

Imagery and Interpretations in Social Phobia: Support for the Combined Cognitive Biases Hypothesis

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Cognitive-behavioral models of clinical problems typically postulate a role for the combined effects of different cognitive biases in the maintenance of a given disorder. It is striking therefore that research has tended to examine cognitive biases in isolation rather than assessing how they work together to maintain psychological dysfunction. The combined cognitive biases hypothesis presented here suggests that cognitive biases influence each another and can interact to maintain a given disorder. Furthermore, it is proposed that the combined effects of cognitive biases may have a greater impact on sustaining a given disorder than if the biases operated in isolation. The combined cognitive biases hypothesis is examined in relation to imagery and interpretation in social phobia. Individuals with social phobia experience negative images of themselves performing poorly in social situations, and they also interpret external social information in a less positive way than those without social anxiety. Evidence of a reciprocal relationship between imagery and interpretations is presented, and the mechanisms underlying the combined effects are discussed. Clinical implications and the potential utility of examining the combined influence of other cognitive biases are highlighted.

COGNITIVE-BEHAVIORAL MODELS OF PSYCHOPATHOLOGY often postulate roles for more than one cognitive bias in the maintenance of a given

disorder. Furthermore, these models often imply bidirectional effects, where one bias or its results influences another bias or the effects of that second bias, and vice versa. It also seems likely that, given that a person may be processing information in more than one system at any one time, these processes and their results may combine to maintain a disorder. The alternative possibility, that cognitive biases always act in isolation, seems implausible, so that at least some combined effects seem correspondingly quite likely. Despite the fact that the cognitive-behavioral models of psychological disorders often postulate such combined processes, clinical psychological research has tended to examine cognitive processes in isolation. Even when different biases are assessed within the same study, they are often not examined with a view to how their combination might maintain disorders (although there are some notable exceptions, e.g., [Watkins & Teasdale, 2004](#); [Wells & Papageorgiou, 1998](#)). We propose that a number of biased cognitive processes often operate simultaneously and/or in succession and that these cognitive processes are likely to work together in various ways serving to maintain specific emotional disorders. In the present paper we focus on one specific disorder—social phobia—and consider how two types of biased cognitive process act in combination and may help to maintain the disorder.

Individuals with social phobia exhibit a number of cognitive biases related to threatening information, including biased attention, selective interpretation, negative self-imagery, and elevated subjective risk (see [Hirsch & Clark, 2004](#), for review). Most research on cognitive processes in social phobia has examined processes in isolation (e.g., [Roth, Anthony, & Swinson, 2001](#)), which provides important information about the biases

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that exist but does not elucidate the role one bias has on another. Some researchers have investigated more than one bias within the same study (e.g., [Brendle & Wenzel, 2004](#); [Mansell & Clark, 1999](#); [Wenzel, Finstrom, Jordan, & Brendle, 2005](#)); although highly informative, these studies do not provide information about the causal role one bias has during the operation of another. In order to assess causality, it is necessary to manipulate one process and then assess its impact on another cognitive process (e.g., [Hirsch, Clark, Mathews, & Williams, 2003](#); [Hirsch, Mathews, Clark, Williams, & Morrison, 2003](#)). The current paper focuses on negative biases of interpretation and self-imagery in the maintenance of social phobia. To anticipate, we argue that these processes combine to maintain social phobia, although we also argue that such combinations of cognitive biases are not confined to imagery and interpretation and probably apply equally to other cognitive biases and to other psychological problems.

The proposal that cognitive biases work together will be referred to as the combined cognitive biases hypothesis: that cognitive biases do not operate in isolation, but rather (a) can influence each another and/or (b) can interact so that the impact of each on another variable (e.g. social anxiety) is influenced by the other. Via both these mechanisms we argue that combinations of biases have a greater impact on disorders than if individual cognitive processes acted in isolation.

Imagery and Interpretation in Social Phobia

MENTAL IMAGERY IN PSYCHOLOGICAL DISORDERS

Reports of spontaneous mental images are common in the anxiety disorders ([Beck, Laude, & Bohnert, 1974](#)) and often appear to embody clients' distorted beliefs about the dangerousness of feared situations. In comparison with verbal propositional representations, images are thought to have a special link with emotion. [Vrana, Cuthbert, and Lang \(1986\)](#) reported that imagining fearful stimuli elicited more physiological activity than when the same information was thought about in verbal form, although this comparison was not balanced for order of presentation. More recently, [Holmes and Mathews \(2005\)](#) required volunteers to either imagine unpleasant events or listen to the same descriptions while thinking about their verbal meaning. Participants in the imagery condition reported more anxiety and rated new descriptions as more emotional than those in the verbal condition.

Mental images are cognitive representations of perceptual information that are not the product of

current external sensory input. Images can comprise any or all sensory modalities (e.g., visual, sound, tactile; [Horowitz, 1970](#)). [Hackmann \(1999\)](#) noted that, within the clinical context, images most typically encompass a range of sensory qualities. The visual modality is the most common imagery modality reported, albeit not exclusively in a range of psychological problems including agoraphobia ([Day, Holmes, & Hackmann, 2004](#)), body dysmorphic disorder ([Osman, Cooper, Hackmann, & Veale, 2004](#)) and cravings ([May, Andrade, Panabokke, & Kavanagh, 2004](#)).

MENTAL IMAGERY IN SOCIAL PHOBIA

Evidence also suggests that social phobia is associated with negative self-imagery. [Hackmann, Surawy, and Clark \(1998\)](#) asked clients with social phobia and nonclinical controls to recall a recent social situation in which they had felt anxious. They were then asked about the presence of any imagery that may have occurred at the time. Clients with social phobia were more likely to report spontaneous images than control volunteers. These clients also reported that when images were experienced during social situations, they believed that the image was an accurate representation of how they appeared to others, although in retrospect they recognized that the image may have been more negative in content than how they would have actually been perceived by others. The content of these images appeared to be a visualization of their feared outcomes, including the way in which they feared that they appeared to others.

An example of negative self-imagery is that reported by a client who had to give a presentation at work. He had an image of himself looking bright red with terrified eyes, as if he was a rabbit caught in headlights, unable to speak clearly and "looking really pathetic." In the study reported by [Hackmann et al. \(1998\)](#), an independent assessor, who had not been informed about group allocation, also rated images reported by participants with social phobia as more negative than those reported by control nonphobic participants.

[Hackmann, Clark, and McManus \(2000\)](#) conducted another semistructured interview with clients with social phobia to determine whether a particular event was associated with the first occurrence of the image. Almost all of the clients identified a specific, embarrassing, or humiliating experience related to their reported image. Again, the image appeared to represent the person's fears about the most negative aspects of the original situation. The events linked to the image were mainly dated around the onset of the social phobia, although clients had often not made an explicit link

between the event and the negative self-image until they were asked about it during the interview.

To summarize, during social situations people with social phobia report experiencing images of themselves performing poorly, exhibiting symptoms of anxiety, or both. These spontaneous and negatively distorted images appear to be linked to aversive social experiences that may have occurred around the onset of the disorder. The images seem to encapsulate the person's feared outcomes and consequently are likely to provoke anxiety.

Evidence that mental imagery does indeed influence anxiety was reported by Hirsch, Clark, et al. (2003). Clients with social phobia were asked to have two conversations with a stranger, once while holding their usual negative self-image in mind¹ and once while holding a more benign image of themselves looking less anxious. Compared to the benign image condition, participants experienced greater anxiety and rated their actual performance (including showing signs of anxiety) as poorer when holding their normal negative image in mind. Hence, participants' interpretations of their own performance were more negative when holding a negative image in mind. The effect of negative imagery was not confined to introspective reports, since an assessor (who did not know which image was being held in mind) also rated participants' performance as poorer when the negative image was held in mind, thus indicating that imagery can elicit changes in observable behaviors. Because the content of imagery was experimentally manipulated in this study, it was concluded that negative self-imagery is indeed causally implicated in social anxiety.

These findings were replicated and extended by Hirsch, Meynen, and Clark (2004). High socially anxious participants had two conversations with a stranger, who was another (non-socially anxious) volunteer who was not informed that the study related to social anxiety or imagery. In one conversation, participants held their usual self-image in mind, and in the other, they were instructed to hold a more benign self-image in mind. As predicted, while holding their usual image in mind, these socially anxious participants reported feeling more anxious, used more safety behaviors, and believed that they performed less

well than they did when instructed to hold an alternative benign self-image in mind. Furthermore, their conversational partners rated the socially anxious person's performance more negatively when the anxious person was holding a negative image in mind, despite being blind to the imagery manipulation. These findings provide further support for the causal role of self-images in maintaining social anxiety and show again that the adverse consequences go beyond subjective self-evaluation of performance.

DISTINCTION BETWEEN IMAGERY AND INTERPRETATION

We argue here that interpretation bias and biased imagery are distinct processes that can combine in their emotional effects. It is therefore necessary first to consider the extent that the two are indeed different from one another. Alternatively, can imagery be seen as simply a form of interpretation? Or vice versa? We propose here that they can be usefully distinguished for several reasons. First, in common with many other researchers, we use the term *interpretation* to refer to a semantic process in which ambiguity of meaning is resolved. Interpretations can be (and often are) expressed in verbal propositional form; indeed, all the studies of interpretation bias reviewed below used verbal measures, whether verbal report or latency to respond to verbal expressions that are congruent or incongruent with specific meanings. Second, as noted elsewhere, verbally based interpretations alone do not seem to induce emotion as do images based on the same event information (Holmes & Mathews, 2005). Further support for this distinction comes from Borkovec, Alcaine, and Behar (2004) who propose an avoidance hypothesis about worry and generalized anxiety disorder. Part of this hypothesis is that people with generalized anxiety disorder engage in worry, which is predominantly a verbal linguistic process with little imagery (Borkovec & Inz, 1990; Freeston, Dugas, & Ladouceur, 1996), in order to avoid the physiological activation and higher levels of emotional distress associated with imagery. Third, while images certainly can convey disambiguating information, unlike interpretations, this property is hardly a necessary feature of imagery; rather, imagery is characterized by its coding in terms of sensory-perceptual information (Kosslyn, 1994).

We concede that a resolution of ambiguity can indeed be embodied within an image but propose that the resolution is commonly (if not always) the result of a prior semantic resolution, which may then be expressed in the form of an image. For example, Hertel, Mathews, Peterson, and Kintner

¹When referring to images in this paper, we are usually describing images with a visual component, although some people do not report a clear visual image. Hence, depending on the sensory qualities most evident, the image may amount to more what might be termed a *felt sense* (Teasdale & Barnard, 1993). Interestingly, however, reports of a felt sense are more prevalent in individuals without social phobia or when individuals with social phobia hold in mind a more benign self-image.

(2003) had participants perform a semantic judgment task designed to facilitate a threatening or nonthreatening interpretation bias. Later, participants constructed self-referent images in relation to new ambiguously threatening homographs. Images were rated by independent raters in terms of how threatening they were. As predicted, images tended to match the valence of the previously practiced meanings. In this case, we suggest that the new cues were first interpreted in terms of the practiced semantic meaning, and this meaning then influenced the image that was constructed. Indeed, the influence of semantic resolutions of ambiguity on subsequent imagery is one of the ways in which we propose the two processes exert their combined effects.

The terms *interpretation* or *inferential bias* have been used here to describe the tendency to give priority to one account of ambiguous events over alternatives, and more specifically, the tendency to favor those having either a positive or negative valence. As mentioned above, methods of assessing such biases have been confined to verbal or semantic measures, such as making decisions about the meaning of ambiguous words or descriptions. For example, interpretation bias was assessed by Mathews and Mackintosh (2000) using a recognition test for sentences that represented possible negative or positive interpretations of a previously viewed ambiguous description. Importantly, changes on this semantic measure of interpretation were not necessarily related to changes in anxiety. Rather, as stated before, it was only when negative interpretations were used to actively generate emotional representations in the form of images that anxiety increased congruently (Holmes & Mathews, 2005). Thus, we suppose that interpretative and inferential biases are critical in directing the way in which ambiguous events or unknown outcomes will be encoded semantically, but the existence of such a bias does not in and of itself elicit strong negative emotions. Instead it may be that emotions associated with interpretation bias will be evident only when an interpretation has guided the content of personally threatening imagery and not when interpretations remain in verbal linguistic form.

INTERPRETATION IN SOCIAL PHOBIA

Social information is often ambiguous. For example, if an individual smiles at another person it could be because the person who is smiling is being friendly and likes the other person (positive interpretation), or it could be because he or she thinks that the other person is foolish and the smile is derisive (negative interpretation). Interpretations

that are biased in a negative direction are postulated to contribute to the maintenance of social phobia.

One domain for potentially biased interpretation relates to how individuals with social phobia think they appear to other people. Rapee and Lim (1992) asked clients with social phobia and nonclinical controls to give a speech to a small audience and then retrospectively rate their own behavior during the speech. Both groups underestimated how well they performed relative to audience ratings, but the underestimation was greater in the social phobia group than the control group. The finding that individuals with social phobia underestimate their performance to a greater degree than nonanxious people has been replicated in clients with social phobia who had a conversation with a stranger (Alden & Wallace, 1995; Stopa & Clark, 1993) and in highly socially anxious samples (Mellings & Alden, 2000). Social phobia is thus associated with a tendency to perceive one's own social performance as poorer than do others.

In order to assess how individuals with social phobia interpret social information, Amir, Foa, and Coles (1998) asked clients with social phobia, clients with obsessive-compulsive disorder and nonclinical controls to read ambiguous scenarios about social or nonsocial situations. Negative, neutral, and positive interpretations of the scenario were then rank ordered by participants, and those with social phobia rated negative interpretations as more likely to come to mind than clients with obsessive-compulsive disorder and nonanxious controls. Stopa and Clark (2000) replicated this finding and also demonstrated that mildly negative social situations were interpreted in a relatively "catastrophic" fashion (i.e., much more negatively) by clients with social phobia than clients with anxiety disorders other than social phobia and nonclinical controls. A further extension of this work by Voncken, Bögels, and de Vries (2003) demonstrated that such negative interpretations can occur across a wider spectrum of situations, even when socially anxious participants were presented with positive and extremely negative, as well as ambiguous or mildly negative, social situations.

Employing a different paradigm, Constans, Penn, Ihen, and Hope (1999) asked high and low socially anxious volunteers to read a scenario that included a number of ambiguous statements related to interpersonal evaluation. Participants were then asked to rate the extent to which they agreed with a given interpretation of the ambiguous information. Individuals without social anxiety rated positive interpretations of ambiguous social information more highly than negative interpretations, whereas participants with social anxiety were relatively

even-handed in their ratings. In this case it appeared that socially anxious people differed from others mainly in lacking the positive interpretive bias evident for nonsocially anxious people.

Research using self-report questionnaires thus suggests that, when given time to reflect, people with social phobia tend to make more negative interpretations of ambiguous social events than nonsocially anxious people. Such questionnaire studies, however, do not distinguish between two theoretically and clinically relevant alternatives. Interpretations may be generated at the time that the ambiguous social information is initially encountered (i.e., on-line) or only later when there is more time for reflection (i.e., off-line). An example of an "on-line" processing paradigm is provided in Calvo, Eysenck, and Estevez's (1994) study in which high and low test-anxious students read incomplete sentences that implied a threatening continuation. Participants then made a speeded lexical decision about final words that were either consistent with the threatening continuation or disconfirmed it. Low test-anxious participants were faster than high test-anxious participants to endorse words that *disconfirmed* a threatening continuation, but there were no significant differences for probes that confirmed the threatening inference. This finding implies that control participants were more likely than high test-anxious participants to have made benign inferences on-line (at the time of reading). Similar results were obtained with reading time measures by Calvo, Eysenck, and Castillo (1997).

Hirsch and Mathews (1997) investigated whether individuals with high or low levels of anxiety about being interviewed made on-line emotional inferences while reading descriptions of being interviewed for a job. At emotionally ambiguous points in the text, low anxious individuals were faster to endorse words that corresponded to benign, as opposed to threatening, interpretations. Highly anxious participants were equally slow to endorse words corresponding to either benign or threat inferences. In a further experiment, group differences were abolished when the same probe words were repositioned to irrelevant points in the text where any inference was very unlikely. Together, these findings suggest that group differences found when information was presented in an ambiguous context were likely to be due to the generation of on-line benign inferences by the low anxious volunteers, whereas interview-anxious participants did not generate such inferences.

It may be supposed, however, that people with more severe social anxiety, such as those with social phobia, would demonstrate a bias to generate

negative inferences on-line. To address this issue, Hirsch and Mathews (2000) asked clients with social phobia and nonclinical controls to complete the same interpretation task, with the addition of a baseline condition designed to ensure that all readers should arrive at the same (forced) inference. When speeded lexical decisions were made at points of emotional ambiguity, nonclinical volunteers endorsed words corresponding to benign inferences as rapidly as they did in the baseline (forced inference) condition. Interestingly, these same participants were significantly slower to endorse words corresponding to socially threatening inferences. In contrast, clients with social phobia did not show clear evidence of any on-line inferences at points of emotional ambiguity. In this ambiguous context, participants with social phobia were significantly slower to endorse words corresponding to either threat or benign interpretations than they were in the baseline condition. These findings suggest that nonphobic controls typically make positive or benign inferences in ambiguous social situations, whereas social phobia appears to be associated with a relative failure to generate emotional inferences, and consequently an absence of the normal positive inferential bias.

Summarizing the findings on interpretation bias in social phobia and high social anxiety, there is clear evidence of a bias to interpret self-performance (including showing symptoms of anxiety) in a less positive way than do non-socially anxious people. On the basis of retrospective (off-line) self-report data, social anxiety is also associated with more negative views of one's own social performance, as compared to independent assessors, than people without social anxiety. Furthermore, when considering how people interpret ambiguous social situations, the normal positive interpretation bias evident for non-socially anxious people is absent in individuals with social phobia or high social anxiety, and the latter are more likely to report negative interpretations when they have time to reflect on the situation (off-line). In on-line experiments, socially anxious people not only lack the positive inferences seen in nonanxious individuals, but also show no clear evidence of negative inferences when the ambiguity is initially encountered. It seems likely that, in the absence of on-line inferences, individuals with social phobia will rely on other sources of input to assess their performance, such as their off-line, negative default interpretations about the risks involved in being in social situations.

The absence of on-line inferences in social phobia may be due to the presence of another cognitive bias in social phobia, namely negative self-imagery.

Within the combined cognitive biases hypothesis, the reason for the absence of positive on-line inferences with social phobia individuals is that negative self-imagery can block their generation. However, as we discuss later, other evidence suggests that the negative content of imagery can have additional directional effects in diverting inferences away from positive content.

Reciprocal Influences of Negative Self-Images and Interpretations in Social Phobia

INTERPRETATION INFLUENCES SELF-IMAGERY

An initial study investigating transfer of interpretation to imagery (briefly discussed above) was reported by Hertel et al. (2003), who used a method of inducing bias first developed by Grey and Mathews (2000). Normal volunteers were first presented with pairs of words that included a homograph having both threatening and benign meanings (e.g., *sink*, *fit*). Participants made a relatedness judgment which required them to indicate whether the words were related in meaning. Participants were allocated to groups according to whether the associated pairs were related to the threat (e.g., *sink-drown*; *fit-epilepsy*) or benign (e.g., *sink-basin*; *fit-strong*) meanings of each homograph. After this training phase, in a supposedly different study, participants were presented with new homographs as cues to produce mental images that they described aloud. Blind judges rated the recorded image content as more threat-related for participants trained to access threatening meanings of homographs than for those who had practiced accessing benign meanings. These data support the idea that an interpretation bias can influence the content of subsequent emotional images, although the findings were not specifically related to social anxiety.

Another study, designed to assess the effect of induced interpretation biases specifically on social imagery, was conducted by Hirsch, Mathews, and Clark (2006). Volunteers, who did not report high levels of social anxiety, were allocated to training conditions designed to induce either a negative or a benign interpretation bias. The method used was adapted from that reported by Mathews and Macintosh (2000) and involved reading scenarios depicting ambiguous social situations. The ambiguity was resolved at the end of each scenario, consistently in either a negative or benign way, depending on group allocation. After the training phase, participants listened to new descriptions in which the ambiguity was not resolved. Participants were asked to generate images of themselves in each

situation, to describe their images aloud, and to rate how pleasant or unpleasant it would be for them to be in the imagined situation. Those participants who had been allocated in prior training to read negative resolutions of the ambiguous social scenarios reported more negative self-images. That is, they rated their own images as being more unpleasant than did participants who had previously been exposed to benign resolutions. This finding was not confined to participants' own ratings, since an assessor who did not know to which group participants had been allocated also rated the image content reported by the negative-trained group as being less pleasant than that of the benign-trained group.

After completing the imagery task, participants rated how anxious they would feel in a to-be-anticipated stressful social situation (leading a seminar) and how well they thought they would perform. Participants trained to develop a more negative interpretation bias rated their anticipated anxiety in this stressful social situation as greater, and their expected social performance as poorer, than did participants trained to develop a more benign interpretation bias. Importantly, these data cannot be explained in terms of elevated anxious mood at the time of making the ratings, since the groups did not differ in this respect. It thus appears that a procedure previously shown to induce an interpretation bias (Mathews & Mackintosh, 2000) also influences later self-imagery, anticipated social anxiety, and estimated social performance. The combined cognitive biases hypothesis suggests that this may be because the induced negative interpretation bias influenced content of imagery and increased anticipated anxiety and expectations of poor social performance. Thus, negative interpretation bias may play a causal role in the maintenance of social anxiety, in part because it influences the content of self-imagery, anticipated anxiety, and poor performance.

IMAGERY INFLUENCES EMOTIONAL INFERENCES

As well as negative interpretations influencing the content of social imagery, the combined cognitive biases hypothesis suggests that negative self-images can influence interpretative processes. Specifically, negative self-imagery in social phobia may explain the lack of positive on-line inferences in social phobia. Hirsch, Mathews, et al. (2003) explored this possibility in a study in which low socially anxious volunteers completed the task described by Hirsch and Mathews (2000). The task involves reading descriptions of job interviews and performing speeded decisions at points of

emotional ambiguity and at other points when inferences were equally forced on everyone (baseline condition). In the study by [Hirsch, Mathews, et al. \(2003\)](#), low socially anxious participants performed the same task while either holding a negative self-image in mind (similar to that described by people with social phobia) or while imagining themselves in the described situation, but without the content of their self-image being specified. Data from participants in this latter condition replicated earlier findings of a benign inferential bias for nonanxious individuals: that is, decisions for words matching positive inferences in ambiguous situations were made as quickly as in the forced baseline condition. In contrast, the participants instructed to hold a negative self-image in mind showed no such evidence of making benign inferences and also reported higher levels of state anxiety. It appears that when nonanxious people are required to hold a negative image in mind it blocks their normal benign inferential bias. This finding suggests that the spontaneous negative self-imagery reported by people with social phobia may have a similar effect, consistent with their lack of a positive on-line inferential bias.

In addition to the detrimental effect of holding a negative self-image on generation of benign inferences, we have also investigated the influence of imagery on inferential processes by requiring participants with high levels of social anxiety to hold a more benign image in mind (in this case of a confident other person) while performing the task described by [Hirsch and Mathews \(2000\)](#). Specifically, [Hirsch, Clark, Williams, Morrison, and Mathews \(2005\)](#) required high interview-anxious volunteers to read descriptions of job interviews, either while imagining themselves in the described situation, or while holding an image as if from the perspective of someone who is confident in interviews. The results indicated that neither group showed evidence of strong on-line inferences: that is, both groups showed significantly slower latencies for responses in the ambiguous context relative to the forced inference baseline condition. However, relative to participants who imagined *themselves* in the situation, those who adopted the perspective of a confident interviewee had particularly slowed responses to words consistent with a threatening interpretation. The implication of this finding is that holding an image as if from the perspective of a confident person is particularly effective in blocking access to threatening interpretations of ambiguous social situations in high socially anxious individuals.

Beyond the hypothesis that self-imagery and interpretation biases combine to maintain social

anxiety, it is also possible that similar processes might operate in the etiology of social phobia. Evidence not inconsistent with this possibility was found by [Hirsch, Clark, Mathews, Williams, and Morrison \(2006\)](#), who asked participants who were very confident about public speaking to produce an image of themselves before giving a speech. This self-image was either of him- or herself performing extremely well or extremely badly while speaking in public. Participants then gave a speech, without any requirement to hold a particular image in mind during the speech. Participants who had previously generated a negative self-image reported feeling significantly more anxious during their speech than did those allocated to the positive image condition, had more negative thoughts and believed that they had performed less well. Interestingly, the impact of negative imagery did not seem to be mediated by changes in anxiety prior to the speech itself, since when this was statistically controlled the differences between conditions remained unchanged. Thus it appears that, even in those individuals who do not normally feel anxious while speaking in public, and who do not normally experience negative self-imagery, prior rehearsal of negative images can lead to increases in anxiety and more negative interpretations of their own performance. While the data from this study support the role of imagery in the maintenance of social anxiety, future research manipulating imagery in nonanxious people could help elucidate the potential role of imagery in the development of social anxiety. Specifically, because the images elicited in this study were intended to resemble those reported by clients with social phobia, this finding may indicate how self-images of performing poorly may, in some cases, contribute to the development of social anxiety in people who have not previously been vulnerable in this respect. It is possible that further research into the hypothesized combined actions of biased cognitive processes may provide information on the etiology, as well as the maintenance, of social phobia.

In summary, generation of negative self-imagery—resembling that evident in social phobia—is associated with higher levels of anxiety, increased self-perception of poor performance, and a greater overestimation of this poor performance in comparison to ratings made by objective judges.

A Combined Cognitive Biases Hypothesis

Research examining inferential bias and negative self-imagery in social phobia has often investigated these cognitive phenomena in isolation. However, the research reviewed so far strongly suggests these two processes can influence each other in a reciprocal manner. More specifically, in keeping

with most cognitive-behavioral models of social phobia (Clark & Wells, 1995; Rapee & Heimberg, 1997), we propose that the two cognitive processes of negatively biased interpretation and stereotyped self-imagery combine to maintain—and perhaps even contribute to the development of—social phobia. Research reviewed above indicates that negative self-imagery increases anxiety, beliefs about poor social performance, salient anxious symptoms, or any combination of those outcomes, as well as an exaggerated negative view of oneself as coming across poorly compared to assessors, over and above the objectively poorer performance and greater signs of anxiety assessed by blind judges (Hirsch, Clark, et al., 2003). Furthermore, as we discuss later, negative imagery can maintain or even augment the tendency to make negative interpretations of past and future social performance.

In addition to the impact of imagery on judgments of performance, negative self-imagery has been shown to block the normal positive interpretation bias evident in nonanxious people (Hirsch, Clark, et al., 2003), while positive or benign imagery further reduced access to threatening inferences so that they were even less available than is typical of nonanxious individuals (Hirsch et al., 2005). Given that negative self-imagery is common in social phobia, it seems likely that this imagery can block on-line inferences, thus negating any potential benefits from any veridical positive feedback.

Interpretations of ambiguity and on-line inferences about social outcomes can also influence self-imagery. Individuals in whom a negative interpretation bias had been induced went on to generate more negative self-imagery about ambiguous social situations (Hirsch et al., 2006). When faced with a potentially stressful social situation, the same group also reported more anticipated social anxiety and greater belief that they would perform poorly. The implication of these experimental findings is that the negative interpretations of ambiguous social situations reported by people with high social anxiety, and their lack of on-line positive inferences, may play a role in forming or maintaining negative self-images, and increasing their anticipated anxiety and poor performance.

The evidence that a negative interpretation bias influences imagery, and that negative self-imagery influences interpretations (and elicits anxiety), supports the hypothesis of mutual influence operating between the two processes. This hypothesis implies not only that cognitive processes contribute to the maintenance of the psychological dysfunction, but that their combined action has consequences beyond those that either bias would produce if operating in isolation. Specifically, the

detrimental impact of negative self-imagery is enhanced by negative interpretations of social performance, and the detrimental impact of negative interpretations (or lack of positive inferences) is enhanced when they are incorporated within self-images with consequent increases in experienced anxiety.

In the remainder of this paper, we speculate further on what a combined cognitive biases hypothesis suggests about social phobia and outline some possible clinical implications. This account is by no means an attempt to provide a complete theoretical model of social phobia, but rather should be considered as explicating one of the mechanisms within the more general cognitive models already outlined by Clark and Wells (1995) and Rapee and Heimberg (1997). Furthermore, the following sections are necessarily speculative and are put forward here with the intention of indicating possible future lines of research that might help to confirm or disconfirm the suggested mechanisms.

INITIAL INTERPRETATIONS AND THE DEVELOPMENT OF NEGATIVE SELF-IMAGERY

When speculating about the effects of the way in which imagery and interpretations influence each other, a useful starting point may be to think about how negative self-images might have originated and how their content may have been influenced by interpretations. Hackmann et al. (2000) observed that negative self-images reported by clients with social phobia are often based on a memory of an aversive or traumatic situation that occurred around the time of onset of the phobia. This suggestion is in keeping with the view of Conway (2001) to the effect that episodic events can be stored as images. Strictly speaking, however, it is not just the veridical sensory data that are stored as an image in memory, but also the interpretation that was made of the original event at the time. Even if the original event was really neutral or only mildly negative, but was interpreted at the time in a catastrophic way, then the stored memory is also likely to contain elements of the catastrophic interpretation, perhaps incorporated into the remembered image of the event. Support for the suggestion that self-imagery is related to such distorted memories comes from Hackmann et al. (2000), who reported that, although the images experienced in social situations appeared to be based on the memory of an actual social event, clients had often not made an explicit link between this original event and content of their negative self-image until they were asked about it, perhaps due to

source monitoring difficulties (Johnson & Sherman, 1990). Given that individuals with social phobia have a bias to generate negative interpretations of social situations, and catastrophize mildly and extremely negative social situations, it seems plausible that in some cases the original event may have been interpreted negatively (Brendle & Wenzel, 2004; Stopa & Clark, 2000; Voncken et al., 2003). Furthermore, clinical experience of working with the memories linked to images in social phobia indicates that, on reflection, clients often note that the actual event probably was not really as traumatic as was interpreted at the time and this negative interpretation was encapsulated within their self-image. Hence, an exaggerated negative interpretation may have been assimilated into the image-memory of the original event. This proposal is in keeping with the supposition that memory is an ongoing event of continuous reconstruction as the situation is recalled and further considered by the person (Coles, Turk, & Heimberg, 2002). Furthermore, other research has shown that interpretations can become more negative over time (Brendle & Wenzel, 2004). Assimilation of information into the image memory may occur during the frequent post-event processing that individuals with social phobia engage in after they have left the situation, when they ruminate on their prior performance (Kocovski, Endler, Rector, & Flett, *in press*; Mellings & Alden, 2000). These incorporated interpretations are apparently not spontaneously reevaluated but tend to remain in relatively encapsulated and unchanging form. Once such a distorted negative self-image has developed, it may be triggered automatically by social cues that match the original event in some way (Hackmann et al., 2000).

We described earlier an example of negative self-imagery in which a client had an image of himself with a bright red face and terrified eyes, as if he were a rabbit caught in headlights, unable to speak clearly and looking really pathetic. Clearly, one key role for interpretation in the chain of events from the original situation to its translation into a negative self-image is an exaggerated negative interpretation of the original event. If the event was interpreted in a benign manner (whether the event was actually positive, neutral, or mildly negative), then the episodic information would have been assimilated into memory in the way consistent with that emotional interpretation. If so, the image would not be expected to intrude spontaneously into consciousness, or if it did, would not be accompanied by any strong negative emotions related to the original interpretation. In contrast, a catastrophic interpretation of the original event might result in the episodic informa-

tion from the original event being processed in a manner similar to traumatic information in post-traumatic stress disorder, with similar intrusive qualities. In social phobia, it is proposed that memories of the original event, in a form potentially influenced by the negative interpretations made of it at the time, recur repeatedly in the form of negative self-images or self-impressions when reactivated by social situations. Support for this suggestion comes from work by Erwin, Heimberg, Marx, and Franklin (*in press*), who have shown that people with social phobia have intrusive recollections of traumatic social events from earlier times and that they react to these intrusions with symptoms not dissimilar to those typically classified as part of posttraumatic stress disorder.

SUBSEQUENT EFFECTS OF SELF-IMAGERY ON INTERPRETATIONS

Once developed, a negative self-image or impression tends to have a number of detrimental consequences, including increases in social anxiety, blocking on-line inferences, and influencing later off-line judgments about performance. As noted earlier, the generation of negative images seems to have particular potency for eliciting congruent emotions, such as anxiety (Holmes & Mathews, 2005). There are several possible reasons for this association between imagery and emotion. As mentioned earlier, emotional episodes may be stored in memory as images, complete with the representation of the emotional reaction, so that recall of that image necessarily elicits elements of the original reaction (Conway, 2001; Holmes & Mathews, 2005). Alternatively, given that the fear system evolved prior to language, it may be that representations within the fear system are encoded in perceptual rather than verbal form (Mathews & MacLeod, 2002). Finally, since images are closely related to perceptual representations, and indeed can sometimes be confused with reality, emotions elicited by real events are likely also to be provoked by related images.

In any event, self-images and the associated emotions may act to interfere with other cognitive operations. One important consequence of this is that attention to, and on-line inferences about, actual social performance or how other people are reacting are reduced or even eliminated. We noted earlier some evidence that nonanxious individuals do indeed make inferences about social situations that are predominantly biased in a positive direction. It seems likely that these positive inferences are adaptive in that they serve to maintain self-esteem and prevent social anxiety from developing (Hirsch & Mathews, 2000). Erosion of, or complete loss of,

the capacity to make inferences thus leaves the socially anxious individual emotionally vulnerable and with no way of repairing his or her mood or self-esteem via inferences based on positive feedback from others, or about his or her own successful performance.

Although less clearly supported by current evidence, there are also some indications that the content of mental imagery has directional effects on the valence of any residual inferences that are made. As noted earlier, [Hirsch et al. \(2005\)](#) found that imagining a confident person had differential effects on the valence of inferences made by socially anxious individuals. Despite a relative lack of strong inferences of any kind in this group, the confident interviewee image had a disproportionate impact in making negative inferences even more difficult to access. The implication of this finding is that holding an image of a confident person is especially effective in blocking access to threatening interpretations, even though there was no evidence that any positive interpretations had been reinstated. It may be that any directional effect due to the emotional content of images operates mainly by inhibiting incongruent interpretations, rather than by facilitating congruent interpretations. Alternatively, it may be that the habitual absence of positive interpretations makes it particularly difficult to reinstate them, and more prolonged practice with positive imagery might be needed before any congruent facilitation of positive inferences could be detected.

SUBSEQUENT EFFECTS DUE TO INTERPRETATION OF SELF-IMAGES

People with social phobia appear to be influenced by the content of their negative self-images when making judgments of how they come across in social situations, rather than by any actual feedback from other people. Processing social feedback requires good eye contact and involvement in a social interaction, both of which are likely to be threatening for clients with social phobia. Judging performance on self-imagery may be a less threatening (but unfortunately less accurate) way of collecting the information. Reliance on the negative self-image when making (off-line) judgments of performance is strongly suggested by the discrepancy between objective judges' ratings and self-ratings of performance, with the discrepancy being greater when a negative image is held in mind than when holding a more benign image ([Hirsch, Clark, et al., 2003](#); [Hirsch et al., 2004](#)). In this way negative self-images influence judgments made by people with social phobia about how they are coming across to others, reinforcing expectations

about similar negative outcomes in the future. Although the most obvious effect of manipulating mental image content was on self-ratings of anxiety and performance, in fact, other people did judge the socially anxious individual's performance more critically when a negative image was being held in mind by that individual (as compared to a benign image). Thus, although an individual with social phobia believes that his or her anxiety is much more evident than it actually is (as assessed by observers), the symptoms are in fact observable to others, albeit to a much lesser extent than the anxious person thinks.

The misinterpretation of an image as representing how the person appears to others during a social encounter suggests a failure to connect the current image with the past aversive social situation, so that the person fails to realize that the image is a form of memory rather than an accurate reflection of how he or she appears now. As well as inferring that a symptom or behavior is observable, socially anxious individuals also make other interpretations based on their own negative self-images. Clients with social phobia are likely to infer that their symptoms of anxiety will be noticed by other people, since in the image the symptoms are very evident. A further effect of negative interpretive bias is that the socially anxious individuals may believe that others will judge any observable symptoms of anxiety very harshly and think that people in general view symptoms of anxiety as indicating something is seriously wrong with the person who displays them ([Roth et al., 2001](#)). Finally, clinical experience suggests that interpretations also have a role in triggering the onset of negative self-images. When a person with social phobia experiences certain internal sensations (such as a warm face) the anxious person may infer that these sensations are indicative of an observable symptom of anxiety (such as blushing). In general, such biased inferences can serve to enhance the symptom itself and also to maintain and reinforce the negative self-image.

CLINICAL IMPLICATIONS

Research discussed above indicates that negative biases of interpretation and imagery contribute to the maintenance of social phobia, so clinical interventions that address these biases either individually or in combination are likely to be therapeutic. Although individuals without social anxiety do not typically generate any self-imagery in social situations, clinical experience indicates that clients with social phobia often find it difficult to stop generating negative self-images, partly because their images occur spontaneously and are

triggered by a number of sensory and perceptual cues. Given this difficulty, it may be more therapeutic to help clients with social phobia to initially substitute their normal negative self-image with another more benign self-image, as a preparatory step towards being able to dismiss self-images altogether. More benign self-imagery can be accessed via video feedback with cognitive preparation as developed by [Clark and Wells \(1995\)](#) and detailed by [Harvey, Clark, Ehlers, and Rapee \(2000\)](#). A further advantage of video feedback is that it enables clients to understand that their negative self-image does not reflect how they actually come across to other people, since they look much less anxious on video than they feel. In this regard it is interesting to note that video feedback is most effective for individuals who have a very unrealistically negative impression of their performance which will, at least in part, be based on their negative self-image ([Rodebaugh, 2004](#); [Rodebaugh & Rapee, in press](#)). Two randomized controlled trials that incorporated these techniques and others that focus on imagery and interpretations have been successful in reducing social phobia ([Clark et al., 2003](#); [Stangier, Heidenrieck, Peitz, Lauterbach, & Clark, 2003](#)).

A further possible therapeutic development is the use of computerized training, such as that developed by [Mathews and Macintosh \(2000\)](#) and discussed above in relation to training interpretation biases. Using Mathews and Macintosh's paradigm, [Murphy, Hirsch, Mathews, Smith, and Clark \(2005\)](#) successfully induced a more benign interpretative bias in high socially anxious volunteers, resulting in less anticipated anxiety for a subsequent social task. If these findings are replicated in clients with social phobia, it could pave the way for cognitive-behavioral therapy to be enhanced by the addition of computerized training of a benign interpretation bias, which could help reduce social anxiety more efficiently.

Given that imagery and inferential processes combine in their effects, another clinical implication is that interventions that target one cognitive process (e.g., imagery) could also have an impact on another (e.g., interpretation). If so, then therapy that focused on one cognitive bias could have effects on other biases. Despite the proposal that targeting one bias may influence other biases and thus enable therapeutic change, when cognitive biases are rigidly entrenched, which may be more likely to occur with more complex or treatment-resistant clients, focusing on just one cognitive process may be insufficient to manifest change. In these cases, then, clients may benefit more from a two-pronged approach that addresses more than

one cognitive bias concurrently. For example, targeting two biases at the same time may enable more rigid cognitive structures to become more malleable, with slight modification of one cognitive process helping ameliorate the other, and vice versa, in order to facilitate clinically meaningful change. These clinical implications should be investigated in order to determine their utility.

The Combined Cognitive Biases Hypothesis: Implications for Other Biases and Disorders

Thus far the combined cognitive biases hypothesis has only been examined in relation to interpretation and imagery in the maintenance of social phobia. There are, however, a number of other cognitive biases evident in social phobia. Future research could usefully investigate the way different cognitive biases combine to augment social anxiety. For example, [Clark and Wells \(1995\)](#) proposed that self-focused attention increases perception of bodily sensations, which in turn may reinforce negative self-imagery and, as discussed above, such imagery can increase anxiety, in turn motivating greater self-focused attention. Hence, research examining how self-focused attention reinforces self-imagery could enhance our understanding of how these processes combine to maintain social phobia and pave the way to refine treatments further. Another potential combined effect of cognitive biases that could be interesting to research experimentally would be the combined effects of self-focused attention and interpretation of bodily sensations, as postulated by [Clark and Wells \(1995\)](#) and [Rapee and Heimberg \(1997\)](#). Self-focused attention may increase the detection of ambiguous physiological sensations, which may be interpreted in an unambiguously negative fashion. Once this has occurred, this explicit negative information may be preferentially attended to, thus providing more opportunity for further interpretive processing to occur. Furthermore, the negative interpretation and attention may in turn increase the salience of any negative imagery, as discussed above. Experiments designed to evaluate these hypothesized combined effects would be informative.

The potential utility of examining the combined cognitive biases hypothesis is not confined to social phobia. [Neisser \(1967\)](#) postulated that many normal cognitive processes are cyclical, so that, for example, interpretation of an object as significant leads to enhanced attention to it, allowing its interpretation to be refined, and so on. It is proposed here that the cyclical nature of cognitive processes equally applies to abnormal psychology and that such processes may have a causal role in

the maintenance and development of a range of psychological disorders. Given that several cognitive biases have been identified in all psychological disorders investigated to date, then research examining the combined action of different prominent biases for a given disorder is likely to provide new insights into how the disorder persists. For example, research investigating the combined influence of attention and interpretation in panic disorder could be informative. In keeping with Clark's (1986) cognitive model of panic, attention to internal bodily sensations increases perceived physiological sensations and this will then provide more information that could be interpreted in a threatening manner, thus fueling anxiety. If a threat interpretation is made, then these physiological sensations will be attended to more and further negative interpretations may be generated. Research investigating the combined effects of attention and interpretative processes could enhance our understanding of the mechanisms underlying panic attacks.

Finally, it may be that the combined cognitive biases hypothesis of the maintenance of psychological dysfunction can also be usefully applied to issues of comorbidity. If psychological disorders are maintained by a number of cognitive biases, then clients who suffer from more than one disorder may have the cognitive biases associated with the individual different disorders operating concurrently. If so, then the biases may combine to maintain the different comorbid disorders. It may, in part, be the combination of cognitive biases across comorbid disorders that hinder therapeutic improvement in more complex comorbid cases. A related point is that the normal cognitive biases evident in a given disorder may operate differently, or not at all, when another comorbid disorder is present. For example, in relation to social phobia it has been shown that when clients have comorbid depression, their normal attentional biases are no longer evident (Grant & Beck, 2006; Musa, Lepine, Clark, Mansell, & Ehlers, 2003). The absence of attentional bias could be due to a number of factors, including the effects of other cognitive biases that are evident in depression. Clearly, the hypothesis that cognitive biases of comorbid disorders may operate in combination, or may influence the typical operation of a given bias, needs to be investigated further. Hence, research which investigates the combination of cognitive biases across comorbid disorders could pave the way for a better understating of how comorbid disorders are maintained and facilitate increased therapeutic effectiveness, perhaps eventually paving the way for conceptualizing a client's problems in terms of

different cognitive biases, rather than merely in relation to different symptom configurations.

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