Do fathers matter? The relative influence of fathers versus mothers on the development of infant and child anxiety
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Citation for published version (APA):

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CHAPTER 2

The evolutionary basis of sex differences in parenting and its relationship with child anxiety in Western societies

Abstract

In this review, we discuss the evolutionary basis of differences in paternal and maternal parenting behavior in Western societies and apply this to the intergenerational transmission of anxiety. The different specializations that males and females developed during the course of human evolution (e.g., social competition, risk taking, taking chances for males, and care, nurturing, intimate bonding for females), are expected to be reflected in their parenting behavior, which evidence confirms. Research is reviewed in which fathers’ and mothers’ role in (overcoming) child anxiety is examined. It seems that some parenting behaviors are protective for anxiety if they are expressed by the parent of one sex, but are a risk for anxiety development if the other parent displays them. Finally, we propose that it might be more difficult for anxious men to teach their sons their gender role, as anxiety hinders exploring the external world and competing with others, whereas anxiety in women is not likely to negatively affect teaching their gender role of protecting, caring and nurturing to their daughters.
Introduction

Evolutionary theory provides a unique and important contribution to the study of parenting and its effects on children (Bjorklund, Yunger, & Pellegrini, 2002; Geary & Flinn, 2001). Although often criticized, an evolutionary approach sheds new light on the way parents parent, on parenting differences between fathers and mothers, and on the consequences hereof for children. Much of the current theory and research on human behavioral evolution uses thoughtful evaluation of evidence and careful consideration of research methodologies. As such, it provides a valid framework to understand important aspects of parenting, and to generate new hypotheses on human behavior, including parenting and child development.

An evolutionary viewpoint is not only applicable to parenting and father-mother differences, anxiety can also be seen from an evolutionary perspective. It is well known that anxiety has an evolutionary origin and function. As Marks and Nesse (1994, p. 248) aptly phrased it, “anxiety increases fitness in dangerous situations which threaten a loss of reproductive resources.” Anxiety is shaped by natural selection to adjust various aspects of an individual in a way that increases its ability to cope adaptively with certain challenges and threats (Nesse, 1998).

It is important to note that evolutionary models do not only apply to early hominids or extant preindustrial societies, but also to Western societies, which have their own place in these models. Western societies can be characterized by their educated populations, industrialization, wealth and democracy (Henrich, Heine, & Norenzayan, 2010), and include for example the United States of America, Canada, Europe, New Zealand, and Australia. The specific ecological and social context of Western societies predicts a distinct functional pattern of human parenting, which can be explained by evolutionary thinking. That is, in virtually all Western societies, social tradition and formal laws prohibit polygamous marriages, and instead, socially imposed monogamy is found in which a family consists of a husband, wife and their children. Another special characteristic of Western societies is that these family units are often physically isolated from their wider kin network, although kin provide both social and economic support to their family members (Geary & Flinn, 2001). Moreover, in Western societies, a shift in labor force has taken place (i.e., increasing female participation in the labor force and economic instability), which made the jobs of men more unstable and this has led men to take a more active role in their nuclear family (Cabrera, Tamis-LeMonda, Bradley, Hofferth, & Lamb, 2000; Presser, 1989).
Following the definition of Bornstein (2005), “parenting includes genetic endowment and direct effects on children of experiences that parents provide, including parents’ beliefs and behaviors; parenting’s indirect influences take place through parents’ relationships with each other and their connection to community networks” (p. x). In this review, we mainly focus on parenting behaviors; that is, specific behaviors that mothers and fathers display in their daily interactions with their child and which are directly aimed at the child.

The evolutionary basis of parenting, human sex differences and anxiety are widely recognized. However, as far as we know, the association between these three concepts is not yet investigated. Therefore, in this review we discuss the evolutionary basis of differences in paternal and maternal parenting behavior in Western societies and apply this to the intergenerational transmission of anxiety (disorders) from parents to children. The goal is to show that an evolutionary perspective on parenting and differences between fathers and mothers can be helpful in explaining their different role in the development of child anxiety. Evolutionary theory can offer psychologists new ways of understanding and thinking about child development and psychopathology.

In the first section of this review, the focus is on the association between evolution and parenting. First, the evolution of paternal care is described. Then, we will describe forms of parental investment and highlight differences between paternal and maternal investment. The section ends with a discussion of differential investment of parents in their children. The second section provides an overview of the empirical evidence on differences in parenting between fathers and mothers. Furthermore, attention is given to differential parenting by fathers and mothers of their sons and daughters. In the third section, we focus on the association between evolution and (child) anxiety. We will first discuss the evolutionary basis of anxiety, followed by age differences in fear content and the evolutionary appropriateness of children’s fears, and then provide an overview of the learning pathways for the development of anxiety in children. In the fourth section, we will review research in which fathers’ and mothers’ role in (overcoming) child anxiety is examined in a comparative way, in order to explore evidence for different roles of fathers and mothers in the etiology of child anxiety. Finally, findings on the evolution of anxiety and parenting are linked to the empirical studies on parenting and anxiety.
The evolutionary basis of paternal and maternal investment

The goal of this section is threefold: (1) to explain why and how paternal investment has evolved in humans; (2) to provide an overview of interparental differences in investment in children; and (3) to describe differential parental investment in offspring.

The evolution of paternal care

When considering the evolution of paternal and maternal roles in child rearing and how these roles have differentiated in the course of human evolution, researchers make use of basic evolutionary theory on sex differences, comparisons with other species (including primates), comparisons with preindustrial and extant traditional societies, and fossil records of human ancestors. As elaborated upon below, there is ample evidence that across cultures, mothers invest more in their children than fathers. From an evolutionary viewpoint, this sex difference in parental investment is not surprising. On the other hand, compared to other species, the amount of parental investment provided by human males is a unique feature of the human species (Bjorklund et al., 2002; Geary & Flinn, 2001). Paternal investment is found in less than 5% of mammals (Clutton-Brock, 1991), whereas in humans, paternal affiliation with, and investment in, offspring is common. Both issues - the evolutionary logic behind relatively less paternal than maternal investment, and what set of evolved characteristics have caused the relatively extensive paternal care in humans - have been addressed elaborately and eloquently before (e.g., Bjorklund et al., 2002; Geary & Flinn, 2001). Therefore, we treat it here relatively briefly.

Because of the fundamental difference between male and female mammals in initial and obligatory investment in their offspring, evolutionary theory predicts that males invest more in mating, whereas females invest more in parenting (Clutton-Brock, 1991). In female mammals, investment starts before birth with the provision of a relatively large egg and nutrition in the womb, and continues after birth with lactation and care and protection, without which the infant would not survive. Male investment can in principle end after copulation without necessarily affecting offspring survival. Consequently, there is a large sex difference in potential rate of reproduction. Female reproductive success is limited by the number of offspring she can bear and rear to reproductive age, whereas male reproductive success is limited by the number of mates he can fertilize. Besides, female mammals are always 100% certain that the offspring is their own, whereas males can never be certain. These fundamental sex differences explain the general pattern that female mammals invest more in their offspring than males.
The family dynamics that characterize humans (*Homo sapiens*), including the extent of male parental investment, are unique compared to other species, and result from a constellation of coevolved characteristics. Evolutionary models involving human paternal investment contend that the major forces that drove the evolution of human family dynamics involved social factors (Bjorklund et al., 2002; Geary & Flinn, 2001). According to the model of Geary (Geary, 2010; Geary & Flinn, 2001), the key factor that shaped human family dynamics and parenting behavior is social competition. The argument is that competition with other humans for access to and control over essential but limited resources (e.g., food, mates, territory) was a key selection pressure, and that cooperation with relatives (i.e., kin-based coalitions) was an important strategy to facilitate such competition with conspecifics. Notably, Geary and Flinn (2001) argue that such kin-based coalitions were male-based, that is, in human ancestors competition between coalitions of male relatives was important. Moreover, there was male-based philopatry, that is, males were the sex that remained in the birth group, whereas females were the migrating sex (i.e., moved to the group of their mate). Besides male competition, it is assumed that females competed with other females for preferable mates with high social dominance and desired parental behavior. In addition, females formed social networks among each other to ensure social support and help in rearing their children.

The competition and cooperation in humans between kin-based social networks (including families) resulted in a complex social ecology consisting of multi-male multi-female communities (Geary & Flinn, 2001). To function successfully in these complex social systems, highly advanced social competencies were required. Across primate species, the complexity of the social ecology is associated with brain size and the length of the juvenile period (see Geary & Flinn, 2001), and it is assumed that in humans, a large brain and an extended developmental period coevolved with the complexity of social life. Moreover, Bjorklund et al. (2002) suggest that the inhibitory ability to control sexual and aggressive behavior in such complex societies also required increased neural capacity and may thus be another driving force in the evolution towards a larger brain. A function of the long juvenile period (and of the large brain) is to learn the social skills and strategies necessary to successfully compete in the local social ecology. A major component of this learning is assumed to have taken place via parenting.

Because of the long developmental period in which children were extremely dependent, substantial investment and support was required from their parents. In addition to maternal investment, paternal help in child rearing was needed to increase the chance that children would survive to reproductive age (Bjorklund et
In view of the importance of social competitiveness in the local social ecology, it is assumed that parental investment was not limited to the provision of food and protection, but also included investment and support in the social domain (e.g., Bögels & Perotti, 2011). As argued by Geary and Flinn (2001) and others, parental investment in humans was (and is) thus focused to an important degree on fostering socio-competitive competencies in children. Of note, investment by fathers is assumed to be related as strongly, if not more strongly, to children’s later social competitiveness as investment by mothers (Geary & Flinn, 2001). According to these evolutionary models, paternal investment should be related to child survival and to children’s social competitiveness. There is indeed evidence that paternal investment (sometimes studied by the effects of father absence) is associated with decreased offspring mortality in extant traditional societies and in preindustrial Western societies (reviewed in Geary, 2010). However, a review of Sear and Mace (2008) on the effects of kin on child survival based on a large number of natural fertility populations showed little effect of the loss of the father on child mortality. In the absence of direct effects of paternal investment on child survival, especially in contemporary resource-rich Western societies, it is assumed that paternal investment has other, more indirect effects on children’s well-being, in particular on their social competitiveness. As suggested by studies on father involvement, absence, and divorce, high levels of paternal investment (including income and play time) are associated with greater social and academic competencies and well-being in children, although sometimes the relations are confounded by genetic, child evocative, and maternal effects (reviewed in Cabrera et al., 2000; Geary, 2010; Geary & Flinn, 2001; Sarkadi, Kristiansson, Oberklaid, & Bremberg, 2008). For example, using a large longitudinal British dataset, Nettle (2008) showed that paternal investment (measured by maternal report on the father’s involvement relative to her own) was positively associated with children’s IQ at age 11, and with upward social mobility at age 42.

In conclusion, the extent of paternal investment found in humans is assumed to have evolved because our ancestors faced a specific constellation of characteristics and ecological circumstances, the most central of which was social competition with conspecifics. Evolutionary logic explains why fathers generally invest less in their children than mothers. The benefit of paternal investment to children is primarily manifest in terms of enhanced social competencies, whereas, particularly in modern Western societies, a direct impact on child survival is of less importance. The factors described above, that is, the evolved patterns of male philopatry and female migration, kin-based multi-male coalitions and female-female competition and social networks; the proportion of paternal versus maternal investment;
and the importance of parental investment for social competitiveness, may all have implications for the qualitative nature of maternal and paternal parenting behavior.

**Interparental differences in investment**

When the relative amount of parental investment is studied in modern humans, different research traditions use different means of quantification. Evolutionary studies often evaluate parental investment in terms of indirect care (i.e., provisioning of resources, protection from predators) versus direct care (e.g., carrying of the infant; Gettler, 2010), whereas in research into paternal effects on child development, parental investment is evaluated in terms of involvement (e.g., Cabrera et al., 2000; Sayer, Bianchi, & Robinson, 2004; Yeung, Sandberg, Davis-Kean, & Hofferth, 2001). In the latter type of studies on paternal involvement, a distinction has been made between accessibility (presence and availability), engagement (direct contact, caregiving, and shared interactions), and responsibility (participation in management, organizational tasks, and monitoring; see Cabrera et al., 2000). Studies on responsibility seem to relate to indirect care, whereas studies on accessibility and engagement seem to concern direct care. Aspects of paternal engagement and accessibility have been studied most often and this research is relevant for the current line of reasoning.

There is converging evidence from different sources of research (e.g., cross-cultural, historical) that mothers invest more in children than fathers, both in terms of time, and in terms of resources. Cross-cultural evidence in a vast amount of countries indicates that mothers spend more time with their children than fathers in all cultures studied, especially when children are young (Geary, 2010). As reviewed by Geary (2010), observational studies show that the proportion that children spend in the presence of, or engaged in activities with their father is but a fraction of that with their mother. Also in modern Western societies, fathers are less engaged with their children than mothers, but the difference is smaller. Using time diaries in a large representative sample of intact families, collected in 1997 in the USA, Yeung et al. (2001) found that fathers’ engagement and availability time with their children (across different child age groups) was 60% to 82% of that of mothers on weekdays, and 80% to 94% on weekends. This pattern was quite consistent across the activity categories: caregiving, play/companionship, teaching/achievement related, household activities, and social activities. Of note, however, is that fathers’ relative direct engagement was particularly high in certain play activities, such that it was 3-6 times higher than mothers for coaching or teaching sports and for other outdoor play. Similarly, Sayer et al. (2004) found that in the last (1998) data wave of their study, mothers spent 1.9 times more time on child care activities than fathers. When considering the subcategory
teaching and play (including helping and teaching, talking and reading, indoor and outdoor playing), mothers still spent 1.3 times more time on these activities than fathers, but the difference was much smaller than the 2.1 ratio found for the subcategory child care time (including baby care, child care of children age five and over, medical care, other care, and travel associated with child care activities). Using a contemporary large British sample, Lawson and Mace (2009) found that across child age, mothers spent more time on parenting activities than their current partner (in most cases the father of the child). This was found at each data wave (7 data waves, from 1.5 years until 9 years) and for each parenting activity, except for physical play. From 3.5 years onwards, the partner of the mother engaged in more physical play than the mother.

Thus, available evidence suggests an overall large interparental difference in amount of investment, with mothers investing more than fathers, differences possibly (increasingly) smaller in contemporary Western societies, and a reverse picture for a number of specific activities such as physical play.

**Differential investment in different children**

Because siblings can differ in their potential to survive and reproduce, evolutionary theory predicts that parents may invest differentially in their children (Buss, 2008). This is because natural selection would have favored parents who invested more in offspring who have higher reproductive potential, that is, are more likely to be reproductively successful. Therefore, it is likely that parents use cues that signal a child’s reproductive potential as a basis for their investment decisions. Various child characteristics have been suggested and studied that could be related to child reproductive potential and influence parents’ differential investment in their offspring. Among these are age and health of the child. It has been predicted and found that older children receive more investment than their younger siblings, particularly in times of stress and low resources (Daly & Wilson, 1988). This is because the reproductive potential of older children is higher since they are more likely to reach reproductive age. As regards health of the child, next to studies showing a negative effect of child congenital abnormalities on parental investment (discussed in Bjorklund et al., 2002; Buss, 2008), the way health affects parental investment is illustrated by a classic study by Mann (1992). She found that mothers of premature low-birth weight twins directed more positive behaviors towards the healthier of the two when they were 8 months old (health was measured at several ages and included developmental, physical, and cognitive measures).
However, differential parental investment in children appears to be affected not only by child characteristics, but also by parental access to resources that can be converted into parental investment (e.g., Beaulieu & Bugental, 2008). The argument is that from an evolutionary point of view it is less beneficial for parents with low resources to invest in a child with low reproductive potential (if there are healthier siblings); consequently, such a high-risk child will receive less investment. However, for parents with high resources, it is beneficial to invest more in a child with low reproductive potential. This is because they can afford to invest a greater amount in that child, while still having sufficient resources to provide for other children (Beaulieu & Bugental, 2008). As a result of the extra investment, the high-risk child may have increased chance to survive to reproductive age, thus increasing the parents’ reproductive success. Support for this model was found in a study of Beaulieu and Bugental (2008) who found that mothers low in ‘attentional’ resources (i.e., depressed) invested more in low-risk (i.e., full-term) children, whereas mothers high in ‘attentional’ resources (i.e., not depressed) invested more in high-risk (i.e., premature) children. Other studies also indicate that parental resources affect their reproductive trade-offs, with parents of higher socioeconomic status (i.e., high in wealth and education) facing stronger trade-offs between family size and parental investment per offspring (i.e., having an additional child is more costly to them; Lawson & Mace, 2009, 2010).

Thus, because siblings may differ in their reproductive potential, child characteristics related to health, including mental health, appear to affect parents’ (unconscious) decisions on the proportion of investment provided to each of their children. However, the picture is not one-dimensional, as the amount of resources parents have available affects their decisions in this respect. In Western societies, the trade-offs parents face with respect to how much to invest in which child are complicated and just beginning to be unraveled (Lawson & Mace, 2009).

### Father-mother differences in parenting

From an evolutionary perspective, it can not only be expected that mothers and fathers differ in the amount of investment in their children, but also that parents interact differently with their children. This section first provides an overview of why and how evolved differences between men and women lead to gender differences in parenting behavior. Second, empirical evidence is reviewed, showing that mothers and fathers indeed differ in parenting behavior. Third, the evolutionary logic behind parental differences in rearing sons and daughters is discussed, as
is assumed that men and women want to prepare their children for their future gender roles. Fourth, this section ends with a discussion of empirical findings showing that parents teach their sons and daughters behaviors appropriate for their future gender roles.

**Evolved gender differences and parenting**

As explained above, males’ higher potential rate of reproduction in comparison to females gives rise to a reproductive strategy focused at finding mates, which more strongly fosters male-male competition to gain access to females (Geary, 2000). Due to stronger competition, males are expected to be more prone to risk-taking than females (e.g., Wilson & Daly, 1985), which is likely to be reflected in their parenting behavior. Furthermore, the larger paternal than maternal uncertainty about biological relatedness to offspring (Geary, 2000) may also result in more risk-taking behavior in interaction with offspring in fathers than in mothers. There is indeed ample evidence that males engage in more risk-taking behavior (e.g., Byrnes, Miller, & Schafer, 1999), are more strongly oriented towards social dominance (e.g., Pratto, Sidanius, Stallworth, & Malle, 1994), and are more competitive than females (e.g., Van Vugt, De Cremer, & Janssen, 2007). By contrast, from females’ lower potential rate of reproduction, larger certainty about biological relatedness to their offspring, and larger investment from the start of gestation (Geary, 2000), it is to be expected that mothers will be more careful and protective towards their children. Empirical evidence indeed shows that females are more risk-aversive (e.g., Eckel & Grossman, 2008), caring (e.g., Feingold, 1994; Stimpson, Jenssen, & Neff, 1992), and empathic or sensitive to the needs of others (e.g., Eisenberg & Lennon, 1983; Schulte-Rüther, Markowitsch, Shah, Fink, & Piefke, 2008) than males.

As outlined above, sex differences in social qualities have most likely evolved due to male philopatry and female migration to the group of their husband, in combination with male competition over access to females and male coalitions for inter-group competition and resources (Geary & Flinn, 2001). Since males remained among their relatives, they formed kin-based coalitions. These relationships may not require as much investment and reciprocity as relations with non-kin, hence a lower level of investment and reciprocity in relationships is expected for males than for females. Furthermore, larger coalitions have been competitively advantageous, resulting in less investment in individual male-male relations. For females migrating to the groups of their husband and ending up in a group of unrelated women, selection presumably favored socially competent women, that is, women who were reciprocally altruistic, shared intimacy and resources, and provided social support (Geary
& Flinn, 2001). These evolved gender differences in social qualities presumably also result in different parenting behavior between fathers and mothers.

It may be expected that fathers and mothers model and actively teach their children their own gender-related competencies, such as taking chances, and social competition for males, and providing protection, caring for others, and intimate bonding for females. Consistent with this idea is the suggestion of Power, McGrath, Hughes, and Manire (1994) that mothers present a model to their children that is less directive, more cooperative, and more responsive to the needs of others, whereas fathers present a model of directiveness and self-assertion. Fathers’ parenting behavior promoting social competition and social status is likely to be expressed in physical and competitive play, encouragement of physical activities, such as sports, and encouragement of physical and cognitive excellence. In line with these suggestions is Paquette’s (2004) evolutionary based model of the father-child relationship that identifies physical play as typical for the paternal parenting style promoting taking chances, overcoming limits, and engaging in social competition. Physical play, and in particular rough-and-tumble play, of fathers is typically characterized by elevated levels of arousal in the child (Carson, Burks, & Parke, 1993; Paquette, 2004). In this manner, the child may gain experience in dealing with this type of bodily experiences that are also characteristic of more stressful and threatening situations in social competitive situations (Paquette, 2004). Mothers’ prototypical parenting behavior fostering nursing, caring, and intimate bonding may consist of sensitive care and play, jointly performing household tasks, encouragement of being sensitive to the needs of others, and engaging in personal conversations about experiences and feelings with her child. A type of play in which the elements of perspective taking and empathizing with others are practiced and improving social relationships is stimulated in pretend play (e.g., Bergen, 2002; Howes, Unger, & Matheson, 1992; Youngblade & Dunn, 1995). Hence, it may be expected that this type of play is more typical for mothers than for fathers. Paquette (2004) and Roggman (2004) link the differential paternal and maternal role in the upbringing of their children to the attachment theory of Bowlby (1969) and Ainsworth, Blehar, Waters, and Wall (1978). They state that the paternal role is more strongly aimed at stimulating exploration, whereas the maternal role is more strongly focused at providing a safe haven.

**Father-mother differences in parenting: Empirical findings**

With regard to parenting, empirical findings support the model that fathers prepare their children to a larger extent for (social) competition, while mothers put more emphasis on protection, care and maintaining intimate relations. For example,
Robinson and Godbey (1997, as cited in Yeung et al., 2001) found that fathers spent most of their time with their children in the form of interactive activities, such as helping with homework, while mothers were responsible for the basic care tasks, such as feeding and cleaning. Similarly, mothers consistently demonstrated more caregiving behavior than fathers across various Western societies in a physical play context (Best, House, Barnard, & Spicker, 1994). Furthermore, numerous studies, both using parent report measures as well as observations, have confirmed that, from infancy onwards, fathers spend relatively more time playing with their offspring than mothers (e.g., Bonney, Kelley, & Levant, 1999; Clarke-Stewart, 1978; Crawley & Sherrod, 1984; Field, 1978; Lamb, 1977; Levey & Fagot, 1997; Lewis & Lamb, 2003; McBride & Mills, 1993; Russell & Russell, 1987). Moreover, the type of play fathers engage in is more often physical, e.g., rough-and-tumble play, than the type of play mothers engage in (e.g., Carson et al., 1993; Crawley & Sherrod, 1984; Lamb, 1977; Lindsey & Mize, 2001; MacDonald & Parke, 1986; Ross & Taylor, 1989). Mothers, by contrast, engage in more pretend play than fathers (e.g., Lindsey & Mize, 2001; Lindsey, Mize, & Pettit, 1997). Concerning the content of pretend play, evidence suggests that mothers use more caring themes, such as feeding and dressing, while fathers use more male role connected themes such as repair and construction (Keren, Feldman, Namdari-Weinbaum, Spitzer, & Tyano, 2005). With respect to protectiveness in general, mothers have also been demonstrated to be more controlling to their children than fathers, which among others is aimed to prevent the child from getting hurt or injured (Verhoeven, Bögels, & Van der Bruggen, 2011).

Regarding the way of interacting, several studies find mothers to be more sensitive and responsive during interactions (e.g., Barnett, Deng, Mills-Koonce, Willoughby, & Cox, 2008; Lewis & Lamb, 2003; Power, 1985). In addition, mothers tend to provide more warmth and support and generally have closer, more intimate relationships with their children and adolescents than fathers do (e.g., McKinney & Renk, 2008; Russell et al., 1998; Simons & Conger, 2007; Steinberg & Silk, 2002; Winsler, Madigan, & Aquilino, 2005). In similar vein, mothers are also more likely to use reasoning and nurturing behavior to achieve their parenting goals, while fathers use more forceful techniques based on parental authority and power (e.g., Bentley & Fox, 1991).

Concerning communication, support has been obtained for a more empathizing and personal style for mothers than for fathers. For example, it has been found that, during conversations with their children, mothers talked about emotional aspects of past events more than fathers (Fivush, Brotman, Buckner, & Goodman, 2000), and
during interactions with their babies, mothers exhibited more frequent perspective taking than fathers did (Lundy, 2003).

Although the majority of studies support the view that fathers encourage taking chances, and social competition more than mothers, while mothers are more protective and stimulate caring for others and intimate bonding more than fathers, some remarks have to be taken into account. Various researchers have stressed that differences in sensitivity and responsiveness (e.g., Lewis & Lamb, 2003; Pleck, 2010; Tamis-LeMonda, 2004) and in type of play between parents are small (Roggman, 2004). These claims are indeed supported by studies reporting fathers and mothers to be equally sensitive and responsive during interactions (e.g., Malmberg et al., 2007; Russell & Russell, 1987; Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004). Of note, none of the studies reported that fathers are more careful or sensitive than mothers. In addition, German mothers played more with their children than fathers, whereas the opposite pattern is found in French and Italian parents (Best et al., 1994). It has to be noted, though, that the sample size of this study was relatively small (n varied from 27 to 29 per country) and conclusions were based on a single task. In conclusion, although studies generally find differences between mothers and fathers in the direction of mothers being more caregiving and sensitive to the needs of others and fathers more playful and risk taking, differences are found to be small. Moreover, parental differences in sensitivity are not always observed, and incidentally, it is found that mothers show more play behavior than fathers.

Parental differences in rearing sons and daughters
Considering evolutionary principles, fathers and mothers presumably would like to optimally prepare their children for their future roles as males and females. Similarly, Block (1983) proposed that parents would be more likely to encourage self-assertive behavior in boys and relationship augmenting behavior in girls. It may therefore also be expected that fathers teach the prototypically father behaviors more intensively and explicitly to their sons than to their daughters, while mothers teach theirs more explicitly to their daughters than to their sons. Due to their gender-dependent expertise, it may therefore be expected that fathers spend more time with their sons than with their daughters, and mothers more time with their daughters than with their sons.

Differential rearing of sons and daughters: Empirical findings
Evidence suggests that, from infancy onwards, parenting behavior is guided by future gender roles and thus differs for boys and girls. A distinction can be made between studies that focus on differential treatment of sons and daughters,
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and on studies that focus on interparental differences in the treatment of sons and daughters. With respect to the first type of studies, Lytton and Romney (1991) reported in their meta-analysis that sex-typed activities are encouraged. For example, playing with dolls is discouraged in boys and encouraged in girls (Fagot, 1978; Snow, Jacklin, & Maccoby, 1983). Or, feminine play themes, such as having a tea-party, are encouraged more in girls, while masculine play themes, such as playing a football match, are encouraged in boys (Jacklin, DiPietro, & Maccoby, 1984).

Furthermore, parental rearing practices have been shown to encourage risk taking more strongly in boys than in girls, as evidenced by the following findings. First, during early childhood, parents encourage greater risk taking in boys than girls and stress greater perceived injury vulnerability among girls than boys (Morrongiello & Dawber, 1999). Likewise, fathers of sons monitored their children less closely than did fathers of daughters during potentially physically threatening situations (Kindleberger & Kuebli, 2007), and girls received more negative reactions when engaging in gross motor activities such as running and jumping than boys (Fagot, 1978). Second, the exploratory behavior of boys is less likely to be restrained than that of girls, even if it is perceived as risky by parents (Block, 1983). Third, fathers spend more time, and engage in more physical play with their sons than with their daughters (Jacklin et al., 1984; Lindsey & Mize, 2001; Phares, 1999).

Moreover, evidence suggests that parents encourage sensitivity to others, cooperation and relationality more in girls than in boys. First, parents engage in more pretend play with girls than with boys (Lindsey et al., 1997; Lindsey & Mize, 2001). With respect to communication, mothers talk about feeling states in themselves and in others more to toddler-girls than to toddler-boys (Dunn, Bretherton, & Munn, 1987); and parents discuss emotional aspects of past events more with their daughters than with their sons (Fivush et al., 2000). Second, helping the parents with tasks in the house is encouraged in girls and discouraged in boys (Fagot, 1978). Third, parents interacted in a more cooperative way with their daughters than with their sons, while solving cognitive tasks (Frankel & Rollins, 1983). In sum, evidence indeed suggests that parents teach their children gender-specific qualities such as taking chances and caretaking. Again, it has to be noted that differences are small. Moreover, no support was found for differential parenting of sons and daughters for the stimulation of achievement (Lytton & Romney, 1991), which can be viewed as an aspect of social competition.

With respect to studies that looked into interparental differences in rearing sons and daughters, there is some evidence that mothers and fathers differ in their differential
treatment of sons and daughters. Lytton and Romney (1991) reported in their meta-analysis support for the tendency that fathers differentiate more than mothers when teaching their children gender-typed behaviors. With respect to physical play, Lindsey and Mize (2001) found that fathers were more likely to be engaged in physical play with boys than with girls, while no differential type of play with boys and girls was found for mothers. Similarly, Jacklin et al. (1984) reported that fathers engaged in more rough-and-tumble play with sons than with daughters, while no such difference was found for mothers. With respect to risk taking, Kindleberger and Kuebli (2007) found that fathers of daughters monitored their girls more closely than fathers of boys, while no such difference was found for mothers.

Summarizing, gender specific parenting of sons and daughters seems to be more pronounced in fathers than in mothers, in particular for male-gender types of play or parenting (e.g., rough-and-tumble play). Of note, again, interparental differences in parenting of sons and daughters appear to be small, are not found for all gender-typed forms of play (e.g., pretend play; Lindsey & Mize 2001), and some studies have also reported absence of such differences (e.g., MacDonald & Parke, 1986; Russell & Russell, 1987).

Evolution and anxiety

Having discussed the evolutionary basis of differences in parental investment and parenting behavior, we shift our attention to the relationship between human evolution and anxiety. In this section, we first explain the evolutionary basis of anxiety and highlight differences between evolutionary relevant and evolutionary irrelevant fears. Second, we show that the development of fears follows a predictable and evolutionary appropriate course. We end this section with a discussion of the acquisition pathways of fear in children.

Evolutionary basis of anxiety

Although excessive anxiety can lead to severe limits in daily functioning (Kroenke, Spitzer, Williams, Monahan, & Löwe, 2007), anxiety helps organisms defend against several kinds of threats (Marks & Nesse, 1994). Different subtypes of fear were shaped during human evolution to cope with a wide variety of threats (Nesse, 1990). For example, fear of strangers protects us from harm by unknown people, and fear of animals from being attacked or poisoned.

As humans evolved in an unpredictable environment in which predators, heights, and hostile strangers were present, it was very important to rapidly locate and quickly respond to potentially dangerous events in the environment.
In support of this notion, research has shown selective attention to potentially threatening stimuli (e.g., Öhman, Flykt, & Esteves, 2001; Öhman, Lundqvist, & Esteves, 2001). This evolved fear module is not only activated in aversive contexts by stimuli that are fear relevant in an evolutionary sense (e.g., Öhman & Mineka, 2001), such as snakes and spiders, but also by evolutionary irrelevant fears (e.g., Blanchette, 2006; Brosch & Sharma, 2005; Fox, Griggs, & Mouchlianitis, 2007); that is, fears that are apparent now, but did not exist in earlier times, such as fear of electricity and cars. This suggests that in addition to an innate ‘module’ to detect relevant threats, experience may also lead to rapid detection of threatening stimuli. As infants and young children have less experience with threatening stimuli than adults, they can be valuable in research studying the role of experience in anxiety. Indeed, studies (e.g., LoBue, 2010) show that infants detect stimuli with which they have had some negative experience more quickly than stimuli with which they had little or no negative experience, suggesting that experience plays a role in humans’ ability to quickly detect modern threats. In sum, the results of the above mentioned experiments point in the direction of a fear module that responds to both evolutionary relevant and evolutionary irrelevant threats.

Nevertheless, there are some remarkable differences between evolutionary relevant and evolutionary irrelevant fears. First, specific phobias for evolutionary relevant objects are more common than phobias for recent dangerous objects (see Emmelkamp & Wittchen, 2009). Second, the study of Bornas, Mühlberger, Llabrés, Wiedemann, and Pauli (2009) showed higher activation of more ancient brain systems in evolutionary relevant phobias compared to evolutionary irrelevant phobias. Third, evolutionary relevant fears are acquired rapidly (Öhman, 1986), and are more difficult to extinguish than fears of evolutionary irrelevant stimuli (Cook, Lang, & Hodes, 1986; Hugdahl & Kärker, 1981). Fourth, associative conditioning is not even needed to prompt evolutionary relevant fears; different studies show that fewer cases of direct classical conditioning had occurred in the etiology of evolutionary relevant than in evolutionary irrelevant phobias (Harris & Menzies, 1996; Menzies & Harris, 1997; Poulton, Davies, Menzies, Langley, & Silva, 1998; Poulton, Menzies, Craske, Langley, & Silva, 1999), which indicates a spontaneous acquisition of evolutionary relevant fears. In sum, both evolutionary relevant and evolutionary irrelevant threats are detected very rapidly, but evolutionary relevant fears are more common, involve older brain regions, are more difficult to extinguish, and can arise without associative conditioning. However, it should be noted that some evolutionary irrelevant fears can be traced back to evolutionary relevant fears. For example, fear of getting an injection may seem evolutionary irrelevant, but painful skin penetration by a sharp object already posed a threat to survival in the course of human evolution.
The development of normal fears in children
As Muris and Field (2011) point out in their review, all children experience relatively mild fears that naturally wax and wane and follow a predictable course. Moreover, there appear to be clear age differences in fear content (see the review of Gullone, 2000). Babies become fearful of stimuli in their immediate environment, such as loud noises. Around their first birthday, infants become fearful of strange persons and separation anxiety arises. Fear of strange objects and heights also increases at this age. In preschool children fear of being alone, darkness, and animals is more prominent. In school aged children fear of supernatural phenomena, social and evaluative situations (fear of failure and criticism), bodily injury, illness, and death becomes increasingly manifest, whereas in adolescence more global fears emerge, such as worries about the economy or politics (Gullone, 2000).

Children’s fears do not only follow a predictable course, but they also seem evolutionary appropriate (Boyer & Bergstrom, 2011). That is, children’s developing fears focus on threats to children’s fitness. For example, infant stranger anxiety is adaptive as it provides a powerful protection against dangerous conspecifics in the light of their extreme helplessness. Another example, the fear of being or sleeping alone is appropriate given the potential danger of predators.

The acquisition of fears in children
Anxiety disorders show significant familial aggregation (Hettema et al., 2001). More specifically, children whose parents have an anxiety disorder are at a greater risk for having an anxiety disorder themselves (Turner et al., 1987). Similarly, parents of children with anxiety disorders are more likely to have an anxiety disorder compared to control parents (Last et al., 1987; Last et al., 1991; Lieb et al., 2000). Estimated heritabilities across the anxiety disorders vary between 30 to 40 percent (Hettema et al., 2001). Genes influence individual differences in levels of anxiety among children, but environmental factors are at least of equal importance (Gregory & Eley, 2007). This leaves room for specific learning experiences during development. Although fears may occur in the absence of learning experiences (as showed above for the evolutionary relevant fears), children can acquire fears via three learning pathways: (1) conditioning; (2) vicarious acquisition (modeling); (3) transmission of information and instruction (Rachman, 1977). Each pathway will be discussed below, with a particular focus on the transmission of fears from parents to children.
The first pathway for the development of anxiety concerns conditioning. As experimental manipulation of fears in children via conditioning raises serious ethical considerations, researchers try to map the role of conditioning in child anxiety by means of naturalistic and retrospective studies. An example of a naturalistic study is the one of Dollinger, O’Donnell, and Staley (1984) who compared the fears of child survivors of a lightning strike with matched control children. The victims of the lightning strike reported more numerous and more intense fears of thunderstorms, lightning, and tornadoes than control children. In their review of the empirical retrospective support for Rachman’s theory of fear acquisition in relation to the origins of childhood phobias, King, Gullone, and Ollendick (1998) found that the percentage of children that acquired their fear via conditioning varied from 0% (for fear of water) to 91% (for fear of dogs) of the children.

The second route for the development of anxiety concerns the modeling of fears. Children can acquire anxiety through observation of other’s fearful behavior, mostly their parents, in response to certain stimuli. For example, in the study of Gerull and Rapee (2002), 15-to-20-month-old infants were shown a rubber snake and spider each paired with a negative or positive expression by their mothers. Results indicated that toddlers showed more avoidance and fearfulness following the negative expressions by mothers compared to positive expressions. More evidence for the transmission of fears from parent to child through modeling comes from an experiment of De Rosnay and colleagues (2006): infants (12 to 14 months) of mothers who were trained to express anxiety were more fearful and avoidant with a stranger after observing their mother interacting socially anxious with the stranger than after a non-anxious mother-stranger interaction.

The third pathway concerns the transmission of fears through information and instruction. Field and colleagues showed in a series of experiments that threat information can lead to fear in children. They presented school-aged children with threat, positive, or no information about three novel animals (Australian marsupials; the cuscus, quokka, and quoll). Verbal threat information created behavioral avoidance, as measured by reluctance to approach a wooden box that they believed to contain the marsupial (Field, 2006a; Field & Lawson, 2003) and increased heart rate during this approach task (Field & Schorah, 2007). Moreover, self-reported fear beliefs increased after hearing the threat information (Field, 2006b; Field & Lawson, 2003), which lasted up to 6 months (Field, Lawson, & Banerjee, 2008). In these experiments, the experimenters offered the verbal threat information. Muris, Van Zwol, Huijding, and Mayer (2010) demonstrated that negative information about an unknown animal given by parents also increases children’s fear.
They provided parents of children aged 8-13 years with information (negative, ambiguous, or positive) about an unknown animal, and were instructed to describe a series of imaginary confrontations with this animal to their child. Results showed that children whose parents received negative information about the animal reported a significantly higher level of fear than children of parents who received positive information.

Research is inconclusive about which pathway plays the most important role in the development of child anxiety (see the review of King et al., 1998). Some studies (e.g., Ollendick & King, 1991) found that a vast majority of children attributed their fear to information/instruction, followed by modeling and direct conditioning. Other studies (e.g., Muris, Merckelbach, & Collaris, 1997) found that most children attributed the onset of their fear to conditioning, followed by negative information/instruction and modeling. Interestingly, in the study of Muris et al. (1997), 33% of the children did not know what caused their fear, suggesting that it may be difficult if not impossible to attribute the etiology of personal fears to one of three pathways. It is important to note that the three pathways of fear are not independent, but interactive (Ollendick & King, 1991). That is, more than one pathway is typically involved in the acquisition of fears in children. Ollendick and King showed that in only a minority of the children information/instruction or modeling alone were sufficient to evoke high levels of fear. For most children, it was necessary that both modeling and information/instruction were present or that these indirect sources of fear were combined with conditioning experiences. Even though it remains unclear which pathway is most important, it is certain that parents may play a role in the transmission of fear through the three pathways.

**Fathers’ and mothers’ effects on child anxiety**

Babies are born anxious, which helps them to survive as they are extremely vulnerable and ask for protection and guidance when anxious. Yet their developmental task is to overcome fear as their vulnerability decreases and their motor and cognitive skills to deal with potentially dangerous situations increase with age. Parents can assist children in overcoming fears by the signals they give about novel and potentially dangerous stimuli, by the role models they give in how to approach such stimuli, by the encouragement and guidance they give their children in approaching such stimuli, by the protection they offer their children while exploring new stimuli, and by the trust they transmit to their children in whether or not they feel their children can cope independently with new stimuli. Based on the evolutionary
based differences between fathers’ and mothers’ roles in child upbringing, fathers and mothers are assumed to play different roles in helping children overcome anxiety, and fathers’ and mothers’ own anxiety is assumed to have different effects on child anxiety based on their different roles (see also Bögels & Perotti, 2011). In this section, we will review research in which fathers’ and mothers’ role in (overcoming) child anxiety is examined in a comparative way, in order to explore evidence for different roles of fathers and mothers in the etiology of child anxiety. We start from the review on the same issue by Bögels and Phares (2008), and add studies that have been published since, covering the years 2006-beginning 2012. A literature search was conducted of all studies analyzing the paternal and maternal role in (overcoming) child anxiety in PsycINFO, PubMed, Web of science, Academic search premier, Psychiatry online, and Medline for the period from 2006 to 2012. Keywords, title and abstract information were used. The main search terms were (in different combinations): father, paternal, parenting, rearing, anxiety, anxiety disorders, stress, behavioral inhibition, internalizing problems, internalizing behavior, sex differences, and gender differences.

Bögels and Phares (2008) reviewed four types of studies concerning paternal factors related to child anxiety: (1) bottom-up studies on differences between fathers versus mothers of anxiety disordered or high anxious versus normal anxious children; (2) top-down studies on characteristics of offspring of fathers versus mothers with anxiety disorders compared to non-anxious fathers and mothers; (3) longitudinal and cross-sectional correlational studies on the relationship between paternal versus maternal factors and child anxiety symptoms, and (4) treatment-related research. We will summarize what was found in the review, and add new studies within the four categories that have been published since 2006. Moreover, we add a fifth line of research that has started very recently: experimental research.

Note that next to the review of Bögels and Phares (2008), a meta-analysis by Van der Bruggen and colleagues in the same publication year (2008) provided tentative support for the idea that paternal rearing is important in child anxiety. That is, the association between parental control and child anxiety was large in studies that did include fathers \(n = 5, d = .84\) and medium in studies including mothers only \(n = 18, d = .50\), although it should be mentioned that this difference in effect size was not significant.

With respect to the different kinds of evidence, it should be noted that some types of paradigms and designs lead to stronger evidence than others (for a full
We assume that studies using observations of parenting, compared to self-reported or child-reported parenting lead to stronger evidence, as observation of parenting by third parties is more objective and less dependent of making social desirable impressions, and are less affected by responder biases. Moreover, studies using longitudinal correlational designs lead to stronger evidence than cross-sectional correlational studies, as sequential rather than associative relations can be investigated. Finally, strongest evidence comes from experimental designs that allow for direct testing of causal relationships.

**Bottom-up studies: Observed rearing**

In the review of Bögels and Phares (2008) three studies were identified that used observations comparing fathers’ and mothers’ parenting behavior of anxious versus normal children. Two of these studies found that both mothers and fathers of anxious children were more controlling, and one study only found mothers of anxious children to be more controlling. However, these studies did not include fathers of divorced and lower SES families, leaving the possibility open that anxious fathers (who are more often from lower SES and divorced) were underrepresented. We identified three more recent bottom-up studies on observed rearing of fathers versus mothers in anxiety-disordered versus normal children.

Suveg et al. (2008) studied children aged 8-13 with \( n = 28 \) and without \( n = 28 \) anxiety disorders, in interaction with both their father and their mother about a situation where the child felt angry, anxious, and happy. Fathers and mothers of anxiety-disordered boys exhibited more negative and less positive affect than fathers and mothers of control children.

Using the same paradigm, Hudson, Comer, and Kendall (2008) studied 55 anxiety-disordered children seeking treatment and 29 control children with their parents. Mothers of anxiety-disordered children showed less warmth during the positive situation compared to mothers of control children, whereas no difference in warmth between the two groups was found for the anxious situation. Fathers of anxiety-disordered children showed less warmth during all situations compared to fathers of control children. With respect to intrusiveness, mothers of anxiety-disordered children showed more intrusiveness in the angry emotion situation compared to mothers of control children, and no such effect for fathers occurred. The effects did not differ for boys and girls.

Bögels, Bamelis, and Van der Bruggen (2008) found that fathers but not mothers of anxiety-disordered children aged 7-18 \( n = 121 \), in comparison to fathers
and mothers of control children \((n = 38)\) were interacting in a borderline more controlling (or less autonomy encouraging), but not more rejecting, way with children in a family discussion around issues of disagreement between parents and child. However, when including only families in which both mother and father participated, also mothers of anxiety disordered children were found to be more controlling. Moreover, fathers, but not mothers, of anxiety-disordered children supported their partners less.

To summarize, some differences in observed parenting between mothers and fathers of anxiety-disordered compared to control children were found in recent studies using family discussion tasks, showing that mothers of anxious children show more intrusiveness while discussing negative emotions, whereas this effect was not found for fathers. Moreover, fathers of anxious children support the mother less during a family discussion than fathers of control children.

**Bottom-up studies: Reported rearing**

Bögels and Phares (2008) identified three bottom-up studies on parents of anxious children relying on self-report, showing that, compared to mothers, fathers were more rigid and depressed, felt more inadequate and worried more about the relationship with their child, and reported giving less guidance to their children. In addition, relative to non-anxious children, high-anxious children felt they could relate better to their mother than father.

A more recent study of Lindhout et al. (2006) compared parent- and child-reported rearing of parents of anxiety-disordered \((n = 25\) mothers and 10 fathers\) and control children \((n = 23\) mothers and 13 fathers\). They found that differences between anxiety-disordered and control children in rearing (i.e., more overprotection according to the anxious children, more worry about and negative affect towards the children, less granting of autonomy) were not different for mothers and fathers. Note however that more than half of the fathers were missing in the anxiety-disordered group, therefore the risk of systematic missings (e.g., more anxious fathers missing) and invalid conclusions as a result is high.

A somewhat different approach was applied by Majdandžić, De Vente, and Bögels (2010) in which anxiety disorders were assessed in 121 couples who were expecting their first child. The parents-to-be rated their own father’s and mother’s encouragement of autonomy (versus overprotection) and acceptance (versus rejection). Analyses taking into account within-couple dependency indicated no differences between men and women in the relation between their
own rearing history and their anxiety. Perceived lower encouragement of autonomy by mothers predicted social anxiety disorder, but not other anxiety disorders, whereas perceived lower encouragement of autonomy by fathers predicted other anxiety disorders, but not social anxiety disorder.

In sum, there is evidence from bottom-up studies using self-report that fathers of anxious children are more controlling, give less guidance, and are more rigid than mothers, whereas a more recent study did not find reported differences in rearing for fathers and mothers. Furthermore, mothers’ role may be more important in social anxiety disorder and fathers’ role in other anxiety disorders.

**Top-down studies**

Very few studies were identified by Bögels and Phares (2008) that studied fathers with anxiety disorders or high anxiety compared to mothers, and the effects on their offspring. They concluded that we know almost nothing about the offspring of parents with anxiety disorders, except that after an earthquake (Kiliç, Özgüven, & Sayil, 2003) fathers’ but not mothers’ PTSD is predictive as to whether their offspring developed PTSD. Moreover, there is some evidence that anxiety in fathers but not in mothers shapes the relationship with the child, such that the child perceives the relationship as less warm (Bögels, Van Oosten, Muris, & Smulders, 2001) and more conflictual (Edwards, Barkley, Laneri, Fletcher, & Metevia, 2001).

More recently, Bögels et al. (2008) showed, in the above reviewed study using a family discussion task, that in families of anxiety-disordered children in which fathers had anxiety disorders ($n = 18$), fathers were borderline more controlling and rejecting towards their anxious child than in families in which fathers had no anxiety disorders. Moreover, mothers in these families were more rejecting towards their anxious child. Furthermore, fathers with anxiety disorders dominated the conversation relative to mothers. Mothers’ anxiety status was not associated with different rearing behaviors in both parents. Bögels et al. (2008) concluded that fathers’ anxiety status seems to make the difference in raising an anxiety-disordered child.

In the study of Hudson et al. (2008; already discussed under bottom-up studies) on the role of children’s emotions and parental anxiety comparing both parents of anxiety disordered and control children, fathers with anxiety disorders ($n = 26$) were less warm than fathers without anxiety disorders ($n = 17$), with anxious fathers of anxious children showing less warmth than anxious fathers of non-anxious children. In contrast, for mothers with ($n = 32$) and without ($n = 36$) anxiety disorders, no differences in displayed warmth were found.
Van Gastel, Legerstee, and Ferdinand (2009) conducted a study with 71 children aged 8-12 with anxiety disorders, their 70 mothers and 58 fathers, and a control sample of 93 children, 93 mothers and 82 fathers. They assessed child and parental anxiety disorders, and perceived but not observed rearing. When entered as separate predictors, maternal but not paternal current anxiety disorder predicted child anxiety disorder. Children of anxiety-disordered fathers perceived them as displaying less anxious rearing compared to children of non-anxious fathers. The authors unfortunately do not explain this contradictory finding, but they note that anxious children may perceive parenting styles differently than non-anxious children and that a perceived parenting style might not correspond with an objective parenting style, or a parenting style as perceived by the parents themselves. No other differences were found in the perceived parenting of mothers and fathers with and without anxiety disorders.

In conclusion, fathers with anxiety disorders are found to display more controlling behavior with their children and dominated the partner conversation with their child present, and were less warm, whereas such differences were not found for mothers with and without anxiety disorders. However, children’s perception of their parents may differ as one study found children of anxiety-disordered fathers to rate them as displaying less anxious rearing than children of fathers without anxiety disorders.

Correlational cross-sectional research: Self-report of parenting
Bögels and Phares (2008) identified a series of correlational cross-sectional studies using self-report on the relation between paternal and maternal variables related to child anxiety and found most, but not all, studies providing evidence of a specific or different role of the father, with child anxiety being related to paternal control, lack of affection, anxious rearing, and paternal anxiety. Moreover, they identified various longitudinal studies, using large samples, which showed that father closeness or the quality of the father-adolescent relationship (in divorced as well as in complete families) predicted anxiety and depressive symptoms better than that of mothers. We identified four more recent cross-sectional correlational studies using self-report, on the relation between paternal and maternal parenting and child anxiety.

Noguchi and Ollendick (2010) found that more family expressiveness as perceived by the father (e.g., “we say anything we want around the home”) was in older youth with psychopathology (n = 178) associated with more social anxiety, whereas family expressiveness as perceived by the mother was associated with less youth social anxiety (the latter finding was in line with predictions that family expressiveness protects against social anxiety). Note however that most of the sample suffered
from ADHD or oppositional defiant disorder, and social anxiety may actually be a protective factor against social impulsivity for these children.

Reitman and Asseff (2010), in a sample of 200 psychology students, found that perceived paternal acceptance was negatively related and maternal control positively related to student anxiety, but only for female undergraduates. For male students the reverse pattern was observed; that is, maternal acceptance was negatively related and paternal control positively related to undergraduates’ anxiety, but non-significant.

Pahl, Barrett, and Gullo (2012) investigated in 236 children aged 4-6 the association between fathers’ and mothers’ negative affectivity and parenting stress and children’s anxiety and behavioral inhibition (BI), all measures being rated by parents. Lower negative affect and parenting stress in mothers was related to less child BI, whereas higher negative affect in fathers was related to less child BI and anxiety. The authors do not give an explanation for this unexpected finding. It may be that fathers’ negative affect toughens up the children (see Belsky, Putnam, & Crnic, 1996), thereby reducing the risk for the development of BI and anxiety.

Verhoeven et al. (2011) studied self-reported paternal and maternal rearing in relation to child anxiety in children ($n = 127$) and adolescents ($n = 179$). They found that maternal overcontrol was uniquely related to elementary school-aged children’s anxiety whereas paternal overcontrol was more important during adolescence. Opposite to expectations, higher levels of parental autonomy granting were related to higher levels of anxiety for younger elementary school-aged children (age < 10). For adolescents, the association between paternal overcontrol and anxiety was stronger for older adolescents (age > 15), with higher levels of overcontrol related to higher levels of anxiety.

Taken together, cross-sectional correlational research with self-reported parenting measures suggests that differences in the relation of maternal and paternal parenting with child anxiety varies with age and child gender. It is of note that paternal and maternal rearing is sometimes oppositely related to child anxiety, suggesting different roles for fathers and mothers in maintaining or overcoming child anxiety.

**Correlational cross-sectional research: Observation of parenting**

Bögels and Phares (2008) identified two correlational cross-sectional studies using observation of parenting. These studies showed that fathers’, but not
mothers’, observed warmth and encouragement of psychological autonomy as reported by the child, were associated with lower levels of internalizing problems. Moreover, paternal anxious responses during discussions led to more perceived threat and avoidance in children than maternal anxious responses. We identified four more recent correlational studies on observed fathering versus mothering and child anxiety.

Hastings et al. (2008) studied 133 children aged 2-5 with all mothers and 105 fathers, measuring vagal tone, parenting as observed in several tasks in the lab and at home, self-reported parenting, and child social wariness as observed in daycare or on preschool and in a laboratory interaction with strange children. The hypothesis was tested that less supportive and more protective overcontrolling parenting would be especially maladaptive for children with weaker vagal suppression, marking a poorer dispositional self-regulatory capacity. In line, when vagal suppression was weaker, more supportive fathering predicted fewer internalizing problems and less inhibition. When vagal suppression was stronger, so called protective overcontrolling fathering predicted less social wariness, whereas when vagal suppression was weaker, there was some trend of protective overcontrolling fathering predicting more social wariness. For mothers, the opposite effect was found: more protective overcontrolling mothering predicted more wariness when vagal suppression was stronger, but not when vagal suppression was weaker. Moreover, there were more links between mothers’ self-reported parenting and child outcomes than for observed parenting, whereas the opposite tended to be true for fathers.

Van der Bruggen, Bögels, and Zeilst (2010a) examined whether the relationships between child trait anxiety, parent trait anxiety and parental control, assessed during two Tangram puzzles in which one time father and one time mother had to assist their child (n = 37), differed as a function of both parent and child gender. They found that higher father trait anxiety was significantly associated with lower paternal control for girls, but not for boys. The relationship between child trait anxiety and parental control did not differ as a function of parent gender.

Van der Bruggen, Stams, Bögels, and Paulussen-Hoogeboom (2010b) studied observed paternal and maternal parenting and depression and anxiety problems in 35 children aged 4.5 years, rating 60 minutes of unstructured father- and mother-child interactions. Results indicated that lower levels of paternal autonomy granting (but not paternal warmth, rejection and psychological control) were associated with more child anxiety/depression at 4.5 years, whereas maternal autonomy encouragement was not associated with child anxiety/depression.
Maternal rejection was associated with more child anxiety/depression, and maternal psychological control was borderline significantly associated with child anxiety/depression. Unexpectedly, maternal warmth was borderline significantly associated with more anxiety/depression.

Karreman, De Haas, Van Tuijl, Van Aken, and Deković (2010), studying 72 two-parent families and their first-born 3 year old, found that observed negative control of both mother and father strengthened the relationship between parents’ rating of child fear and internalizing problems. Parenting behaviors of both fathers and mothers were unrelated to parents’ ratings of fear or internalizing problems.

In sum, correlational studies on observed parenting related to child anxiety suggest different roles for fathers and mothers, for example, paternal lower autonomy encouragement and maternal rejection are found to be related to young children’s anxiety. Moreover, one study found that in children who are susceptible for rearing because of weaker emotion regulation, paternal overcontrol was associated with more child anxiety, whereas maternal overcontrol was associated with less child anxiety, indicating different roles for fathers and mothers in sensitive children. Finally, the finding that observed parenting leads to stronger support for father-child anxiety associations, whereas reported parenting to more mother-child anxiety association, may explain inconsistent research findings concerning father-mother differences.

**Longitudinal studies**
Bögels and Phares (2008) identified only one longitudinal study on how differences in observed rearing of fathers versus mothers predict BI in infant boys. Belsky, Hsieh, and Crnic (1998) showed that fathers’ more negative rearing behavior towards their sons who are high in negative emotionality at age 1 predicted less BI at age 4, whereas mothers’ rearing did not predict BI. Bögels and Phares (2008) explain this finding by that fathers’ role might be to toughen up their temperamentally sensitive children. Four more recent longitudinal studies were identified.

McShane and Hastings (2009) tested a new vignette measure of parenting in 115 mothers and 92 fathers of preschool children, and measured children’s observed anxiety and teacher-reported internalizing problems, 1 year apart. Maternal overprotection and paternal critical control predicted child anxiety and internalizing problems. Paternal support predicted less internalizing problems in girls only. Conversely, children’s anxiety predicted increasing paternal overprotection, and their internalizing problems tended to predict increasing maternal overprotection and critical control.
Hughes and Gullone (2010) asked 177 adolescents and their parents (172 mothers, 124 fathers) to complete measures about internalizing symptoms 6 months apart. Reciprocity was found between adolescents and mother internalizing symptoms; that is, maternal internalizing symptoms at T1 predicted adolescents’ self-reported internalizing symptoms at T2, and interestingly, adolescent internalizing symptoms at T1 predicted maternal internalizing symptoms at T2. Reciprocity did not occur between adolescents and father internalizing symptoms. Parenting lower self-esteem at T1 of both mothers and fathers predicted children’s internalizing symptoms at T2.

Edwards, Rapee, and Kennedy (2010) had 632 mothers and 249 fathers complete questionnaires at two measurement occasions, 12 months apart, concerning their preschool children age 3-5 at T1. According to maternal report, child anxiety at T2 was predicted by previous maternal overprotection and negative affectivity, and according to paternal report, child anxiety was predicted by previous paternal overprotection but not negative affectivity.

Majdandžić and colleagues (2014b) investigated fathers and mothers while doing one puzzle and two game tasks with their two children, age 2 and age 4 (n = 188). They assessed overinvolvement and challenging parenting behavior, a new parenting concept that is assumed to be more characteristic for fathers and it was hypothesized that fathers who challenge their children more will help their children overcome social anxieties. Mother’s challenging parenting behavior predicted more social anxiety 6 months later in the oldest child, and father’s challenging parenting behavior predicted less subsequent social anxiety of the oldest child. For the youngest child, maternal and paternal parenting behavior did not predict subsequent social anxiety.

To conclude, the few available longitudinal studies on father-mother differences show that, compared to mothers, fathers may have a specific role in certain children already at a very young age: fathers’ toughening up of their infant boy with a sensitive temperament protects against a BI development, challenging fathering predicts less social anxiety in the first-born child, and fathers’ support predicts less internalizing symptoms in girls. Of note, fathers’ internalizing symptoms do not predict adolescents’ internalizing symptoms whereas mothers’ internalizing symptoms do, and the other way around, suggesting that mothers’ and adolescents’ anxiety and depression are more intertwined than in fathers.
Treatment research

Evidence on differences between the role of the father and mother in child anxiety can also come from studies on parents’ role in treatment. Fathers are however much less involved in treatment of children’s psychopathology than mothers, and very little is known about the inclusion of fathers in treatment of child anxiety disorders in contrast to externalizing disorders, where including fathers positively predicts outcome (Bögels & Phares, 2008).

Liber et al. (2008) investigated the predictive value of paternal and maternal emotional warmth, rejection, overprotection, anxiety, and depression for CBT outcome in clinic-referred anxious children (n = 124, ages 8-12, 123 mothers, and 108 fathers). A higher level of maternal emotional warmth was associated with a less favorable treatment outcome. Higher levels of paternal rejection, anxiety, and depressive symptoms were consistently associated with a less favorable treatment outcome. Child gender did not interact with any of the predictors.

In line, a somewhat older study of Rapee (2000) studying effects of CBT involving parents for n = 95 anxiety disordered children aged 7-16, that was not included in the 2008 review of Bögels and Phares, found that paternal, but not maternal pretreatment anxiety predicted less favorable outcome for the children.

Podell and Kendall (2011) investigated the effect of father and mother attendance in CBT for youth aged 8-13 with anxiety disorders (n = 45), in a non-randomized fashion, that is, within a family CBT in which both the father and the mother were expected to participate in the sessions. The authors found that combined father and mother attendance was associated with improved child outcome, suggesting that fathers’ presence, next to mothers’ presence, is important in child anxiety treatment. On a critical note, it remains unclear whether father attendance was related to divorce status, as 8 of the 45 children lived only with the mother.

A recent study of Van der Bruggen and Bögels (2012a) randomized fathers (n = 21) and mothers (n = 27) of children aged 7-12 with anxiety disorders to follow a Parent Cognitive Behavior Therapy in father or mother groups. Both father and mother groups were effective in reducing child anxiety symptoms and disorders, and there was no significant difference in effect for children whose father had followed the training compared to children whose mother had followed the training. Results suggest that both fathers and mothers are important change agencies in helping children overcome excessive fears.
In sum, these four treatment-related studies point to a specific role of the father in helping anxiety-disordered children overcoming their fears, suggesting that anxious and depressed fathers have a particular negative effect on treatment of their anxious children. Moreover, involving fathers in treatment is as effective as involving mothers, and involving both parents is more effective than involving only mothers.

**Experimental research**

Very recently, researchers have started to compare the effects of anxious versus confident father and mother behavior using experimental paradigms in which parental anxiety is manipulated. Such designs offer the most powerful tests of potential differences in effects of fathers’ and mothers’ modeling.

Burstein and Ginsburg (2010) trained 12 fathers and 13 mothers to act once anxious and once confident before two planned spelling tests with their child aged 8-12. Children endorsed higher anxiety levels, anxious cognitions, and desired avoidance, in the condition in which the parents displayed anxiety, regardless of parent gender. Moreover, fathers had a stronger effect on child anxiety and cognition than mothers.

Bögels and colleagues (2011) studied 141 children aged 9-11 who were confronted with ambiguous social situations in which the father or mother figure responded in a socially anxious or socially confident way, and the children had to indicate how socially anxious they would feel. Children in general and children with low social anxiety were found to be more influenced by their mothers’ compared to their fathers’ behavior. However, high socially-anxious children were more influenced by their fathers’ compared to mothers’ reaction.

Also conducted in our lab, a recent study of Aktar et al. (2013b) compared social referencing in 1 year old infants ($n = 122$) while watching their fathers ($n = 122$) compared to their mothers ($n = 120$). Two tasks were displayed: meeting a stranger and a dinosaur toy. The association between infant avoidance and expressed parental anxiety did not differ for mothers and fathers. However, it appeared that paternal encouragement was positively associated with infant avoidance, while maternal encouragement had a negligible relation with infant avoidance. The authors conclude that parental encouragement may not always help infants to decrease their avoidance in face of ambiguous stimuli.

In conclusion, the three experimental studies reviewed here support the view that both mothers and fathers play an important role in the development or overcoming
of child anxiety. One study showed that fathers are even more influential than mothers on high anxious children.

**Summary**

When integrating the findings from the different type of studies on parental effects on child anxiety reviewed above, a complex picture emerges. With respect to overcontrolling parenting behavior, some studies show that maternal overcontrol is more related to child anxiety (e.g., Hudson et al., 2008; Reitman & Asseff, 2010; Verhoeven et al., 2011), whereas other studies come to conclude that overcontrolling behavior of the father is more associated with anxiety in the child (e.g., Bögels et al., 2008; McShane & Hastings, 2009; Van der Bruggen et al., 2010b), whereas still other studies did not find a different association of overcontrolling behavior of mothers and fathers with child anxiety (e.g., Karreman et al., 2010; Van der Bruggen et al., 2010a).

Overprotective parenting might lead to anxiety because it reduces children’s exposure to novelty and hinders the development of coping skills and sense of control (Chorpita & Barlow, 1998), thereby raising the risk for the development of an anxiety disorder. Both maternal and paternal overprotection appeared to be associated with child anxiety. Only one of the reviewed studies found that maternal overprotection, but not paternal overprotection, predicted later child anxiety (McShane & Hastings, 2009). However, as mothers are in general more careful, risk-aversive and protective than fathers, as argued above, maternal protective behavior may sooner turn into overprotective parenting than paternal protective behavior.

Regarding parental warmth, anxious fathers appear to show less warmth compared to non-anxious fathers. Paternal warmth seems to promote children’s mental health; that is, it is associated with lower levels of internalizing problems (Bögels & Phares, 2008). By contrast, too much maternal warmth seems to hinder child development: two studies showed that maternal warmth was associated with more anxiety and depression (Van der Bruggen et al., 2010b) and a less favorable treatment outcome for children with anxiety disorders (Liber et al., 2008).

Parental rejection/negativity, whether expressed by fathers or mothers, mainly has negative consequences for children (Bögels et al., 2008; Liber et al., 2008; Van der Bruggen et al., 2010b). However, two studies (Belsky et al., 1998; Pahl et al., 2012) showed that higher negative affect in fathers was associated with less child BI and anxiety. Negative parenting behavior may thus also have favorable outcomes for some children.
Conclusions and discussion

In this review we discussed the evolutionary basis of differences in paternal and maternal parenting behavior in Western societies and applied this to the intergenerational transmission of anxiety (disorders) from parents to children.

First, we examined the relationship between evolution and parenting. We argued that paternal investment evolved mostly because of the increased complexity of the social networks in which our ancestors lived. In this complex social ecology, maternal investment and support were not sufficient to raise children given their extremely long developmental period to reproductive age. Although fathers do invest in their children, the amount of investment remained larger for mothers than fathers, and this interparental difference in investment still holds today. Moreover, in which of their children parents invest more seems to be related to offspring’s reproductive potential. It appeared that parents invest more in healthy children. In this sense, it does not seem beneficial to invest in anxious children. However, investing in anxious children may be advantageous as the differential susceptibility for rearing theory (Belsky & Pluess, 2009) states that some children are more susceptible, for better or worse, to effects of parenting than others. In particular, it has been hypothesized that parenting affects emotionally reactive children to a larger extent than other children (Belsky, 2005). Several studies support this hypothesis (e.g., Blair, 2002; De Rosnay et al., 2006; Klein Velderman, Bakermans-Kranenburg, Juffer, & Van IJzendoorn, 2006). Moreover, there might be a sex difference in the reproductive potential of anxious children. That is, the attainment of life goals (i.e., finding a partner, marrying, becoming a parent) may be more difficult for anxious men than for anxious women. There is some research supporting this notion. For example, men with a history of shyness are more likely than their non-shy counterparts to delay entry into marriage and parenthood, whereas women with a history of shyness more often follow a conventional pattern of marriage, childbearing, and homemaking (Caspi, Elder, & Bem, 1988; Kerr, Lambert, & Bem, 1996). A complicating factor is the fact that differential parental investment is also affected by parental access to resources (as already explained above; Beaulieu & Bugental, 2008). In this sense, it is less beneficial for low SES parents to invest in an anxious child, especially an anxious boy, when there are also more confident or non-anxious siblings, whereas high SES parents who have enough resources are expected to invest more in their anxious child.

Second, we focused on differences in parenting behavior between mothers and fathers. In the complex social ecology of our ancestors, sex differences in
social qualities evolved and lead to differences in parenting behavior between fathers and mothers, with fathers and mothers each teaching their children their own gender-related competencies: e.g., care, nurturing, and intimate bonding for females, and social competition, risk taking, and taking chances for males. The reviewed empirical evidence indicates that mothers and fathers still differ in their parenting behavior towards their children, although differences are sometimes small and not all studies show such differences. In addition, as parenting involves preparing children for their future gender roles (e.g., social competition, risk taking, taking chances for males, and care, nurturing, intimate bonding for females), parents raise their sons differently than their daughters, with fathers being found to differentiate more between girls and boys than mothers. For anxious men, it might be more difficult to teach their sons these roles, as anxiety hinders exploring the external world and competing with others, whereas anxiety in women is not likely to negatively affect teaching their gender role of protecting, caring and nurturing to their daughters.

Third, the association between evolution and (child) anxiety was assessed. We explained the evolutionary basis of anxiety and showed that humans (both adults and children) possess an evolved fear module which is activated by both evolutionary relevant and evolutionary irrelevant threats, although evolutionary relevant fears can be acquired faster and even without associative conditioning. It was shown that children’s fears center around threats to their fitness and follow not only a predictable, but also an evolutionary appropriate course. Lastly, parents can play an important role in the learning and unlearning of children’s fears. Children are born with fears of stimuli that protect them from situations and dangers they cannot yet cope with. Anxiety is in this sense an adaptive emotion. Staying anxious, however, is not adaptive. Especially fathers may help children overcome these natural fears by orienting them towards the external world and by modeling how to approach novel and potentially dangerous situations. Paternal challenging behavior may also reduce a child’s fears (e.g., Majdandžić et al., 2014b) as this risky behavior exposes the child to fearful stimuli and can provide the child with a positive experience. As a result, children’s coping skills might improve, and the fear for these stimuli might disappear. In this way, these thrilling experiences provided by the father may have the same anti-phobic effect as children’s own risky play (for a review of the anti-phobic effect of children’s risky play see Sandseter & Kennair, 2011). However, taking too much risks or having too little anxiety can be dangerous. Here, mothers may have a role to play: mothers can protect the child and prevent the child from getting hurt.
Fourth, we focused on differences between mothers’ and fathers’ role in the development of child anxiety. Research was reviewed and arranged according to the type of study. Both maternal and paternal parenting behavior appear to play a role in child anxiety, with sometimes effects only found for mothers, and not for fathers, or the other way around. Moreover, in some studies parenting behavior of mothers and fathers was oppositely related to child anxiety, suggesting radically different roles for fathers and mothers. For example, in the study of Majdandžić et al. (2014b) maternal challenging behavior predicted more social anxiety six months later, whereas paternal challenging behavior predicted less subsequent social anxiety of the first-born child. An explanation for this finding may be that challenging behavior conflicts with the evolutionary based maternal role of protecting and caring for the child. That is, mothers’ challenging behavior may go at the cost of her protective and caring role. The presence of maternal care, in turn, may be a necessary condition for the positive effects of paternal challenging behavior on child anxiety (Bögels & Phares, 2008). That is, as the father-child relationship satisfies the child’s need to be stimulated, to overcome limits, and to learn to take chances, the mother-child relationship permits the child to be calmed again (Paquette, 2004). Some specific parenting behaviors may thus be protective for anxiety if they are expressed by the parent of one sex, but be a risk factor for the development of anxiety if the parent of the other sex displays that behavior.

Some studies reviewed by Bögels and Phares (2008) suggested that fathers’ role may be particularly important during adolescence. They explain this by the fact that in adolescence the developmental task of the child is to explore the larger external world and leave the nuclear family and particularly the mother, and that the fathers’ role in this phase is to stay close, whereas the mothers’ role is to let go. In addition, our review showed that fathers may already play an important, and sometimes unique, role in the development of their very young children (e.g., Hastings et al., 2008; Van der Bruggen et al., 2010b).

With regard to parenting effects related to child gender, some studies found different effects of parenting behavior on child anxiety for boys and girls (e.g., McShane & Hastings, 2009; Reitman & Asseff, 2010; Van der Bruggen et al., 2010a), whereas other studies did not find different effects of parenting on child anxiety for sons and daughters (e.g., Hudson et al., 2008; Liber et al., 2008). From an evolutionary perspective, it can be expected that fathers and mothers differ in their parenting behavior towards boys and girls and this is what we indeed found with respect to general parenting behavior (see the section on parental differences in rearing sons and daughters). In short, fathers seem to prepare their
children for (social) competition, while mothers put more emphasis on protection, care and maintaining intimate relations. However, this issue remains unstudied in the child anxiety literature. Note that the power in most studies was too low to reliably investigate child gender by parent gender issues in the anxiety literature. To untangle the complex links between maternal and paternal parenting behavior and anxiety of their offspring, future research should take child gender into account.

With respect to research paradigms, experimental paradigms can provide the strongest evidence concerning different roles of mothers and fathers in the development of child anxiety, as it allows direct testing of the causal relationship between parenting and child anxiety and purely testing father versus mother effects. The few experimental studies reviewed here suggest that fathers do have stronger effects on child anxiety than mothers (Burstein & Ginsburg, 2010) and that fathers’ stronger influence is restricted to high (socially) anxious children (Bögels et al., 2011). The experimental approach to studying parental effects on child anxiety is relatively new, and more experiments should be conducted in which mothers’ and fathers’ anxiety or behavior towards anxiety provoking stimuli is manipulated and effects on child anxiety is studied. An example is an experiment that is now conducted in our own lab in which infants aged 10-14 months are encouraged by their father or mother to cross a visual cliff in order to assess the effect of paternal versus maternal reinforcing behaviors and fear signals on children’s anxiety.

The inclusion of fathers in research on child anxiety remains important. Some studies reviewed above suffered from an overrepresentation of missing fathers combined with a lack of information on these missing fathers, possibly leading to an underestimation or distortion of father effects (e.g., anxious, divorced, and busy in the outside world fathers may be missing). Researchers should do their utmost best to recruit representative groups of fathers.

In this review, we have deliberately focused only on Western societies as evolutionary processes depend on the specific social and ecological context. The role of the maternal and paternal behavior in the development of child anxiety may be different for other cultures. For example, Paquette (2004) reviews literature suggesting that only in industrialized and individualistic cultures, which value competition, independence and assertiveness, fathers display high levels of physical and rough-and-tumble play. In collectivistic cultures, which value sharing and cooperation, such as Chinese, Malaysian and Indian culture, fathers display only low levels of physical play or this behavior is even completely absent. Paquette argues that parents in all cultures behave towards their children in a way
that ensures that their children will develop the necessary abilities and skills to adapt and survive to reproductive age. To illustrate, Chen et al. (1998) investigated maternal child-rearing attitudes and beliefs and toddlers’ behavioral inhibition in China and Canada. In the Chinese sample, mothers’ warmth and acceptance was positively associated with child inhibition, and maternal rejection and punishment was negatively associated with inhibition. The opposite was found in the Canadian sample. As can be seen, cultural factors may influence the role of parenting in child development and it seems interesting to study the connection between human sex differences, parenting, and anxiety in other cultures.

As a final remark, it should be noted that numerous factors are involved in the etiology of child anxiety and that parenting and human evolution are only two of them. Other factors include child characteristics, such as behavioral inhibition (e.g., Fox et al., 2005) and children’s differential susceptibility for rearing (Belsky & Pluess, 2009), marital functioning (Heinrichs, Cronrath, Degen, & Snyder, 2010), co-parenting (Majdandžić, De Vente, Feinberg, Aktar, & Bögels, 2012), attachment (Colonnesi et al., 2011), and the broader sociocultural context (e.g., Lamb, 2010). Nevertheless, we argue that an evolutionary perspective on parenting differences between mothers and fathers can be helpful in the further study of family factors explaining children’s anxiety and that evolutionary theory can offer psychologists and health care practitioners valuable insights in understanding and treating children’s anxiety disorders.