

## PRACTICE REVIEW

# CLINICAL IMPLICATIONS OF ATTENTIONAL BIAS IN ANXIETY DISORDERS: AN INTEGRATIVE LITERATURE REVIEW

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*Research on information processing biases has been motivated by the hope that it would lead to new and more efficient psychotherapeutic interventions. The literature is abundant with empirical data of attentional biases toward threat stimuli in anxiety disorders. This article aims to review the existing literature on the topic of attentional bias in anxiety disorders and discuss important implications for clinical practice. We adopted an integrative approach to link research data on attentional bias, information processing, and cognitive accounts (automaticity and controllability) with clinical practice in cognitive-behavioral therapy. It is important to develop and apply therapeutic interventions that can effectively reduce negative attentional biases while treating the main problems associated with anxiety disorders. However, it remains to be seen whether cognitive therapy interventions targeting more voluntary, strategic information processing can have a positive impact on automatic, involuntary processing involved in attentional biases.*

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During the past two decades experimental psychopathologists have increasingly applied the concepts and methods of cognitive psychology to explain cognitive biases associated with anxiety, depression, and anger. These studies have proved to be very successful in mapping out the various cognitive changes in different functional and dysfunctional emotional states. One of these research areas that attracted the attention of both clinical and experimental psychologists is attentional bias in emotional disorders (e.g., Beck, 1976; Beck & Clark, 1997; Eysenck, 1992; Gelder, 2001; Mathews, 2001; Mathews & MacLeod, 1994; McNally, 1995; Mogg & Bradley, 1998; Williams, Watts, MacLeod, & Mathews, 1997). Cognitive models suggest that information-processing biases cause, maintain, and exacerbate anxiety symptoms because anxious individuals fail to attend to information that signifies safety or that provides information to make a more realistic and logistic interpretation of the situation (e.g., Beck, Emery, & Greenberg, 1985; Mathews, 1990; Mathews & MacLeod, 2002).

It has long been assumed that emotions such as fear and anxiety direct attention by emphasizing the affectively toned stimuli in the environment that are significant to the individuals (Oatley & Jenkins, 1996). Mood-congruence theory assumes that information is selectively encoded or retrieved while individuals are in a mood state consistent with the affective valence of the information (MacLeod, 1999). This selective attention can activate associated memory processes (Bower, 1981, 1987). It is

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now widely accepted that anxious individuals selectively attend to the threat-related information in the environment (e.g., Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van Ijzendoorn, 2007; Gotlib, Kasch, Traill, Arnow, Joermann, & Johnson, 2004; MacLeod, Mathews, & Tata, 1986; Mathews & MacLeod, 1994). In contrast, the evidence for a similar attentional bias toward negative stimuli in depression is relatively inconsistent. A number of studies have shown that depressed individuals exhibited selective attention to negatively toned stimuli (e.g., Gotlib, Krasnoperva, Yue, & Joermann, 2004; Mathews, Ridgeway, & Williamson, 1996), whereas some others failed to find attentional biases in depression (e.g., MacLeod et al., 1986; McCabe & Gotlib, 1995; Mogg, Bradley, Williams, & Mathews, 1993). However, clinical or nonclinical depression is often characterized as the predominance of negative memory biases rather than attentional biases (e.g., Bradley, Mogg, & Williams, 1995; Denny & Hunt, 1992; Ruiz-Caballero & Gonzalez, 1994; Watkins, 2002; Watkins, Martin, & Stern, 2000). It has been suggested that the attentional biases sometimes seen in depression are a function of elevated anxiety levels often observed in depressed individuals (Yovel & Mineka, 2005).

In general, research on information-processing biases has been motivated by the hope that it would lead to new and more efficient therapeutic interventions. Given that the existence of cognitive biases for negative information in emotional disorders has been well documented, a next phase of research is to establish whether or not such biases are amenable to treatment and, if so, more specifically to determine the corresponding therapeutic interventions. Thus, it is important to move beyond description of threat-relevant biases and design studies that examine the effectiveness of cognitive and behavioral interventions in modifying such biases. This article aims to review the existing literature on the topic of attentional biases in anxiety disorders and then discuss important implications derived from these studies for clinical practice. We adopted an integrative approach to link research data on attentional bias, information processing, and cognitive accounts (automaticity and controllability) with clinical practice in cognitive-behavioral therapy (CBT) and outlined the directions for fur-

ther research on the applications of CBT interventions to reduce such biases.

### Attentional Bias and Anxiety Disorders

A large body of literature has described the attentional bias exhibited by clinically or nonclinically anxious individuals (see Bar-Haim et al., 2007, for a recent review). Researchers have investigated attentional biases in a variety of anxiety disorders, positing that such biases might play a role in the aetiology and maintenance of problems associated with anxiety disorders. The literature examining attentional bias has widely used variants of the emotional Stroop or the dot-probe detection tasks.

In the Stroop color-naming task, subjects are presented with emotionally threatening words (e.g., *danger* or *injury*) and emotionally nonthreatening words (e.g., *chair* or *picture*) in different-colored print, and are asked to name the color of the ink as quickly as possible, rather than reading the word (Mathews & MacLeod, 1985). Slowed response indicates that subjects attended to the content of the word, making it more difficult simply to name the color; this effect is known as *interference effect*. Stroop studies have been quite consistent in showing that clinically and nonclinically anxious individuals have repeatedly been found to display disproportionately longer color-naming latencies on the threat-related words than nonanxious control subjects (see Williams, Mathews, & MacLeod, 1996, for a review). Such results are typically interpreted in terms of the attention of anxious individuals to be preferentially allocated to the threat content of stimuli.

There are two competing explanations for the attentional biases shown in the emotional Stroop task: general emotionality and disorder specificity. In line with the theory of disorder specificity, studies have shown that patients with anxiety disorders demonstrate longer latencies to color-name threat words that are specific to their disorder than to neutral words. For example, patients with social phobia displayed longer latencies to color-name social threat (e.g., public speaking-related) words (Amir, Freshman, & Foa, 2002; Hope, Rapee, Heimberg, & Dombeck, 1990; Mattia, Heimberg, & Hope, 1993; Spector, Pecknold, & Libman, 2003), while those with panic disorder showed longer latencies to color-name physical threat words (e.g., Ehlers, Margraf, Davies, & Roth, 1988; McNally, Riemann,

& Kim, 1990). Patients with obsessive-compulsive disorders (OCD) also displayed specific attentional biases measured by longer latencies to color-name OCD related words (Cohen, Lachenmeyer, & Springer, 2003; Foa, Ilai, McCarthy, Shoyer, & Murdock, 1993; Lavy, van Oppen, & van den Hout, 1994; see also Muller & Roberts, 2005 for a review), whereas individuals with generalized anxiety disorders (GAD) showed a general attentional bias toward negative emotional words (Becker, Rinck, Margraf, & Roth, 2001; Bradley, Mogg, Miller, & White, 1995) or threat words with physical danger contents (e.g., "injury") (Mogg, Mathews, & Weiman, 1989). Similarly, the longest color-naming latencies have been found on fear-related words in patients with specific phobia (Johnsen, Thayer, Laberg, Wormnes, Raadal, Skaret, Kvale, & Berg, 2003; Lavy, van den Hout, & Artuz, 1993; Watts, McKenna, Sharrock, & Trezise, 1986), on words related to the traumatic events in patients with post-traumatic stress disorder (PTSD) (Foa, Feske, Murdock, Kozak, & McCarthy, 1991; Kaspi, McNally, & Amir, 1995; Pineles, Shipherd, Welch, & Yovel, 2007), and on illness-related words in patients with elevated high health anxiety (Owens, Asmundson, Hadjistavropoulos, & Owens, 2004). Moreover, there has been considerable evidence that longer response latencies on threat-words bias can be observed in nonclinical trait anxious populations, that is, anxiety as a personality disposition (Broadbent & Broadbent, 1988; Egloff & Hock, 2001).

In a dot-probe task (MacLeod et al., 1986), participants are shown a pair of stimuli (word or pictures) for a short time at two different spatial locations on a screen. One of the stimuli is neutral and the other stimulus is emotionally valenced. After the stimuli are erased, a dot probe immediately appears in the location of one of the stimuli and the subject should press the corresponding response key to indicate its position whenever he/she detects the probe. It is assumed that responding to the probe will be faster when attention is already allocated to the spatial location where the probe appears. If participants respond more quickly to a probe displayed in the same location as emotionally valenced stimulus, this suggests that they are attending to that negative stimulus. Using this paradigm, MacLeod and colleagues found that anxious patients detected probes faster when these (dots) appeared in the

vicinity of the threat words, supporting the hypothesis that these patients systematically directed their attention toward the threat-related stimuli (MacLeod et al., 1986). With the use of different variants of this method, such effects have been replicated by other investigators in individuals with GAD (e.g., Mogg & Bradley, 2005; Mogg, Mathews, & Eysenck, 1992), OCD (e.g., Tata, Leibowitz, Prunty, Cameron, & Pickering, 1996), PTSD (e.g., Bryant & Harvey, 1997; see Buckley, Blanchard, & Neill, 2000, for a review), social phobia (e.g., Mogg & Bradley, 1999, 2002; Musa, Lepine, Clark, Mansell, & Ehlers, 2003), panic disorder (e.g., Kroeze & van den Hout, 2000), dysphoria (e.g., Beevers & Carver, 2003; Bradley, Mogg, & Lee, 1997), and nonclinical anxiety (Mogg, Bradley, De Bono, & Painter, 1997). Taken together, these studies support an anxiety-related bias in shifting attention toward the location of briefly presented threat stimuli in clinical and nonclinical anxiety samples.

The duration at which participants are exposed to threat stimuli on the dot-probe task may play a key role in determining attention allocation. For example, as with the Stroop method, some studies have suggested enhanced attention to fear-relevant stimuli in specific phobias, but others suggested avoidance. These findings are not necessarily incompatible, because there may be an initial attentional bias towards fear-relevant stimuli in phobic individuals, which subsequently resulted in avoidance of threat cues in some anxious individuals. Consistent with this view, Mogg and Bradley (2006) found that the short stimulus-exposure conditions (100 ms, subliminal) produced a rapid, initial attentional bias for fear-related stimuli in spider-fearful individuals, but this selective attention disappeared at longer stimulus durations (200 and 500 ms, supraliminal). In another study, Cooper and Langton (2006) have found that normal participants initially attended to the angry face at 100-ms presentation and then shifted to the happy face by 500 ms. More recently, Koster, Crombes, Verschuere, Damme, & Wiersema (2006) have shown that high trait anxious individuals showed enhanced attentional engagement with, and had impaired disengagement from, highly threatening information at 100-ms picture presentation, but at 200 and 500 ms they showed rapid attentional avoidance (disengagement) from threat. In other studies, it has been reported that socially anxious individuals demonstrated quicker orienting to,

and disengagement from, emotional faces relative to neutral faces (Fox, Russo, Bowles, & Dutton 2001; Garner, Mogg, & Bradley, 2006). Consistent with vigilance-avoidance hypothesis (see Williams et al., 1997), these findings suggest that processing information in a subliminal level (100 ms) may require initial rapid orienting toward emotional stimuli followed by avoidance or quick disengagement of attention in a supraliminal level (500 ms or above) of processing.

It is worth noting that not all studies reported an attentional bias in anxiety disorders (see de Jong & Martens, 2007; Kampman, Keijsers, Verbraak, Naring, & Hoogduin, 2002; Wenzel & Holt, 1999). One reason for this lack of attentional bias might be that biases toward semantic representations of threat (e.g., threat words: *spider*, *disease*) may be different from biases toward actual threat experienced, particularly in specific phobia (e.g., actual spider or disease). Using more ecologically valid stimuli in the dot-probe task may provide a more direct measure of attentional bias than words. For instance, to examine attentional bias in social phobia, high socially anxious individuals can be shown a video of social performance (e.g., public speech) and then their attention can be measured with the use of an eye-tracking technique. It is also suggested that there might be different patterns of attentional allocation between analog and clinical groups.

It has been argued that the findings based on the dot-probe paradigms can be interpreted as a difficulty to disengage attention from threat, rather than vigilance for threat (Koster, Crombez, Verschuere, & Houwer, 2004). For example, Amir, Elias, Klumpp, and Pezeworski (2003) found that individuals with social phobia have difficulty disengaging their attention from socially threatening stimuli rather than demonstrating a facilitated processing of threat. In a more recent study using two versions of the dot-probe task, researchers have found that trait anxiety is related to disengagement difficulties rather than faster orienting toward threat (Salemink, van den Hout, & Kindt, 2007). This delayed disengagement hypothesis has also been supported in a study that showed high trait anxious individuals demonstrated a specific tendency to dwell on fear-relevant stimuli, as opposed to negative information in general (Georgiou, Bleakley, Hayward, Russo, Dutton, Eltiti, & Fox, 2005). One of the plausible accounts for these findings is that the

difficulty to disengage attention from threat might occur in a later stage of information processing, when memory processes related to maladaptive schemas are activated.

On the other hand, recent studies have suggested that, depending on the sources of attentional focus (i.e., external vs. internal cues), some anxious patients actively avoid external cues, while paying attention to internal stimuli. Chen, Ehlers, Clark, and Mansell (2002) found that patients with generalized social phobia directed their attention away from the facial expressions with positive, negative, and neutral valence, despite being faster in identifying the probe in the location of household objects in a dot-probe task. It has also been found that nonclinical socially anxious participants exhibited preferential attention to information about internal physiological cues (e.g., heart rates) relative to a sound wave (Bögles, Rijsemus, & DeJong, 2002; Pineles & Mineka, 2005). In line with the Clark and Wells (1995) model of social phobia, these findings emphasize the role of self-focused attention and reduced processing of external social cues in maintaining social anxiety. With the use of real-life threat stimuli, this differential attentional pattern toward physical threat cues was shown in individuals with panic attacks (Ehlers & Breuer, 1995).

Although attentional biases in adults have been widely studied for more than two decades, similar studies in children and adolescents are relatively new. Using the emotional Stroop or the dot-probe paradigms, a number of studies have reported threat-related attentional biases in anxious children and adolescents (e.g., Eschenbeck, Kohlmann, Heim-Dreger, Koller, & Leser, 2004; Heim-Dreger, Kohlmann, Eschenbeck, & Burkhardt, 2006; Hunt, Keogh, & French, 2007; Reid, Salmon, & Lovibond, 2006; Richards, Richards, & McGeeney, 2000; Tagavi, Dalgleish, Moradi, Neshat-Doost, & Yule, 2003). In a more recent review, Puliafico and Kendall (2006) have concluded that a large body of research suggests that anxiety-disordered youth selectively allocate their attention toward threat-related information.

Taken together, although a wealth of literature suggests that anxious individuals selectively attend to the threat stimuli, findings of attentional bias may differ depending on the nature of stimuli, duration of stimulus presentation, clinical or nonclinical features of anxiety, variants of measures, type of the disorder and source of threat

stimuli (external vs. internal cues). As information processing involves both preconscious and conscious levels of processing, it is important to determine whether attentional bias occurs automatically or is a voluntarily controlled process. Consistently, cognitive models differ in terms of the stages of information processing involved in the biased processing. As automaticity or controllability of information processing has clinical implications, in the next section we review some of the relevant cognitive accounts and discuss their implications for treatment.

### Automatic and Controlled Information Processing

It is clinically important to determine whether attentional bias in anxiety disorders is a function of *automatic* (involuntary) or *strategic* (voluntary) processing. To formulate therapeutic interventions, cognitive-behavioral therapists should be aware of the cognitive models that describe automaticity and controllability of human information processing. Cognitive models differ with regard to the roles they assign to biases in perceptual and conceptual properties of stimuli. In line with this account, some cognitive theories propose that biases in information processing occur at all stages of information processing (Beck et al., 1985; Beck & Clark, 1997; Bower, 1981, 1987), whereas some other models suggest that these biases occur at specific stages of information processing (McNally, 1995; Williams et al., 1997).

According to schema-congruent theories (Beck et al., 1985; Beck & Clark, 1997; Bower, 1981, 1987), schemas guide information processing and largely determine how information is attended to, encoded, interpreted, and remembered. As a result, threat-related stimuli are preferred at all stages of information processing, including early perceptual processing such as attention and stimulus encoding and later conceptual processing such as memory and interpretation.

Beck and Clark (1997) have introduced a three-stage model of information processing of anxiety consisting of (a) *initial registration*, (b) *immediate preparation*, and (c) *secondary elaboration*. The first stage of processing involves a very rapid, involuntary, and automatic recognition of threat information by the activation of the *orienting mode*. The recognition of a negative stimulus leads to the immediate preparation stage

involving the activation of the *primal mode*. In this mode, a cluster of interrelated schemas is activated to meet evolutionary-derived objectives such as safety and security (Beck, 1996). The primal-mode processing involves a mixture of both automatic and more elaborative or strategic processing (e.g., activation of negative automatic thoughts). The activation of the primal mode leads to secondary elaboration stage, that is, elaborative and strategic processing based on the activation of the *metacognitive mode*. At this stage information processing is characteristically slow, effortful, and schema driven. Beck and Clark (1997) suggested that automatic anxious thoughts and biased cognitive processing result from the activation of the orienting and primal threat modes at the earlier stages of information processing. Therefore, according to Beck and Clark (1997) the main task in treating anxiety disorders should focus on the deactivation of the primal-threat mode and the strengthening of more reflective and elaborative processing.

As mentioned earlier, other theories propose that anxious individuals are prone to biases at specific stage of information processing. Based on these models, some authors have suggested that attentional system of anxious individuals is dysfunctionally sensitive to, or facilitated by threat-related stimuli and that these individuals tend to direct their attention toward threatening cues during an early, automatic stage of information processing (McNally, 1995; Williams et al., 1997). Mathews (1990) proposed that anxiety is associated with hypervigilant mode in which the individuals automatically scan the environment for threatening stimuli. This initial attentive mode prioritizes the automatic encoding of threat, but not the more strategic and elaborative processing that will serve subsequent recall. Mathews (1993) further proposed that there are individual differences in readiness to adopt a vigilant processing mode for threat, and that vulnerable people experiencing stressful life events are more likely to present hypervigilant mode for threat (i.e., the bias is an interactive function of trait vulnerability and stressors). Öhman (1993) emphasized the role of automatic and preattentive processes in mediating vulnerability to phobias. Once this preattentive mechanism detects a threatening stimulus, attention automatically shifts to its location. Later, Öhman (1996) suggested that the automatic nature of this mechanism might explain why phobic reactions have proved relatively re-

sistant to conscious interventions, such as verbally mediated attempts to modify fear responses. The assumption that preattentive and attentional biases operate as cognitive predisposing (vulnerability) factors for anxiety disorders is also a key feature of Eysenck's (1992) hypervigilance theory. According to this view, such biases should be evident primarily in anxiety-prone individuals under stressful conditions or nonclinical individuals with high trait anxiety who are experiencing adverse life events.

Taken together, it is important to determine whether attentional bias is an automatic process or occurs in an elaborative, more controlled stage of cognitive processing. One of the questions drawn from this conclusion is that if attentional bias occurs in earlier, automatic stages of information processing, will conscious therapeutic interventions (e.g., cognitive therapy) be helpful for patients with anxiety disorders? For example, McNally (1995) suggests that verbally mediated therapies will be ineffective in the treatment of anxiety disorders because the attentional bias occurs in the early stages of information processing, and is involuntary and possibly unconscious. In the following section, we discuss implications of attentional biases in anxiety disorders for clinical practice in the light of automatic or controlled information processing.

### **Clinical Implications for Cognitive-Behavioral Therapy**

So far there have been very few direct clinical applications of experimental work on attentional bias in terms of the development of therapeutic techniques. Given that a biased attention toward threat stimuli in anxiety disorders is well documented, it is important for clinicians to develop and apply therapeutic interventions that are effective in reducing attentional bias as well as treating the main anxiety problem. As Dalglish and Watts (1990) suggested, part of the treatment contribution of these findings is more likely to lie in the modification of existing CBT techniques rather than developing new techniques.

#### *Implications for Behavioral Interventions*

To the extent that attentional bias is automatic and involuntary, behavioral interventions such as exposure-based treatment may be more efficacious than verbally mediated therapy. Behavioral

interventions such as graded in vivo or imaginary exposure, and anxiety management training may help anxious clients exert control over their attentional processing. Such interventions may block further elaborative processing of threat stimuli, thereby preventing the activation of anxious thoughts in memory structure. Although they emphasize the importance of the verbal mediation interventions (cognitive therapy) for anxiety disorders, Beck and Clark (1997) concluded that verbal mediation is a necessary but not sufficient component of any anxiety treatment approach. They proposed that exposure is an essential component of anxiety reduction because it ensures the complete activation of primal threat mode so that more adaptive elaborative processing of the threat can be taken place. From a cognitive perspective, it is assumed that activating beliefs with the use of in vivo exposure techniques provides optimal conditions for testing and disconfirming the negative cognitions, and such disconfirmation is then more likely to generalize to similar social situations.

From a behavioral perspective, the repeated experience of a neutral stimulus as conditioned stimulus (CS<sup>+</sup>) associated with a threatening experience as unconditioned stimulus (US) results in attentional resources diverted toward the CS<sup>+</sup> (Dawson, Schell, Beers, & Kelly, 1982; Mackintosh, 1975). Therefore, an attentional bias is subject to extinction if the CS<sup>+</sup> presented without US reinforcement. It has been reported that experimentally induced attentional bias in a nonclinical sample can be extinguished by CS<sup>+</sup> presentations without US (Van Damme, Crombez, Hermans, Koster, & Eccleston, 2006). Moreover, exposure provides opportunity to habituate and acquire new experiences and preclude reinforcing the maladaptive behaviors (see Marks, 1986). Thus, exposure may be an effective intervention in modifying attentional bias to threat in anxiety disorders.

Evidence of alternations in attentional biases following treatment of anxiety disorders may be also conceptualized within the theoretical framework of an "emotional processing" model (see Foa & Kozak, 1986; Foa & McNally, 1986). In this model, the extended and repetitive presentation of the feared object or situation (flooding or graded exposure) is thought to provide corrective or incompatible information that can lead to a reprocessing of fear memory structures composed of three essential propositions (elements): the stimulus element, the response element, and

the meaning element. Thus, the activation of several mechanisms can lead to potentially therapeutic changes in emotional processing of the fear- and anxiety-related stimuli, and subsequently reducing attentional biases.

A number of studies reported to have found that behavior therapy interventions such as *flooding*, *graded exposure*, *desensitization*, and *anxiety management* can produce a positive therapeutic effect on attentional biases in patients with OCD (Foa & McNally, 1986), specific phobia (Lavy et al., 1993; Watts et al., 1986), and GAD (Mathews, Mogg, Kentish, & Eysenck, 1995; Mogg, Bradley, Miller, & White, 1995). However, there are some difficulties interpreting these findings. For example, it is not clear whether a reduction in attentional bias is a direct by-product of habituation or symptom relief due to exposure exercises or anxiety reduction following relaxation training, or whether the positive therapeutic effect on attentional bias is interpreted as a reduction in or complete elimination of attentional bias; these studies often included short-term interventions with no follow-up phase. Furthermore, in some of these studies behavior therapy was far from a clear-cut experimental intervention. It also should be noted that these studies used color-naming latency (interference effect) based on the Stroop task, so their findings need to be replicated with the use of the dot-probe paradigm. Although exposure-based interventions are an integral part of CBT for anxiety disorders, no study has compared the effectiveness of exposure therapy versus cognitive therapy on attentional biases in anxiety disorders.

### *Implications for Attention Training Strategies*

In addition to more conventional cognitive and behavioral interventions, attention training (ATT) can be applied as part of a brief intervention program to divert attention from potential anxiety-provoking cues. ATT strategy is based on the assumption that someone can only fully attend to a single stimuli or thought at a given time. This displaces the anxiety-provoking cue and, thereby, prevents the activation of associated negative thoughts. Wells and Mathews (1994) developed the self-regulatory executive function (S-REF) model that causally links psychopathology to self-focused attention or online processing of negative self-beliefs, threat monitoring, and maladaptive coping. In this model, ATT is a key

component of cognitive-behavioral treatment, which aims to modify perseverative self-relevant processing associated with emotional disorders (Wells, 2000). The role of self-focused attention is also emphasized in depression. According to the self-regulatory perseveration theory proposed by Pyszczynski and Greenberg (1987), the negative memory bias commonly found among depressive subjects is mediated by a depressive self-focusing style in which one focuses on the self when negative outcomes are salient.

Given the role of self-focused attention and attentional bias in emotional disorders, it is obvious that psychotherapists should employ techniques that aim to exert control on internal and external cues attended. Wells, White, and Carter (1997) suggest several types of attention-control strategies that could facilitate anxiety reduction. First, attention may be diverted to neutral stimuli in order to interrupt dysfunctional thoughts or reduce the intensity of negative emotions. Second, attention may be explicitly focused on the task at hand and prevent further negative information processing. Third, attention may be directed toward information that disconfirms negative appraisal. For example, socially phobic patients may be instructed to draw attention toward features of the external environment that are incompatible with their negative self-evaluations rather than self-focusing in a feared situation or performance. A number of case studies reported that ATT reduced anxiety and negative beliefs in patients with panic attack, social phobia, and hypochondriasis (Papageorgiou & Wells, 1998; Wells et al., 1997). Also, it was found that non-anxious students who were trained to be avoidant of threat reported less stressor-induced anxiety than the participants trained to be vigilant for threat (MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002). However, the therapeutic effect of ATT on reducing attentional bias toward internal or external threat cues in anxiety disorders remain to be examined in controlled clinical trials.

The role of attention is also important in new developments in *mindfulness-based* treatment. Mindfulness is defined as “a particular way of paying attention: on purpose, moment-by-moment, and without judgment” (Kabat-Zinn, 1994). Influenced by a Buddhist tradition, mindfulness meditation is viewed as the intentional self-regulation of attention to facilitate greater awareness and acceptance of bodily sensations, thoughts, and emotions. In mindfulness-based

cognitive therapy (MBCT), patients are taught to concentrate on the effects of negative mind states on the body, rather than ruminating about or suppressing the mind state (see Williams, Duggan, Crane, & Fennell, 2006). MBCT emphasizes acceptance rather than changing the content of thinking or suppressing thoughts (Segal, Teasdale, & Williams, 2004). At least one study has linked increased attentional bias to thought suppression (Fawzy, Hecker, & Clark, 2006).

It should be noted that the effectiveness of ATT is often idiosyncratic and, therefore, it is important for the clients to practice and test the different techniques to determine which one is the most applicable for them and under what circumstances. Furthermore, it should be noted that anxious clients may misuse the ATT to constitute (or reinforce) safety-seeking behaviors or avoid confronting a difficult situation. For example, if a socially anxious woman is always involved in a physical activity (e.g., handing round drinks) at parties in order to divert her attention from threatening situation rather than engaging in more social activities such as mixing with people, she is unlikely to overcome her social fears. It is, therefore, equally important to discourage any avoidant or safety-seeking behaviors in the course of psychotherapy and teach the client to practice concentrating on those aspects of the situation or performance that are positive and nonthreatening.

### *Implications for Cognitive Therapy*

Contrary to an automatic processing account, if an attentional bias is mediated by voluntary, elaborative processing, then cognitive therapy interventions will be helpful in modifying such a bias. One of the clinical implications of the schema-congruent account (Beck et al., 1985) of attentional biases is that any therapeutic interventions should challenge and modify the actual contents of danger schemas together with associated maladaptive assumptions and automatic thoughts during the course of cognitive therapy. Indeed, cognitive therapy involves a variety of techniques aimed at eliciting and challenging threat-related misinterpretations. As Brewin (1996) suggested, by drawing attention to the client's negative automatic thoughts and maladaptive assumptions and challenging these with the use of logical examinations and behavioral experimentation, the therapist can help the client develop new rules for discriminating situations or stimuli that are

truly threatening from those that merely arouse the feeling of being threatened. This cognitive-behavioral hypothesis testing is similar to the process of construct elaboration described by Kelly (1955). The anxious client's attempts in making these discriminations and allocation of adaptive attentional patterns then can change the content of verbally accessible knowledge (negative interpretations) so that previously threatening situations are reclassified as nonthreatening in memory and automatic activation of the unconscious attentional bias is decreased.

Cognitive models of anxiety disorders are characterized by the existence of cognitive distortions in a variety of anxiety disorders, such as catastrophic misinterpretations in panic-attack patients (Clark, 1986), responsibility appraisals (Salkovskis, 1985, 1993) and thought-action fusion thoughts (Rachman, 1997, 1998) in OCD patients, metacognitive beliefs in GAD (Wells, 1995), and thoughts associated with losing control in agoraphobia and with threat in phobias (see Wells, 1997). These cognitive distortions, alongside the disorder specificity of attentional biases, imply that thought processes are intertwined with attentional processing. In line with this view, using a dichotic listening task, Wenzel (2006) reported that listening to anxious automatic thoughts caused attentional biases toward the threat-relevant materials. This finding suggests that the patients may consciously allocate their attention to threat information. Thus, cognitive therapy interventions (e.g., cognitive restructuring) that challenge negative automatic thoughts may reduce or eliminate attentional bias in anxiety disorders.

On the other hand, challenging the contents of cognitive distortions can result in a reduction of anxiety state, thereby, positively altering the affective valence of stimuli. As the affective valence of the stimuli changes, attentional biases to, and avoidance of, threat-related stimuli can decrease. Consequently, cues in the environment will no longer be perceived as negative or being aversive or anxiety provoking, so that adaptive attentional resources are likely to be allocated to them. There is experimental evidence that effortful, elaborative processes can outweigh involuntary automatic processes and behavior (Mathews & MacLeod, 1994). Given the wealth of clinical literature on the effectiveness of cognitive therapy for anxiety disorders (e.g., Beck, 1976; Beck & Clark, 1988; Chambless & Gillis, 1993; Leahy, 2003; Wells, 1997; see Starcevic, 2006 for a

recent review), it seems sensible to conclude that cognitive reconstructing (verbal mediation) might result in correcting the involuntary, automatic threat-related processing. However, the effects of cognitive therapy techniques on preconscious processing of threat stimuli and underlying mechanisms of correcting attentional bias remain open to more investigation in rigorous experimentally controlled trials.

### *General Research and Clinical Considerations*

There are individual differences in efforts to regulate anxiety-provoking situations or coping styles (Aver, Corace, Endler, & Calvo, 2003). When encountering threatening stimuli, some individuals appear to seek knowledge about the stimuli or process them more (e.g., sensitizers or monitors), whereas others appear to avoid threat-related stimuli (e.g., avoiders or repressors). A number of researchers have shown that repressors who maintain an attentional focus away from threatening words are more efficient in inhibiting threatening information, and avoid processing unwanted stimuli (Fox, 1993; Myers & McKenna, 1996; Ruiter & Brosschot, 1994). Therefore, it has been suggested that a repressive coping style (high defensiveness) is associated with avoidant cognitive processing style. This finding implies that anxious individuals' responses to threatening situations may depend on dispositional copying styles or personality traits. One question that remains to be investigated is whether or not these different coping styles require different psychotherapeutic strategies. For example, a more direct rationalistic cognitive psychotherapy might be helpful for cognitive avoiders or repressors, but not necessarily a constructive therapeutic strategy for sensitizers or monitors. The latter patients may benefit from a constructivist cognitive psychotherapy (see Guidano, 1984; Mahoney, 1993; Neimeyer, 1993). To our knowledge no study has examined the applicability of different cognitive-behavioral techniques to anxious individuals with different cognitive copying styles.

Furthermore, the differential attentional preference has some treatment implications. First, it helps therapists recognize the functional importance of specific external and internal cues for different clients with anxiety as their common clinical problem. Although the detection of early signs of heart attack, fainting, or other physical

harms (engagement) is important for taking preventive actions and thus for reducing risk in panic-attack patients, looking away and avoiding eye contact with other people (disengagement) is likely to reduce threat for a social-phobic patient because it makes it more difficult for other people to engage the patient in a conversation and thus provides a psychological escape (or relief) for the patient (see Chen et al., 2002). However, this strategy carries a risk of reinforcing avoidance or safety-seeking behaviors, and thereby it can be counterproductive in the treatment process if applied inappropriately (see Thwaites & Freeston, 2005). Second, it provides information that therapists can use to elicit negative automatic thoughts associated with these explicit anxiety-provoking stimuli in real-life situations. Third, once the anxiety-provoking cues and associated thoughts have been identified, therapeutic interventions to counter them can be explored and tailored to the client's anxiety problems in a more collaborative way. Thus, in the process of CBT it is important to identify the attentional preferences of clients with anxiety problems and use them in case formulation and treatment plan.

It is also suggested that selective processing indices may represent sensitive measures of clinical change in response to therapeutic interventions for the anxiety disorders (Mogg et al., 1995). However, the clinical use of these indices as a measure of treatment outcome has been questioned. A study found no evidence for a reduction in attentional bias following positive outcome of CBT (Devineni, Blanchard, Hickling, & Buckley, 2004). However, using a small sample size in this study limits its power to generalize the findings. Clearly, more research is needed to examine the validity and reliability of measures of attentional bias that can be used to assess treatment outcomes in anxiety disorders.

### **Conclusion**

One of the most important advances in the laboratory-based investigation of emotional states was the discovery that they were subject to the laws of rigorous scientific experimental research. Although the implications of these experimental findings for clinical work have so far been relatively slight, experimental research on attentional bias has provoked particular interest in developing scientifically rigorous models of

emotional disorder. These information-processing models can help us refine or develop behavioral and cognitive interventions in order to modify and correct dysfunctional attentional processing effectively. However, it remains to be seen whether cognitive therapy interventions targeting more voluntary, strategic information processing can have a positive therapeutic impact on automatic, involuntary processing involved in attentional biases.

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