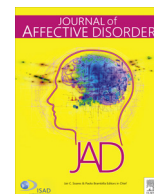




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Review article

The aetiology and maintenance of social anxiety disorder: A synthesis of complimentary theoretical models and formulation of a new integrated model



Quincy J.J. Wong*, Ronald M. Rapee

Centre for Emotional Health, Department of Psychology, Macquarie University, Sydney, Australia

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ABSTRACT

Background: Within maintenance models of social anxiety disorder (SAD), a number of cognitive and behavioural factors that drive the persistence of SAD have been proposed. However, these maintenance models do not address how SAD develops, or the origins of the proposed maintaining factors. There are also models of the development of SAD that have been proposed independently from maintenance models. These models highlight multiple factors that contribute risk to the onset of SAD, but do not address how these aetiological factors may lead to the development of the maintaining factors associated with SAD.

Methods: A systematic review of the literature was conducted to identify aetiological and maintenance models of SAD. We then united key factors identified in these models and formulated an integrated aetiological and maintenance (IAM) model of SAD. A systematic review of the literature was then conducted on the components of the IAM model.

Results: A number of aetiological and maintaining factors were identified in models of SAD. These factors could be drawn together into the IAM model. On balance, there is empirical evidence for the association of each of the factors in the IAM model with social anxiety or SAD, providing preliminary support for the model.

Limitations: There are relationships between components of the IAM model that require empirical attention. Future research will need to continue to test the IAM model.

Conclusions: The IAM model provides a framework for future investigations into the development and persistence of SAD.

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* Corresponding author.

E-mail address: quincy.wong@mq.edu.au (Q.J.J. Wong).

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1. Introduction

Social anxiety disorder (SAD) is characterised by a recurrent and intense anxious response to social or performance situations in which evaluation from other people may occur (American Psychiatric Association [APA], 2013). Incidence rates for the disorder are highest during childhood and adolescence (e.g., between 10 and 20 years of age; Beesdo et al., 2007; Wittchen et al., 1999) and once the disorder manifests, it typically follows a chronic course (Wittchen and Fehm, 2003). Prominent psychological models of the maintenance of SAD specify key cognitive and behavioural factors that account for the continued experience of social-evaluative anxiety in individuals who are already diagnosed with SAD (Clark and Wells, 1995; Heimberg et al., 2010; Hofmann, 2007; Rapee and Heimberg, 1997). These models have stimulated a large body of research and treatment protocols derived from these models have been found to be efficacious (e.g., Clark et al., 2003; Rapee et al., 2009). By their nature, these models aim to describe the maintaining factors of SAD. However, they do not specify in detail an aetiological basis for the disorder or indicate how the maintaining factors might develop. Largely independently of these maintenance models, several aetiological models for SAD have also been proposed (e.g., Hofmann and Barlow, 2002; Rapee and Spence, 2004). These latter models specify biological, psychological, and social factors that increase risk for the development of SAD. However, these models do not specify the origins of factors that maintain the disorder, or point to links between aetiological and maintaining factors. Although there have been efforts to integrate the aetiology and maintenance of SAD (Higa-McMillan and Ebesutani, 2011; Kimbrel, 2008), there is currently still no model that comprehensively integrates what are considered to be the key aetiological and maintaining factors of SAD in the literature.

In this paper, we aim to develop such a model. We first present a systematic review of the theoretical literature on SAD to ascertain existing aetiological and maintenance models of the disorder and related review papers. The broad coverage of this systematic review allows us to determine a comprehensive set of aetiological and maintaining factors for SAD that are proposed in the literature and considered to be theoretically important. Next, we unite these factors and present an integrated aetiological and maintenance (IAM) model of SAD. Alongside our descriptions of the components of this model, we present a systematic review of the empirical literature on each component and specify which parts of the model require further empirical testing. Again, the broad coverage of these systematic reviews allows us to determine the extent of empirical support for each of the components of the model. In the final section, we elaborate upon directions for future research based on our integrated model. As will be evident, the IAM model adds incremental value to the literature over and above existing aetiological and maintenance models because it encompasses a comprehensive set of aetiological and maintaining factors currently considered to be theoretically significant and is based on a thorough examination of the empirical literature. Moreover, the IAM model specifies novel links between aetiological and

maintaining factors, clarifies novel research directions, and should help to improve both treatment and prevention.

2. Method

2.1. Systematic search strategy

Models related to the aetiology and maintenance of SAD were obtained via an examination of articles (including reference lists) that were found from a systematic electronic database search of PsycINFO and Scopus using combinations of the following keywords: theory, theoretical, model, social anxiety, social phobia, and social anxiety disorder. A similar search strategy was used when obtaining studies for the empirical evaluation of the components of the IAM model (e.g., for anticipatory processing, the above databases were searched using a combination of the key terms: anticipatory processing, social anxiety, social phobia, and social anxiety disorder). The following inclusion criteria for articles were also applied to all database searches: (a) reported in English, (b) abstract available, (c) for PsycINFO year published between 1900 and 2015, and for Scopus year published between 1960 and 2015, and (d) article contained in journal or book. In addition, the database search for models of SAD was restricted to reviews. After unique articles were obtained from the database searches, the titles and abstracts of articles were screened to determine their relevance. Articles that could be immediately excluded during screening were removed from further consideration. Full texts of articles that passed the screening were then obtained. For the database search for models of SAD, full text articles were assessed for whether they contained such a model. For the search for studies for the empirical evaluation of the components of the IAM model, full text articles were evaluated as to whether it contained a study that examined an empirical relationship between the factor/process of interest and social anxiety or SAD.

3. Results and discussion

Search results are shown in Tables 1–4, and these tables are also referred to in the relevant sections below. Given space limitations, cited articles in this paper are only illustrative of the pattern of findings from our systematic searches and are not exhaustive. Where possible, recent papers have been cited.¹

3.1. Factors involved in the aetiology of SAD

Over the last 20 years, a number of reviews of risk factors for SAD along with theories about their interrelationships have been published (e.g., Morrison and Heimberg, 2013; Higa-McMillan and Ebesutani, 2011; Kimbrel, 2008; Ollendick and Benoit, 2012; Wong

¹ Database search strings and complete lists of articles obtained from all searches are available upon request from the first author.

Table 1
Systematic search results: models of SAD.

	Model search
Records identified through database searching	PsycINFO=86 Scopus=208 (26 from reference lists)
Records after duplicates removed	287
Records screened by title/abstract	68 (219 excluded)
Full-text articles assessed for eligibility	31 had no model (contained a review); 8 full text unavailable
Studies included in systematic review	29 had a model

and Rapee, 2015). In these papers, a number of biological, psychological, and social factors have been identified that increase risk for the development of SAD. While most papers have been descriptive (e.g., summarised proposed aetiological factors and evidence for them), some of the papers have offered a greater level of explanation (e.g., proposed how aetiological factors operate and interact to produce SAD; see also Table 1). Some examples of the most recent papers that have provided integrated predictions of relations between aetiological factors and SAD are provided in Table 5. Across these papers several common factors have been suggested. There appears to be widespread acceptance for the importance of genetic predispositions and temperament as early risk factors for SAD. Similarly, most authors ascribe important influence to early cognitive biases, negative social or life experiences, as well as parent/child relationships and relationships with peers. There appears to be less widespread emphasis on additional factors including the influence of biological factors, the impact of performance deficits and general learning processes, and the shaping influence of cultural factors.

3.2. Factors involved in the maintenance of SAD

Over the past several decades, numerous models have drawn on psychological concepts to account for the maintenance of SAD (e.g., Clark and Wells, 1995; Heimberg et al., 2010; Hofmann, 2007; Rapee and Heimberg, 1997; Trower and Gilbert, 1989; see also Table 1). Several of the more recent models (Clark and Wells, 1995; Hofmann, 2007; Rapee and Heimberg, 1997) and subsequent revised models (e.g., Heimberg et al., 2010) have become prominent in the social anxiety literature. Across these prominent maintenance models of SAD, it is proposed that individuals with the disorder engage in maladaptive cognitive and behavioural processes that maintain an anxious response whenever social-evaluative situations are encountered. Specific cognitive and behavioural maintaining processes are proposed that occur before, during, and after social-evaluative situations. Table 6 summarises the components proposed within each of the more prominent models. As can be seen, models of the maintenance of SAD are relatively consistent and agree on the importance of several key factors including: anticipatory and post-event processing, avoidance and escape behaviours, attentional biases (including both self-focus and external threat focus), safety behaviours, performance deficits, and negative self processing. Interestingly, cognitive avoidance appears to be a factor that has only recently been proposed.

3.3. Integrating aetiology and maintenance: the IAM model of SAD

3.3.1. Overview of the model

We propose an integrated aetiological and maintenance (IAM) model of SAD based on our systematic review of the current theoretical and empirical literatures. In the model, we specify

Table 2
Systematic database search results: aetiological factors of the IAM model.

	Temperament	Parent behaviour	Peer experiences	Life events	Culture
Records identified through database searching	PsycINFO=205 Scopus=134 (4 from reference lists)	PsycINFO=133 Scopus=109 (6 from reference lists)	PsycINFO=207 Scopus=127	PsycINFO=95 Scopus=91 (11 from reference lists)	PsycINFO=110 Scopus=155 (20 from reference lists)
Records after duplicates removed	265	192	238	166	248
Records screened by title/abstract	85 (180 excluded)	85 (107 excluded)	99 (139 excluded)	47 (119 excluded)	86 (162 excluded)
Full-text articles assessed for eligibility	54 had no relevant data or analysis; 1 full text unavailable	36 had no relevant data or analysis; 1 full text unavailable	21 had no relevant data or analysis; 2 full text unavailable	16 had no relevant data or analysis; 3 full text unavailable	38 had no relevant data or analysis; 2 full text unavailable
Studies included in systematic review	30 in total: 12 CS and 9 L had positive association between temperament and SA/SAD; 1 CS and 3 L had null findings. 2 CS and 3 L had positive association between temperament and SA/SAD but moderated by third variable.	48 in total: 23 CS, 7 L, 4 E had positive association between (negative) parent behaviour and SA/SAD; 4 CS and 4 L had null findings; 2 CS had mixed findings. 4 CS had positive association between (negative) parent behaviour and SA/SAD but moderated by third variable.	76 in total: 48 CS and 10 L had positive association between (negative) peer experiences and SA/SAD; 8 CS and 3 L had null findings; 1 L had mixed findings. 6 CS had positive association between (negative) peer experiences and SA/SAD but moderated by third variable.	28 in total: 24 CS and 3 L had positive association between (negative) life events and SA/SAD; 1 L had null findings.	46 in total: 35 CS had association between cultural variables and SA/SAD (direction of association depends on cultural variable examined); 9 CS had null findings; 2 CS had mixed findings.

Note. SA=social anxiety; SAD=social anxiety disorder; CS=cross-sectional studies; L=longitudinal studies; E=experimental studies.

Table 3
Systematic database search results: the SET principle of the IAM model.

	Amygdala reactivity	Social-evaluative cognitions
Records identified through database searching	PsycINFO=190 Scopus=70 (1 from reference lists)	PsycINFO=205 Scopus=201 (15 from reference lists)
Records after duplicates removed	216	280
Records screened by title/abstract	81 (135 excluded)	165 (115 excluded)
Full-text articles assessed for eligibility	36 had no relevant data or analysis	75 had no relevant data or analysis; 1 full text unavailable
Studies included in systematic review	45 in total: 31 CS had positive association between amygdala reactivity and SA/SAD; 12 CS had null findings; 2 CS had mixed findings.	89 in total: 72 CS and 9 E had positive association between social-evaluative cognitions and SA/SAD; 4 CS had null findings; 1 CS and 1 E had mixed findings. 2 E had positive association between social-evaluative cognitions and SA/SAD but moderated by third variable.

Note. SA=social anxiety; SAD=social anxiety disorder; CS=cross-sectional studies; L=longitudinal studies; E=experimental studies.

aetiological factors that have a theoretical and empirical basis and that are most likely to exert their influence early in life as SAD typically has its onset between the ages of 10 and 20 (e.g., Beesdo et al., 2007). We first present the argument that specific aetiological factors will determine the threat value that is assigned to social-evaluative stimuli (see Fig. 1; cf. Hofmann and Barlow, 2002). We further propose the argument that the threat value of social-evaluative stimuli is represented in an operating principle that guides an individual's functioning in their environment. For simplicity, we henceforth refer to this operating principle as the social-evaluative threat (SET) principle. Additionally, we henceforth refer to the 'threat value of social-evaluative stimuli' simply as 'threat value.' The SET principle is conceptualised as an individual difference variable such that various expressions of the principle in the population lie on a continuum where social-evaluative stimuli can have low to high threat values. Aetiological factors have the potential to increase the threat value and such an increase encourages the development of primary cognitive processes to detect social-evaluative threat (i.e., self-focus, attention to threat in the environment) and primary behavioural processes that eliminate social-evaluative threat (i.e., avoidance and escape). Hence in this model we propose these developmental pathways as novel links that connect aetiological factors to specific factors that are theoretically and empirically associated with the maintenance of SAD.

We further propose that development of the primary cognitive and behavioural processes increase the likelihood of: (a) the maintenance of the threat value assigned to social-evaluative stimuli, (b) the development of performance deficits (due to anxiety, limited attention, or a lack of age-appropriate social skills/knowledge), and (c) the development of secondary cognitive processes that aim to detect social-evaluative threat (i.e., anticipatory processing, post-event processing) and secondary cognitive and behavioural processes that aim to eliminate social-evaluative threat (i.e., cognitive avoidance and safety behaviours, respectively). Each of these components that develop out of the primary cognitive and behavioural processes is also proposed to maintain the threat value represented in the SET principle. The developmental pathways between the primary processes, performance deficits, and secondary processes in the IAM model provide additional novel links that ultimately connect aetiological factors with other specific factors that are theoretically and empirically associated with the maintenance of SAD.

Notably, it is evident that a number of components in the IAM model are expected to operate as maintaining factors for the threat value represented in the SET principle. We point out though that the maintaining factors referred to in the IAM model (see Fig. 1) are those that have been previously used to explain the

persistence of SAD (cf. Table 6). However, these maintaining factors have been re-conceptualised in the IAM model and used to explain maintenance of the threat value represented in the SET principle rather than expression of the clinical disorder.

An increase in the threat value represented in the SET principle has one other important consequence; it leads an individual to experience more frequent anxiety and higher levels of anxiety in social-evaluative situations. Consistent with previous suggestions in the literature (e.g., Rapee and Spence, 2004), more frequent/severe levels of social-evaluative anxiety will be associated with a diagnosis of SAD but this association will be imperfect because diagnosis also requires an assessment of whether the levels of social-evaluative anxiety cause personal distress or are deemed to interfere with one's functioning. Thus, although more frequent/severe levels of social-evaluative anxiety may not result in a diagnosis of SAD, they are expected at least to increase the likelihood of life interference and SAD onset. As is evident from our description, the SET principle is a separate construct to social-evaluative anxiety, as well as a diagnosis of SAD (see also Fig. 1).

Overall, the IAM model provides a novel account of how particular risk factors for SAD ultimately increase the probability of the emergence of maintaining factors as well as increase the likelihood of disorder onset. We assume that individuals can be exposed to different patterns of aetiological factors and consequently have similar changes in the threat value represented in their SET principles (cf. equifinality; Cicchetti and Rogosch, 1996; Ollendick and Hirshfeld-Becker, 2002). Moreover, we assume that individuals may be exposed in a similar way to a set of aetiological factors, but have different outcomes in terms of the threat value that is given to social-evaluative stimuli (cf. multifinality). Each of the key components of the IAM model will be elaborated upon in the following sections.

3.3.2. The social-evaluative threat (SET) principle

The core component in the IAM model is the SET principle that captures the extent that social-evaluative stimuli are threatening and guides an individual's functioning. Social-evaluative stimuli have their source from other people and either implicitly or explicitly convey judgement to the individual. As such, the term 'social-evaluative stimuli' for example includes (but is not limited to) facial expressions (e.g., angry expressions, neutral expressions, or smiling expressions), eye contact (e.g., direct eye gaze or avoidant eye gaze), gestures and postures (e.g., arms crossed or dominant posturing), as well as a variety of behaviours (e.g., individual leaves a room or individual becomes aggressive) that convey an indication of evaluation. In addition, the term 'social-evaluative stimuli' can refer to higher-order social concepts that convey an indication of evaluation (e.g., authority, social status,

Table 4
Systematic database search results: the maintaining factors of the IAM model.

	Anticipatory processing	Avoidance or escape	Self-focus	Attentional bias to threat	Safety behaviours	Cognitive avoidance	Performance deficits	Post-event processing
Records identified through database searching	PsycINFO=21 Scopus=19 (2 from reference lists)	PsycINFO=404 Scopus=476 (5 from reference lists)	PsycINFO=98 Scopus=85 (1 from reference lists)	PsycINFO=35 Scopus=17 (25 from reference lists)	PsycINFO=84 Scopus=61	PsycINFO=43 Scopus=34	PsycINFO=66 Scopus=57 (5 from reference lists)	PsycINFO=69 Scopus=63
Records after duplicates removed	24	757	112	64	94	53	91	72
Records screened by title/abstract	22 (2 excluded)	141 (616 excluded)	72 (40 excluded)	52 (12 excluded)	42 (52 excluded)	16 (37 excluded)	29 (62 excluded)	62 (10 excluded)
Full-text articles assessed for eligibility	4 had no relevant data or analysis	81 had no relevant data or analysis; 7 full text unavailable	37 had no relevant data or analysis	7 had no relevant data or analysis	15 had no relevant data or analysis	4 had no relevant data or analysis	8 had no relevant data or analysis	14 had no relevant data or analysis
Studies included in systematic review	18 in total: 10 CS had positive association between anticipatory processing and SA/SAD; 7 E showed AP leads to negative outcomes; 1 E had null findings.	53 in total: 45 CS had positive association between avoidance/escape with SA/SAD; 5 E showed exposure/training approach behaviour leads to positive outcomes; 1 CS and 1 E had null findings; 1 E had mixed findings.	35 in total: 22 CS had positive association between self-focus and SA/SAD; 7 E showed increasing self-focus leads to negative outcomes; 1 CS and 5 E had null findings.	45 in total: 29 CS had positive association between attentional bias to threat and SA/SAD; 5 E showed training away from threat leads to positive outcomes; 1 E showed training towards threat leads to negative outcomes; 7 CS and 3 E had null findings.	27 in total: 21 CS had positive association between safety behaviours and SA/SAD; 5 E showed decreasing safety behaviours leads to positive outcomes; 1 E showed increasing safety behaviours leads to negative outcomes; no null findings.	12 in total: 9 CS, 1 L, 1 E had positive association between cognitive avoidance and SA/SAD; no null findings; 1 CS had mixed findings.	21 in total: 12 CS had positive association between performance deficits and SA/SAD; 7 CS had null findings; 2 CS had mixed findings.	48 in total: 25 CS and 12 L had positive association between post-event processing and SA/SAD; 8 E showed post-event processing leads to negative outcomes; 1 CS and 2 E had null findings.

Note. SA=social anxiety; SAD=social anxiety disorder; CS=cross-sectional studies; L=longitudinal studies; E=experimental studies.

Table 5
Specific examples of papers that have provided integrated predictions of relations between aetiological factors and SAD and the factors that each have included.

Factors	Hofmann and Barlow (2002)	Rapee and Spence (2004)	Kearney (2005)	Kimbrel (2008)	Higa-McMillan and Ebesutani (2011)
Genes (e.g., broad vulnerability to psychopathology versus specific vulnerability to SAD)	✓	✓	✓	✓	✓
Temperament (e.g., behavioural inhibition, shyness, negative affectivity)	✓	✓	✓	✓	✓
Cognitive factors (e.g., self-focus, cognitive distortions or biases)	✓	✓	✓	✓	✓
Negative life events/traumatic social events (e.g., loss of loved one, interpersonal conflict in the family)	✓	✓	✓	✓	✓
Parent factors					
Parenting style (e.g., overprotective, controlling)	×	✓	✓	✓	✓
Parent-child attachment (e.g., insecure attachment)	×	✓	×	✓	✓
Parent-related learning mechanisms (e.g., modelling, direct conditioning)	×	✓	✓	✓	✓
Peer experiences (e.g., peer rejection, teasing, bullying)	×	✓	✓	✓	✓
Performance deficits (e.g., due to anxiety, due to lack of age-appropriate social skills or knowledge)	×	✓	✓	✓	×
Other biological factors (e.g., neurotransmitters, specific brain structures)	×	×	✓	✓	✓
General learning mechanisms (e.g., modelling, direct conditioning)	✓	×	×	✓	✓
Cultural factors (e.g., individualist versus collectivist culture)	×	✓	×	×	×

social role). The SET principle captures the extent that social-evaluative stimuli are threatening via a threat value that is assigned to stimuli. We propose that a threat value for a specific type of social-evaluative stimulus can be changed independently of other threat values (e.g., threat value is increased for angry facial expressions only) and threat values can also be changed simultaneously for several types of stimuli. Although social-evaluative stimuli include the range of stimuli described, we refer to social-evaluative stimuli in a general sense in subsequent sections for simplicity.

An important aspect of the IAM model is our proposition that the SET principle is reflected at both the neurobiological and cognitive levels. That is, changes in the threat value represented in the SET principle are realised in particular changes to an individual's neurobiology and cognitive processes.² In terms of neurobiology, a review of the literature suggests that aberrant amygdala activity is one part of the neurobiological representation of the SET principle (e.g., see Brühl et al., 2014; Cisler and Koster, 2010; Fouche et al., 2013; Shin and Liberzon, 2010, for reviews; see Hattingh et al., 2013, for a meta-analysis; see also Table 3). For example, our review yielded fMRI studies with cross-sectional designs only, the majority of which demonstrated that relative to non-anxious controls, individuals already diagnosed with SAD exhibited greater amygdala activation in social-evaluative situations or when viewing stimuli related to social-evaluative threat (e.g., faces displaying negative emotions, critical comments referring to the self; e.g., Blair et al., 2008; Lorberbaum et al., 2004; Phan et al., 2006).

Several studies have suggested other neurobiological factors that may also represent the SET principle. For example, cross-sectional fMRI studies have shown that individuals already diagnosed with SAD exhibited a range of other aberrant brain activity, including: dysfunctional prefrontal cortex activity (e.g., Blair et al., 2011; Ding et al., 2011), dysfunctional connectivity of the amygdala (Pannekoek et al., 2013), dysfunctional connectivity between frontal and limbic areas (Baur et al., 2013), and dysfunctional activity in a range of other brain regions (see e.g., Gentili et al., 2009; Klumpp et al., 2012; Saren et al., 2007). The findings in these latter studies have not been replicated to the same extent as the amygdala findings. Notably, the fMRI studies in general have demonstrated aberrant brain activity in individuals already with SAD and it is not possible to tell whether such brain activity was present before SAD onset. Longitudinal research will be needed to determine this. Nonetheless, existing studies suggest that increases in threat value are likely to be reflected in the development of atypical activity in certain brain areas.

We propose that the SET principle is also reflected at the cognitive level in terms of cognitions that highlight for an individual that social-evaluative stimuli pose a danger to the self. Evidence suggests negative social-evaluative cognitions about the self in social contexts (e.g., negative mental representations of the self, negative social-evaluative thoughts/beliefs, negative social-evaluative imagery, negative interpretation biases) are parts of the cognitive representation of the SET principle. A review of the literature revealed cross-sectional and experimental studies (see Table 3) that consistently indicate relative to non-anxious (or low anxious) controls, individuals already diagnosed with SAD as well

² Those familiar with the social anxiety literature may be wondering how the SET principle might be different to fear of negative evaluation. Fear of negative evaluation is a cognitive-affective dimension related to SAD and captures an individual's concerns about being negatively judged by others. In contrast, the SET principle is reflected along neurobiological and cognitive dimensions, and captures the extent that social-evaluative stimuli are threatening (i.e., the extent that stimuli representing judgement from others, regardless of valence of judgement, are dangerous).

Table 6
Summary of factors proposed in prominent maintenance models of SAD.

Factors	Clark and Wells (1995)	Rapee and Heimberg (1997)	Hofmann (2007)	Moscovitch (2009)	Heimberg et al. (2010)
Before social-evaluative situations					
Anticipatory processing	✓	✓	✗	✗	✓
Avoidance behaviour	✓	✓	✓	✓	✓
During social-evaluative situations					
Negative social-evaluative cognitions	✓	✓	✓	✓	✓
Self-focus	✓	✓	✓	✓	✓
Safety behaviours	✓	✓	✓	✓	✓
Cognitive avoidance	✗	✗	✗	✗	✓
Performance deficits due to anxiety	✓	✓	✗	✗	✓
Performance deficits due to lack of social skills	✗	✓	✗	✗	✓
Escape behaviour	✓	✓	✓	✓	✓
Attentional bias to threat	✗	✓	✗	✗	✓
After social-evaluative situations					
Post-event processing	✓	✓	✓	✗	✓

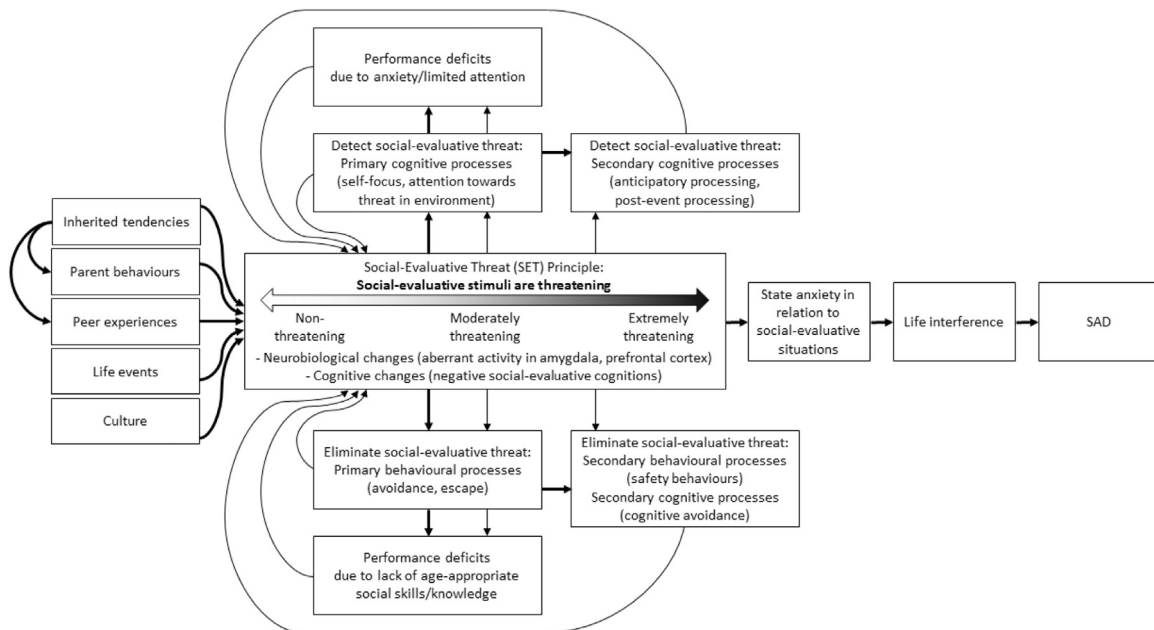


Fig. 1. The integrated aetiological and maintenance (IAM) model for SAD. Note. Bold arrows indicate aetiological pathways. Other arrows indicate key maintaining pathways.

as non-clinical high socially anxious individuals have reported more negative representations of the self (e.g., Mansell and Clark, 1999; Rapee and Abbott, 2006; Wilson and Rapee, 2006), stronger social-evaluative thoughts/beliefs (e.g., Boden et al., 2012; Gros and Sarver, 2014; Kley et al., 2012; Wong et al., 2014), endorsed negative social-evaluative imagery (e.g., Hackmann et al., 2000, 1998), and demonstrated negative interpretation biases (e.g., Cederlund and Öst, 2011; Higa and Daleiden, 2008; Dryman and Heimberg, 2015; Miers et al., 2008; Schmitz et al., 2011). In terms of the model, these studies suggest that increases in the threat value are likely to be reflected in the development of negative social-evaluative cognitions. Notably, for individuals whose cognitive capacity is still in development (e.g., young children), it is expected that negative social-evaluative cognitions will emerge when the threat value represented in the SET principle is increased, but they may not have the insight to be able to report on these cognitions. Moreover, we propose that as an individual matures cognitively, the complexity of their negative social-evaluative cognitions increases (see also Vasey et al., 1994). This latter proposal remains to be tested and will need to be addressed by future research.

In sum, the SET principle is operationalised at the neurobiological and cognitive levels, and accordingly, measurement of the threat value represented in the SET principle would involve an assessment of an individual's neurobiological and cognitive responses to social-evaluative stimuli. The greater the threat value represented in an individual's SET principle, the more their neurobiology will atypically respond to social-evaluative stimuli and the more severe their negative social-evaluative cognitions. While there is evidence that supports these characteristics among people diagnosed with SAD, we argue that a high threat value assigned to social-evaluative stimuli in the SET principle is a necessary but not sufficient condition for a clinical diagnosis of SAD and that such an elevated threat value for social-evaluative stimuli should precede development of the clinical disorder.

3.3.3. Factors underlying aetiology of the SET principle

By definition, the SET principle is a basic human feature, hence the concept of aetiology refers to factors that increase (or decrease) the threat value represented in the SET principle. Threat values may increase or decrease at any point in an individual's lifetime, although greater flexibility is likely earlier in life and

threat values are likely to be more consistent beyond middle adolescence. In general, individuals will experience varying degrees of exposure to the different aetiological factors, and so individuals will have different threat values assigned to social-evaluative stimuli. Following current evidence on aetiological factors (see Table 2), we focus on inherited tendencies (temperament), parent behaviours, peer experiences, life events, and culture in this section as factors that are most likely to lead to variations in the threat value represented in the SET principle (see Fig. 1). We point out that it is possible for aetiological factors to influence each other. However, in the IAM model, we only link inherited tendencies with parent behaviours and peer experiences because these relationships are currently the ones with empirical support (although future research may indicate other links). We also highlight that it is possible that aetiological factors may be influenced by protective factors, an issue that we will address at the end of this paper. In the sections that follow, it will be important to recognise our assertion that the SET principle is correlated with the construct of social anxiety and with the clinical entity SAD (although they are distinct constructs). This allows existing research that demonstrates relationships between various aetiological factors and social anxiety or SAD to be used as empirical support for our current suggestions.

3.3.3.1. Inherited tendencies. The term temperament has been used in different ways in the field and various methods have been used to measure this construct. Despite the fact that temperament as commonly assessed reflects a combination of genetic and environmental influence (see Saudino, 2005, for a review), hypothetically, temperament is often seen to have predominantly genetic influence (e.g., Kagan, 1989) and may be viewed as an endophenotype. In turn, these inherited tendencies can be evaluated along several dimensions including arousal levels, avoidance, and attentional control (e.g., Zentner and Bates, 2008). We do not see the SET principle as a form of temperament. Rather, certain temperaments are expected to raise the threat value represented in the SET principle. For example, an infant's avoidant temperamental style may lead them to avoid social-evaluative stimuli as one type of avoided stimuli. Successful avoidance results in decreased exposure to social-evaluative stimuli and hence uncertainty regarding such stimuli. Given the aversiveness of uncertainty, this then provides the circumstances for the infant to associate social-evaluative stimuli with threat and consequently there is an increase in the threat value represented in their SET principle. We propose that temperament has the greatest potential to influence the threat value represented in the SET principle from birth to childhood. We also suggest that the longer the period a child engages in avoidance as a temperamental style or the stronger the tendency to avoid (and in doing so avoid social-evaluative stimuli), the greater the increase in threat value.

Our proposals are based generally on a review of two lines of research. First, a line of research has begun to examine the link between genetics and the temperamental factors most related to social anxiety (e.g., shyness, behavioural inhibition). Although existing measures of these temperamental constructs are likely to capture inherited tendencies to varying degrees, consistent with the proposed genetic influence on temperament, a majority of gene studies have identified specific genes that are linked with shyness and behavioural inhibition (Arbelle et al., 2003; Battaglia et al., 2005; Fox et al., 2005; Smoller et al., 2003) while reported null findings have been in the minority (e.g., Schmidt et al., 2002).

Second, a line of research has examined temperament in relation to social anxiety, and the most studied temperamental style is behavioural inhibition. Our review of the literature has indicated both cross-sectional and longitudinal studies linking behavioural inhibition and social anxiety or a diagnosis of SAD. Focusing on

longitudinal studies because they can distinguish the temporal ordering of variables, the majority of such studies have demonstrated a positive association between childhood behavioural inhibition and either social anxiety or a diagnosis of SAD later in time (e.g., Chronis-Toscano et al., 2009; Hudson et al., 2011; Muris et al., 2011; Rapee, 2014; see Clauss and Blackford, 2012, for a meta-analysis; see also Table 2) although the prediction of SAD from childhood behavioural inhibition is far from perfect. It is also noteworthy that these studies assess behavioural inhibition typically in children from 2 to 4 years and thus are unlikely to fully capture inherited tendencies which are more likely to be present at an earlier developmental stage. Some studies have identified basic early behaviours (e.g., motor activity, crying) that are more akin to inherited tendencies and predict later behavioural inhibition (Calkins et al., 1996; Kagan and Snidman, 1991). These studies taken together: (a) suggest an empirical link from basic early behaviours to behavioural inhibition to social anxiety or SAD, and thus (b) are suggestive of our proposed link between temperament and the SET principle. Future research will need to explicitly test this proposed link.

Based on our review of the social anxiety literature, we further propose that temperament defined as inherited tendencies can affect two other aetiological factors that in turn can influence the threat value represented in an individual's SET principle. First, there is a body of research that has indicated that an infant's temperament (e.g., avoidant, inhibited) can elicit certain parent behaviours (e.g., excessive protection; see Kiff et al., 2011; Rubin et al., 2009, for reviews). We propose that these parent behaviours in turn increase the threat value assigned to social-evaluative stimuli (see Parent behaviours section). Second, a body of research has indicated that where an infant has opportunities to interact with similar-aged counterparts, an infant's temperament (e.g., avoidant, inhibited) can lead them to experience negative interactions with peers (see Rubin et al., 2009; Sanson et al., 2004, for reviews). We propose that these negative peer experiences in turn also increase threat value (see Peer experiences section). Although we have suggested that temperament can influence parent behaviours and peer experiences, we note that the latter two components can act independently of temperament to affect the threat value represented in the SET principle. For example, a child's SET principle may be influenced by parenting behaviours and negative peer experiences that occur without elicitation by the child's own temperament (e.g., exposure to parenting style influenced by existing parental psychopathology, victimisation from an especially callous peer).

3.3.3.2. Parent behaviours. A critical aspect of parent/child interactions according to the IAM model is parent behaviours that provide an opportunity for the child to learn that social-evaluative stimuli are threatening. Parents may indicate the danger of social-evaluative stimuli to their child either directly (e.g., verbalisations that encapsulate negative outcomes associated with exposure to social-evaluative stimuli) or indirectly (e.g., verbalisations that encourage or allow avoidance of or escape from social-evaluative situations; modelling of avoidance/escape). We propose that these parent behaviours have the potential to increase the threat value represented in an individual's SET principle from birth onwards. More specifically, we suggest that the longer or the more intense the exposure to these parent behaviours, the greater the increase in threat value. There are also likely to be sensitive periods (e.g., early childhood) where parent behaviours produce a stronger influence (see Bornstein, 2002).

Our review of studies on parent behaviours in the social anxiety literature has indicated cross-sectional, longitudinal, and experimental studies that generally support our suggestions. Focusing on longitudinal and experimental studies because they provide an

indication of the temporal ordering of variables, the majority of these studies have demonstrated that several parent factors, including parenting styles characterised by over-control or over-protection, insecure parent-child attachment, and expressed parental anxiety during social interactions, play a role in the prediction of higher levels of later social anxiety and social avoidance in their children (e.g., Bar-Haim et al., 2007; Brumariu and Kerns, 2008; de Rosnay et al., 2006; Hane et al., 2008; Lewis-Morrarty et al., 2012; see also Table 2). Further research is required though to explicitly link the parent behaviours described to the SET principle.

3.3.3.3. Peer experiences. Experiences with peers that are likely to be most influential according to the IAM model are those that involve some form of negative evaluation (e.g., ostracism, teasing, bullying). Such experiences provide the conditions for an individual to associate social-evaluative stimuli with threat. The potential for peer experiences to influence the threat value represented in an individual's SET principle typically starts in childhood during which there is increased exposure to peers (e.g., starting school) and continues through adolescence and beyond. Over these periods of exposure to peers, direct experiences (e.g., being the target of teasing) are likely to be more influential than indirect experiences (e.g., hearing about friend being teased). With regard to direct experiences, the greater the duration of negative peer experiences (e.g., repeated teasing) or the more severely negative an experience, the greater the increase in threat value. The timing of occurrence of negative peer experiences during sensitive periods (e.g., early childhood) is also likely to have a relatively greater effect (see Ladd and Sechler, 2013).

Our proposals are generally supported by our examination of studies on peer experiences in the social anxiety literature that has yielded cross-sectional and longitudinal studies. Focusing on longitudinal studies, the majority of these studies have demonstrated that negative peer experiences that are most likely to increase the threat value (e.g., relational victimisation, overt victimisation, low peer acceptance) predict higher levels of later social anxiety (e.g., Levinson et al., 2013; Loukas and Pasch, 2013; Ranta et al., 2013; Siegel et al., 2009; Tillfors et al., 2012; see also Table 2). Although there is little research evaluating the influence of siblings on social anxiety, at least one cross-sectional study has shown an association between sibling violence and social anxiety disorder in their sibling (Bandelow et al., 2004). However, other research has failed to demonstrate such an association (Magee, 1999). Overall, an important direction for future research will be to demonstrate an explicit empirical link between the peer experiences discussed and the SET principle.

3.3.3.4. Life events. Highly stressful or traumatic events with a social element (e.g., exposure to interpersonal conflict in the family; physical, emotional, or sexual abuse) provide the conditions for an individual to associate social-evaluative stimuli with threat and thus are expected to increase the threat value represented in the SET principle. The life events described can occur at any time in an individual's life and influence the SET principle. Direct experiences with life events (e.g., actually experiencing interpersonal conflict) are likely to be more influential than indirect experiences (e.g., hearing about interpersonal conflict that happened to someone else). For direct experiences, we propose that there is a greater increase in the threat value represented in the SET principle for individuals who experience multiple life events of the sort described or if they experience a single event that is particularly severe. Furthermore, there are likely to be sensitive periods (e.g., early childhood) where the occurrence of a life event has a greater effect on the threat value (see Teicher et al., 2003).

Our proposals are based generally on our review of the research on life events in the social anxiety field. Focusing on longitudinal

studies, the majority of results have shown a positive association between self-reported negative life events or traumatic social events and social anxiety (e.g., Aune and Stiles, 2009; Calvete et al., 2015; Hamilton et al., 2013; see also Table 2). Importantly for the IAM model, further studies are needed that clearly demonstrate a link between socially relevant negative life events and the SET principle.

3.3.3.5. Culture. Aspects of an individual's culture are proposed to influence the SET principle and increase the threat value represented therein. Certain cultures may require individuals to adhere more strongly than others to specific social norms and one consequence for not doing so includes negative evaluation from others (e.g., stigma associated with individuals who have mental health difficulties; individuals who are part of a specific ethnic or religious group who are judged according to negative stereotypes). Such cultural values increase opportunities for individuals who differ from cultural social norms to associate social-evaluative stimuli with threat. We propose that an individual's culture has the potential to affect the threat value represented in their SET principle from birth onwards. Specifically, we propose that the longer an individual who differs from cultural social norms is exposed to a culture that requires adherence to those norms, or the more strongly the culture enforces the norms (e.g., the culture may emphasise the social costs of negative evaluation), the greater the increase in threat value. Moreover, there are likely to be sensitive periods (e.g., early childhood) where an individual's culture is more likely to have a greater influence on the SET principle (see Heine and Lehman, 2004).

These suggestions are supported generally by our examination of research on culture in the social anxiety literature that has indicated only cross-sectional studies. These studies have generally shown an association between cultural variables and social anxiety (see Table 2). For example, one line of studies has demonstrated on balance that compared to individuals of Caucasian descent, individuals of Asian descent endorse higher social anxiety levels (e.g., see Kreig and Xu, 2015; Woody et al., 2015, for meta-analyses). Compared with Western countries, many Asian countries are more likely to be collectivistic and generally there are stricter social rules and greater social costs for individuals who deviate from those rules in collectivistic countries compared to individualistic countries (Heinrichs et al., 2006). Notably, there is another line of cross-sectional research that has demonstrated associations between different cultural regions and a diagnosis of SAD (see Brockveld et al., 2014; Hofmann et al., 2010, for reviews). However, this research more likely reflects cultural influences on the impairment produced by social reticence and the subsequent assignment of a disorder (Rapee et al., 2011), an issue that is discussed later in this paper. A great deal more research will be needed to explicitly link cultural factors to the SET principle.

3.3.3.6. Summary. We propose five aetiological factors (inherited tendencies, parent behaviours, peer experiences, life events, and culture) that can each influence the threat value represented in the SET principle. We also propose that two of these aetiological factors (parent behaviours and peer experiences) can themselves be influenced by one of the other factors (inherited tendencies). For each aetiological factor, the longer the duration, the greater the intensity, or if the factor occurs during a sensitive period, the greater the influence on the threat value represented in the SET principle.

3.3.4. The SET principle and the development of primary cognitive and behavioural processes that aim to detect and eliminate social-evaluative threat

We have proposed several factors that can facilitate the

neurobiological changes (e.g., aberrant amygdala and prefrontal cortex activity) and cognitive changes (negative social-evaluative cognitions) that reflect the threat value represented in the SET principle. These neurobiological and cognitive changes underpinning the principle are proposed to support further neurobiological, cognitive, and behavioural developments that enhance an individual's ability to detect and eliminate social-evaluative threat (see Fig. 1). Hence, across development, an increase in the threat value represented in the principle will result in the improved detection and elimination of social-evaluative threat.

The detection of social-evaluative threat is underpinned by developments in neurobiological (e.g., amygdala; Cisler and Koster, 2010) and cognitive processes that increase attention directed to both the self (e.g., to detect internal bodily signals or negative cognitions that indicate social-evaluative threat; to detect one's performance or appearance and how it is observable to others) and the external environment (e.g., detection of negative evaluation from other people; cf. Table 6). We consider these cognitive processes to be 'primary' because they are proposed to be part of the first set of processes that emerge in response to increases in the threat value represented in the SET principle. Our review of the social anxiety literature on attention (see Schultz and Heimberg, 2008, for another review) has yielded cross-sectional and experimental studies that have provided fairly consistent support for an association between high trait social anxiety levels and high levels of trait or state self-focused attention (e.g., Bögels et al., 2014; Gaydukevych and Kocovski, 2012; Glick and Orsillo, 2011; Hodson et al., 2008; see also Table 4). Cross-sectional and experimental studies have also provided fairly consistent support for an association between high trait social anxiety levels and attention towards social threat (e.g., Eastwood et al., 2005; Mogg et al., 2004; Moriya and Tanno, 2011; Pishyar et al., 2004; Sposari and Rapee, 2007; see also Table 4). That is, higher levels of social anxiety are associated with enhanced detection of or preferential allocation of attention to negative social stimuli (e.g., angry faces) relative to control stimuli. Overall, the weight of the evidence provides support for our proposal that both attention directed to the self and to potential indicators of evaluation in the environment play a role in the detection of social-evaluative threat. Further research will be needed to demonstrate that the neurobiological and cognitive aspects of the SET principle are explicitly linked to these primary cognitive processes.

The elimination of social-evaluative threat is underpinned by developments in neurobiological (e.g., amygdala and projections to motor areas; Hofmann et al., 2012; Kent and Rauch, 2003) and behavioural processes that increase physical avoidance of and escape from social-evaluative threat (cf. Table 6). Again, we consider these behavioural processes to be 'primary' given they are part of the first set of processes that develop in response to increases in the threat value represented in the SET principle.³ Our review of the social anxiety literature has yielded cross-sectional studies that have shown that avoidance and escape are consistently associated with high levels of social anxiety and SAD (e.g., Carleton et al., 2010; Heuer et al., 2007; Ottenbreit et al., 2014; Whiteside et al., 2013; Wong and Moulds, 2011a; see also Table 4). These findings provide support for our proposal that avoidance and escape play a role in the elimination of social-evaluative threat.

³ An interesting point to consider from the perspective of the IAM model is the relative amounts of time that would be devoted to detecting and eliminating social-evaluative threat. Overall, the detection of social-evaluative threat is likely to take relatively less time because this involves the attentional system in the IAM model (i.e., self-focus and attention towards threat in the environment) working in an automatic fashion. In contrast, elimination of social-evaluative threat is likely to take relatively more time because implementation of avoidance strategies might require consideration and adaptation to the social-evaluative situation at hand.

Further research is necessary however to show that the neurobiological and cognitive aspects of the SET principle are explicitly linked with these primary behavioural processes.

3.3.5. The consequences of the primary cognitive and behavioural processes that aim to detect and eliminate social-evaluative threat

The changes in neurobiology (e.g., amygdala, projections from the amygdala), cognition (primary attentional processes), and behaviours (primary avoidance/escape processes) that enhance an individual's ability to detect and eliminate social-evaluative threat increase the probability of three outcomes.

3.3.5.1. Outcome 1: maintenance of the threat value of social-evaluative stimuli

Although the primary cognitive and behavioural processes (and associated neurobiology) are intended to detect and eliminate social-evaluative threat respectively, their operation is also expected to maintain the threat value represented in an individual's SET principle. For example, the primary cognitive process of self-focus enhances an individual's ability to detect internal threat responses (e.g., physiological signals or negative social-evaluative cognitions that occur during social-evaluative situations). These responses when detected are interpreted in line with the individual's SET principle and consequently reinforce the threat value represented in the principle (see also previously discussed literature related to interpretation biases in the section on the SET Principle). Similarly, the primary cognitive process of attention towards the social environment enhances the detection of social cues that are interpreted as threatening. In this way the primary cognitive processes that detect social-evaluative threat serve to maintain the threat value representation of the SET principle.

Our review of studies on attention directed to the self and to the environment in the social anxiety literature has indicated evidence that is consistent with the maintenance function of the primary cognitive processes (see also Schultz and Heimberg, 2008, for another review). A majority of experimental studies have demonstrated that the induction of state self-focus results in higher levels of state social anxiety and more negative social-evaluative thoughts (e.g., Bögels and Lamers, 2002; Gaydukevych and Kocovski, 2012; Woody and Rodriguez, 2000; see also Table 4). Furthermore, a majority of experimental studies that have looked at manipulation of attentional biases has shown that training attention away from stimuli related to social threat towards neutral stimuli in socially anxious individuals results in lower levels of social anxiety (e.g., Amir et al., 2009; Heeren et al., 2011, 2012; Li et al., 2008; Schmidt et al., 2009; see also Table 4). Building on these studies, further research will be needed to demonstrate a maintenance effect of the primary cognitive processes on the neurobiological and cognitive aspects of the SET principle.

The primary behavioural processes that operate to eliminate social-evaluative threat are also expected to maintain the threat value represented in the SET principle. To illustrate, an individual who avoids or escapes a social situation prevents exposure to an opportunity that potentially allows them to acquire evidence against their SET principle, thereby preserving the threat value. As a basis for the proposed maintenance effect of the primary behavioural processes, our review of the social anxiety literature yielded experimental studies, the majority of which indicated that exposure to social-evaluative situations without avoidance or escape results in decreased social-evaluative anxiety and positive social outcomes (e.g., Kim, 2005; Rinck et al., 2013; Smits and Powers et al., 2006; Smits and Rosenfield et al., 2006; Taylor and Amir, 2012; see also Table 4). Future research should explicitly demonstrate the described maintenance effect of the primary

behavioural processes on the neurobiological and cognitive components of the SET principle.

3.3.5.2. Outcome 2: development and operation of performance deficits

The emergence and subsequent operation of primary cognitive and behavioural processes that detect and eliminate social-evaluative threat should increase the likelihood of performance deficits in social-evaluative situations (cf. Table 6; see Fig. 1). Situationally, performance deficits can occur either through the performance-interfering influence of increased anxiety (following increased detection of social-evaluative threat) or through the reduction in attentional resources available for competent performance (as a result of attentional resources allocated to the detection of social-evaluative threat). Over the longer term, repeated avoidance of and escape from social situations will reduce opportunities to develop age-appropriate social skills and knowledge, thereby also contributing to the occurrence of performance deficits. In line with previous models (e.g., Clark and Wells, 1995; Rapee and Heimberg, 1997), performance deficits should increase the probability that an individual will experience negative evaluation from others and in this way reinforce the threat value represented in their SET principle.⁴ Hence this conceptualisation incorporates two proposals: (a) the primary cognitive and behavioural processes potentially cause performance deficits due to anxiety, restricted attentional resources, or a lack of age-appropriate social skills/knowledge and (b) these performance deficits will serve to maintain the threat value represented in an individual's SET principle.

Consistent with our proposals, our review of the literature yielded cross-sectional studies on performance deficits, the majority of which indicated that individuals who are most likely to possess a SET principle with a high threat value (i.e., socially anxious individuals) exhibit performance deficits on social-evaluative tasks (e.g., Alfano et al., 2006; Baker and Edelman, 2002; Inderbitzen-Nolan et al., 2007; Spence et al., 1999; Voncken and Bögels, 2008; see also Table 4). Future research should explicitly examine the neurobiological and cognitive aspects of the SET principle and their link with performance deficits and how these might change across development. Moreover, it is evident that further research is needed on the different mechanisms by which performance deficits might occur as well as the maintenance effect of performance deficits.

3.3.5.3. Outcome 3: development and operation of secondary cognitive and behavioural processes

Following the emergence of the primary cognitive and behavioural processes, we predict that another set of cognitive and behavioural processes aimed at detecting and eliminating social-evaluative threat will develop as the individual matures (see Fig. 1). We consider this subsequent set of cognitive and behavioural processes to be 'secondary' because they are proposed to

emerge after the primary processes.

We propose the primary cognitive processes (i.e., attention to the self and to the social environment) support the development of complex secondary cognitive processes that aim to detect social-evaluative threat before and after social situations. These processes are commonly referred to as anticipatory processing and post-event processing (cf. Table 6). Interestingly, conceptualisations of anticipatory processing and post-event processing involve elements of self-focus and a focus on negative evaluation (e.g., Clark and Wells, 1995), which may allude to the origins of these complex secondary processes from the primary cognitive processes that we have proposed. The operation of anticipatory processing and post-event processing is expected to enhance the detection of social cues that are interpreted as threatening in accordance with the SET principle, resulting in the reinforcement of the threat value represented in the principle. Furthermore, in line with previous models (e.g., Clark and Wells, 1995; Hofmann, 2007), engaging in anticipatory processing and post-event processing is likely to interfere with an individual's ability to effectively engage with others upon entering social situations at future points in time (e.g., anticipatory processing and post-event processing are likely to contribute to the generation of state anxiety via the SET principle that interferes with engagement upon entering a social-evaluative situation). This increases the probability of negative evaluation from others and the likelihood that the threat value in the SET principle is reinforced. We have thus put forth two main proposals: (a) primary cognitive processes play an aetiological role for anticipatory processing and post-event processing, and (b) anticipatory processing and post-event processing function to maintain the SET principle.

These proposals are based generally on our review of the social anxiety literature on anticipatory processing and post-event processing. Cross-sectional, longitudinal, and experimental studies were found that consistently demonstrated that trait social anxiety is positively associated with both anticipatory processing (e.g., Hinrichsen and Clark, 2003; Hodson et al., 2008; Miers et al., 2014; Mills et al., 2013; Vassilopoulos, 2004) and post-event processing (e.g., Makkar and Grisham, 2011; Miers et al., 2014; Schmitz et al., 2011; Wong, 2015; see Brozovich and Heimberg, 2008; Penney and Abbott, 2014, for reviews; see also Table 4). Additionally, in support of the maintenance function of the secondary cognitive processes, the majority of experimental studies have shown that engaging in anticipatory processing (e.g., Hinrichsen and Clark, 2003; Mills et al., 2014a, 2014b; Vassilopoulos, 2005; Wong and Moulds, 2011b) and post-event processing (e.g., Brozovich and Heimberg, 2011, 2013; Kocovski et al., 2011; Rowa et al., 2014; Wong and Moulds, 2009) results in higher levels of social anxiety and more negative cognitive outcomes for socially anxious individuals (see also Table 4). Based on our review, it is clear that further research is needed to examine the neurobiological and cognitive aspects of the SET principle and their links with the secondary cognitive processes, as well as the maintenance effect of the secondary cognitive processes on the SET principle. Moreover, it is evident that there is a lack of studies on the role that the primary cognitive processes play in the development of anticipatory processing and post-event processing, an area that will need to be addressed by future research (see also section on directions for future research in relation to the combined cognitive bias hypothesis; Hirsch et al., 2006).

The primary behavioural processes (i.e., avoidance and escape) are expected to support the emergence of more subtle and complex secondary cognitive and behavioural processes that aim to eliminate social-evaluative threat. As an individual matures, they are increasingly exposed to social-evaluative situations with more complex social rules and social-evaluative threat they cannot avoid or escape. Hence, there is a need for the evolution of more

⁴ The key result of performance deficits from the perspective of the IAM model is the increased probability of actual negative evaluation and reinforcement of the threat value of social-evaluative stimuli. There are two other important points related to this issue. First, it is possible in some instances that performance deficits do not lead to negative evaluation from others (e.g., other people have not detected the deficits or others have detected the deficits but do not negatively evaluate). However, in the context of the IAM model, performance deficits of significance are those that increase the probability of negative evaluation from others. Second, the specific effects of performance deficits might depend on insight. For example, an individual with performance deficits might have insight into these deficits, and thus become anxious when approaching social-evaluative situations, further increasing the likelihood of disrupted performance and negative evaluation from others. It is also possible that an individual with performance deficits may not have insight into their deficits, and takes part in social-evaluative situations with the result that they are negatively perceived by others.

advanced, elaborate, and creative strategies that aim to eliminate social-evaluative threat in these circumstances without physically removing oneself. We refer to such behavioural strategies as safety behaviours (or subtle avoidance) and parallel cognitive strategies as cognitive avoidance (cf. Table 6). The occurrence of safety behaviours and cognitive avoidance prevents an individual from being exposed to evidence that runs contrary to the threat value represented in their SET principle and in this way maintains the threat value. In line with previous models (e.g., Rapee and Heimberg, 1997; Heimberg et al., 2010), safety behaviours and cognitive avoidance are also likely to prevent individuals from effectively engaging with social-evaluative situations. This increases the probability of negative evaluation from others and the likelihood that the threat value represented in the SET principle is maintained. We have thus indicated two main predictions: (a) primary behavioural processes contribute to the aetiology of safety behaviours and cognitive avoidance, and (b) safety behaviours and cognitive avoidance will serve to maintain the SET principle.

Our proposals have their general basis in cross-sectional, longitudinal, and experimental studies on safety behaviours and cognitive avoidance that have been obtained from our review of the social anxiety literature. These studies have demonstrated that trait social anxiety has consistent associations with safety behaviours (e.g., Cumming et al., 2009; McManus et al., 2008; Plasencia et al., 2011; Stangier et al., 2006; Thomas et al., 2012) and cognitive avoidance (e.g., Breen and Kashdan, 2011; Kashdan et al., 2013, 2014; Panayiotou et al., 2014; see also Table 4). Furthermore, in line with the maintenance function of safety behaviours, experimental studies have consistently demonstrated that the use of safety behaviours results in higher social-evaluative anxiety (Langer and Rodebaugh, 2013) and the reduction of safety seeking behaviours leads to lower social-evaluative anxiety and reductions in anxiety-related self-judgements (Morgan and Raffle, 1999; Taylor and Alden, 2010, 2011; Wells et al., 1995; see also Table 4). Notably, one study has demonstrated that individuals with SAD who were instructed to reduce safety behaviours relative to those who were not given such instructions in the context of a conversation: (a) were judged by independent observers as exhibiting less anxiety-related behaviours and more social approach behaviours, and (b) elicited more positive reactions from their conversational partner (i.e., greater partner willingness to engage individual; Taylor and Alden, 2011). This study supports our proposal that safety behaviours can interfere with an individual's engagement with social-evaluative situations and lead to negative judgements from others. Similar experimental findings for cognitive avoidance have yet to be demonstrated in the social anxiety literature. As for the IAM model, future research will need to demonstrate explicit links between the neurobiological and cognitive aspects of the SET principle and the secondary cognitive and behavioural processes that aim to eliminate social-evaluative threat. Future research will also need to focus on demonstrating the maintenance effect of these secondary cognitive and behavioural processes on the SET principle. Furthermore, the role of primary behavioural processes in the development of safety behaviours and cognitive avoidance will need to be investigated.

3.3.5.4. Summary

Increases in the threat value represented in the SET principle encourage the development of primary cognitive and behavioural processes that detect and eliminate social-evaluative threat. These primary processes increase the likelihood that: (a) the threat value of an individual's SET principle is maintained, (b) an individual exhibits performance deficits (due to anxiety, limited attention, or a lack of age-appropriate social skills/knowledge), and (c) an

individual develops secondary cognitive and behavioural processes that further aim to detect and eliminate social-evaluative threat in more complex ways.

3.3.6. The SET principle and the development of SAD

Each of the components of the IAM model that have ultimately developed from increases in the threat value represented in the SET principle (i.e., primary and secondary processes, performance deficits) serve to maintain this threat value. In turn, maintenance of the threat value drives the operation of the primary and secondary processes and the associated occurrence of performance deficits. Thus, all the components form a self-perpetuating cycle. The components at this point in the IAM model are neither a problem or a disorder. It is what happens in the latter sections of the model that moves an individual to experience a clinical disorder.

Individuals with SET principles where social-evaluative stimuli are assigned with higher threat values are expected to experience more frequent anxiety and higher levels of anxiety in relation to social-evaluative situations. Hence, an individual with a SET principle that social-evaluative stimuli are extremely threatening is more likely to: (a) develop maintaining factor components that each operate at a high severity level over time (e.g., more persistent and pervasive avoidance of social-evaluative stimuli, self-focus and attentional focus to social-evaluative threat in the environment that happens more frequently and is more difficult to disengage from) and maintain the individual's extreme threat value assigned to social-evaluative stimuli, and (b) experience frequent anxiety and severe levels of anxiety whenever social-evaluative stimuli are encountered. An important direction for future research will be to examine the suggested relationship between the neurobiological and cognitive aspects of the SET principle and more frequent/severe anxiety that is experienced in relation to social-evaluative situations.

We further propose that an individual who experiences frequent/severe anxiety as a result of their SET principle is expected to have an increased likelihood of life interference and a diagnosis of SAD. Notably, in line with previous theorising (Rapee and Spence, 2004), there is an imperfect correspondence between frequent/severe anxiety in relation to social-evaluative situations and life interference because the latter also depends on other factors, such as a person's age, gender, life goals, and culture. For example, cultural norms and expectations are likely to influence the acceptability of socially anxious behaviours and hence affect whether these behaviours cause personal distress or are deemed to interfere with one's functioning (e.g., Rapee et al., 2011; Schreier et al., 2010). To further illustrate with a specific example, evidence indicates that the lifetime prevalence of SAD is generally higher in Western regions of the world compared to Asian countries (e.g., Hofmann et al., 2010) consistent with a more positive attitude toward socially reticent behaviour among Eastern compared with Western populations that is applied from childhood (Chen et al., 2009, 1998).⁵

⁵ In the previous section on Culture, we provided evidence that compared to individuals of Caucasian descent, individuals of Asian descent endorse higher social anxiety levels (e.g., Heinrichs et al., 2006). In the current section, we have provided evidence that indicates that the lifetime prevalence of SAD is generally higher in Western regions of the world compared to Asian countries (e.g., Hofmann et al., 2010). These two statements might seem contradictory, but are compatible with each other. Individuals in Asian countries might have higher social anxiety levels compared to individuals from Western countries, but because socially anxious traits are more acceptable in Asian cultures compared to Western cultures (e.g., Chen et al., 2009), such traits therefore might be less likely to be deemed as problematic in the former versus the latter culture. This would be consistent with an overall lower rate of SAD in Asian countries than Western countries.

It is possible that an individual's SET principle leads to the development of commensurate maintaining factors and the individual experiences anxiety in social-evaluative situations yet experiences no life interference and does not meet criteria for a diagnosis of SAD. For such an individual to have an increased likelihood to meet criteria for SAD, they would need to be exposed to one or more of the proposed aetiological factors. Exposure to such factors would likely increase the threat value represented in the individual's SET principle. This in turn would increase the probability of two outcomes; first, the individual's maintaining factor components would be expected to operate with greater severity, and second, the individual should experience more frequent and severe anxiety in relation to social-evaluative situations which increase the probability of life interference and a diagnosis of SAD (although as previously noted the influence of other factors on life interference would also need to be considered).

In sum, the SET principle and the components that develop from this principle together form a self-perpetuating cycle that ultimately results in the experience of anxiety in relation to social-evaluative situations. This self-perpetuating cycle may develop and operate in the absence of a diagnosis of SAD. However, the greater the threat value represented in an individual's SET principle, the greater the operational severity of the maintaining factor components, and the more likely the individual will experience frequent/severe social-evaluative anxiety, experience life interference and meet criteria for SAD.

4. Limitations and directions for future research

The IAM model provides a framework to encourage future research to more closely integrate understanding of factors that underlie both the aetiology and maintenance of SAD. We have already highlighted specific areas of the model that require further research. These suggested lines of future inquiry, together with several other proposed lines of investigation based on the IAM model, will be elaborated upon in this section. First, as is evident in the presentation of our model, there is currently only indirect evidence supporting factors that initiate an increase in the threat value represented in the SET principle. Although studies have indicated that several of the aetiological factors are linked with either higher levels of social anxiety or a diagnosis of SAD, there is a need for longitudinal studies that examine the interrelationships between the proposed aetiological factors and later neurobiological changes (e.g., amygdala reactivity to social-evaluative stimuli) and cognitive changes (e.g., negative social-evaluative cognitions) that reflect the SET principle.

A second related line of investigation will need to examine the aetiological factors in more detail. As is evident in the IAM model, aetiological factors differ in the developmental period during which they have the greatest potential to influence the threat value in the SET principle. As such, certain aetiological factors may play a larger role in the development of SAD for some individuals depending on the age of onset of SAD and future research should examine this. For example, for individuals with SAD who report that they have "always been this way" suggesting a very early onset of the disorder, inherited tendencies may play a relatively large aetiological role in increasing the threat value of social-evaluative stimuli early on. Future research will also need to examine whether there are protective factors that buffer against the proposed effect of aetiological factors. Protective factors may simply be the reverse of proposed aetiological factors. As an example from the literature on temperament and parenting, [Lewis-Morrarty et al. \(2012\)](#) showed a significant link between consistently high behavioural inhibition and higher levels of later social anxiety in the presence of high maternal overcontrol, while there was no such

link in the presence of low maternal overcontrol. This finding as applied to the IAM model may mean that inherited tendencies can increase the threat value represented in the SET principle. However, the additional presence of parent behaviours that encourage a child to learn that social-evaluative stimuli are not threatening (e.g., parents expose their child to and allow them to cope with novel social situations) may act as a protective factor that prevents the threat value represented in the SET principle from increasing. There may also be protective factors that are not simply the reverse of proposed aetiological factors. For example, in the context of peer experiences, there is evidence that the impact of peer victimisation is decreased when children have a close friendship (e.g., [Hodges et al., 1999](#)). In general, future research should examine protective factors in relation to the aetiological factors of the IAM model. On a related point, future research will need to consider the potential interactions between the aetiological factors themselves proposed in the IAM model, as well as potential interactions between the proposed maintaining factors (cf. combined cognitive bias hypothesis; [Hirsch et al., 2006](#)).

A third avenue for future investigation as indicated in previous sections concerns whether the neurobiological and cognitive changes that represent the SET principle lead to the development of the primary cognitive and behavioural processes that detect and eliminate social-evaluative threat. In other words, there is a need for longitudinal studies that investigate whether increases in the threat value represented in the SET principle (e.g., increases in amygdala reactivity to social-evaluative stimuli, greater endorsement of negative social-evaluative cognitions) predicts enhanced detection of social-evaluative threat (e.g., stronger self-focus and attentional biases towards social-evaluative threat in the environment) and elimination of the threat (e.g., greater tendency to avoid/escape social-evaluative threat). Another possibility for future research is to examine whether experimental manipulation of the neurobiological and cognitive aspects of the SET principle leads to predicted changes in self-focus, attentional biases towards social-evaluative threat, and avoidance/escape behaviours. For example, using real-time functional brain imaging and neuro-feedback techniques (see [Caria et al., 2012](#); [deCharms, 2008](#); [Hofmann et al., 2012](#)), individuals may be trained to self-regulate amygdala reactivity to social-evaluative stimuli over a period of time (i.e., manipulation of neurobiological representation of SET principle) to see whether this leads to decreases in each of the primary cognitive and behavioural processes. Of course, future studies along the lines described will need to take into account potential moderators of the operation of the relevant processes. For example, the availability of attentional control resources is likely to affect the operation of the primary cognitive processes (see e.g., [Judah et al., 2013](#)).

A fourth line of research that has been highlighted in previous sections involves the examination of whether the primary cognitive and behavioural processes that detect and eliminate social-evaluative threat are precursors to the other relevant maintaining factor components. Specifically, targeted longitudinal studies should determine whether: (a) stronger self-focus and attentional biases towards social-evaluative threat in the environment predict more severe performance deficits due to anxiety/limited attention as well as stronger anticipatory processing and post-event processing later in time, and (b) a stronger tendency to avoid/escape social-evaluative threat predicts more severe performance deficits due to a lack of age-appropriate social skills/knowledge and more severe safety behaviours as well as cognitive avoidance later in time. Manipulation of the primary cognitive and behavioural processes may also assist in the examination of their proposed role. For example, training individuals to self-focus and attend to social-evaluative threat (e.g., see [Beard, 2011](#)) should increase later anticipatory processing and post-event processing.

A fifth research stream involves the investigation of the IAM model holistically. Specifically, future research will need to examine whether individuals who have a SET principle where social-evaluative stimuli have a higher threat value (e.g., greater amygdala reactivity to social-evaluative stimuli and stronger negative social-evaluative cognitions) exhibit higher levels of the maintaining factor components. Furthermore, as alluded to in previous sections, there is a need to examine whether: (a) such individuals experience more frequent and higher anxiety in relation to social-evaluative situations, (b) such individuals experience greater life interference, and (c) there is a higher rate of SAD in these individuals (relative to individuals with SET principles where social-evaluative stimuli have lower threat values).

A sixth line of research should examine the specificity of the proposed aetiological and maintaining factors of the IAM model to SAD. We have described how specific aetiological factors can increase the threat value of social-evaluative stimuli represented in the SET principle and ultimately increase vulnerability for SAD, but the factors might also have broader effects than what we have indicated in the IAM model, such as increasing vulnerability to other disorders (i.e., transdiagnostic risk factors; see [Nolen-Hoeksema and Watkins, 2011](#)). For example, highly stressful or traumatic events with a social element as we have indicated might contribute vulnerability for SAD, but might also contribute vulnerability for other disorders such as post-traumatic stress disorder or depression. Thus, it may be fruitful for future research to examine the effect of an aetiological factor as proposed in the IAM model as well as any broader effect of the factor that may be relevant to other disorders. A similar point can be made about the maintaining factors of the IAM model.

Should the previous suggested lines of research provide helpful insights into the development and persistence of SAD, a seventh line of research will need to examine how these insights can translate into novel prevention and treatment strategies for SAD that enhance existing strategies. For example, for individuals already diagnosed with SAD, future research might examine whether the neurobiological and cognitive aspects of the SET principle can be treatment targets (see [Hofmann et al., 2012](#)) that lead to a decrease in the operational severity of the maintaining factor components and potential remission of SAD. Moreover, for 'high-risk' individuals not yet diagnosed with SAD, and given in the IAM model that the SET principle is a precursor to the maintaining factor components which in turn are precursors to the onset of SAD, it may be possible to target the neurobiological and cognitive aspects of the SET principle to decrease the operational severity of the maintaining factor components early so that the onset of SAD is prevented. Future research will determine whether there are other novel ways to prevent and treat SAD based on the IAM model.

5. Conclusions

The IAM model extends the current literature on the development and persistence of SAD by uniting current theory on the aetiology and maintenance of the disorder and providing a much-needed evidence-based framework that: (a) integrates proposed aetiological and maintaining factors for SAD, (b) specifies a novel account of the developmental sequence from the action of proposed aetiological factors to increases in the threat value of social-evaluative stimuli represented in the SET principle, followed by the emergence of the maintaining factor components, and then the onset of SAD, and (c) explains the development of the maintaining factors, how an individual develops SAD, and how SAD is maintained. The IAM model thus provides a comprehensive understanding of the development and persistence of SAD based on

current theory and research and it is our hope that the model stimulates new research that furthers our understanding and improves prevention and treatment strategies for SAD.

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