AN INFORMATION PROCESSING MODEL OF ANXIETY:
AUTOMATIC AND STRATEGIC PROCESSES

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Summary—A three-stage schema-based information processing model of anxiety is described that involves: (a) the initial registration of a threat stimulus; (b) the activation of a primal threat mode; and (c) the secondary activation of more elaborative and reflective modes of thinking. The defining elements of automatic and strategic processing are discussed with the cognitive bias in anxiety reconceptualized in terms of a mixture of automatic and strategic processing characteristics depending on which stage of the information processing model is under consideration. The goal in the treatment of anxiety is to deactivate the more automatic primal threat mode and to strengthen more constructive reflective modes of thinking. Arguments are presented for the inclusion of verbal mediation as a necessary but not sufficient component in the cognitive and behavioral treatment of anxiety. Copyright © 1997 Elsevier Science Ltd

INTRODUCTION

Over the past decade psychological theories, research and treatment of anxiety disorders have increasingly turned to information processing paradigms derived from experimental cognitive psychology and social psychology to understand the cognitive basis of anxiety. A core tenant of these theories is that the type of emotional information and the manner in which it is processed are crucial factors in the etiology, maintenance and treatment of anxiety disorders (Beck, Emery & Greenberg, 1985; Eysenck, 1992; Wells & Matthews, 1994; Williams, Watts, MacLeod & Mathews, 1988). Thus anxiety involves the selective processing of information perceived as signifying a threat or danger to one's personal safety or security (Beck et al., 1985). Cognitive theories have been proposed for a number of specific anxiety disorders including panic disorder (D. M. Clark, 1986), social phobia (Stopa & D. M. Clark, 1993), obsessive–compulsive disorder (Salkovskis, 1985, 1989) and generalized anxiety disorder (Beck et al., 1985; Wells, 1995). Although these theories differ slightly depending on the specific anxiety disorder, all consider a selective bias for threat information in attention, interpretation and memory a central characteristic that distinguishes anxious and non-anxious states (Beck et al., 1985; McNally, 1994).

There are a number of research questions that can be raised about the cognitive basis of anxiety. Some of the issues addressed in the cognitive experimental literature include: (a) whether selective processing of threat is specific to anxiety vs other emotional states; (b) whether threat bias is confined to certain cognitive processes or is it apparent at all stages of information processing; (c) whether threat bias in anxiety should be considered a state or trait phenomena; and (d) whether automatic or strategic modes of information processing dominate in anxiety (Mathews & MacLeod, 1994; Williams et al., 1988). It is this latter question which has been of particular interest to experimental psychopathologists working from an information processing perspective on anxiety.

McNally (1995) recently offered a most thoughtful review on the role of automatic processes in anxiety. The distinction between automatic and controlled or strategic levels of control has played an important role in theories of attention, memory, and skill acquisition or performance (Hasher & Zacks, 1979; Posner & Snyder, 1975; Schneider & Shiffrin, 1977; Shiffrin &

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Automaticity: (a) is effortless, involuntary or unintentional; (b) is generally outside conscious awareness though some automatic processes may become accessible to consciousness; (c) is relatively fast and difficult to stop or regulate; (d) consumes minimal attentional or processing capacity; (e) relies on a parallel type of processing; (f) is stereotypic involving familiar and highly practiced tasks; and (g) utilizes low levels of cognitive processing with minimal analysis (Logan, 1988; McNally, 1995; Sternberg, 1996; Wells & Matthews, 1994). Wells and Matthews (1994) considered “independence from attentional resources” and “insensitivity to voluntary control” the key criteria for automaticity. McNally (1995) concluded that the processing bias in anxiety is automatic in terms of being involuntary and possibly unconscious but it is not resource or capacity-free.

Controlled or strategic processes are considered qualitatively different from automatic processing. Controlled processing: (a) is intentional, voluntary or effortful; (b) is fully conscious; (c) is relatively slow and so more amenable to regulation; (d) consumes considerable attentional or processing resources; (e) relies on serial processing where information is processed one step at a time; (f) can deal with novel, difficult and unpracticed tasks with many variable features; and (g) utilizes higher levels of cognitive processing involving semantic analysis and synthesis (McNally, 1995; Sternberg, 1996). One of the hallmarks of strategic processing is its meaning-assignment capabilities—its ability to provide meaningful interpretation of novel, complex information. Because of this McNally (1995) concluded in his review that the propensity to inappropriately interpret innocuous stimuli or situations as threatening, a core cognitive process in anxiety disorders, probably depends on strategic, elaborative processing.

McNally (1995) concluded that the view of automatic and, for that matter, strategic processing as unitary concepts has not been proven valid in social cognition studies that involve the processing of personally relevant and emotional information. That is, the various defining characteristics of automatic and strategic processing have not been found to reliably covary in these studies. Consequently some have argued that there are varieties of automaticity, others where all cognitive tasks involve varying amounts of automatic and strategic processing, and still others where automatic and strategic processing occur on a continuum (see McNally, 1995).

Two further aspects of the automatic/strategic distinction are worth noting. First the range of tasks and processes that have been characterized as automatic vary considerably, from experiments involving the subliminal presentation of discrete bits of information to the execution of highly complex tasks like driving a car, reading, typing on a keyboard or playing a musical instrument. Second there is a dynamic nature to cognitive processing that involves movement back and forth between automatic and strategic processing. Many tasks acquire automaticity through practice, whereas other automatic, stereotypic tasks may succumb to controlled effortful intervention (Sternberg, 1996). Given these considerations, the usefulness of the automatic/strategic processing distinction for understanding information processing in complex emotional states like anxiety can be questioned. McNally (1995) noted that the development of pure-process experimental tasks may be very difficult if not impossible because most tasks involve a mixture of strategic and automatic processing. In sum it may be more beneficial to consider the specific processing characteristics involved at the various stages of information processing in anxiety rather than to adhere rigidly to the automatic/strategic distinction.

In this paper we discuss a refined schema-based information processing model of anxiety that was originally presented in Beck et al. (1985). Specific reference is made to the various characteristics that have distinguished automatic and strategic processing and we explain how these processing characteristics define the cognitive basis of anxiety. We conclude with a consideration of the treatment implications of this model and McNally’s assertion (McNally, 1995) of the ineffectiveness of verbally mediated therapies of anxiety.

**AN INFORMATION PROCESSING MODEL OF ANXIETY**

The cognitive model of anxiety first proposed by Beck et al. (1985) is a schema-based information processing perspective that considers the erroneous or biased interpretation of stimuli as dangerous or threatening to an individual’s physical or psychological well-being, a core feature
of anxiety disorders. Along with the selective processing of threat or danger stimuli, the anxious individual underestimates personal coping resources and the safety or rescue features in the environment. Furthermore the distinction between normal and pathological anxiety is one of degree rather than kind because of the vital role that fear plays in the survival of the organism. The difference is that in pathological anxiety there is a biased or overestimated perception of danger which does not correspond to the exigencies of the internal or external environment, whereas in nonclinical anxiety states the estimation of threat corresponds more closely to the objective dangers in the environment. For example acute anxiety in response to repeated chest discomfort would be pathological for the young person with no previous history of coronary artery disease but it might be quite realistic for a middle aged man who recently suffered a myocardial infarct.

The cognitive model recognizes that anxiety consists of a complicated pattern of cognitive, affective, physiological and behavioral changes (Beck et al., 1985; D. M. Clark & Beck, 1988). At the physiological level one finds autonomic hyperarousal in preparation for flight, fight, freezing or fainting. At the behavioral level we see: (a) mobilization in order to escape or defend one's self against the perceived danger; (b) inhibition of risk taking behavior in an attempt to maximize safety; and (c) deactivation of motor responses resulting in avoidance and feelings of helplessness. At the subjective or affective level the individual feels frightened or apprehensive. And finally, at the cognitive level anxiety involves: (a) certain sensory-perceptual symptoms such as feelings of unreality, hypervigilance and self-consciousness; (b) thinking difficulties such as poor concentration, inability to control thinking, blocking, and difficulty reasoning; and (c) conceptual symptoms like cognitive distortions, fear-related beliefs, frightening images and frequent automatic thoughts (Beck et al., 1985). This complex cognitive-affective-physiological-behavioral pattern that we call anxiety arises from a particular three-stage information processing sequence that constitutes the very heart of the cognitive model of anxiety. Furthermore it is the propensity of this information processing apparatus to inappropriately generate threat meaning assignments to innocuous stimuli that is the main problem that must be rectified in the treatment of anxiety disorders.

Stage I. Initial registration

The first stage of processing threat information involves a very rapid, automatic recognition of a stimulus. That part of the information processing system responsible for the initial recognition of stimuli has been referred to as the orienting mode (Beck, 1996). Information processing by the orienting mode represents automatic processing par excellence. That is, we find that at this stage information processing is characterized by all of the features of automaticity, with strategic or elaborative processing playing no role in information processing at this stage. The orienting mode, then, processes information very rapidly, involuntarily, and generally outside of conscious awareness. At the moment of stimulus registration, parallel processing would be possible and minimal attentional resources would be required. Automaticity can also be seen at this stage by the involvement of low levels of cognitive processing. The orienting mode is predominantly driven by the stimuli that impinge on the organism so that very little higher level or semantic analysis occurs at this stage. The orienting mode, then, is more perceptually than conceptually driven. The function of this "early warning detection system" is to identify stimuli and assign an initial processing priority through the allocation of attentional resources. Moreover the orienting mode is most likely to assign information processing priority to stimuli or situations that threaten the survival of the organism.

The existence of a very rapid, involuntary, unconscious, stimulus-driven registration process is vital to the survival of the organism (Beck et al., 1985). A process that allows for rapid processing of information, especially threat information, will optimize our chances of survival. However, processing at this stage may be relatively undifferentiated, simply involving recognition of the valence (positive, negative, neutral) or personal relevance (relevant for me vs irrelevant for me) of stimuli. Mathews and MacLeod (1994) in their review of the experimental literature on anxiety concluded "that the earliest (preattentive) analysis of stimulus meaning may serve only to classify stimuli as related to threat or not" (p. 39). McNally (1995) reiterated this position indicating that preattentive processing in anxiety may only be sensitive to global
valence effects. These conclusions are based on subliminal studies which found that anxious patients were more sensitive to negative stimuli in general but they did not show a more specific biased processing for anxiety-related information (e.g. Mogg, Bradley, Williams & Mathews, 1993; Bradley, Mogg, White & Millar, 1995). Thus anxiety may involve a biased orienting mode in the form of selective attention to negative, personally relevant information. Although this will have evolutionary value because negative stimuli are more likely to threaten our vital resources than positive information, the problem in anxiety is that the orienting mode is excessively tuned to detect negative stimuli. What is created by this anxious orienting mode is a propensity to allocate attentional resources to negative stimuli, setting the stage for the activation of the type of threat-related elaborative processing that characterizes anxiety states.

Stage II. Immediate preparation

The recognition of a personally relevant negative stimulus by the orienting mode leads to the next stage in the processing of threat—that of immediate preparation. This stage involves the activation of the primal mode, a cluster of interrelated schemas embodying more primitive and immediate cognitive/affective/behavioral/physiological patterns aimed at meeting evolutionary derived objectives such as survival, safety, security, procreation and sociability (Beck, 1996; Beck et al., 1990). The primal mode most relevant to anxiety, the threat mode, seeks to ensure the individual's survival by maximizing safety and minimizing danger. Because of this basic survival orientation, primal modes tend to be rigid, inflexible and reflexive. Once activated, primal modes capture much of the attentional resources of the information processing apparatus thereby reducing or eliminating the capacity for more reflective, secondary considerations.

Activation of the 'threat' primal mode results in a coordinated goal-directed strategy aimed at minimizing danger and maximizing safety (Beck, 1985). A number of primal responses can be identified including: (a) autonomic arousal—preparation for enacting defensive behaviors such as fight or flight; (b) behavioral mobilization and inhibition—escape and avoidance behavior aimed at reducing risk and danger; (c) primal thinking—a narrowing or constriction of cognitive processing onto the threat stimulus as well as the production of repetitive, involuntary automatic thoughts and images involving possible threat and danger; (d) a feeling of fear—which motivates the individual for action; and (e) hypervigilance for threat cues. In sum once the primal threat mode is activated, it tends to dominate the information processing apparatus, thereby blocking off other secondary, more constructive or reflexive modes of thinking.

What characterizes primal processing in anxiety? Unlike the orienting mode, primal processing is much less automatic, involving a mixture of both automatic and more elaborate or strategic processing. It is automatic in terms of being rapid, involuntary, inflexible and primarily stimulus-driven. However, primal processing also shares many characteristics of more elaborate, controlled processing. At this stage we see the beginning of primary threat appraisal or the semantic analysis of the threat stimulus. The primary threat appraisal, like other controlled processes, will capture a great deal of attentional resources giving it top processing priority. It will involve some higher level schematic processing from the primal mode because at this point the earliest phase of threat meaning—assignment emerges, although much of the input for this early semantic analysis will be stimulus-driven. Furthermore the rapid, involuntary nature of processing at this stage means that processing may occur outside of awareness, though individuals will be aware or conscious of the products of the primary threat appraisal.

The primal mode constructs an initial threat impression based on incomplete information available to the individual. This impression indicates that the individual's vital interests may be threatened and that further processing and action must be taken (Beck et al., 1985). The formation of an initial threat impression will result in the activation of the goal-directed primal response pattern described previously. This cognitive/affective/behavioral/physiological pattern will be quite automatic, non-rational and involuntary. Automaticity at this juncture of the anxiety response resembles other highly complex automatic behaviors that have been studied in cognitive social psychology such as driving a car, dialing a familiar telephone number, reading, or playing a musical instrument. In fact the anxiety response pattern associated with primary threat appraisal falls into the same category with many other types of 'mindless' automatic behaviors which individuals engage in during their everyday life (Langer, 1989). An example of
mindless automatic behavior in the routine of daily life might be that you intend to stop at the convenience store on the way home from work but instead drive right by ending up in your driveway without the quart of milk. Langer (1989) stated that one reason for mindless automatic responses is that we may form ‘mindsets’ based on the acceptance of an impression or piece of information at face value without the benefit of thoughtful reflection. When this information is encountered in the future, the individual automatically interprets and reacts to the information on the basis of this preconceived mindset. James Reason (1990) also described a type of error called slips which result from automatic processes (see also Sternberg, 1996). When one adopts the broader conceptualization of automaticity as used in cognitive and social psychology, the primal processing we have described for anxiety clearly fits within this category of response.

There are two products of primal threat appraisal that are important in the experience of anxiety. First the activation of the primal mode causes a constriction or narrowing of cognitive processing that leads to certain biases and inaccuracies. The anxious individual engages in selective abstraction, becoming hypersensitive to the potentially harmful aspects of a situation but ignoring its more positive features. We also find that processing at this stage is very rigid and dichotomous with a corresponding intolerance for uncertainty or ambiguity. Finally there is an overestimation of the probability and severity of the threatening situation resulting in the catastrophic thinking that so characterizes anxiety disorders such as panic (Beck et al., 1985; D. M. Clark, 1986; D. M. Clark & Beck, 1988).

A second product of the primal mode activation is the occurrence of negative automatic thoughts involving themes of threat and danger. These thoughts are automatic in the sense that they are involuntary, rapid and specific to the threatening situation. However they do share some characteristics of elaborative processes in that they are the products of an initial semantic analysis of threat and individuals can be taught to become aware of their automatic thinking. In this sense the conceptualization of anxious thoughts as automatic is consistent with the broader notion of automaticity adopted in cognitive and social psychology.

Stage III. Secondary elaboration

The activation of the primal threat mode leads to the final stage in the cognitive model of anxiety—that of secondary elaboration. Here we find the full activation of elaborative semantic processing. Information processing at this stage is characteristically slow, effortful and schema-driven, although cognitive processing of threat will continue to be involuntary because of the activation of the primal mode. We see at this stage the activation of other schemas representing the current concerns and personal issues of the individual, a type of contextualized processing involving the self-in-relation-to-the-world. The individual engages in a more reflective consideration of the current context and their coping resources. A secondary appraisal process occurs in which anxious individuals evaluate the availability and effectiveness of their coping resources to deal with the perceived threat (Beck et al., 1985).

This elaborative strategic processing of threat relative to one's coping resources is possible because of the activation of the metacognitive mode, or thinking about thinking. A number of researchers have noted that the avoidance or failure to elaborate and process the attributes or features of the threatening stimulus at the strategic level may be an important process in maintaining clinical anxiety (Mathews, 1990; Zinbarg, Barlow, Brown & Hertz, 1992). As individuals reflect (or fail to reflect) on their anxious thoughts, feelings and sensations prompted by the primal mode, three possible outcomes can occur. First, a further escalation of the anxiety occurs because of a blocking of a more constructive, realistic reappraisal of the situation, the continued domination of the more automatic primal threat mode and the resultant failure to strategically process features of the threat situation. Or second, anxiety may decline because a more constructive reappraisal of the situation has caused individuals to ‘downgrade’ the probability or severity of the threat and to ‘upgrade’ their ability to cope. Or third, the anxiety may subside because individuals have engaged in some defensive behavior prompted by the primal mode such as escape or avoidance.

There are two aspects of the secondary elaborative stage that must be considered—the first being that of worry. Borkovec, Robinson, Pruzinsky and DePree (1983) defined worry as:
To consider excessive worry a core cognitive feature of anxiety disorders, especially generalized anxiety disorder, is apparent by definition. Furthermore a number of theoretical accounts have been proposed to explain the occurrence of excessive or pathological worry (i.e. Barlow, 1988; Borkovec, Shadick & Hopkins, 1990; Eysenck, 1992; Wells, 1994). Despite some differences in the processes proposed for maintaining worry, most agree that worry is the result of elaborative processing triggered by earlier automatic processes of anxiety (Mathews, 1990). In the cognitive model currently proposed, worry is very much an elaborative process resulting from the activation of both the primal threat mode and other more constructive, reflective modes of thinking. Although the elaborative process involved in worry may lead to adaptive response and the reduction of anxiety, more often than not the excessive, pathological worry that characterizes anxiety disorders like generalized anxiety leads to an escalation of anxiety because of the domination of primal mode thinking.

A second aspect of the elaborative processing that takes place at this stage centers on the concept of safety signals. Rachman (1984a, b) proposed a safety-signal theory to account for weaknesses in the two-factor theory of fear—i.e. the persistence of avoidance behaviour in the absence of fear and evidence that fear is not always followed by avoidance (Woody & Rachman, 1994). Rachman argued that anxiety states such as agoraphobia and, more recently, generalized anxiety disorder (GAD), involve an interplay between the avoidance of threat or danger and the search for safety signals. One of the main assumptions of the safety-signal perspective is “that the amount of threat/comfort experienced by a person with agoraphobic problems is primarily a function of the perceived access to, and speed of a return to, safety” (Rachman, 1984a, p. 60). However anxious individuals generally engage in unsuccessful attempts to achieve and maintain safety which may involve behaviors like sitting next to an exit, being accompanied by a close friend or family member, carrying a prescription of tranquilizers, carrying cards with coping statements, and the like (Rachman, 1984a; Woody & Rachman, 1994). Thus the absence of reliable safety signals leaves the individual in a state of chronic fear (Rachman, 1984b). On the other hand the presence of fear will trigger a vigorous search for safety cues. Reductions in safety are most often caused by the experience of failure or some other negative life experience such as the loss of a trusted friend, which can disrupt the balance between danger and safety (Rachman, 1984a). Thus the excessive dependency that has so often been noted in individuals with chronic anxiety may reflect the presence of an intense, exclusive safety signal (Woody & Rachman, 1994).

Rachman’s safety-signal perspective on anxiety can be accommodated within the information processing model proposed in this paper. First it must be pointed out that there is a strong cognitive aspect to the conceptualization of safety proposed by Rachman. Although discrete environmental cues may become safety signals for the anxious individual, there is considerable variability between individuals on what constitutes a safety signal. Rachman (1984a) noted that evaluations of predictability, dependability, estimates of the probability of the worst outcome, and perceived confidence in one’s coping ability will determine the safety value of a person, situation or object. As a result we would view the search for safety signals as involving a more strategic, elaborative processing at the third stage of the model. Clinical experience indicates that anxious patients are usually quite aware of the important safety signals in their life and there is often a great deal of planned activity that goes into maximizing one’s sense of safety. Thus the development of safety signals that effectively reduces anxiety usually requires the execution of complex behavioral patterns that would require extensive higher-order schematic processing. Therefore the search for safety signals can be viewed as a goal-directed strategy resulting from more reflective constructive modes of thinking which may be activated to counter the hyperventilation of the primal threat mode. In the end, however, we would agree with Rachman’s quote (Rachman, 1984b) of Bandura who stated “that the best way to create a sense of safety is to equip people with coping skills and a robust belief in their coping capabilities” (p. 636).
COGNITIVE THERAPY OF ANXIETY

Having described a schema-based information processing model of anxiety that involves features of automatic and strategic processing, we conclude by discussing the clinical implications of this model for the treatment of anxiety. As well we would like to consider McNally's assertion (McNally, 1995) that verbally mediated therapies for anxiety will be ineffective because the early stages of information-processing are involuntary and possibly unconscious. McNally based this conclusion on: (a) findings from thought suppression studies indicating that direct attempts to suppress thoughts that arise from automatic cognitive processes may be counterproductive; (b) animal learning research which indicates that the reduction of conditioned fear responses does not involve extinction but rather the acquisition of new learning; (c) a study by Ohman and Soares (1994) suggesting that in vivo exposure may directly correct unconscious fear biases; and (d) research indicating that mental health is not characterized by an absence of cognitive bias but rather the presence of a skewed positivity bias.

Based on the current cognitive model, the treatment of anxiety must involve the deactivation of the automatic, hypervalent primal threat mode and a strengthening of the elaborative, strategic processes involving the activation of more constructive, reflective modes of thinking. In other words therapy must aim at reducing the influence of Stage II processing and reinforce the impact of Stage III processing. Furthermore because the model proposes that threat-meaning assignment is the sine qua non of anxiety disorders, effective treatment must modify the threat appraisal process. The presence of automaticity does not negate this requirement. Rather as we have discussed previously, except for Stage I processing, the cognitive bias in anxiety is a complex mixture of automatic and strategic processes. Although threat meaning assignment in anxiety occurs automatically like other 'mindless' habitual processes and behaviors, at the same time the individual is gripped by a state of continual repetitive anxious thinking that dominates the information processing apparatus.

The crucial question becomes one of how can we most effectively modify exaggerated threat meaning assignment in anxiety? Which intervention approaches can be used to 'turn off' the primal threat mode and 'turn on' more constructive elaborative processing of stimuli? McNally (1995) argues that verbally mediated therapies, like cognitive therapy, are not up to the task because of the involuntary nature of the cognitive bias in anxiety. His suggestion is that behavioral interventions should be used to teach anxious patients coping strategies aimed at dealing with the adverse consequences of anxiety. Our position is that verbal mediation is a necessary but not sufficient component of any anxiety treatment approach which seeks to deactivate primal threat processing and maximize a more constructive elaborative or strategic mode of information processing. In considering these two positions the following points are worth noting.

First some degree of verbal mediation will be necessary in any effective treatment of anxiety because of the central role played by threat meaning assignment in anxiety. One of the most effective ways of deactivating the primal threat mode is to counter it with more elaborative, strategic processing of information resulting from the activation of the constructive, reflexive modes of thinking. In fact one could as easily conceptualize anxiety in terms of the ineffective use of more elaborative, constructive processing as the activation of a primal threat mode. The clinical procedure of applying reflective verbal strategies to evaluate the validity of anxious thoughts derived from the primal threat mode can be seen as a natural extension of anxiety reduction carried out by non-anxious individuals. For example one may hear a loud noise in the middle of the night and immediately feel tense with the thought “Could it be a burglar?” The non-anxious individual would evaluate this conjecture and recall that the shutters on the downstairs window make that same kind of noise. In this case a 'verbal' approach involving reflective evaluation of an anxious thought has led to a reduction in tension or anxiety.

Second cognitive therapy does not assume that verbal mediation is the only avenue for anxiety reduction. In fact Beck et al. (1985) described a number of exposure based approaches that must be used by the cognitive therapist for the successful treatment of anxiety. Exposure is a necessary component of anxiety reduction because it ensures the complete activation of the primal threat mode so that more elaborative strategic constructive processing of the threat
stimulus can take place rather than the cognitive avoidance which is more typically seen in anxiety disorders (see also Foa & Kozak, 1986; Zinbarg et al., 1992).

Third if automaticity in anxiety disorders is defined primarily in terms of involuntary processing, then how does this threaten the potential therapeutic benefits of verbally mediated therapeutic interventions? The concept of involution is not well defined in most writings on automaticity, with the distinction between what is an ‘involuntary’ vs a ‘voluntary’ process not clearly specified. In fact there is an element of ‘willful independence’ in many conscious, elaborative processes such as worry and unwanted intrusive thoughts (Borkovec et al., 1990; Rachman, 1981). Thus we contend that the presence of involuntary cognitive processing in anxiety does not negate the possible therapeutic benefits of verbally mediated treatments because: (a) involuntary cognitive processing is probably evident in most psychological disorders; (b) most cognitive processes involve a mixture of automatic and strategic processing; and (c) the distinction between ‘voluntary’ and ‘involuntary’ is probably one of degree rather than kind.

Fourth, there is experimental evidence that effortful, elaborative processes can override involuntary automatic processes and behavior. Mathews and MacLeod (1994) noted that mood-congruent recall and the influence of mood on judgments can be eliminated with verbal instructions. Langer (1989) described how people can become more ‘mindful’ to counter the negative effects of ‘mindless’ automatic patterns of response. If one also considers the treatment outcome literature on the effectiveness of cognitive therapy for anxiety (i.e. Chambless & Gillis, 1993; D. M. Clark, Salkovskis, Hackmann, Middleton, Anastasiades & Gelder, 1994; Feske & Chambless, 1995), then there is both clinical and nonclinical evidence for the potential therapeutic benefits of corrective, elaborative verbal and experiential feedback on the involuntary, automatic threat-related cognitive processes of anxiety. Furthermore, if fear can be acquired by the verbal transmission of information (Rachman, 1977), than why would we not also accept the possibility that anxiety reduction can occur in response to corrective verbal information? In fact most of our education and self-correction is verbally based.

And finally, it should be pointed out that cognitive therapy, though a verbally mediated treatment modality, does not teach patients to suppress their ‘involuntary’ anxious thoughts. Rather the cognitive therapist teaches the anxious individual a strategy that emphasizes elaboration and reflection on their threat-related cognitions. Corrective information gleaned from behavioral exercises and verbal hypothesis-testing is used to fortify more constructive modes of thinking and dampen down the primal threat mode. In this way cognitive therapy discourages, rather than reinforces, the patient’s automatic tendency to engage in cognitive avoidance or attempts to suppress anxious or worrisome thinking. We should also add that if the activation of a more constructive, realistic mode of thinking about situations results in a positivity bias or a tendency to overemphasize the safety features of a situation, this can be easily accommodated by the model. What determines the ‘quality of information processing’ is not the elimination of all cognitive bias and the achievement of some perfect rational representation of ‘objective’ reality, but rather a mode of information processing which maximizes the functional adaptation and quality of living for the individual. If this goal is achieved through the creation of a positivity bias, than this would be acceptable within the proposed cognitive model.

**CONCLUSION**

In this paper we have presented a three-stage schema-based information processing model of anxiety. We believe that the central cognitive problem in anxiety is the excessive and/or inappropriate generation of threat meaning assignment in response to stimuli or situations that are innocuous. Furthermore we have argued that the distinction between automatic and strategic processing involves the consideration of a diverse number of processing characteristics. The various stages of information processing in anxiety will involve a mixture of automatic and strategic processing characteristics. The initial registration of the threat stimulus at Stage I, involving the orienting mode, processes information very rapidly, involuntarily and preattentively. However processing at this stage is more perceptual than conceptual, involving only gross or rudimentary processing of the valence or personal relevance of the stimulus. The function of
Stage I processing, then, is to assign a processing or attentional priority to the incoming information.

Stage II, or immediate preparation, involves the activation of the primal threat mode. Here processing is viewed as a true mixture of automatic and strategic processing, with the end result being the activation of a coordinated automatic behavioral/physiological/affective/cognitive goal-directed response pattern we call anxiety. Processing at this stage will be rapid, involuntary, inflexible and primarily stimulus-driven because of the importance of threat-related information processing for the survival of the organism. However we also see at this stage the introduction of more elaborative processing in the form of primary threat appraisal or the formation of an initial threat impression. Automatic anxious thoughts and biased cognitive processing result from the activation of the primal threat mode.

The final stage, that of secondary elaboration, involves the activation of other schemas representing the current concerns and personal issues of the individual. It also allows for a more reflective, constructive reconsideration of the ‘threat-stimulus’. A secondary appraisal process occurs at this stage in which individuals evaluate the availability and effectiveness of their coping resources. Processing at this stage is slow, effortful, schema-driven and fully conscious. The metacognitive mode is activated in which individuals consider their own thinking or processing resources. Processing at this stage is slow, effortful, schema-driven and fully conscious. The metacognitive mode is activated in which individuals consider their own thinking or processing of the threat stimulus. Worry and the search for safety signals are two important aspects of Stage III processing.

Based on this information processing model, the main task in the treatment of anxiety is the deactivation of the primal threat mode and the strengthening of more reflective, constructive elaborative processing at Stage III. Contrary to McNally’s conclusion (McNally, 1995) we have discussed a number of reasons why verbal mediation is a necessary but not sufficient component in the treatment of anxiety. Although there are many research questions that remain unanswered about the cognitive bias in anxiety, we believe the current information processing model can provide a useful theoretical framework for understanding many of the findings of cognitive experimental studies in anxiety. As well the model offers a rationale for the use of cognitive and behavioral interventions in the treatment of anxiety. Whether this theoretical formulation advances our understanding of anxiety must await the outcome of future information processing studies.

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