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Disturbed Social Information Processing as a Mechanism in the Development of Social Anxiety Disorder

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ABSTRACT—***Social anxiety disorder (SAD) is one of the most common mental disorders and becomes chronic if left untreated. Even when it is treated, outcomes are less promising than for other anxiety disorders. Thus, many are interested in preventing SAD and in the mechanisms involved in the development of SAD. In this article, I propose in a new model that disturbances in social cognition (cognitive biases, emotion recognition and understanding, negative expectations) and dysregulated social emotions (social fear and self-conscious emotional arousal) in toddlerhood and early childhood lead to avoidance and high levels of anxiety in social situations. When repeated over time, these impair daily functioning and result in a disorder. Biological factors (e.g., fearful temperament), environmental factors (e.g., parental mentalizing), and past experiences may be distal factors that contribute to the development of SAD via disturbed sociocognitive processing and dysregulated emotions. Based on this model, I conclude by describing clinical implications and recommendations for research.***

KEYWORDS—*social anxiety disorder; social cognition; social emotions; social information processing*

Social anxiety disorder (SAD) is characterized by a persistent fear of others' negative evaluation in social or performance situations that leads to avoidance of these situations and that, when repeated over months, results in the disorder (American Psychiatric Association, 2013). People with SAD are typically quiet and withdrawn in groups or when meeting people. They avoid drawing attention to themselves because they fear they may act in a way that others will evaluate negatively and that they will be judged as unlikable, incompetent, or boring (Stein & Stein, 2008). In children, this anxiety response may appear in the form of crying, inhibition, or clinging to parents or other familiar people in social situations, including speaking in front of others, meeting new people, asking for help in school, and going to play dates or parties (Spence & Rapee, 2016).

SAD is typically diagnosed in late childhood or adolescence, but high levels of social anxiety are seen in early childhood and pose a risk for developing SAD (Nikolić, 2020). Once developed, SAD may become chronic if left untreated (Spence & Rapee, 2016). Even after treatment, children with SAD are more likely to retain their diagnosis than children with other anxiety disorders (Hudson et al., 2015). Given the serious impairments and adverse treatment outcomes associated with SAD, prevention and early treatment may be particularly beneficial to prevent the development of SAD and associated impairments in social functioning. Therefore, understanding the early etiological mechanisms of SAD is crucial for identifying children at risk and improving treatment by focusing on the specific mechanisms involved in the development of the disorder.

Currently, we lack etiological models of SAD that describe the precise mechanisms involved in the development of the disorder. Etiological models describing proximal mechanisms focus on cognitive factors and anxiety disorders in general (e.g., Lau & Waters, 2017). Etiological models that focus specifically on SAD describe distal biological factors (e.g., temperament) and environmental factors (e.g., parenting) that increase the risk of developing the disorder (e.g., Spence & Rapee, 2016), but do

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not specify the proximal, intervening mechanisms through which these risk factors operate to affect SAD. In this article, I propose in a new model that children's disturbed social information processing, including disturbed sociocognitive processes and dysregulated emotions, is an intervening mechanism that carries the influence of distal factors to SAD. This model is based on work showing that disturbances in sociocognitive processing (e.g., Henderson & Wilson, 2017; Morales, Fu, & Pérez-Edgar, 2016) and dysregulated emotions (e.g., Nikolić, de Vente, Colonnesi, & Bögels, 2016; Nikolić et al., 2020) are associated with social anxiety in early childhood, before children typically develop SAD.

THE ETIOLOGICAL MODEL OF SAD: DISTURBED SOCIAL INFORMATION PROCESSING AS AN INTERVENING MECHANISM

The social information processing theory describes the mental processes—cognitions and emotions—responsible for the display of certain behavior as a response to a social stimulus (Crick & Dodge, 1994). The original model emphasized the role of cognitive factors, but an expanded model focuses on emotions in social information processing (Lemerise & Arsenio, 2000). Since the theory integrates distal biological and environmental factors with proximal, intervening mechanisms of psychopathology, it may be a useful framework to describe the development of SAD.

Briefly, the social information processing theory assumes that social information processing consists of six steps, starting with encoding—attending to certain internal and external social cues, which are then interpreted. Next, the child's goals for the social situation are clarified, possible responses are accessed and evaluated, and the most favorable response is chosen and enacted behaviorally (Crick & Dodge, 1994). Following this theory, I focus on the six steps of social information processing and describe cognitions and emotions relevant for the development of SAD in each of the steps (see Figure 1).

Encoding and Interpreting Cues

Encoding refers to the attention and processing of relevant social stimuli (Crick & Dodge, 1994). Disturbances in encoding may occur when encoding is biased. Children with social anxiety show cognitive biases when encoding social stimuli in childhood: They initially are vigilant to threatening social stimuli, such as angry faces (e.g., Abend et al., 2018; Waters, Mogg, Bradley, & Pine, 2011), but subsequently avoid them, reducing opportunities to habituate or reappraise them (Stirling, Eley, & Clark, 2006). In addition, children with social anxiety avoid positive social cues (e.g., happy faces; Pérez-Edgar et al., 2010). They tend to focus their attention not only on threatening cues from their environment but also on their own internal threatening cues, such as an increasing heart rate (Blöte, Miers, Heyne, Clark, & Westenberg, 2014; Kley, Tuschen-Caffier, & Heinrichs, 2012; Miers, Blöte, de Rooij, Bokhorst, & Westenberg, 2013). This tendency to focus on internal cues (i.e., self-focused attention) has been found in late childhood and adolescence. However, attentional bias to threat also has been found in socially withdrawn and behaviorally inhibited children (who are at risk for developing SAD) in early childhood (e.g., Henderson & Wilson, 2017). Thus, children with social anxiety have heightened attention to threat cues from the environment and heightened self-focused attention, and they display these disturbances across childhood.

When interpreting their own internal and others' external cues, children with social anxiety also show information-processing biases. First, they display interpretation biases, negatively interpreting ambiguous social information or situations (e.g., Bögels, Snieder, & Kindt, 2003; Stuijfzand, Creswell, Field, Pearcey, & Dodd, 2018). For example, when asked about ambiguous social situations, such as passing a group of peers who are laughing, anxious children are more likely to interpret the peers' behaviors in a threatening manner, such as that the peers are laughing at the child, not at something else (Barrett, Rapee, Dadds, & Ryan, 1996). Second, children with social anxiety display attribution biases, attributing negative events to internal causes and positive events to external causes (Haller, Raeder, Scerif, Kadosh, & Lau, 2016). These biases may result from deficits in sociocognitive skills, such as emotion recognition and mental state understanding (Banerjee & Henderson, 2001). Children with social anxiety also show deficits in recognizing (Nikolić et al., 2019) and understanding the causes of others' emotions and other mental states as early as age 4 (Banerjee & Henderson, 2001; Colonnesi, Nikolić, de Vente, & Bögels, 2017). Because they have difficulty understanding other people, they may experience social situations as ambiguous and unpredictable, and may display cognitive biases in interpreting and attributing social events (Clark & Wells, 1995).

However, some children with social anxiety may display advanced mental state recognition and understanding. For example, children with an advanced understanding of others' emotions and beliefs (Cutting & Dunn, 2002) are more sensitive to others' criticism. Also, some children with social anxiety excel at mental state recognition of others (Nikolić et al., 2019). Thus, some children with social anxiety may recognize and interpret social cues accurately, even more so than children without social anxiety. Having advanced sociocognitive skills is typically advantageous socially, for example, in children who are securely attached to their parents and who have high self-esteem. But advanced sociocognitive skills may be related to higher levels of social anxiety when children are very sensitive to others' opinions of them and very self-conscious (Nikolić et al., 2019).

Clarifying Goals

After children encode and interpret social cues, they select a goal for the social situation, which is a preferred or desired outcome (Crick & Dodge, 1994). Social information processing

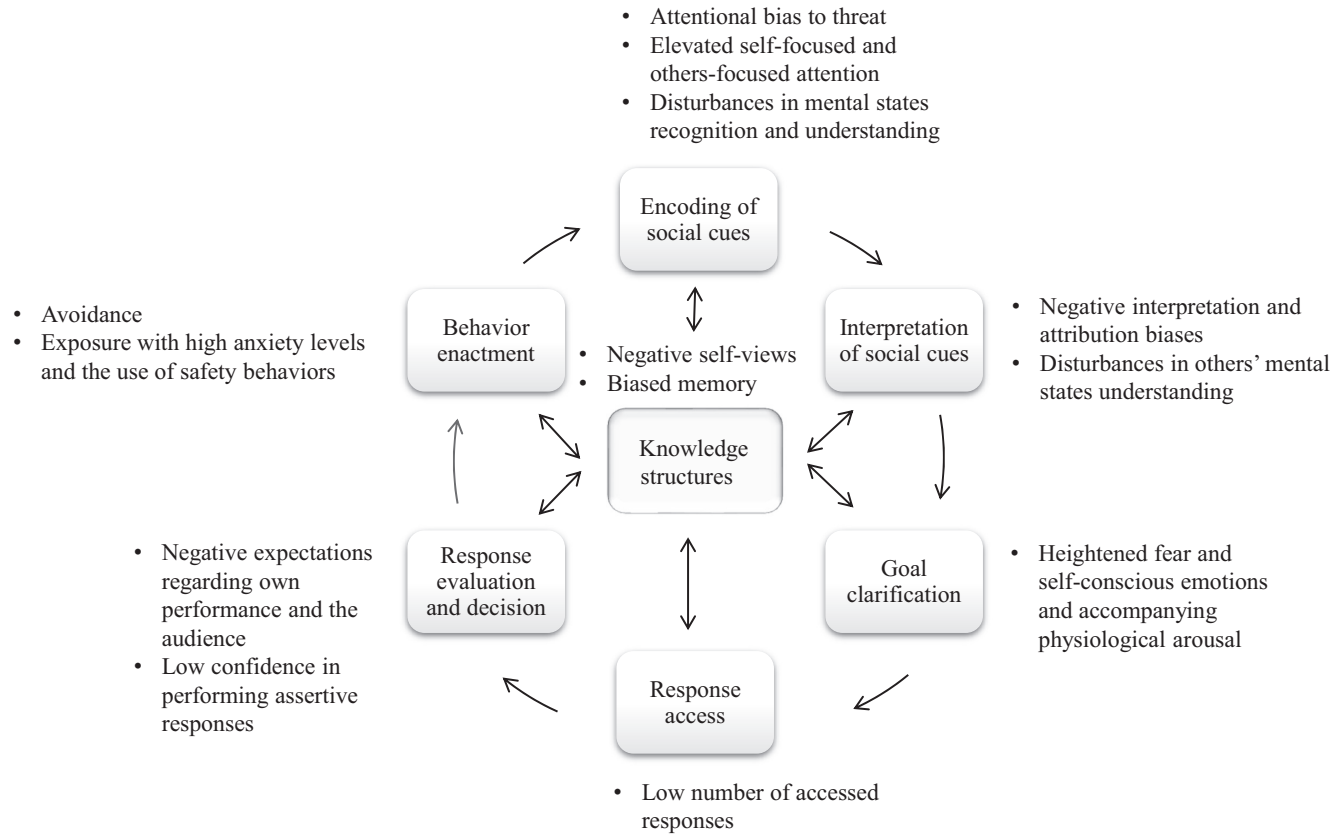

Figure 1. **Social information processing model of childhood social anxiety disorder development.**

theory defines these goals as arousal states that orient children toward producing a particular outcome. Emotions experienced after interpreting the cues act as motivators of certain goals. After encoding and interpreting social cues as threatening, a fight-or-flight system may activate in children with social anxiety, who then experience fear and accompanying high levels of autonomic arousal, such as increased heart rate and sweating (e.g., Nikolić, Aktar, Bögels, Colonnesi, & de Vente, 2018; Nikolić et al., 2016; Schmitz, Krämer, Tuschen-Caffier, Heinrichs, & Blechert, 2011).

In addition, children with social anxiety who have advanced sociocognitive skills, who spend more time observing others, and who easily become aware that they are the subject of others' evaluation experience heightened self-conscious emotional arousal and accompanying physiological blushing (Nikolić, Brummelman, Colonnesi, de Vente, & Bögels, 2018; Nikolić et al., 2019, 2020). These dysregulated social emotions and accompanying physiological hyperarousal appear in toddlerhood and early childhood. Children with social anxiety fear that exhibiting this heightened physiological arousal, such as through blushing and sweating, is embarrassing and that others will notice these symptoms and judge them negatively (American Psychiatric Association, 2013). Because they fear others' rejection, these children want to reduce uncomfortable physiological hyperarousal (American Psychiatric Association, 2013; Eley, Stirling, Ehlers, Gregory, & Clark, 2004). Therefore, their goal in social situations is reducing heightened physiological arousal so they can protect themselves (Erdley & Asher, 1996) and avoid others' negative evaluation (American Psychiatric Association, 2013). This goal clarification is likely an automatic process that happens without thinking, also called preemptive processing, and it typically occurs under conditions of heightened arousal (Crick & Dodge, 1994).

Generating Response, Deciding, and Enacting

Once the goal to reduce heightened emotional arousal and avoid negative evaluation is clarified, children access possible responses to the social situation and evaluate these responses in terms of the outcomes they would produce. Few studies have examined the generativity of responses accessed by children with social anxiety. However, in a few studies, socially withdrawn children (who were at risk for SAD) displayed fewer social problem-solving solutions than sociable children (e.g., Adalbjarnardottir, 1995), suggesting that children with social anxiety may generate fewer responses to social situations.

When children access different responses, they select and enact the response they evaluate most positively with respect to the goal (Crick & Dodge, 1994). Responses may be evaluated in

terms of the social appropriateness (i.e., acceptability) of the response, its instrumental and emotional consequences, and the degree of confidence children have in their ability to perform a certain response (i.e., self-efficacy; Crick & Dodge, 1994). Children with social anxiety have negative expectations regarding how well they will interact or perform, and how others may react to them (e.g., Blöte et al., 2014). Therefore, although they may rate the assertive responses positively (Erdley & Asher, 1996), they may choose not to engage in a social situation because of a lack of confidence that engagement would lead to positive outcomes (i.e., low self-efficacy for assertive responses). Rather, children with social anxiety may choose to avoid social situations because social avoidance may lead to the desired emotional and instrumental outcomes: enabling a child with social anxiety to reduce heightened emotional arousal and avoid other people's negative evaluations.

Children with social anxiety and social withdrawal tendencies respond to social situations by avoiding them (Barrett et al., 1996; Erdley & Asher, 1996). When avoidance is socially inappropriate or unacceptable to others, these children may choose to remain in the social situation while using safety behaviors, so the goal of reducing arousal and avoiding others' negative evaluation is fulfilled at least partially (Spence & Rapee, 2016). Indeed, children with social anxiety use safety behaviors, such as avoiding eye contact and saying very little, in anxiety-provoking situations to reduce arousal and avoid others' negative evaluations (e.g., Kley et al., 2012).

DIRECTIONALITY IN SOCIAL INFORMATION PROCESSING

According to the social information processing theory, it is assumed that when children encounter social stimuli, they first encode and interpret the stimuli, then react affectively. This suggests that cognitive factors underlie emotional functioning. It is also in line with empirical evidence that cognitive factors may lead to certain emotions. For example, attentional bias to threat may cause elevated fear and accompanying physiological arousal (Van Bockstaele et al., 2014). In addition, advanced abilities to recognize and understand other people's mental states may lead to heightened self-conscious emotional arousal in social situations (Nikolić et al., 2019). Similarly, self-focused attention—being aware of one's own arousal and appearance—also may lead to heightened self-conscious emotional arousal (e.g., Kley et al., 2012).

Although cognitions may cause certain emotions, cognition and emotion interact and are interdependent, so emotions can also influence cognitive processes (Lemerise & Arsenio, 2000). For example, not only does attentional bias during encoding cause fear and related physiological arousal as a response, fear may cause attentional bias (Van Bockstaele et al., 2014). Therefore, even before social information processing in a specific situation starts, when children first enter that social situation, they may experience emotional arousal unrelated to the social situation. This emotional arousal may influence encoding and all the subsequent steps in social information processing (Lemerise & Arsenio, 2000).

FACTORS INFLUENCING SOCIAL INFORMATION PROCESSING IN SAD

According to the social information processing theory, children's knowledge structures, such as self-views, social schemas, and memory representations, function as working models to guide social information processing (Crick & Dodge, 1994). Children with social anxiety have negative self-views and social schemas—in short, they have low self-esteem (e.g., van Tuijl, de Jong, Sportel, de Hullu, & Nauta, 2014), and see themselves as lacking social skills and being socially incompetent (Spence & Rapee, 2016). They also show memory bias; that is, they persistently recall negative past events and interpret past social interactions negatively (Spence & Rapee, 2016). Negative self-views and negative memory representations influence how children with social anxiety approach social situations and process social information in these situations. For example, negatively recollecting past events may result in heightened emotional arousal and consequent avoidance of the forthcoming social situation (e.g., Spence & Rapee, 2016). Also, past experiences of social avoidance that lead to reduced arousal may result in preferences for the same response in the future.

Experiences and biological characteristics shape children's social information processing directly or indirectly through knowledge structures, such as self-views and memory representations (Crick & Dodge, 1994). For example, children's lack of emotion recognition and emotion understanding may be, at least in part, due to the lack of parental mentalizing (parents' use of language related to mental states—emotions, wishes, cognitions—when talking to their children) and secure attachment (e.g., Zeegers, Meins, Stams, Bögels, & Colonnesi, 2019). But enhanced mental state understanding in children with social anxiety may result when parents mentalize frequently but are rejecting, criticizing, or lacking in warmth (Muris & Meesters, 2014).

Biological characteristics, such as biologically based fearful temperament, also may influence children's social information processing. Because children with a fearful temperament are generally hyperaroused, reactive, and alert, they may enter social situations hypervigilant and hyperaroused (Liu & Pérez-Edgar, 2019), which may impede their social information processing.

Experiences with parents, in combination with biological factors, such as temperament, also may shape knowledge structures in childhood. For example, parents who focus on threat cues in social situations model for their children a view of the social world as dangerous. Children of anxious parents may enter social situations knowing that the social world is threatening

and thus be fearful and aroused in social situations, especially if they already have a fearful temperament (Aktar, Majdandžić, de Vente, & Bögels, 2013). Similarly, overprotective parents may communicate to their children that the social world is threatening and thus promote avoidance (e.g., Bögels, van Oosten, Muris, & Smulders, 2001). Other children may have experiences of being criticized and rejected by their parents, and may enter social situations with negative self-views that may, in turn, lead to heightened self-conscious emotional arousal (Muris & Meesters, 2014).

DEVELOPMENTAL CONSIDERATIONS

Most of the evidence I have presented shows that young children at high risk for SAD (due to high behavioral inhibition, social withdrawal, or high levels of social anxiety) display disturbances in sociocognitive and socioemotional processes in toddlerhood and early childhood before SAD is typically diagnosed. For example, attentional bias to threat can be found in infancy (Morales et al., 2017) and empirical evidence suggests that it is present in children at risk for SAD in early childhood (Henderson & Wilson, 2017). Similarly, children at risk for SAD display difficulties with emotion recognition and emotion understanding in early childhood (Battaglia et al., 2004; Colonnesi et al., 2017). However, heightened self-focused attention, negative interpretation bias, and attribution bias have been investigated only in older children and adolescents (e.g., Miers et al., 2013), so we do not know whether young children at risk for SAD display these biases early in their development. Similarly, advanced sociocognitive abilities have been found in older but not younger children with social anxiety (Nikolić et al., 2020).

Regarding social emotions, dysregulated social fear and accompanying autonomic hyperarousal seem to be important for the development of SAD in toddlerhood (Nikolić, Aktaret al., 2018). Dysregulated social fear in toddlerhood influences symptoms of social anxiety in early childhood, which puts children at risk for developing SAD later in childhood (Nikolić et al., 2020). Dysregulated self-conscious emotions and accompanying prolonged physiological blushing influence the development of SAD in early childhood at around age 4 (Nikolić et al., 2020). This is likely because, at this age, children internalize social standards and rules, and understand that other people can judge them by these rules (Nikolić, 2020).

In conclusion, different sociocognitive and socioemotional disturbances seem to pose a risk for developing SAD at different developmental stages. Whereas attentional bias to threat and dysregulated fear seem to be important for developing SAD in infancy and toddlerhood, disturbances in emotion recognition, emotion understanding, and heightened self-conscious emotional arousal seem to be important for the development of SAD in early childhood. Self-focused attention and interpretation biases likely play role in the development of SAD later in childhood and adolescence. Whether these disturbances exist and contribute to SAD earlier in child development remains to be investigated.

LOOKING AHEAD

The model of SAD development I propose is based on empirical evidence from numerous studies of young children. However, for some steps of social information processing, we lack strong empirical evidence. Most importantly, response generation has not been investigated in children with social anxiety. Furthermore, fear of physiological symptoms, such as blushing and sweating, and the consequent goal of reducing those symptoms have not been investigated extensively in children with social anxiety. Empirical studies examining the generativity and quality of generated responses to social situations, as well as fear of physiological symptoms in children with social anxiety, are needed.

Some of the studies reviewed here investigated mental processes in older children who had already developed SAD. Thus, it remains unclear if the disturbances in these mental processes are premorbid factors influencing the development of SAD or a consequence of SAD that has already developed. To understand whether disturbances in mental processes are etiological factors of SAD, we need studies of children who may be at high risk of developing SAD as well as longitudinal studies. For example, interpretation and attribution biases need to be investigated in young children at high risk for SAD.

Finally, this proposed model assumes that biological factors and experiences influence children's knowledge structures and social information processing, which, in turn, influence the development of SAD. Longitudinal research is needed to shed light on possible mediating effects—how distal biological and environmental risk factors influence SAD through certain mental processes. Empirical work supports the indirect effect of fearful temperament on SAD via attentional biases (Pérez-Edgar et al., 2011). Future research may address whether fearful temperament and other individual factors in combination with parenting factors contribute to the development of SAD via other sociocognitive and socioemotional disturbances.

CLINICAL IMPLICATIONS

Knowledge about social information processing in SAD can be useful in identifying steps to take when mental processes are disturbed and in targeting those processes in treating SAD. For example, disturbances in encoding and interpreting cues (e.g., cognitive biases and deficits in mentalizing) may be targeted through cognitive bias modification training and sociocognitive skills training, such as Social Emotion Learning curricula. To target elevated fear and self-conscious emotional arousal, mindfulness-based approaches may be useful; these kinds of treatments reduce psychological symptoms in childhood, including anxiety (Zoogman, Goldberg, Hoyt, & Miller, 2015). Finally,

combining treatments targeting both sociocognitive skills deficits and emotional reactivity may prove most useful in treating SAD since children may learn to cope with their emotions while practicing socially competent behaviors.

CONCLUSIONS

Researchers have proposed that distal biological and environmental factors pose a risk for developing SAD; however, we know less about the mechanisms through which these distal factors operate to lead to SAD. I proposed a social information processing model to explain how disturbances in mental processes —social cognition (information processing biases, mental state recognition, and understanding) and social emotions (social fear and self-conscious emotions)—may lead to social avoidance and high levels of anxiety in social situations. These, in turn, may impair children's social functioning and, over time, lead to SAD. Some empirical evidence supports this model; however, more longitudinal work and studies of children who may be at high risk for developing SAD are needed to evaluate how mental processes involved in social information processing in infancy and early childhood contribute to the development of SAD. Applying this knowledge to the prevention and treatment of SAD may help alleviate SAD in children and youth.

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