACTIONS TO NOVELTY IN TRIADIC PARENT-INFANT-OBJECT INTERACTIONS

Typically Developing Infants

The effects of mothers’ positive and negative emotional expressions on infants’ behavioral and emotional reactivity have been extensively studied in social referencing (SR) situations where infants are confronted with strangers, unfamiliar toys and visual cliff situations at the end of the first year (see Feinman et al., 1992 for a review). Findings from these observational studies provide support for a direct influence of parents’ expressions of negative emotions at the end of the first year on infants’ affect and behavior: Infants interact with novel stimuli less, and manifest more negative affect (i.e., fear) and more avoidance when the referee expresses negative (vs. positive) emotions to these stimuli.
Two studies investigated the effect of parents’ anxious signals in SR situations on infants’ behavior in typically developing infants to understand early mechanisms fear learning from anxious parents in infancy. De Rosnay, Cooper, Tsigaras, and Murray (2006) investigated the effects of mothers’ expressions of anxiety towards a stranger on infants’ stranger anxiety. Parents without anxiety disorders were trained to behave in socially anxious ways in a stranger SR paradigm. In this paradigm, a stranger first engages the parent in a conversation about parenthood while the infant is watching the interaction. At the end of the parent-stranger interaction, the stranger makes a gradual approach towards the infant, and picks him/her up from the high chair. Findings from this study revealed that expressions of maternal anxiety towards the stranger can trigger infants’ avoidance of the stranger. This effect was moderated by infants’ fearful temperament, that is, the link between maternal negative reactions and infants’ avoidance of the stranger was stronger for infants with high levels of fearful temperament (De Rosnay et al., 2006). The second observational study investigated the associations of mothers’ and fathers’ expressions of anxiety and infants’ fear and avoidance in the visual cliff (Möller, Majdandžić, & Bögels, 2014). In the visual cliff paradigm, infants are placed on the shallow end of the cliff, and are encouraged to crawl towards their parent who stands at the deep end of the cliff (Sorce, Emde, Campos, & Klinnert, 1985). Möller and colleagues (2014) found that fathers’, but not mothers’ anxious signals predict temperamentally fearful infants’ avoidance of the visual cliff. Taken together, findings from both studies reveal an interplay between parents’ expressions of anxiety and infants’ fearful temperament in SR situations. In line with diathesis-stress (Zuckerman, 1999) and vulnerability-stress (Ingram & Luxton, 2005; Nigg, 2006) models, the findings show that temperamentally fearful infants are more vulnerable to the expressions of parents’ anxiety in SR contexts.

Regarding effects of mothers’ vs. fathers’ emotional signals in SR situations, an earlier study did not find a significant difference on infants’ reactions to novel toys with mothers and fathers (Hirshberg & Svejda, 1990), while the findings of Möller et al. (2014) suggest that fathers’ but not mothers’ expression of anxiety predict avoidance of the cliff. This discrepancy in the findings may possibly be related to the testing of SR processes in situations that involve qualitatively different types of threat (i.e., falling vs. being harmed by an ambiguous object or by a stranger). Nevertheless, findings from both studies suggest that both parents’ emotional expressions in SR situations is directly linked to infants’ reactions towards novel/ambiguous aspects of the environment.

**Infants of Depressed and Anxious Parents**

Probably due to the specific relevance of SR situations for infants’ fear acquisition, SR studies in clinical samples have focused on the effects of anxious parents’ expressions of fear and anxiety, rather than the effect of depressed parents’ dysphoric style during triadic parent-infant-object interactions. Although the associations between parents’
emotional signals and infants’ reaction to novelty have not been investigated in the context of SR, an earlier study investigating infants’ object exploration and emotional expressions reported that daughters (but not sons) of depressed (vs. non-depressed) parents express less positive and more negative affect than infants of non-depressed mothers in triadic parent-infant-object interactions (Hart, Field, Del Valle, & Peláez-Nogueras, 1998). Moreover, infants of depressed mothers were less likely to explore the toy objects. The findings from this earlier study reveal that maternal depression may affect parents’ and infants’ facial expressions similarly in dyadic parent-infant and triadic parent-infant-object interactions. Furthermore, it shows that exposure to parental depression may be linked to a decrease in infants’ exploring of the novel stimuli in the environment. In a recent discussion Peláez, Virues-Ortega, Field, Amir-Kiaei, and Schnerch (2013) suggested that flat affect in depressed parents limits the availability of the parents to provide threat/safety signals to their infants in SR situations. Gewirtz and Peláez-Nogueras (1992) further suggest that as a result of parents’ unavailability/non-responsivity in SR situations, infants will be less likely to use the mother as a source of information in SR situations. This idea awaits further investigation in SR situations in infants of parents with depression.

The first studies focusing at the effect of anxiety disorder on parents’ and infants’ expressions of negative emotion in SR situations investigated the associations between socially anxious parents’ expressions of anxiety and infants’ fear and avoidance of strangers to shed light on the early intergenerational transmission of social anxiety (Aktar, Majdandžić, De Vente, & Bögels, 2013; Murray et al., 2008). Murray and colleagues investigated SR processes in a longitudinal design with socially anxious (vs. reference) mothers and their infants at 10 and 14 months in the stranger SR paradigm. Socially anxious mothers expressed more anxiety than reference mothers both at 10 and 14 months. Furthermore, highly behaviorally inhibited infants of mothers with social anxiety disorder showed a longitudinal increase in avoidance of strangers in SR situations from 10 to 14 months. In a later replication and extension of this study to nonsocial SR situations and to parents with nonsocial types of anxiety disorders, Aktar et al. (2013) found that parents’ expressions of anxiety in the SR situations predict 12-month-old infants’ avoidance in SR situations (in interaction with infants’ behavioral inhibition), rather than parental lifetime (social and nonsocial) anxiety diagnoses. This finding shows that 12-month-old infants’ avoidance of novelty is related to their environmental exposure to anxious responses in the SR situations, rather than parents’ dispositions for anxiety disorders. Consistent with previous evidence (De Rosnay et al., 2006; Murray et al., 2008), there was a positive association between parents’ expressions of anxiety and infants’ avoidance of novelty for infants with moderate-to-high levels of fearful temperament. However, parents’ expressions of anxiety in the situation did not predict infants’ avoidance when infants had low levels of behavioral inhibition, and when parents expressed low levels of anxiety.
In a follow-up study of this sample at 30 months in SR situations, parental social anxiety diagnosis (with or without comorbid nonsocial anxiety diagnoses) rather than parents’ expressions of anxiety predicted toddler’s fear/avoidance of strangers, suggesting that the link between parents’ expressions of anxiety and children’s fearful/avoidant reactions may be specific to SR situations at the end of first year of life (Aktar, Majdandžić, De Vente, & Bögels, 2014). Moreover, there were positive associations between expressions of anxiety of parents with comorbid social and other anxiety diagnoses at 12 months and children’s fear/avoidance at 30 months. Thus, exposure to expressions of anxiety from parents with comorbid social and other anxiety diagnoses in SR situations at the end of first year may prospectively influence offsprings’ avoidance of novelty in toddlerhood. At 12 and 30 months, no significant differences were found in this sample in the associations between mothers’ and fathers’ expressions of anxiety, indicating that fathers’ emotional expressions are as important as mothers’ for infant’s fear learning. Taken together, the available evidence from clinical samples suggest that exposure to parental expressions of anxiety in SR situations at the end of first year may concurrently and prospectively increase infants’ avoidance of novelty, and thereby contribute to parent-to-infant transmission of anxiety.

Section Summary and Conclusions
The evidence reviewed above suggests that infants’ exposure to parents’ expressions of emotion towards novel objects/people/events in the environment have a direct effect on infants’ avoidance of these novel stimuli at the end of the first year both in community samples and in clinical samples (Aktar et al., 2013; De Rosnay et al., 2006; Möller et al., 2014; Murray et al., 2008). Increases in parents’ expressions of anxiety towards certain stimuli can lead to the intergenerational transmission of fear/anxiety in this period as infants use parents’ situation-specific expressions of fear and anxiety in SR situations as signals for safety/threat (Aktar et al., 2013; Murray et al., 2008). Because clinically anxious parents experience and express excessive levels of anxiety/worry in response to certain stimuli in SR situations, infants of anxious parents are likely to be repeatedly exposed to high levels of parental anxiety expressions at the end of first year. Evidence showing a pronounced increase in anxiety expressions of mothers and fathers with social anxiety disorder in the stranger SR paradigm supports this idea (Aktar et al., 2013; Murray et al., 2008).

Findings from experimental and semi-experimental SR studies in community samples and in clinical samples consistently suggest that infants’ own temperamental dispositions (i.e., behavioral inhibition) moderate the effects of exposure to parents’ expressions of anxiety on infants’ emotional and behavioral responses to ambiguity in SR situations (Aktar et al., 2013; De Rosnay et al., 2006; Möller et al., 2014; Murray et al., 2008). Consistent with the predictions of diathesis-stress, vulnerability-stress and differential susceptibility models (Belsky & Pluess, 2009; Ingram & Luxton, 2005;
Nigg, 2006), temperamentally inhibited/difficult/fearful infants are more vulnerable to the effects of exposure to parents’ negative emotions in triadic contexts at the end of first year. Moreover, exposure to parents’ expressions of anxiety at 12 months from parents with comorbid social and other anxiety diagnoses predict infants’ responses to strangers 18 months later (Aktar et al., 2014). Thus, exposure to anxiety expressions from parents with more severe forms of anxiety disorders at the end of first year may have prolonged effects in the offsprings’ later avoidance of novelty in toddlerhood.

**EXPOSURE TO PARENTS’ FACIAL EXPRESSIONS AND INFANTS’ ATTENTION TO OTHERS’ EMOTIONAL EXPRESSIONS IN DYADIC AND TRIADIC CONTEXTS**

**Typically Developing Infants**

To our knowledge, only one study tested the links between infants’ exposure to parents’ emotional expressions and infants’ attention to others’ facial expressions of emotion in typical development. De Haan et al. (2004) studied the associations of maternal positive and negative affect, and of infants’ fearful temperament with 7-month-old infants’ looking preferences and event-related potentials (ERP) to fearful and happy faces. Mothers reported their experience of positive (e.g., interest, excitement, pride) and negative (e.g., irritability, guilt, nervousness, stress, fear) emotions, as well as infants’ fearful and positive temperament. The findings revealed that infants showed a negativity bias in their looking preferences (i.e., they attended more to fearful than happy faces). Moreover, the negativity bias in infants’ attention was moderated by mothers’ positive (but not negative) affect. Only infants of mothers with high levels of positive affect looked longer to fearful faces, while infants of mothers with low positive affect did not show a looking preference. Thus, it seems that there is a negative association between exposure to mothers’ happy facial expressions and infants’ interest in happy faces at 7-month-old infants. ERP correlates of infants’ attention revealed that temperamentally fearful infants devoted more attention (larger Nc component) to fearful than happy facial expressions. Moreover, temperamentally positive infants of highly positive mothers also allocated more attention (larger Nc) to fearful than happy facial expressions, while maternal negative affect did not predict infants’ attention. Thus, it seems that infants who experience more positive emotions show a decrease in ERP indices of attention allocation to happy faces when they have been more frequently exposed to it from their mothers. Findings from this first study on the effects of exposure on infants’ attention allocation to facial expressions are in line with the idea that the variation in infants’ exposure to parents’ positive affect, together with infant temperament predict infants’ attention allocation to emotional stimuli in typical development.
Jones, Slade, Pascalis, and Herbert (2013) investigating infants’ attention (or interest) in mothers’ neutral facial expressions as a function of parents’ depression, anxiety and stress levels revealed that higher levels of anxiety (but not depression or stress) are linked to less interest to mothers’ (but not to strangers’) neutral faces from the infants. Thus, previous findings indicating a lower likelihood of negative reactions to mothers’ still-face in infants of anxious parents (Kaitz et al., 2010) may be related to an overall decrease in attention to mothers’ neutral face. It is difficult to explain why anxiety but not depression predicted infants’ interest to mothers’ neutral faces, but the findings suggest that heightened exposure to parents’ negative emotional expressions in the case of anxiety is linked to less interest to mothers’ neutral expressions. It remains to be investigated how infants’ exposure to parental depression and anxiety alters their attention to positive and negative (vs. neutral) facial expressions.

Infants of Depressed and Anxious Parents
In line with the evidence on a significant role of exposure to parents’ positive emotion on infants’ emotional processing in typical development, studies in infants of clinically depressed mothers reveal significant associations between exposure to mothers’ depressive moods and infants’ attention to facial expression of emotion. Infants of depressed parents show differences in behavioral correlates of attention to sad and happy faces that are indicative of an increased familiarity to sad vs. happy faces in dyadic person-infant contexts (see Field, Diego, & Hernandez-Reif, 2009 for a review). Differently from their peers who allocate enhanced attention to sad facial expressions (probably due to its novelty), 3- and 6-months-old infants of depressed mothers spend less time looking at sad faces as compared to infants of non-depressed mothers (Field, Pickens, Fox, Gonzales, & Nawrocki, 1998). Infants of depressed parents are also more likely to attend to mothers’ happy facial expressions in face-to-face interactions (Striano, Brennan, & Vanman, 2002), and habituate more slowly to happy facial expressions as compared to infants of non-depressed mothers (Hernandez-Reif, Field, Diego, Vera, & Pickens, 2006). Unlike typically developing infants, infants of depressed mothers fail to discriminate happy from neutral faces following habituation (from 3 to 6 months; Bornstein, Arterberry, Mash, & Manian, 2011), and show less interest to both happy and sad faces, independent of who (mother vs. stranger) poses the expressions (at 5 months, Diego et al., 2004). Taken together, the evidence from infants of depressed parents in dyadic contexts reveals a negative association between infants’ exposure to mothers’ sad faces and infants’ attention to sad faces. In contrast to normally developing infants who are most familiar with happy facial expressions, infants of clinically depressed parents seem to be more familiar with sad faces. It remains to be investigated how exposure to parents’ depression alters infants’ attention allocation to emotions other than joy and sadness.
The first evidence on the effect of parental anxiety disorders on infants’ attention has come from Creswell and colleagues (Creswell et al., 2008; 2011) who investigated the effects of parental social anxiety disorder on infants’ attention allocation to low vs. high intensity negative facial expressions (fear and anger) in a clinical sample. Creswell et al. (2008) compared the differences in initial orientation, and total looking time to fearful and angry facial expressions in infants of mothers with (vs. without) social anxiety disorder. Infants of socially anxious mothers were more likely to orient, and to look at low (vs. high) intensity fearful faces at 10 weeks of age while infants of reference mothers showed the opposite pattern, that is, a bias for high intensity fearful faces. There were no group differences in infants’ interest to anger: all infants, independent of parents’ social anxiety showed more looking to high (vs. low) intensity faces. Interestingly, observations of infants’ temperament and of parents’ expressions of anxiety with a stranger did not account for differences in infants’ visual interest to fearful faces. In a follow-up of this sample, a preference for high intensity fear faces at 10 weeks predicted higher anxiety symptoms in the offspring of mothers with social anxiety disorders, while a preference for low intensity fear faces predicted less anxiety at 2 years (Creswell et al., 2011). Infants of index mothers showed the opposite pattern with a preference for high intensity fearful faces being associated with less anxiety at 2 years. This study is not only the first evidence revealing directly links between early attention and later anxiety outcomes in the offspring of socially anxious mothers, but it also suggests that the associations of offspring’s early attention to facial expressions to later anxiety may differ as a function of maternal anxiety diagnoses. It seems that the adaptive and maladaptive attention trajectories in infants’ emotion processing may be different in the presence of an anxious mother, that is, avoidance of high intensity (i.e., a preference for low intensity) fearful faces seems to be an adaptive response in infants of socially anxious mothers, while a preference for high intensity fearful faces is adaptive in typical development. The effect of exposure to parents’ anxiety disorders on infants’ attention allocation awaits to be further explored both in dyadic and triadic contexts to disentangle the differences in developmental trajectories of infants with or without a parent with anxiety disorder.

Section Summary and Conclusions
Evidence reviewed above on the association between exposure to parents’ facial expressions in the first postnatal year and infants’ attention to emotional expressions highlights the crucial role that parental positive emotions have in shaping infants’ attention to parents’ faces, and to emotional expressions from strangers. First, the normal variation in infants’ exposure to positive emotions from parents in this period seems to influence infants’ attention to positive emotions expressed by strangers (De Haan et al., 2004). Increases in infants’ exposure to mothers’ happy emotions seem to be associated with decreases in infants’ attention allocation to happy (vs. fear) facial
expressions, and an increase in attention to strangers’ fearful expressions at 7 months.

Similarly, the significant increase in infants’ exposure to mothers’ sad emotions in the case of clinical maternal depression seems to be associated with decreases in infants’ attention allocation to sad (vs. happy) facial expressions, and an increase in attention to happy facial expressions (Field et al., 1998; Striano et al., 2002). In contrast to typically developing infants who are most familiar with happy facial expressions, infants of clinically depressed parents seem to be more familiar to sad faces, and perceive the happy faces as more novel. This finding is in line with Vaish and colleagues’ (2008) suggestion that the distribution of infants’ overall exposure to emotional facial expressions would to be less positively skewed towards the positive end when mothers express more negative emotions, which makes negative expressions more familiar, and less interesting for infants of clinically depressed parents.

Higher levels of maternal anxiety (but not depression or stress) was found to be related to less interest to mothers’ (but not to strangers’) neutral faces in a community sample, while how exposure to parental anxiety may alter infants’ attention to mothers’ and others’ negative facial expressions remains to be investigated (Jones et al., 2013). The only longitudinal evidence reveals that the links of offspring’s early attention to facial expressions to later anxiety may be moderated by the presence of social anxiety diagnosis in mothers. A preference for high intensity fearful faces in infancy seems to be linked to less anxiety in normally developing samples, while a preference for low intensity fearful faces seems to be linked to less anxiety when the mother has social anxiety disorder.

To sum up, the studies from typically developing infants and infants of depressed mothers consistently reveal a negative association between infants’ exposure to specific facial expressions from parents and their attention allocation to these emotional expressions from strangers, while findings from mothers with social anxiety disorder reveal a negative association between parental anxiety disorders and infants’ interest to high intensity fearful faces. Taken together, the findings support the idea that alterations in infants’ exposure to parents’ positive and negative emotions in early interactions are linked to infants’ familiarity and attention to emotional facial expressions of others.

DISCUSSION

In the present article, we reviewed evidence for the associations between infants’ exposure to parents’ emotional expressions and socio-emotional development in the first postnatal year by focusing on infants’ emotional expressions, and reactions during interactions with parent, and their attention to others’ facial expressions. The evidence on the links between infants’ exposure to parents’ negative emotional...
expressions and infants’ own negative emotional expressions and behavioral reactions to novelty in early interactions consistently reveals significant positive associations. In other words, infants’ emotional and behavioral reactions seem to directly relate to their parents’ emotional and behavioral reactions in the first year. For example, 2-to-6-month-olds become more negative and less positive when exposed to more negative and less positive affect from parents in face-to-face interactions, (e.g., Forbes et al., 2004; Campbell et al., 1995; Cohn et al., 1990). Similarly, when exposed to parents’ fearful expressions directed to a novel stimulus in SR situations, 10-to-14-month-olds become more avoidant of the novel stimulus (Aktar et al., 2013; De Rosnay et al., 2006; Möller et al., 2014; Murray et al., 2008). Although infants’ fine-tuning to parents’ expressions of emotion in this period is essential for the infants’ survival, socio-emotional development, and socialization, the evidence reviewed in the current article indicates that it appears to create a vulnerability for the effects of exposure in the offspring of parents with clinical depression and anxiety. Thus it seems that in the first year of life, infants may already take over depressed and anxious interaction patterns from their parents via repeated exposure to parents’ depressed and anxious moods.

Our review on the effects of exposure to parental depression and/or anxiety on emotional expressions and reactivity in everyday situations suggests distinct influences of mothers’ depression and anxiety diagnoses on mothers’ and infants’ expressions of negative emotions in their interactions, while the effect of fathers’ depression and anxiety awaits to be investigated in future studies. Infants of depressed mothers are exposed to less positive, and more negative and neutral affect from mothers in early interactions (Campbell et al., 1995; Cohn et al., 1990). In contrast, expressions of affect in mothers with anxiety disorders (without comorbid depression), and in infants of mothers with anxiety disorders do not seem to differ from reference parents (Kaitz et al., 2010; Murray et al., 2007; Weinberg et al., 2008). One explanation for the lack of evidence that anxiety-disordered mothers would expose their infants to more negative emotions, is the specificity of anxious parents’ expressions of negative emotions to their confrontations with anxiety-provoking stimuli during triadic parent-infant-object interactions (Aktar et al., 2013; Murray et al., 2008).

Although parents’ depressed affect was suggested to have a distinct influence in SR situations due to diminished availability of depressed parents as referees in SR situations (Peláez et al., 2013), and to the resulting decrease in infants’ frequency of using the parents as referees (Gewirtz & Peláez-Nogueras, 1992), the effect of a depressed affect in SR situations awaits to be explored with mothers and fathers. If the effects of exposure in the case of parental depression extend to the triadic parent-infant-object interactions like suggested, this would reveal continuity in the effects of exposure to parental depression between dyadic parent-infant and triadic parent-infant-object interactions in the first year. In contrast, if exposure to
Parents’ negative emotions and infants’ socio-emotional development

Parents’ depression does not affect triadic parent-infant-object interactions, it may mean that exposure effects in the case of depression and anxiety in the first year may be dynamically changing within the first year across the two milestones of socio-emotional development (i.e., onset of dyadic and triadic interactions). For a better understanding of specific influences of exposure to parental depression and anxiety in infants’ early socio-emotional development, it is important that future studies test the effects of exposure in the first year in longitudinal designs that incorporate the dyadic parent-infant and triadic parent-infant-object interactions in community and clinical samples of anxious and depressed parents.

The evidence on the links between infants’ exposure to parents’ facial expressions of emotions and their processing of emotional facial expressions revealed that infants’ exposure to mothers’ positive affect predict their attention to strangers’ positive vs. negative emotions (De Haan et al., 2004), while the effect of infants’ exposure to paternal positive and negative affect has not yet been investigated. The negative association between infants’ exposure to a certain emotion from the mothers and their attention to others’ expressions of that emotion seems to hold across infants of mothers from clinical and non-clinical samples. That is, typically developing infants who have been exposed to high levels of maternal positive affect in everyday life attend less to the happy (vs. fearful) facial expressions (De Haan et al., 2004), while infants’ of depressed mothers who are exposed to increased levels of negative emotions seem to attend less to sad (vs. happy) facial expressions (Field et al., 1998; Field et al., 2009; Hernandez-Reif et al., 2006; Striano et al., 2002). Thus, depression-related increases in infants’ exposure to maternal negative emotions seem to decrease infants’ attention to negative emotions due to increased familiarity/decreased novelty of negative emotional expressions in infants’ emotional environment. It is important to note that the links of infants’ attention to their exposure to negative emotions suggest a pattern that is reverse to the findings suggesting enhanced attention to negative facial expression in parents and children with depression and anxiety (Leppänen, 2006; Van Bockstaele et al., 2014).

In summary, we conclude that the variation in infants’ exposure to parents’ positive and negative facial expressions resulting from parental depression and anxiety is positively associated with infants’ expressions of positive and negative emotions, and emotional reactivity to novelty in daily interactions while it is negatively associated with infants’ attention allocation to positive and negative emotional expressions. This conclusion on effects of exposure to parental negative emotions in typical development and in infants of depressed and/or anxious parents is limited by the little evidence available on exposure effects in infancy. It is important to note that most of the work reviewed in the current article is simply correlational and cross-sectional. The available longitudinal work is confined to short-term prospective designs that, most of the time did not directly assess clinical outcomes.
Nevertheless, the available evidence on the exposure effects in the first year of life is in line with the multi-component model by Goodman and Gotlib (1999). Namely, it shows that parents with depression and anxiety express more negative and flat emotional expressions in everyday interactions with their infants. Due to experience-dependent nature of early socio-emotional development, and parents’ heightened negative affect expressions, depression and anxiety diagnoses make parents and the interpersonal environment that they provide less than optimal for children’s socio-emotional development. The evidence revealing more negative and flat expressions of affect, and less attention to others’ negative emotion in infants of depressed and anxious parents reveals that this suboptimal interpersonal environment may affect infants’ socio-emotional development. The links between parents’ and infants’ expressions of affect, and behavioral reactivity in everyday interactions confirm the idea that children will acquire negative and avoidant interactive styles that look similar to negative behaviors and moods of depressed and anxious parents. On the other hand, the links between infants’ overall exposure to parental negative emotion and attention to others’ emotional expressions reveal a negative, rather than a positive association (when exposed to high levels of a certain emotion from the parent, infants seem to attend less to that emotion in others’ facial expressions). Thus, exposure to parents’ negative emotions does not necessarily have only adverse effects on infants’ development, but it can also desensitize infants to others’ negative emotions, thus alter infants’ processing towards the non-anxious, non-depressed information processing style. Alternatively, infants’ lower attention to negative emotional faces when being exposed frequently to negative parental emotions could be considered as avoidance, and may constitute the basis of an avoidant style in life and in relationships. The associations between exposure-related alterations in infants’ emotional and behavioral reactions in daily parent-infant interactions, and in infants’ attention to others’ emotion remain to be investigated in future multi-method longitudinal studies combining the observation of everyday interactions with experimental studies measuring infants’ attention to emotional stimuli. In contrast to the components summarized above, the current review does not allow any evidence-based conclusions on the last component of the model by Goodman and Gotlib (1999), i.e., on the links of exposure-related alterations in infants’ socio-emotional development and the development of anxiety disorders and depression in childhood or adolescence. It remains unknown whether the increase in flat and negative affect expressions of infants resulting from exposure to parental anxiety and depression predisposes the offspring for the development of depression and anxiety. It is therefore crucial to investigate the specific contributions of these early exposure-related alterations in the emotional and behavioral reactions and attention in infancy to later depression and anxiety. This is attainable via longitudinal designs incorporating the measurement of socio-emotional development together with the diagnostic measurements that identify depression and anxiety in the offspring. In the
next section, we put the findings in the context of intergenerational transmission by addressing potential mechanisms that may link exposure effects in infants’ emotional expressions, behavioral reactions and infants’ attention to the intergenerational transmission of depression and anxiety in infancy.

**Intergenerational Transmission of a Depressive Interpersonal Style From Parents in Infancy**

The findings consistently show that depressed mothers trigger a depressed interaction style characterized with less positive and more negative affect from their infants in early interactions. Field and colleagues (Field, 1984; Field et al., 1998) suggested that repeated exposure to alterations in these first early dyadic interactions may generalize to infants’ expression of emotion in their interactions with other adults, and contribute to a less positive and more negative affective tone from the infant, and correspondingly trigger less positive affect from others in dyadic interactions. The environmental transmission of this depressive interpersonal style from parents to infants may contribute to the intergenerational transmission of parental depression in these early dyadic interactions.

The association between an increase in exposure to parents’ depressed mood and an increase in infants’ attention allocation to happy (vs. sad) expressions from strangers imply a different influence of exposure to parental depression on infants’ attention allocation (Field et al., 1998; 2009; Hernandez-Reif et al., 2006; Striano et al., 2002). That is, infants of depressed parents attend to others’ positive facial expressions rather than negative emotions that they are already familiar with from their interactions with mothers. Infants of depressed parents also show more interest to mothers’ happy facial expressions (Striano et al., 2002). More attention to positive expressions may be adaptive for infants of depressed parents as biases towards the positive emotions would increase infants’ chances for exposure to more positive emotions, and would serve to diminish deviations in infants’ distribution of overall exposure to emotions. In other words, infants’ increased attention to happy expressions in this period may be a protective mechanism that shields the infants from increases in exposure to negative or flat emotional expressions of the mothers with depression by directing their attention to mothers’ and others’ positive expressions (and away from mothers’ and others’ negative expressions).

**Mechanisms of transmission**

Field (1984) suggested two potential mechanisms behind exposure to parental depression and the early transmission of a depressive interpersonal style from depressed parents to children in infancy. First, infants may acquire a dysphoric interaction style by mirroring parents’ expressions of emotion during dyadic face-to-face interactions. In line with this idea, positive associations were reported not only between infants’ and mothers’ expressions of specific emotions, but also between
infants’ and mothers’ use of eye and brow muscles while expressing these emotions during face-to-face interactions (Malatesta & Haviland, 1982). Second, the decreased positivity of depressed parents may render the dyadic interactions less arousing, exposing infants to lower than optimal levels of stimulation (Field, 1984). In addition to a decrease in positive arousal specifically stemming from the decreased positivity in parents’ emotional expressions in early interactions that was the scope of the current discussion, depressed parents seem to provide a less stimulating environment for infants’ development. For example, depressed mothers are less likely to tell stories, while depressed fathers are less likely to play, and sing to their infant (Paulson, Dauber, & Leiferman, 2006), supporting the idea of decreased positive arousal in interactions of depressed parents with their infants as a potential mechanism of intergenerational transmission of depression.

Intergenerational Transmission of Anxious/Avoidant Reactivity Patterns from Parents in Infancy
The findings consistently reveal a significant effect of exposure to parental expressions of anxiety on infants’ emotional expressions and emotional reactivity to novel/ambiguous stimuli at the end of the first year (Aktar et al., 2013; De Rosnay et al., 2006; Möller et al., 2014; Murray et al., 2008). The related increase in infants’ expressions of fear and behavioral avoidance towards novel stimuli was found to be more pronounced in infants with a temperamental disposition for fear. Thus, inherited temperamental dispositions exacerbate the effects of exposure to parental anxiety. The interplay between infants’ temperamental dispositions and exposure to parental anxiety may be contributing to the intergenerational transmission of parental anxiety in these early dyadic interactions (Fisak & Grills-Taquechel, 2007; Murray et al., 2009; Rapee, 2001).

Mechanisms of transmission
The mechanisms explaining the links between repeated exposure to fearful/anxious expressions from parents with anxiety disorders and the resulting increase in infants’ fear/avoidance responses in infancy have been operationalized within the framework of fear acquisition models (Fisak & Grills-Taquechel, 2007; Murray et al., 2009; Rachman, 1977). Together with the learning experiences that involve direct confrontations with threat (i.e., classical conditioning), indirect acquisition of fear via verbal or non-verbal forms of social learning are among the major pathways for fear acquisition (Olsson & Phelps, 2007; Rachman, 1977), and for early social transmission of fear from parents in SR situations at the end of the first year (Askev & Field, 2008; Rapee, 2001). Classical conditioning and observational learning precede language (and instructional learning) in our evolutionary history and seem to rely on the same emotional brain systems (i.e., amygdala-mediated fear learning pathways, Olsson & Phelps, 2007). In line with this, vicarious learning is often conceptualized as a form of classical conditioning where a fearful/anxious signal from the parent act as an unconditional
Parents’ negative emotions and infants’ socio-emotional development

stimulus, triggering fearful/anxious reactions from the infant when paired with the ambiguous stimuli like objects or strangers in the environment (see Askew & Field, 2008 for a review). Following the pairing, the ambiguous stimuli become conditioned stimuli, evoking fearful/anxious reactions from the child. For infants of parents with anxiety disorders, who by definition have more frequent and intense experiences of anxiety triggered by innocuous cues (rather than actual threat; APA, 2013), these pathways may be mediating the increase in infants’ reactivity to ambiguous/novel stimuli and contribute to parent-to-infant transmission of anxiety. In addition to fear responses, infants’ observational learning of anxious parents’ anxious/avoidant behavioral styles via repeated exposure, and the resulting increase in infants’ overall perception of threat in the environment were suggested to contribute to the social transmission of anxiety from parents with anxiety disorders (Fisak & Grills-Taquechel, 2007; Rapee, 2001). Finally, anxious parents’ reinforcement of infants’ anxious/avoidant behaviors has been stressed as a form of operant conditioning. Fisak and Grills-Taquechel (2007) suggest that differently from reference parents who reinforce approach and exploration of novelty with their infants, parents with anxiety disorder can reinforce anxious/avoidant coping styles due to their own excessive reactions, or to previous aversive experiences in anxiety-provoking situations.

The findings revealing decreased interest to mothers’ neutral expressions in community samples of anxious mothers (Jones et al., 2013), and a preference for low-intensity negative expressions in infants of parents with social anxiety disorder (Creswell et al., 2008; 2011) may serve to decrease exposure to parents’ anxiety. Thus, infants’ decreased attention to high intensity negative faces, and mothers’ neutral faces when mothers have anxiety may be part of a protective mechanism that shields the infant from increases in exposure to fearful/anxious expressions of the mothers with anxiety by directing the attention away from mothers’ faces, and from mothers’ and others’ high intensity negative emotions. Less exposure to emotional affect from mothers, and to low intensity negative faces from others may help bringing the distribution of overall exposure to positive and negative affect in infants of anxious parents closer to the distribution of typically developing infants.

Exposure to the Other Parents’ Emotional Expression as a Moderator of Exposure to Depression and Anxiety

Considering that effects of exposure to parents’ emotional expressions mostly happen together in development, and jointly determine the distribution of infants’ overall exposure to emotions, it is also important to look at the joint effects of infants’ exposure to emotions from mothers and fathers. Two important aspects determine whether the influence of exposure to the other parents’ emotional expressions is a risk or a buffer (see Goodman & Gotlib, 1999): The other parents’ involvement in infant care and the other parents’ depression and/or anxiety. The other parents’ involvement is a measure of the frequency of infants’ exposure to the parents’ expressions of
emotion, while parents' depression and anxiety determine the proportion of exposure to positive vs. negative emotions from the other parent. Fathers' availability and mental health appear as a moderator of exposure to mothers' depression in the developmental model of intergenerational transmission of depression by Goodman and Gotlib (1999). In accordance with this model, we suggest that exposure to the other parents' emotions can become a risk factor in infancy when higher frequencies of exposure to the other parent co-occur with depression and anxiety in the other parent. Thus, when the other parent is highly involved in the infants' care and has a depression and/or anxiety diagnosis, the other parent may exacerbate the effect of depression and anxiety in one parent. Note that due to assortative mating, parents with depression and anxiety disorders are more likely to choose partners that do have similar types of psychopathology, resulting in significant associations between couples' depression and anxiety diagnoses (Goodman, 2004; Matthey et al., 2003), and in higher risk for psychopathology in the offspring (Merikangas, Prusoff, & Weissman, 1988; Merikangas, Weissman, Prusoff, & John, 1988). Psychopathology in the other parent not only contributes to a more pronounced genetic and biological risk for intergenerational anxiety, but also to more pronounced alterations in the overall distribution of infants' exposure to parental emotions when the other parent is highly involved in care. In line with this idea a study in a clinical sample of depressed mothers revealed that exposure to postpartum maternal depression is linked to later internalizing and externalizing problems in the offspring in the toddlerhood only in the presence of paternal psychopathology (Dietz, Jennings, Kelley, & Marshal, 2009). Furthermore, a community study reported that exposure to fathers' depression in infancy strengthens the association between early exposure to mothers' depression in infancy and children's behavioral problems in the kindergarten only if the father is involved in care (Mezulis, Hyde, & Clark, 2004). These findings suggest that the other parents' depression, together with his/her involvement can create more pronounced alterations in infants' exposure, and lead to poorer outcomes. Similarly, when both the mother and the father have anxiety disorders, and are involved in infants' care, a higher frequency of exposure to parental expressions of anxiety in anxiety-provoking situations would be expected to be associated with worse outcomes than in the case of a single parent having anxiety disorder.

Alternatively, in cases where the other parent has no diagnosis of depression or anxiety, and is involved in infant care, exposure to the other parents' emotional expression may provide the infants the opportunity to interact more positively with the other parent on a regular basis, which may help to bring the distribution of infants' overall exposure closer to the typically developing infants' exposure. The findings suggesting that fathers compensate for mothers' depression by expressing more positive affect than their depressed partners in their face-to-face interactions with the infant support this idea (Edhborg et al., 2003; Hossain et al., 1994).
findings revealing no differences in the interactions of depressed mothers and non-depressed fathers with their infants (Chabrol et al., 1996) and less optimal interactions in non-depressed fathers when the mother is depressed (Goodman, 2008) show that the other parent may not always be able to compensate for depression and anxiety in his partner. Thus, the other parent’s ability to compensate may depend on a number of factors including his/her own depression and the negative influences of living with a depressed partner on the other parent’s own functioning and on the marital relationship quality. More recent evidence on the links between maternal depression and the other parents’ involvement in child care has revealed that fathers’ ability to compensate for mother by increasing involvement may be dynamically changing within the first postnatal year (Goodman, Lusby, Thompson, Newport, & Stowe, 2014). More specifically, maternal depression in the first 6 months was linked to higher levels of compensatory involvement from fathers, while maternal depression in the second half of the first year was linked to less involvement from fathers. Thus, fathers’ ability to compensate may decrease in cases where maternal depression continues across the first year. Likewise, the other parents’ availability and ability to compensate for the effects of exposure to the anxious parent’s anxiety was suggested to constitute a buffer for infants’ exposure to the expressions of anxiety from the anxious parent (see Bögels & Perroti, 2011; Bögels & Phares, 2008).

Exposure to Parental Depression and Anxiety and Infants’ Socio-Emotional Development: Future Directions

Based on our review on the associations between exposure to parents’ emotional expressions and infants’ socio-emotional development in the first year of life, we suggest that the following issues should be given priority in future research. First, it is important to notice that previous investigations of exposure to parental emotion effects in daily interactions, and in infants’ attention did not include measurements of purely genetic and biological influences. It is therefore unclear to what extent the associations in parents’ and infants’ expressions of emotions and reactions to novel stimuli are explained by environmental exposure after controlling for genetic and biological vulnerabilities in the offspring of parents with depression and anxiety. The studies investigating the links between overall exposure to parents’ depression/anxiety and infants’ attention has relied on mothers’ report of negative affect, depression and anxiety. Observations of parents’ negative emotions may constitute a more objective index of infants’ actual exposure, and therefore must be considered in future studies. Second, exposure effects have not been investigated longitudinally or cross-sectionally across the developmental transitions signaling the onset of dyadic parent-infant and triadic parent-infant-object associations. For example, although we know that mothers with depression are less positive and more flat during parent-infant interactions in the first half year of life, we don’t know whether these parents also express less positive emotion during infants’ exploration of objects in triadic
parent-infant-object interactions that emerge later in the second half year of life. Future longitudinal investigations of the exposure effects should take into account the transitions in infants’ socio-emotional development in the investigation of effects of exposure to parents’ emotions, depressed and/or anxious moods. The third issue concerns the associations between behavioral and physiological correlates of infants’ emotional reactivity and of attention allocation. Further research should aim at elucidating the links between infants’ emotional expressions, behavioral reactions and attention to emotion for a more complete picture of infants’ socio-emotional development in different levels of analysis. The final issue is the inclusion of fathers. Previous evidence reviewed above on exposure effects in typically developing infants and in infants of depressed and/or anxious parents predominantly comes from mothers. For a more complete understanding of the exposure effects in the family contexts in early years, it remains essential to investigate differential and interactive effects of exposure to mothers’ and fathers’ negative moods in everyday interactions on infants’ socio-emotional development. Inclusion of fathers is important to understand the compensating or exacerbating effect that the secondary caregiver can have in case of a depressed and/or anxiety disordered mother.

Transactions Between Exposure and Other Mechanisms in the Intergenerational Transmission of Depression and Anxiety: Future Directions

How does exposure to parental depression and anxiety in the first year of life interact with inherited genetic/biological predispositions, and other environmental mechanisms to determine depression and anxiety outcomes in the offspring? Inherited genetic markers for depression and anxiety and innate dysfunction in early neuro-regulatory systems in the offspring of prenatally depressed and anxious parents (Goodman & Gotlib, 1999) may create additional vulnerabilities, and strengthen the effect of the deviations related to exposure effects on later psychopathology. For example, both depression and anxiety disorders in mothers show high continuity between the prenatal and postnatal years, infants of depressed mothers are therefore likely to have already been exposed to mothers’ depression prenatally (Heron, O’Connor, Evans, Golding, & Glover, 2004). Newborns of prenatally depressed mothers show altered biochemical/physiological responses (e.g., lower levels of dopamine, higher levels of cortisol levels, and lower vagal tone) that resemble their mothers’ responses (Field, Diego, Hernandez-Reif, 2006). The observed effects of exposure may therefore be partially explained by these biochemical/physiological alterations. Alternatively, the link between exposure to parents’ negative emotions and later psychopathology may be stronger in children of prenatally depressed mothers due to these early biochemical/physiological vulnerabilities. Likewise, other environmental mechanisms are at work during and after the first year of life including low marital quality/satisfaction, parenting stress, and socioeconomic disadvantages may diminish/exacerbate exposure effects.
It is therefore important to incorporate other environmental, biological and genetic mechanisms that operate in intrapersonal and interpersonal levels before, during, and after infancy together with exposure to parental emotional expressions in the intergenerational transmission of depression and anxiety disorders. Considering the diversity of child outcomes in the offspring of anxious and depressed parents, parallel longitudinal measurements of other environmental and genetic factors, in addition to exposure effects are crucial in delineating the effects of environmental exposure on concurrent socio-emotional development and subsequent development of depression and anxiety in childhood and adolescence. Family, twin and adoption studies investigating these mechanisms in the intergenerational transmission of anxiety from a developmental psychopathology perspective may provide important insights to how exposure-related vulnerabilities in infancy cross-sectionally and longitudinally interact with other genetic or environmental vulnerabilities to determine offsprings’ socio-emotional development and psychopathology. This requires a shift from reliance on self-report measures to the integration of different methodologies allowing the assessment of environmental, biological and genetic mechanisms in future family, twin and adoption studies addressing intergenerational transmission of depression and anxiety.

Clinical Implications
The findings reviewed above on the effects of exposure to parental depression and/or anxiety on infants' socio-emotional development highlight the importance of interventions targeting mood and anxiety disorders in the first years of parenthood to decrease the early risk posed by exposure to parents’ negative moods. Although interventions targeting maternal depression are efficient in decreasing parents’ experience of negative emotions (like stress), they may not be always enough to reestablish the typical interaction patterns in early parent-infant interactions (Forman et al., 2007). Studies testing the effects of interventions targeting parent-infant interaction in addition to mother's depressive symptoms revealed promising results, although the outcomes were related to other aspects of dyadic functioning (like parental responsivity) than emotional expressions (see Poobalan et al., 2007). Thus, it remains to be investigated whether the interventions targeting parent-infant dyad can reestablish the typical emotional expression and reactivity patterns in early parent-infant interactions, and buffer the offspring from exposure effects. Not only the effect of parental depression interventions, but also the effect of parental anxiety interventions on parent-child-object interactions in anxiety-specific contexts in the postnatal year is an important issue that needs to be addressed in future studies. Interventions that aim to shield the infant from exposure to negative parental emotions in the postnatal year should consider and target the negative effects of partners’ depression on the functioning, parenting stress and psychopathology of the other parent, and in his/her relationship with the offspring in addition to depression and anxiety diagnosis in one parent.
CONCLUSIONS

The first major conclusion of the current review is that the extent to which parents express negative emotions with their infants has a direct link to infants’ expressions of emotion in their early interactions with parents. Infants’ expression of emotion echoes their parents’ expression of emotion in early interactions in typically developing infants of non-diagnosed parents and in infants of parents with depression and/or anxiety diagnoses. Thus, infants’ repeated exposure to clinically depressed parents’ flat and negative interaction styles in dyadic parent-infant interactions may contribute to the transmission of a similar depressed interaction style from parents to children in the first year of life and constitute risk for the development of depression. Likewise, repeated exposure to fearful and anxious interaction styles from parents with anxiety disorders in triadic parent-infant-object interactions may contribute to infants’ learning of fear and contribute risk for early intergenerational transmission of anxious reactivity patterns from anxious parents to offspring, and to the development of child anxiety.

The second conclusion of the current review is that the extent of exposure to parents’ positive and negative emotions is linked to infants’ attention allocation to others’ positive and negative expressions. Increased exposure to a certain emotion from the parent in the early months seems to be related to a decrease in infants’ attention allocation to that emotional expressions both in typically developing infants, and in infants of depressed parents. Infants of non-diagnosed parents allocate more attention to fearful facial expressions, rather than to happy expressions that their mothers have frequently exposed them in their interactions. In contrast, infants of clinically depressed parents allocate more attention to happy facial expressions, rather than to sad expressions that their mothers have frequently exposed them in their interactions. As suggested above, an increase in attention to others’ positive expression in infants of depressed parents may be a protective mechanism that may help bringing the distribution of infants’ overall exposure to positive and negative affect closer to those of the typically developing infants by increasing the chances of positively interacting with others. Likewise, the decreased interest to mothers’ faces in infants of anxious mothers and to high intensity negative emotional expressions in infants of mothers with social anxiety disorder may help bringing the distribution of infants’ overall exposure to negative affect closer to those of the typically developing infants by decreasing the chances of exposure to mothers’, and to others’ high intensity negative expressions.