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Red cheeks, sweaty palms, and coy-smiles: The role of emotional and socio-cognitive disturbances in child social anxiety

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The overarching aim of this dissertation was to investigate the role of disturbances in social emotions and social cognition in child social anxiety. We examined elevated social fear operationalized through physiological hyperarousal, blushing, which is a marker of heightened self-consciousness and self-conscious emotions, and the elevated self-conscious emotion of shyness operationalized through facial shy expressions in relation to child social anxiety. As to social cognition, we investigated the role of Theory of Mind (ToM)—the ability to understand and predict other people's behaviors based on their mental states—in child social anxiety.

We investigated the emotional and socio-cognitive disturbances in child social anxiety by employing cross-sectional, prospective, high-risk, and experimental study designs and using a multi-method approach (physiological measures, observations, questionnaires, tests, and interviews). Child social functioning was investigated in different social settings, such as an interaction with a stranger and a social performance. Children ranging from 1 to 12 years old were included in the studies of the present dissertation. By investigating aspects of child emotional and socio-cognitive functioning in relation to child social anxiety in early and late childhood, we aimed to elucidate our understanding of possible novel pathways involved in the development of social anxiety, and eventually Social Anxiety Disorder (SAD).

In **Section 1**, elevated fear in social situations operationalized trough physiological hyperarousal was examined as a risk factor for child social anxiety. Chapter 1 presents a high-risk study in which children of parent(s) with and without lifetime SAD were compared in their physiological hyperarousal during two social situations: a social performance in front of a small audience and watching back the performance. Children with one or

both parents diagnosed with lifetime SAD were considered to be at high risk for developing SAD themselves because SAD is known to accumulate in families. Physiological hyperarousal was indexed through increased heart rate (HR), reduced heart rate variability (HRV), and elevated electrodermal activity (EDA). Additionally, blushing was physiologically measured as blood pulse volume (AC reactivity), blood volume (DC reactivity), and temperature reactivity. Finally, physiological hyperarousal was also investigated in relation to child social anxiety symptoms. Although we did not find evidence for general physiological hyperarousal in children at high risk for SAD, we found patterns of physiological hyperarousal indexed as reduced HRV and elevated EDA in children with greater social anxiety. Chapter 2 describes a study in which physiological hyperarousal measured as increased HR, reduced HRV, and elevated EDA was measured during an interaction with a stranger in children when they were 2.5 and 4.5 years old. We examined whether children of parents with and without lifetime SAD differ in their patterns of physiological activity in early childhood. Also, we investigated whether physiological hyperarousal in early childhood is linked to later child social anxiety, at the age of 7.5. Again, we found no evidence of physiological hyperarousal in children at high risk for SAD, but we did find physiological hyperarousal indexed through increased HR, reduced HRV, and elevated EDA to be linked to later child social anxiety. In sum, Section 1 offered, to our knowledge for the first time, evidence that physiological hyperarousal during a social performance and social interaction is a characteristic of social anxiety already in early childhood. Furthermore, the studies in this section revealed that physiological hyperarousal in early childhood constitutes a risk for later child social anxiety. Possibly, it is also involved in the development of SAD. We, however, did not find evidence that physiological hyperarousal characterizes children at high risk for SAD because of their parents' SAD. Hence, a mechanism other than physiological hyperarousal likely plays a role in the intergenerational transmission of social anxiety, and eventually SAD.

Blushing is a physiological response assumed to be specific for SAD. Therefore, in **Section 2**, blushing was investigated, to our knowledge for the

first time, in relation to child social anxiety. Chapter 3 presents meta-analytic evidence that individuals with SAD or high social anxiety blush more. Although the effect for physiological blushing was small, the effect for self-reported blushing in socially anxious individuals was large. However, all studies included in the meta-analysis involved adults and no conclusion could be made about the possible role of blushing in the development of social anxiety and SAD. The findings from the Chapter 1 indicated that children at high risk for SAD because of their parent(s) lifetime SAD blush more during a social performance and watching back the performance compared to children of parents without lifetime SAD diagnosis. Furthermore, the findings of the studies presented in Chapter 1 and Chapter 4, in which we investigated children's blushing in combination with shyness while performing a song in front of a small audience, revealed that blushing in social situations is related to greater social anxiety already during early childhood. Chapter 5 presents an experimental study that investigated whether socially anxious children aged 8-12 blushed when praised in an overly positive, inflated manner. After singing a song in front of a small audience, children randomly received inflated, non-inflated, or no praise from an "expert" singer. We found evidence that inflated praise causes blushing in socially anxious children. Finally, the findings of Chapter 9 suggested that blushing during singing a song in front of a small audience is related to greater child social anxiety. In sum, the studies revealed that both young and older socially anxious children blush more in social situations in which they are exposed to a possible or real evaluation of others. Furthermore, blushing seems to be the specific mechanism of social anxiety transmission from parents to children. Thus, it is likely that blushing in childhood plays an etiological role in the development of SAD.

Although we found evidence that children with greater social anxiety blush more compared to less socially anxious children, we did not assume that blushing always forms a risk for social anxiety. Blushing is assumed to be adaptive in certain social situations because it helps the blusher to appease others and improve the blusher's social standing, for instance, when

their social status is threatened. However, in situations in which there is no clear threat to the person's social standing, but the person who blushes perceives the situation as threatening, blushing may be dysfunctional. For example, the findings of Chapter 5 indicated that children with greater social anxiety blush more when receiving overly positive, inflated praise, but not when receiving non-inflated praise or no praise at all. Possibly, children who are socially anxious perceive inflated praise as a threat to their social standing because their own image of themselves does not match the inflated image that the overly positive praise conveys of them. Hence, although seemingly benign for the majority of children, socially anxious children likely perceive overly positive, inflated praise as a threat to their social standing.

Similarly, we assumed that blushing in combination with socially adaptive behaviors would not be related to social anxiety. For example, positive shy expressions (i.e., gaze and/or head aversions just before the apex of the smile—coy-smiles) have been assumed to be socially adaptive because they evoke positive reactions from others and help children overcome their arousal and concerns about possible negative evaluation in social situations. Therefore, in Section 2, we also investigated self-conscious emotion of shyness. Positive shy expressions are assumed to be displays of ambivalence between the motivation to approach and avoid social situations. They increase interpersonal liking and affiliative behaviors of others thereby allowing children to overcome their concerns and gain positive experiences in arousing social situations. The findings of Chapter 4 suggested that blushing was not related to social anxiety in children who displayed many positive shy expressions during a social performance. Only children who blushed and expressed few or no positive shy expressions were ones with high social anxiety levels. On the other hand, negative shy expressions (i.e., negative facial expressions accompanied by gaze and/or head aversions), which are assumed to present mainly avoidance, were found to be highly related to social anxiety. Thus, negative shyness, unlike positive shyness, seems to be less socially adaptive because the avoidance of social situations

does not allow children to interact with others, experience positive reactions from others, and overcome their arousal and concerns. Likely, these children find social situations discomforting and start avoiding them, and, in the long run, become socially anxious.

Because positive and negative shy expressions have different consequences for child social anxiety, we traced the developmental patterns of these expressions. Chapter 6 presents a study that investigated physiological activity, social behavioral inhibition—a temperamental style of extreme withdrawal and avoidance in novel social situations; and affiliative behaviors (i.e., smiling) while interacting with a stranger of positively shy, negatively shy, and non-shy children in infancy and toddlerhood. Because both positive and negative shy children experience ambivalence in social situations, namely a wish to engage, but also a need to avoid the social situation due to a possible threat, we assumed that positively and negatively shy children would display patterns of physiological hyperarousal compared to non-shy children. We also expected both positive and negative shyness to be rooted in social behavioral inhibition. However, because positive shy expressions seem to be socially adaptive, we hypothesized that positively shy children would display a decrease in social behavioral inhibition and an increase in affiliative behaviors from infancy to toddlerhood. By contrast, because negative shy expressions seem to be less adaptive and related to social anxiety, we expected that negatively shy children would display high and stable social behavioral inhibition compared to other children. Indeed, we found evidence that positively shy children were hyperaroused in social situations but did not express more social behavioral inhibition than non-shy children. Furthermore, they displayed a decrease in behavioral inhibition and an increase in smiling attesting to the adaptive role of positive shyness in social situations. Although we did not find evidence of physiological hyperarousal in negatively shy children, we found, as expected, higher and stable social behavioral inhibition of these children compared with positively shy and non-shy children. Stable social behavioral inhibition is a risk factor for later SAD. Given that we also found negatively shy children to be socially

anxious in early childhood, we concluded that negatively shy children are likely at risk for developing SAD. In sum, Section 2 offers evidence that blushing and expressing negative shyness in social situations are features of social anxiety in early and late childhood. These disturbances in social emotions may be candidates that play an important role in the etiology of SAD as well. By contrast, expressing positive shyness in social situations seems to be socially adaptive and protective of social anxiety.

In **Section 3**, socio-cognitive abilities that are assumed to accompany social emotions were examined in relation to child social anxiety. Because social emotions require appraisals of social situations, namely of other people and social norms and rules, we assumed that disturbances in these appraisals may be involved in dysregulated social emotions that socially anxious children experience and display. We investigated understanding of emotions, namely shyness and blushing, and ToM as socio-cognitive abilities that may play role in the development of child social anxiety, and eventually SAD.

Chapter 7 explored the developmental trends of the levels and understanding of self-conscious shyness and blushing in children aged 3-9. Children reported on their levels of self-conscious shyness and blushing and they were interviewed about their understanding of shyness and blushing. We found that children may experience self-conscious shyness already in early childhood. Also, we found that self-conscious shyness develops irregularly, following a U-shape trend. That is, the levels of self-conscious shyness decrease from early to middle childhood, after which they again increase in late childhood. No such trends were found for self-reported blushing. The findings also suggested that the understanding of self-conscious shyness and blushing develops with age and that sudden “jumps” in the understanding of these conceptions in a more mature way occur much later than the first experience of these phenomena. Hence, we concluded that children may, already at the age of three, experience complex self-conscious emotions, but they have explicit knowledge about these emotions only later in childhood. Finally, we found that the levels of self-conscious

emotions are not related to children's understanding of emotions. Thus, this socio-cognitive ability to understand complex emotions seem not to be related to individual factors, such as shyness and blushing, which pose a risk for social anxiety.

Chapter 8 investigated ToM in relation to social anxiety in 4.5 years old children, taking into account that individual differences in shy expressions may influence the relation between ToM and social anxiety. We found that deficits in basic ToM abilities are related to greater social anxiety. This association was, however, influenced by shy expressions. For children who displayed many positive shy expressions while singing a song on stage in front of a small audience, there was no association between ToM and social anxiety, attesting to the adaptive role of positive shyness in social functioning. The finding that deficits in ToM relate to greater social anxiety in children was supported by a few other studies, however, some studies failed to find the relation between ToM and child social anxiety. Chapter 9 examined the relation between ToM and social anxiety in children aged 8-12, assuming that a curvilinear relation between ToM and child social anxiety may exist. That is, both low and advanced ToM may be related to social anxiety. Indeed, we found that not only deficits in ToM, but also advanced ToM abilities relate to child social anxiety. Hence, although difficulties in understanding other people may bring fear in social situations and possibly lead to social anxiety, advanced ToM seems to be related to greater social anxiety as well. Advanced ToM abilities may give rise to the awareness of a possible negative situation in social situations of exposure, which may increase self-consciousness and evaluative concerns. In turn, these concerns in social situations may lead to social anxiety. In sum, how children make sense of other people and social world, and in particular, how they understand other people's minds, relates to their social anxiety in early and late childhood.

In conclusion, we adopted a novel approach to studying child social anxiety by investigating emotional and socio-cognitive disturbances in early childhood, when the first symptoms of social anxiety occur, and in late

childhood, when social anxiety is at raise. The findings of this dissertation show, to our knowledge for the first time, that elevated fear operationalized through physiological hyperarousal and blushing, a marker of heightened self-conscious emotions, characterize social anxiety already during early childhood. Furthermore, physiological hyperarousal seems to be a valid early predictor of later social anxiety and blushing is likely a mechanism of intergenerational transmission of social anxiety, and eventually SAD. Negative shy expressions, rooted in high social behavioral inhibition, seem to pose a risk for social anxiety whereas positive shyness seems to be socially adaptive and protective of social anxiety in early childhood. Finally, disturbances in ToM abilities, such as deficits and advanced ToM, relate to child social anxiety. Therefore, it seems that emotional and socio-cognitive disturbances play a major role in child social anxiety and may be involved in the development of SAD as well.

In the last chapter, I propose a theoretical model of the development of SAD in which I set forth tested and assumed hypotheses of how emotional and socio-cognitive disturbances interact with each other, but also with general individual factors and environmental factors in the development of SAD. Based on this model, I offer directions for future research and clinical implications. Derived from the findings of the present dissertation, treatment programs should explicitly target emotional and socio-cognitive processes in children at risk for or with already developed SAD.