Do fathers matter? The relative influence of fathers versus mothers on the development of infant and child anxiety
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CHAPTER 3

Social referencing and child anxiety: The evolutionary based role of fathers’ versus mothers’ signals

Abstract

Children use signals from others to guide their behavior when confronted with potentially dangerous situations, so called social referencing. Due to evolutionary based different expertise of fathers and mothers, parents might be different social references for their children. The present study tested the influence of paternal and maternal social referencing signals on child anxiety. We expected that (1) children would show different social reference processing towards fathers’ and mothers’ signals; (2) in male-specific situations children would be more influenced by paternal signals, and in female-specific situations by maternal signals; (3) boys would respond with more anxiety to female-specific situations, and girls to male-specific situations; (4) high anxious children would be more susceptible to parental, and specifically paternal, social referencing signals than low anxious children. Children aged 8-13 read scripts of ambiguous situations in which the mother/father signaled anxious/confident behavior, and indicated how anxious they would feel. Experiment 1 (n = 129) concerned non-social situations, and Experiment 2 (n = 124) social situations. As expected, children responded with more anxiety to scripts in which their parent acted anxious than to scripts in which their parent acted confident. Children, also high-anxious children, were not differently affected by signals of fathers and mothers. Girls responded with more anxiety than boys in male-typical non-social situations. Congruence between the parent signaling and his/her evolutionary expertise did in general not affect social referencing. In conclusion, independent from parental evolutionary based expertise or from children’s level of anxiety, fathers’ signals have as much influence on their children’s anxiety as mothers’.
Introduction

Anxiety disorders have significant familial aggregation (Hettema et al., 2001), and anxiety disorders of parents and their children are strongly associated (Last et al., 1987, 1991; Lieb et al., 2000; Turner et al., 1987). One important factor in the transmission of anxiety (disorders) from parents to children is social referencing, which refers to the process in which children acquire information from experienced others, mostly their parents, to guide their interpretation and behavior when confronted with novel or ambiguous situations (Feinman & Lewis, 1983). Social referencing showed to play a role in the acquisition of fear already early in life. For example, Gerull and Rapee (2002) demonstrated that in 15-20-month-old infants fear expressions towards and avoidance of two stimuli (a rubber snake and spider) increased after negative reactions from their mothers towards the two stimuli. Another example with respect to social anxiety, De Rosnay et al. (2006) showed that 12-14-month-old infants were more fearful and avoidant with a stranger when mothers acted anxious in interaction with a stranger than when mothers acted nonanxious. Note, however, that the evidence for an association between anxiety disorders in parents and expressing anxiety towards potentially threatening situations with their child present is conflictual (see Aktar et al., 2013b).

However, only two social referencing studies have looked at effects of fathers versus mothers on children’s anxiety. First, Bögels et al. (2011) presented children aged 8-12 years scripts of ambiguous social situations in which either the father or the mother acted socially anxious or confident. Unselected children appeared to give more weight to (i.e., were more influenced by) mother’s signals compared to father’s signals. However, high socially anxious children gave more weight to their father’s signals, while low socially anxious children gave more weight to their mother’s signals. The authors concluded that the role of fathers might be boosting the social confidence of socially anxious children, whereas the role of mothers teaching social wariness to children with little social anxiety. Second, Aktar et al. (2013b) found, using a social referencing paradigm, that one-year-old infants who were confronted with novelty (a dino toy and a stranger) displayed more avoidance when their parent expressed more anxiety towards the novelty, and fathers were not differently influential from mothers. Thus, the findings on fathers’ versus mothers’ social referencing are scarce and inconsistent.

In our review on sex differences in parenting and its relationship with child anxiety in Western societies (Möller, Majdandžić, De Vente, & Bögels, 2013a), we showed that different evolutionary based specializations of mothers and fathers
are reflected in their parenting behavior. In line with this, it may be assumed that fathers and mothers play a different role in child anxiety, which may be explained by evolutionary based sex differences. That is, in the course of human evolution men have specialized more in confronting the larger environment, such as approaching potentially dangerous animals and unfamiliar humans, exploring new territory, social competition, and risk taking. Women have specialized more in care tasks, such as feeding, soothing and comforting the child, and intimate bonding (Bögels & Perotti, 2011; Möller et al., 2013a). From this different specialization of men and women in the course of evolution, it can be hypothesized that fathers and mothers have a comparative advantage over their partner in their domains of expertise (Bögels & Perotti, 2011). Children may then be differentially affected by paternal and maternal signals in novel and potentially dangerous situations according to the evolutionary relevance and the type of that particular situation.

Moreover, according to the differential susceptibility theory, some children are more susceptible, for better or worse, to effects of parenting than others (Belsky & Pluess, 2009). Indeed, studies have found that parenting affects emotionally reactive children to a larger extent than other children (e.g., Blair, 2002; Klein Velderman et al., 2006). As mentioned above, Bögels et al. (2011) found that fathers’ signals were more influential for high socially anxious children, whereas mothers’ signals were more influential for low socially anxious children, suggesting differential susceptibility based on parent sex.

The goal of the present study was to investigate fathers’ and mothers’ social referencing role in child anxiety, addressing several important questions that have remained unanswered. First, little is known about the relative influence of fathers versus mothers as a source of social referencing. Second, the role of evolutionary expertise has never been investigated in understanding paternal versus maternal social referencing. If we know more about possible differences between paternal and maternal roles in social referencing, early interventions for anxiety disorders in children might be specified for each parent. Therefore, in the present study we aimed to assess whether paternal and maternal social referencing signals have a different effect on child anxiety and whether evolutionary expertise of parents plays a role herein. We hypothesized that children are influenced more by the signal of the parent that has the most evolutionary based expertise with the potentially dangerous situation. More specifically, we expected a larger influence of paternal signals in male-specific situations (with which males have more evolutionary expertise) and a larger influence of maternal signals in female-specific situations (with which females have more evolutionary expertise). Furthermore, we aimed
to assess whether boys and girls differed in their susceptibility for parental and maternal signals. As it is suggested that fathers and mothers aim to optimally prepare their children for their future roles as males and females (Möller et al., 2013a), it may be that boys and girls refer more to the behavior of their same-sex parent. We hypothesized that boys would be more susceptible for paternal signals and girls for maternal signals. In addition, we hypothesized that boys would find the female-specific situations more anxiety-provoking and that girls would find the male-specific situations more anxiety-provoking, as they have less experience with these situations. Finally, we aimed to assess whether anxious children would be more susceptible to parenting influences (in this case: parental social referencing signals), in general, and specifically to paternal signals. We expected that high anxious children would be more susceptible to their parents’ and particularly their fathers’ signals.

Thus, the present study investigated social referencing of father and mothers, extending the design of Bögels et al. (2011) by differentiating between male-specific and female-specific situations in the social fear domain. Moreover, in the present study we added a non-social fear domain to the social domain used in Bögels et al. (2011). We developed a series of scripts for children that were novel and ambiguous, and potentially dangerous, in which their father or their mother would respond in an anxious or confident way. The children rated their anxiety in that imagined situation. In two experiments we investigated differences in child anxiety in social referencing according to the sex of the parent in the script, and the type of the situation of the script (non-social male-specific vs. nonsocial female-specific situations in Experiment 1, and social male-specific versus social female-specific situations in Experiment 2).

Method

Participants
Children aged 8–13 from eight primary schools, and their parents, were invited to participate. Children and parents received information about the study and both had to sign informed consent. Of the 898 invited children, 265 children (30%) were allowed and agreed themselves to participate. Subsequently, 5 children were absent on the day of testing and 7 children had too much missing data. Eventually, data of 253 children were included in the analyses, of which 129 children participated in Experiment 1, and 124 children in Experiment 2. In Experiment 1, 94 (73%) mothers and 78 (60%) fathers participated. These figures were 94 (76%) for mothers and
87 (70%) for fathers in Experiment 2. Children whose parents participated did not differ on sociodemographic variables from children whose parents did not participate, except that parents who did not participate were more often divorced. Characteristics of the participating children and parents are depicted in Table 1.

Table 1. Characteristics of the participants

<table>
<thead>
<tr>
<th></th>
<th>Experiment 1</th>
<th>Experiment 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys (n, %)</td>
<td>53 (41%)</td>
<td>58 (47%)</td>
</tr>
<tr>
<td>Age (M, SD)</td>
<td>11.06 (1.04)</td>
<td>10.93 (.99)</td>
</tr>
<tr>
<td>Born in the Netherlands</td>
<td>125 (97%)</td>
<td>123 (99%)</td>
</tr>
<tr>
<td>Living with both parents</td>
<td>100 (78%)</td>
<td>104 (84%)</td>
</tr>
<tr>
<td>Father (n, %)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (M, SD)</td>
<td>45.07 (5.37)</td>
<td>45.43 (5.46)</td>
</tr>
<tr>
<td>Born in the Netherlands</td>
<td>68 (87%)</td>
<td>81 (93%)</td>
</tr>
<tr>
<td>Working fulltime (n, %)</td>
<td>64 (82%)</td>
<td>66 (76%)</td>
</tr>
<tr>
<td>Number of children (M, SD)</td>
<td>2.69 (1.34)</td>
<td>2.52 (.98)</td>
</tr>
<tr>
<td>Educational level (M, SD)</td>
<td>5.71 (1.97)</td>
<td>5.87 (1.86)</td>
</tr>
<tr>
<td>Mother</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (M, SD)</td>
<td>43.73 (4.78)</td>
<td>43.11 (4.17)</td>
</tr>
<tr>
<td>Born in the Netherlands</td>
<td>86 (91%)</td>
<td>85 (90%)</td>
</tr>
<tr>
<td>Working fulltime (n, %)</td>
<td>10 (11%)</td>
<td>9 (10%)</td>
</tr>
<tr>
<td>Number of children (M, SD)</td>
<td>2.72 (1.46)</td>
<td>2.46 (.95)</td>
</tr>
<tr>
<td>Educational level (M, SD)</td>
<td>5.40 (1.95)</td>
<td>5.65 (1.93)</td>
</tr>
</tbody>
</table>

Note. *On a scale from 0 (primary education) to 8 (university).

Assessments

Social referencing

Children’s response to parental signals in ambiguous situations was assessed by eight scripts (stories) with two experimental conditions (anxious/confident parental signal), two parental sex conditions (father/mother), and two situational conditions (evolutionary male-specific/evolutionary female-specific). In the scripts children were confronted with a potentially dangerous situation, and their father or mother reacted in either an anxious or confident manner. An example of a script with the experimental manipulation of father/mother and anxious/confident signal between brackets is: ‘You and [dad/mum] are visiting your uncle. Your uncle likes to hunt and proudly shows a large shotgun. You look at [dad/mum]. [Dad/Mum] starts and asks anxiously if the gun is loaded./[Dad/Mum] looks very interested and wants to hold the gun].’ For more examples of the scripts see the “Appendix”.
The first author developed thirty scripts that were then presented to three experts in evolutionary psychology (David Geary, Ben Winegard, and Annemie Ploeger), and to the study authors MM and SB who together rated the scripts. These persons assigned each script to the male or female domain of expertise or to neither domain (that is: males and females are equally experienced with the subject of the script) based on evolutionary reasoning. Based on these ratings, the best 16 scripts were selected for use in this study. For 81% (n = 13) of the scripts at least three (out of four) raters agreed. Then, seven children from 9 to 12 years tested the scripts for comprehensibility and duration. According to their feedback the scripts were slightly adapted.

Experiment 1 tested scripts in which the parent was (in presence of the child) involved in a non-social situation (e.g., getting lost), and Experiment 2 tested scripts in which the parent was involved in a social situation (e.g., talking to new neighbors). In Experiment 1, half (n = 4) of the scripts were about male-specific non-social situations [getting lost (abstract orientation), weapons, dark, chopping wood]. These items were based on the male expertise in hunting, fighting and abstract navigation (see Buss, 2008). The other half of the scripts were about female-specific situations [n = 4, disease, contaminated food, getting lost (beacon orientation), eating berries in a forest]. The female-specific situations were based on the female expertise in gathering and spatial orientation using concrete landmarks (see Buss, 2008). In Experiment 2, the scripts were about the social domain and tested male-specific social situations (n = 4), in which social performance plays a role, (throwing cans in front of an audience, saying something in a TV-show, giving a speech, vocational guidance in a classroom) against female-specific social situations (n = 4), in which the emphasis was more on intimate social interaction (handling a crying baby, talking to new neighbors, dealing with a crying aunt, self-disclosure about your health). These items were based on sex differences in empathy and dominance (e.g., Baron-Cohen, 2005; Geary, 2010; Hoffman, 1977).

Children were instructed to imagine the situation as if they experienced it themselves, and were asked to indicate how they would feel on a 1–5 scale, ranging from very safe (1) to very afraid (5). The scripts were counterbalanced across children, so that each different story was equally often followed by a father or a mother and an anxious or confident signal.
**Ecological validity of the ambiguous scripts**

To assess the ecological validity of the scripts parents filled out a questionnaire including four scripts from the experiment in which the child participated. The four scripts with a maternal response that were presented to the child were now presented to the mother, and the four with a paternal response to the father. Scripts were adapted so that now parents were the main character. For example: ‘You and your child are visiting your brother. Your brother likes to hunt and proudly shows a large shotgun. You child looks at you. [(1) You start and ask anxiously if the gun is loaded. / (5) You look very interested and want to hold the gun].’ Parents had to indicate what their reaction would be on a 5-point scale, with the anxious response on one extreme (1) and the confident response on the other (5). The reaction to the ambiguous situation as indicated by the parent was subtracted from the reaction of the parent that was presented to the child (i.e., confident response = 1, anxious response = 5), resulting in a difference score that reflects the discrepancy in reaction between the parent in the script and the real parent. A mean difference score across scripts was created for the mother and father separately. The higher the mean, the lower the ecological validity of our scripts.

**Child anxious symptoms**

Anxiety of the children was assessed with an adapted version of the Screen for Child Anxiety Related Emotional Disorders (SCARED-71), which measures symptoms of all anxiety disorders in youth aged 8-18 years. The SCARED was originally developed by Birmaher et al. (1997), and over the years the screening tool has been revised and modified several times (e.g., Muris, Dreessen, Bögels, Weckx, & Van Melick, 2004), eventually leading to the SCARED-71 (Bodden et al., 2009). The subscales on Obsessive Compulsive Disorder (OCD) and Post Traumatic Stress Disorder (PTSD) were omitted because they were not of interest in the present study, and because OCD and PTSD are no longer under the umbrella of the anxiety disorders in DSM-5. Three items were added to the specific phobia subscale (about anxiety for weapons, getting lost and eating expired food) to assess the anxiety for these themes that were included in the scripts. Children had to indicate how frequently they experienced each of the 61 anxiety symptoms using a 3-point Likert scale with almost never = 0, sometimes = 1, and often = 2. For self-reported child anxiety, a mean item score was created by averaging the 61 item scores. Higher mean items scores indicated more severe anxiety and/or anxiety in more domains. Both parents also filled in the adapted SCARED about their child. As fathers’ and mothers’ ratings of their child’s fear were substantially associated ($r = .67$ in Experiment 1 and $r = .64$ in Experiment 2, $p < .001$), a mean item score across parents was calculated.
The SCARED-71 shows good reliability: the internal consistencies of the subscales are moderate to high (Cronbach’s alpha ranging from .64 to .88 for the child version and .66-.93 for the parent version). Moreover, anxious children score significantly higher on the total score and on all subscales compared to control children, indicating good discriminant validity (Bodden et al., 2009). In the present study, Cronbach’s alpha of the total score of the child self-report version was .92 in Experiment 1 and .93 in Experiment 2. In both experiments, Cronbach’s alpha of the total score was .92 for fathers and .94 for mothers.

Children and parents filled in additional questionnaires concerning their own and their children’s/parents’ anxiety for a different study that were not used in the present study.

Procedure
Children completed the questionnaires in their classroom during school hours, which lasted approximately 45 min. The first author or a master student was present to help. Children received a small gift after filling in the questionnaires. Parents completed the questionnaires at home, which lasted approximately 60 min, and received a compensation (10 euro per parent) for taking part in the study. Schools received a compensation of 100 euro per 60 participating children. The study was approved by the ethical committee of the University of Amsterdam.

Statistics
First, for each of the two experiments, a repeated measures GLM was carried out with type of parental signal (anxious/confident), sex of the parent in the script (father/mother) and type of situation (male-specific/female-specific) as within subject variables and self-reported child anxiety as dependent variable. To investigate the role of child sex in the susceptibility to parental social referencing signals the repeated measures GLM was rerun with child sex as a covariate. To test whether anxious children would be more susceptible to parental social referencing signals, particularly those of fathers, than non-anxious children, the repeated measures GLM was rerun with mean self-reported anxiety of the child as a covariate and with mean child anxiety as assessed by fathers and mothers as a covariate.
Results

Effect of the ecological validity of the parental reactions
In Experiment 1 a significant correlation was found between the ecological validity of the father’s reaction (difference score reflecting the discrepancy in reaction between the father in the script and real father) in the situations and the self-reported anxiety of the child, \( r = -.43, p < .001 \), indicating that the discrepancy between the real father’s reaction and the reaction of the father in the script influenced the self-reported anxiety of the child. However, entering the ecological validity variable as a covariate in the GLM measuring anxiety of the child in Experiment 1 did not change the results. Moreover, as the ecological validity of the parental reactions was not associated with child anxiety in Experiment 2, ecological validity was not further used in the analyses.

Social referencing to parent
In both experiments, a main effect for type of signal occurred, for Experiment 1: \( F(1, 128) = 49.98, p < .001 \); for Experiment 2: \( F(1, 123) = 66.21, p < .001 \). Post-hoc t-tests indicated that children responded with more anxiety to scripts in which their parent gave an anxious signal (Experiment 1: \( M = 2.94, SD = .75 \); Experiment 2: \( M = 2.88, SD = .73 \)) compared to scripts in which their parent gave a confident signal (Experiment 1: \( M = 2.47, SD = .77 \); Experiment 2: \( M = 2.33, SD = .77 \)), for Experiment 1: paired t(128) = 7.07, \( p < .001 \), \( d = .62 \); for Experiment 2: paired t(123) = 8.14, \( p < .001 \), \( d = .73 \). Thus, our experimental manipulation succeeded.

Sex of the parent
In both experiments, no main effect for parent sex occurred, for Experiment 1: \( F(1, 128) = .13, p = .721 \); Experiment 2: \( F(1, 123) = .01, p = .944 \). This suggests no different influence of fathers’ and mothers’ signals on child anxiety. Means and standard deviations of children’s response to fathers’ versus mothers’ anxious or confident signals in each experiment are presented in Tables 2 and 3.

Type of situation
In Experiment 1, focusing on non-social situations, no main effect for type of situation was found, \( F(1, 128) = .335, p = .564 \), indicating no difference in child anxiety between male-specific and female-specific nonsocial situations. No interaction between parent sex and situation occurred, \( F(1, 128) = .012, p = .913 \), suggesting that fathers and mothers did not differ in their influence on their child’s anxiety in male-specific and female-specific non-social situations. Also, no interaction between parental signal and type of situation occurred, \( F(1, 128) = .39, p = .532 \),
suggesting that children’s anxiety in response to scripts in which their parent gave an anxious signal did not differ from children’s anxiety in which their parent gave a confident signal in both male-specific and female-specific non-social situations.

Table 2. Means and standard deviations of children’s (n = 129) anxious response to scripts in which either mother or father gave either an anxious or confident signal in male-specific or female-specific non-social situations (Experiment 1)

<table>
<thead>
<tr>
<th></th>
<th>Male-specific situations</th>
<th>Female-specific situations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Father</td>
<td>Mother</td>
</tr>
<tr>
<td>Anxious parental signal</td>
<td>2.93 (1.21)</td>
<td>2.89 (1.08)</td>
</tr>
<tr>
<td>Confident parental signal</td>
<td>2.48 (1.13)</td>
<td>2.47 (1.10)</td>
</tr>
</tbody>
</table>

Note. * On a scale from 1 (very safe) to 5 (very afraid).

Table 3. Means and standard deviations of children’s (n = 124) anxious response to scripts in which either mother or father gave either an anxious or confident signal in male-specific or female-specific social situations (Experiment 2)

<table>
<thead>
<tr>
<th></th>
<th>Male-specific situations</th>
<th>Female-specific situations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Father</td>
<td>Mother</td>
</tr>
<tr>
<td>Anxious parental signal</td>
<td>2.70 (1.02)</td>
<td>2.76 (.97)</td>
</tr>
<tr>
<td>Confident parental signal</td>
<td>2.06 (1.02)</td>
<td>1.93 (1.00)</td>
</tr>
</tbody>
</table>

Note. * On a scale from 1 (very safe) to 5 (very afraid).

In Experiment 2, concerning social situations, a main effect for type of situation was found, F(1, 123) = 80.72, p < .001. Post-hoc t-tests revealed that children responded with more anxiety in female-specific situations (M = 2.85, SD = .75) than in male-specific situations (M = 2.52, SD = .75). The interaction between parent sex and type of situation was non-significant, F(1, 123) = .75, p = .388, suggesting that fathers and mothers did not differ in their influence on their child’s anxiety in male-specific and female-specific social situations. The interaction between parental signal and type of situation was significant, F(1, 123) = 8.51, p = .004 (see Figure 1). Post-hoc t-tests revealed that in scripts in which the parent gave an anxious signal, children responded with less anxiety in male-specific (M = 2.73, SD = .85) than in
female-specific \((M = 3.02, SD = .85)\) social situations, paired \(t(123) = -3.76, p < .001, d = .34\). Likewise, in scripts in which the parent gave a confident signal, children responded with less anxiety in male-specific \((M = 1.99, SD = .83)\) compared to female-specific \((M = 2.67, SD = 1.02)\) social situations, paired \(t(123) = -7.36, p < .001, d = .73\). The mean difference in anxiety of the child in response to a confident signal between the male-specific and female-specific social situations was larger \((M = -.68, SD = 1.03)\) than the mean difference in anxiety of the child in response to an anxious signal between the male-specific and female-specific social situations \((M = -.29, SD = .87)\), paired \(t(123) = 2.92, p = .004, d = .41\).

![Figure 1. Influence of paternal and maternal anxious and confident signals on child anxiety in male-specific and female-specific social situations (Experiment 2)](image)

**Child sex**

Rerunning the GLM repeated measures with child sex as covariate, revealed in Experiment 1 (concerning non-social situations) a significant interaction between type of situation and child sex, \(F(1, 127) = 6.93, p = .010\). According to post hoc \(t\)-tests girls responded in male-typical non-social scripts with more anxiety \((M = 2.83, SD = .77)\) than boys \((M = 2.50, SD = .66)\), \(t(127) = 2.49, p = .014, d = .46\). No significant interactions emerged between child sex and type of signal or parent sex, indicating that paternal and maternal confident and anxious signals had no differential effect on boys and girls. In Experiment 2 (concerning social situations), child sex did not interact with the within subject variables type of signal, parent sex and type of situation, indicating that paternal and maternal confident and anxious signals had no differential effect on boys and girls in both male-specific and female-specific situations.
Differential susceptibility
In both experiments, children’s level of anxiety (mean self-reported anxiety of the child as well as mean child anxiety as assessed by both parents) was not significantly related to children’s anxious response to the parental signals, indicating that high anxious children were not more susceptible for parental signals than low anxious children. Moreover, child anxiety did not interact with parent sex, suggesting that high anxious children were not more susceptible for fathers’ signals.

Discussion
In the present study we found that signals of fathers and mothers are in general both important for the social reference process in child anxiety. Opposite to expectations, the social reference process did not depend on the parental evolutionary based expertise with the potentially dangerous situation. Furthermore, child anxiety was not associated with higher susceptibility to parental signals in general and to paternal signals specifically.

The finding that fathers’ and mothers’ signals did not differently influence child anxiety suggests that fathers, in both social and non-social situations, have as much influence on shaping child anxiety or confidence as mothers. This result is different than that of Bögels et al. (2011), using children of the same age and a similar paradigm of scripts, but restricted to social situations, who found that overall, mothers had more influence on child anxiety. Nevertheless, the current results do support the equally important role of the father in shaping child anxiety (Bögels & Phares, 2008), which is notable since fathers spend less time with their children in general (Geary, 2010). As mothers and fathers form a dynamic system in raising their children (e.g., Bögels & Perotti, 2011; Majdandžić et al., 2012), the inclusion of fathers in research remains an important issue.

This study did not confirm the hypothesis that evolutionary based expertise of males and females led children to be differentially affected by paternal, compared to maternal, signals in novel and potentially dangerous situations. It may be that (evolutionary based) differences between the influence of the father and mother are more subtle than assumed, as a result of which our study design could not reveal these possible differences. Therefore, the male-specific and female-specific content of the anxiety domains we used in the present study may need further refinement. However, there was a large agreement between the evolutionary experts about the assignment of the scripts to the different domains, suggesting at least some construct validity.
Interestingly, in the social situations, we found that children responded with less anxiety to parental signals in male-specific social situations compared to female-specific social situations. Children reported especially less anxiety to parental confident signals in male-specific situations compared to the female-specific situations. That is: children were more influenced when their parents provided a confident model in the male-specific (social performance) situations than in the female-specific (social interaction) situations. Perhaps our chosen situations also represented another important differentiation. For example, social settings can be divided in contingent and non-contingent interactions (Schlenker & Leary, 1982). In contingent interactions the behavior of a person depends to a large extent on the behavior or responses of other people, whereas in non-contingent interactions a person’s behavior is largely dependent on internal plans so that others’ direct responses are less important. Furthermore, contingent interactions occur more frequently than non-contingent interactions. Our female-specific interaction situations correspond with contingent interactions, and our male-specific performance situations correspond with non-contingent interactions. Because of the lower frequency of these non-contingent or performance situations, especially in the life of children aged 8–13 years, and the fact that immediate responses of others are not so important, a child may consider the impression the parent makes in the male-specific non-contingent situations less important than in the female-specific contingent or interaction situations. Therefore, the anxiety level of a child in response to those male-specific social performance situations may be lower when a parent gives a confident signal. Although this ad hoc explanation might be the cause of our findings, it is a speculative explanation that requires further testing.

Concerning child sex, it was found that boys and girls did not differ in their susceptibility to paternal and maternal signals, as we had expected. However, as hypothesized, we found that girls responded with more anxiety than boys to male-typical situations, but only in non-social situations. Girls may find these situations more frightening, because they have less experience with them. Unexpectedly, boys did not respond with more anxiety to the female-specific situations. An explanation may be that the female-specific situations may be more recognizable for boys, as boys, and all children in general, spend more time with their mother than with their father (Geary, 2010). In this sense, boys may have experienced the female-specific situations in the scripts as less novel, and thus less anxiety provoking.

The results of our study do not support the differential susceptibility theory, stating that some (notably anxious) children are more susceptible to effects of parenting
than others (confident children) (Belsky & Pluess, 2009). Also, we did not confirm the hypothesis, based on the study of Bögels et al. (2011), that anxious children would be particularly influenced by their fathers’ signals. An explanation for the absence of differential susceptibility may be that the use of scripts is less suitable for assessing differential susceptibility to parental signals, as children do not directly observe the maternal and paternal signals of anxiety and confidence. However, Bögels et al. (2011) used similar scripts and did find differential susceptibility to paternal signals for high socially anxious children, indicating that scripts can be sensitive to differential susceptibility.

A strength of the present study was the design which enabled us to control the variables under study and to purely test father versus mother effects. The use of questionnaires made it possible to test a large sample of children and parents. However, the results of this study should be interpreted with the following limitations taken into account, and based on these limitations several directions for further research can be formulated. First, our cross-sectional design and study procedures do not allow for any causal conclusions. Second, the different fear domains tested in this study are of a complex nature, and therefore experiments in which single situations can be tested in real settings should be developed, such as heights, getting lost, and performing in front of an audience. Our counterbalanced design unfortunately did not allow us to test single situations. Third, the sample of this study was quite homogeneous, with mostly married Caucasian parents and their children. We recruited this sample on purpose, because children from other cultures may interpret the stories in a different way or may not easily imagine themselves in some situations. In addition, this study only included children in middle childhood, from 8 to 13 years of age. However, parental influence in anxiety provoking situations in general, and the role of the father in particular, could be larger for younger children (Bögels & Phares, 2008). Moreover, research suggests that the role of the father may be more important in adolescence compared to middle childhood. For example, Flouri and Buchanan (2003) found that although both involvement of the father and the mother contributed significantly to self-reported happiness of the adolescent, father involvement had the strongest effect. Therefore, experiments should be developed with children from other age groups. Fourth, the characteristics of the non-responders are unknown and it is possible that highly anxious parents and children did not participate in the study. Fifth, this study relies on a community sample of children and parents. Therefore, we do not know if the results can be generalized to clinical groups of children and parents with anxiety disorders. It may be expected that clinically anxious children will respond with more anxiety to anxious parental signals, as anxiety disordered children display an attentional bias.
toward threat related information (Puliafico & Kendall, 2006). It remains uncertain whether clinically anxious children would respond with less anxiety to confident parental signals. As the present study showed that the social reference process does not depend on the parental evolutionary based expertise with the potentially dangerous situation, it may be expected that this will also hold for clinically anxious children. Sixth, it is unclear whether results can be generalized to the real life. As Bögels et al. (2011) already pointed out, the stories were presented in text form, while most signaling may be of a visual nature. Already in infancy, children are influenced by their parents’ non-verbal behavior. For example, Feinman and Lewis (1983) showed that affect of a mother’s message influences the response of her infant to a stranger. Ten-month-old infants, who directly received positive or neutral non-verbal messages or no message about the stranger, were friendlier to the stranger when the mothers had spoken in a positive tone rather than neutrally. However, the scripts we used systematically contained descriptions of non-verbal behavior, such as ‘Mum turns red’ and ‘Dad looks worried’, next to verbal behavior, which makes it likely that the reader unconsciously incorporates the non-verbal content into his thinking. Another important threat to generalizability is that we do not know whether the responses of the children would be similar if children’s real parents reacted that way. We partly solved this problem by asking the parents what kind of reaction they would give in the situations presented to their children, and there appeared no effect of the discrepancy between the reaction of the real and imaginary parent on the reaction of the child. However, this effect cannot fully be ruled out. Seventh, and maybe most importantly, the scripts are a newly developed assessment tool of which the psychometric properties are still unknown. Although we developed the scripts with the use of experts in the field of evolutionary psychology and counterbalanced the presentation of the scripts, we do not have data on the reliability of the measure. Therefore, the conclusions of the present study should be interpreted with caution and future studies should examine the psychometric properties of the scripts.

Although further investigations with clinically anxious children and their parents are clearly needed, the present study is an important first step in studying the differential effects of paternal and maternal social referencing signals on child anxiety using a paradigm of ambiguous scripts. Our study showed that both paternal and maternal signals are important for children’s anxious response, irrespective of paternal and maternal evolutionary expertise, and irrespective of the level of child anxiety. If our results can be replicated in clinically anxious children and their parents, it should be seriously considered how to adapt the treatment and prevention of child anxiety according to these findings. It may then be needful to include both fathers and
mothers in the treatment of child anxiety, as fathers are still included to a lesser extent than mothers (Bögels & Phares, 2008). Parents’ confident signals can teach the child the world is safe, and in this sense parents may act as a buffer against child anxiety. However, as anxious parental signals may induce anxiety in the child, targeting parents’ own anxiety may be important as well.
Appendix

Below, for each domain an example of a script is presented. Note that the experimental manipulation of father or mother response has been put between brackets. Furthermore, the anxious parental signal is presented after the first bullet, followed by the confident signal. Each child filled in only one version of each script: paternal anxious, maternal anxious, paternal confident or maternal confident.

Non-social domain: Male-specific situation
You and [dad/mum] are visiting your uncle. Your uncle likes to hunt and proudly shows a large shotgun. You look at [dad/mum].

• [Dad/Mum] starts and asks anxiously if the gun is loaded.
• [Dad/Mum] looks very interested and wants to hold the gun.

Non-social domain: Female-specific situation
[Dad/Mum] gets milk out of the fridge and pours it into your glass. You notice the milk is two days expired. You look at [dad/mum].

• [Dad/Mum] starts, grabs the glass and says: “Don’t drink this, otherwise you will get sick!”
• [Dad/Mum] smells the milk and says: “Oh, we can still drink that up.”

Social domain: Male-specific situation
Your grandfather and grandmother are married for 40 years and therefore they are giving a party. [Dad/Mum] hands them a gift on behalf of the family. Then, your uncle shouts “Aren’t you going to say something?!” You look at [dad/mum].

• [Dad/Mum] turns red, mumbles something unintelligible and quickly sits down.
• [Dad/Mum] smiles and enthusiastically starts telling a story about your grandparents.

Social domain: Female-specific situation
You and [dad/mum] are watching TV in the living room when the doorbell rings. Your aunt comes in crying. You look at [dad/mum].

• [Dad/Mum] swallows and doesn’t know exactly what to do.
• [Dad/Mum] gets up, asks what’s going on and comforts your aunt.