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Invited essay

A cognitive model of posttraumatic stress disorder

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Abstract

Posttraumatic stress disorder (PTSD) is a common reaction to traumatic events. Many people recover in the ensuing months, but in a significant subgroup the symptoms persist, often for years. A cognitive model of persistence of PTSD is proposed. It is suggested that PTSD becomes persistent when individuals process the trauma in a way that leads to a sense of serious, current threat. The sense of threat arises as a consequence of: (1) excessively negative appraisals of the trauma and/or its sequelae and (2) a disturbance of autobiographical memory characterised by poor elaboration and contextualisation, strong associative memory and strong perceptual priming. Change in the negative appraisals and the trauma memory are prevented by a series of problematic behavioural and cognitive strategies. The model is consistent with the main clinical features of PTSD, helps explain several apparently puzzling phenomena and provides a framework for treatment by identifying three key targets for change. Recent studies have provided preliminary support for several aspects of the model. © 2000 Elsevier Science Ltd. All rights reserved.

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Posttraumatic stress disorder (PTSD) is a common reaction to traumatic events such as assault, disaster or severe accidents. The symptoms include repeated and unwanted reexperiencing of the event, hyperarousal, emotional numbing and avoidance of stimuli (including thoughts) which could serve as reminders for the event. Many people experience at least some of these symptoms in the immediate aftermath of the traumatic event. A sizeable proportion recover in the next few weeks or months, but in a significant subgroup the

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symptoms persist, often for years (Kessler et al., 1995; Rothbaum, Foa, Riggs, Murdock & Walsh, 1992). It is largely the subgroup of people with persistent PTSD who seek treatment. For these people social and occupational functioning are often severely impaired. The purpose of this paper is to introduce a cognitive model that was designed to explain the persistence of PTSD and to provide a framework for the cognitive-behavioural treatment of PTSD. The model draws heavily on the writings of other theorists (Brewin, Dalgleish & Joseph, 1996; Conway, 1997a; 1997b; Foa & Riggs, 1993; Foa & Rothbaum, 1998; Foa, Steketee & Rothbaum, 1989; Horowitz, 1997; Janoff-Bulman, 1992; Joseph, Williams & Yule, 1997; Markowitsch, 1996; Resick & Schnicke, 1993; van der Kolk & Fisler, 1995; van der Kolk & van der Hart, 1991). However, the model is distinct in the particular synthesis it provides.

1. A cognitive model of PTSD

1.1. Overview

When trying to conceptualise PTSD from a cognitive perspective, one is immediately presented with a puzzle. PTSD is classified as an anxiety disorder. Within cognitive models, anxiety is a result of appraisals relating to impending threat. However, PTSD is a disorder in which the problem is a memory for an event that has already happened. We suggest that this apparent puzzle can be resolved by proposing that persistent PTSD occurs only if individuals process the traumatic event and/or its sequelae in a way which produces a sense of a serious current threat. The model proposes that two key processes lead to a sense of current threat.

1. individual differences in the appraisal of the trauma and/or its sequelae
2. individual differences in the nature of the memory for the event and its link to other autobiographical memories.

Once activated, the perception of current threat is accompanied by intrusions and other reexperiencing symptoms, symptoms of arousal, anxiety and other emotional responses. The perceived threat also motivates a series of behavioural and cognitive responses that are intended to reduce perceived threat and distress in the short-term, but have the consequence of preventing cognitive change and therefore maintaining the disorder. Figure 1 summarises the key variables in the model. Each is explained in greater detail below.

1.2. Appraisal of the trauma and/or its sequelae

It is assumed that, unlike individuals who recover naturally, individuals with persistent PTSD are unable to see the trauma as a time-limited event that does not have global negative implications for their future. The model proposes that these individuals are characterised by idiosyncratic negative appraisals of the traumatic event and/or its sequelae that have the *common effect of creating a sense of serious current threat*. This threat can be either external (e.g. the world is a more dangerous place) or, very commonly, internal (e.g. a threat to one's view of oneself as a capable/acceptable person who will be able to achieve important life goals

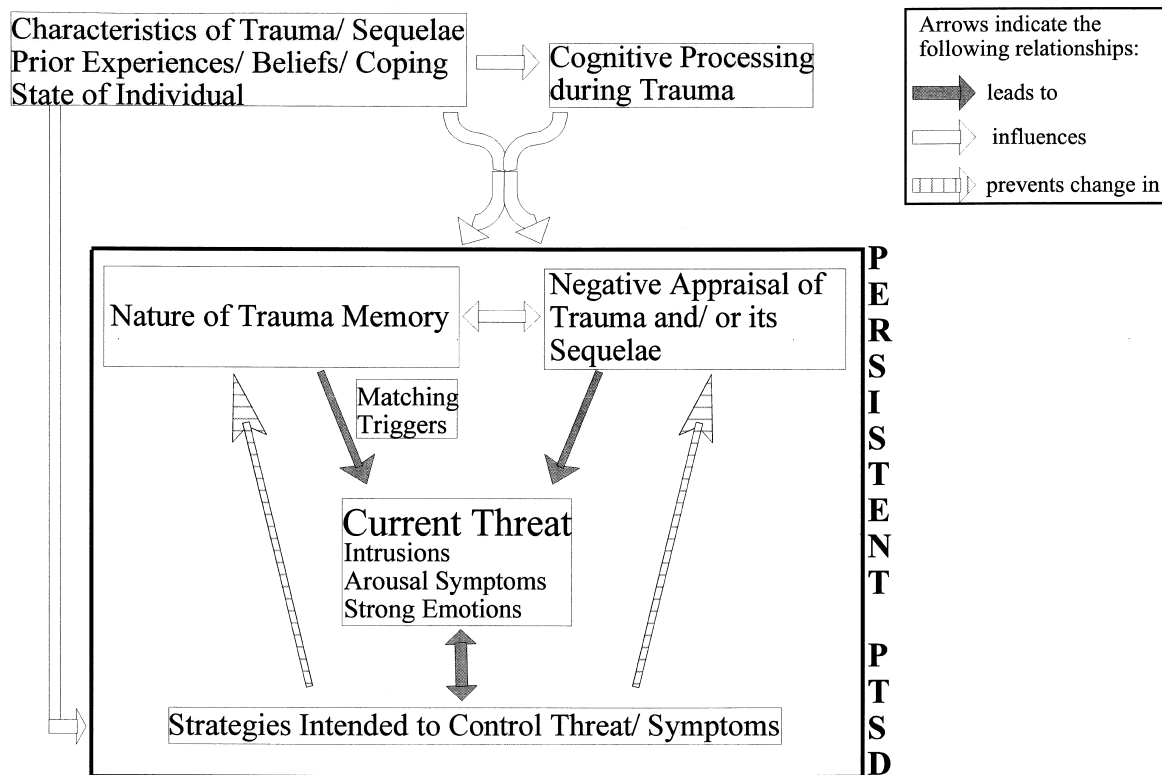


Fig. 1. A cognitive model of PTSD.

(see also Foa & Riggs, 1993; Janoff-Bulman, 1992; Joseph et al., 1997; Meichenbaum, 1997; Resick & Schnicke, 1993)). Examples are given in Table 1.

1.2.1. Appraisal of the traumatic event

Several types of appraisal of the traumatic event can produce a sense of current threat. First, individuals may overgeneralise from the event and as a consequence perceive a range of normal activities as more dangerous than they really are. They may exaggerate the probability of further catastrophic events in general or take the fact that the trauma happened to them, as opposed to other people, as evidence for appraisals such as “I attract disaster” or “bad things always happen to me”. Such appraisals generate not only situational fear but also avoidance which maintains the overgeneralised fear. Common examples include avoiding driving after experiencing a road traffic accident because of an unrealistic belief about the likelihood of future accidents or severely restricting one’s social life after a sexual assault for a similar reason.

Second, appraisals of the way one felt or behaved during the event can have long-term threatening implications. For example, a woman who experienced sexual arousal during a particularly protracted rape interpreted her response as a sign that she had secret desires that were repulsive to her. Similarly, another woman who was raped by an acquaintance interpreted

Table 1

Examples of idiosyncratic, negative appraisals leading to sense of current threat in persistent PTSD

What is appraised?	Negative appraisal
Fact that trauma happened	“Nowhere is safe” “The next disaster will strike soon”
Trauma happened to me	“I attract disaster” “Others can see that I am a victim”
Behaviour/emotions during trauma	“I deserve that bad things happen to me” “I cannot cope with stress”
<i>Initial PTSD symptoms</i> Irritability, anger outbursts	“My personality has changed for the worse” “My marriage will break up” “I can’t trust myself with my own children”
Emotional numbing	“I’m dead inside”, “I’ll never be able to relate to people again”.
Flashbacks, intrusive recollections and nightmares	“I’m going mad”, “I’ll never get over this”.
Difficulty concentrating	“My brain has been damaged”, “I’ll lose my job”.
<i>Other people’s reactions after trauma</i> Positive responses	“They think I am too weak to cope on my own” “I am unable to feel close to anyone”
Negative responses	“Nobody is there for me” “I cannot rely on other people”
<i>Other consequences of trauma</i> Physical consequences	“My body is ruined” “I will never be able to lead a normal life again”
Loss of job, money etc.	“I will lose my children” “I will be homeless”

her inability to spot that this was likely to happen as a sign that she was much less capable of ‘reading’ other people than she thought and that she should therefore abandon her cherished plans for a career in clinical psychology.

1.2.2. Appraisals of trauma sequelae

A variety of idiosyncratic, negative appraisals of the sequelae of the traumatic event can produce a sense of current threat and contribute to persistent PTSD. These include: interpretation of one’s initial PTSD symptoms, interpretation of other people’s reactions in the aftermath of the event and appraisal of the consequences that the trauma has in other life domains (e.g. physical consequences such as pain and financial or professional consequences).

Symptoms such as intrusive recollections and flashbacks, irritability and mood swings, lack

of concentration and numbing are common reactions shortly after a traumatic event. If individuals do not see these symptoms as a normal part of the recovery process, they may interpret them as indications that they have permanently changed for the worse or as indicators of a threat to their physical or mental well being (see also Ehlers & Steil, 1995; Foa & Riggs, 1993; Foa & Rothbaum, 1998; Jones & Barlow, 1990). Table 1 gives several examples of negative appraisals of initial PTSD symptoms. Such appraisals maintain PTSD by directly producing negative emotions (e.g. anxiety, depression or anger) *and* by encouraging individuals to engage in dysfunctional coping strategies that have the paradoxical effect of enhancing PTSD symptoms. For example, individuals who believe that intrusive recollections mean they are losing control of their mind are likely to try hard to push such recollections out of their mind. Unfortunately, active thought suppression of this type often makes the thought *more* likely to come to mind (Wegner, 1989).

Other people, including family and close friends, are often uncertain about how they should respond to a trauma victim and may avoid talking about the event in order not to distress the victim. This ‘consideration’ can be interpreted as a sign that others do not care, or, worse still, that they think the event was partly the victim’s fault. Such interpretations are likely to directly produce some of the symptoms of PTSD (estrangement from others and social withdrawal) and are also likely to prevent victims from discussing the trauma with others, hence reducing the opportunity for therapeutic reliving (see below) and for feedback from others that might help correct excessively negative views about the meaning of the event. Of course some people are also objectively uncaring, rejecting or critical of victims after a traumatic event. If traumatised individuals consider these people’s views important, they may interpret such reactions as a sign that they are to blame for the event, that they are unworthy, that they are unlikeable or that they will not be able to have close relationships with others.

Traumatic events can have negative long-term effects on many areas of life, including the individual’s physical health, appearance, vocational and financial situation. These can be interpreted as a sign of a permanent negative change of one’s life for the worse or as a sign that worse is still to come.

1.2.3. Appraisals and emotional responses

The nature of predominant emotional responses in persistent PTSD depends on the particular appraisals (see Beck, 1976). Appraisals concerning perceived danger lead to fear (e.g. “Nowhere is safe”), appraisals concerning others violating personal rules and unfairness lead to anger (e.g. “Others have not treated me fairly”), appraisals concerning one’s responsibility for the traumatic event or its outcome lead to guilt (e.g. “It was my fault”), appraisals concerning one’s violation of important internal standards lead to shame (e.g. “I did something despicable”) and appraisals concerning perceived loss lead to sadness (e.g. “My life will never be the same again”). Most patients with persistent PTSD experience a range of negative emotions. This is partly because different appraisals are activated at different times and partly because the degree of conviction varies from time to time. For example, the possibility that a loss may occur tends to be associated with anxiety whereas perceived certainty of a loss tends to be associated with depression.

1.3. Memory for the traumatic event

The nature of trauma memory and its relationship to unwanted recollections is another puzzle of persistent PTSD. On the one hand, patients often have difficulty in *intentionally* retrieving a complete memory of the traumatic event. Their intentional recall is fragmented and poorly organized, details may be missing and they have difficulty recalling the exact temporal order of events (Foa & Riggs, 1993; Foa, Molnar & Cashman, 1995; van der Kolk & Fisler, 1995; Koss, Figueredo, Bell, Tharan & Tromp, 1996; Amir, Stafford, Freshman & Foa, 1998). On the other hand, patients report a high frequency of *involuntarily* triggered intrusive memories involving reexperiencing aspects of the event in a very vivid and emotional way. Models of PTSD need to explain this apparent discrepancy between difficulties in intentional recall and easily triggered reexperiencing of the event. In addition, the involuntary reexperiencing has a number of important characteristics that need to be explained. These characteristics will be described first. We will then go on to outline a possible explanation for the memory disturbance.

- Reexperiencing mainly consists of sensory impressions, rather than thoughts. The impressions can involve all modalities including physical sensations, but are predominantly visual (see Ehlers & Steil, 1995; van der Kolk & Fisler, 1995). For example, a man who experienced a head-on car crash at night kept seeing headlights coming towards him.
- The sensory impressions are experienced as if they were happening right now rather than being memories from the past and the emotions (including physical reactions and motor responses) accompanying them are the same as those experienced at the time ('original' emotions). They lack the awareness of remembering that usually characterises autobiographical memories (see also Foa & Rothbaum, 1998; and Brewin et al.'s, 1996, concept of situationally accessible memories). Reemtsma (1997) who was kidnapped and held hostage in a cellar for a month provides a good illustration. After the kidnappers set him free, the terror he experienced in the cellar kept haunting him. He describes this experience as "being back in the cellar". Note that he does not say it was *like* being back in the cellar.
- The original emotions and sensory impressions are reexperienced even if the individual later (i.e. at another time during the event or afterwards) acquired new information that contradicted the original impression or if he/she knows that these impressions did not turn out to be true. For example, a patient whose father committed suicide by shooting himself, kept reexperiencing a panicky urge to find his father and the feeling of responsibility for rescuing him that he had when he discovered the suicide note. At the time, he erroneously thought that his father had taken sleeping tablets and could be saved if he acted quickly enough.
- "Affect without recollection". Individuals with PTSD sometimes reexperience physiological sensations or emotions that were associated with the traumatic event *without* a recollection of the event (lack of source information, see also Schacter, Norman & Koutstaal, 1997). For example, a rape victim noticed that she was feeling extremely anxious while talking to a female friend in a restaurant and only subsequently realised that the feeling was probably triggered by the presence of a man on another table who bore some physical similarity with the rapist.

- The involuntary reexperiencing of the traumatic event is triggered by a wide range of stimuli and situations. Many of the trigger stimuli are cues that do *not* have a strong *semantic* relationship to the traumatic event, but instead are simply cues that were *temporally associated* with the event. Common examples are physical cues similar to those present shortly before or during the traumatic event (e.g. the shape of a person, spatial cues, smells, a pattern of light, particular phrases said in a certain tone of voice), similar emotional states (e.g. feeling helpless or trapped) or other similar internal cues (e.g. touch on a certain part of the body, proprioceptive feedback from one's own movements or posture).

It is proposed that the intrusion characteristics and the pattern of retrieval that characterises persistent PTSD (poor intentional recall, vivid unintentional reexperiencing with 'here and now' quality) is due to the way the trauma is encoded and laid down in memory.

1.3.1. Poor elaboration and incorporation into autobiographical memory base

There are two routes to the retrieval of autobiographical information (see also Brewin et al., 1996). First, through higher-order meaning-based retrieval strategies (e.g. remembering the first day at school). Second, through direct triggering by stimuli that were associated with the event (e.g. particular smells or a piece of music). Much of the normal processing of autobiographical memories appears to have the function of reducing the ease with which memories of past experiences are unintentionally retrieved while we are engaging in everyday tasks. Autobiographical events are usually incorporated into an autobiographical memory knowledge base that is organized by themes and personal time periods (Conway & Pleydell-Pearce, 1997). This type of elaboration enhances the first retrieval route and *inhibits* the second (see Conway, 1997b; Markowitsch, 1995) and has the effect that when an autobiographical memory enters consciousness, it comprises both specific information about the event *and* general information about the lifetime period that the event took place in and abstracted information about the type of event in general (e.g. school days in general).

We propose that in persistent PTSD one of the main problems is that the trauma memory is poorly elaborated and inadequately integrated into its context in time, place, subsequent and previous information and other autobiographical memories (see also Siegel, 1995). This explains problematic intentional recall (weak semantic route to retrieval), the 'here and now' quality (no context in time, hence the perception of current threat), the absence of links to subsequent information (e.g. "I did not die") and the easy triggering by physically similar cues.

1.3.2. Strong S–S and S–R associations

We propose that a further problem in persistent PTSD is that S–S and S–R associations are particularly strong for traumatic material. This makes triggering of memories of the event and/or emotional responses by associated stimuli even more likely (see also Conway, 1997a; Foa et al., 1989; Keane, Zimering & Caddell, 1985; Charney, Deutch, Krystal, Southwick & Davis, 1993). A good illustration of how S–S associative learning leads to involuntary reexperiencing is given by Reemtsma (1997). His most distressing intrusion after his release from the cellar was hearing a knocking sound, and he experienced great distress with this intrusion. His kidnappers had knocked at the door of the cellar when bringing him food, water, etc. When

they knocked, he had to lie down immediately with his face to the floor and make sure he did not see them, knowing he would be killed if he did. He describes that initially the intrusive knocking sound appeared to come out of the blue, but that he gradually became aware that this intrusion was often triggered by hearing footsteps. During his captivity, he had heard footsteps approaching before the kidnappers knocked at the door. The sound of footsteps had become associated with the sound of knocking.

Two aspects of S–S and S–R associative learning are of interest in explaining the persistence of PTSD. First, this form of learning helps the organism in making predictions (including those that operate outside awareness) about *what will happen next*. It appears that in PTSD distinct¹ stimuli that were present shortly before or during the traumatic event become associated with the default prediction of severe danger to self. Second, retrieval from associative memory is cue-driven and unintentional so that the individual may not always be aware of the triggers for reexperiencing (as in Reemtsma's example) and may not be aware that his/her emotional reaction is due to activation of the trauma memory (affect without recollection)². Failure to spot the origin of the reexperiencing symptoms makes it difficult for the patient to learn that there is no present danger when exposed to the triggers³.

1.3.3. *Strong perceptual priming*

We propose that there is particularly strong perceptual priming (a form of implicit memory) for stimuli that were temporally associated with the traumatic event, i.e. there is a reduced perceptual threshold for these stimuli. As a consequence of the reduced perceptual threshold, cues that were associated with the trauma and that consequently can directly trigger the trauma memory are more likely to be noticed. As implicit memory traces are not well discriminated from other memory traces (Baddeley, 1997), vague physical similarity would be sufficient in perceiving stimuli as similar to those occurring in the traumatic situation (poor stimulus discrimination) and thus triggering reexperiencing symptoms, even if the context in which the stimulus configuration is observed is very different. For example, a patient who had been involved in a car crash at night noticed that a patch of bright sunlight on his lawn triggered vivid intrusions of headlights coming towards him.

1.4. *Relationship between the nature of trauma memory and trauma appraisals*

There is a reciprocal relationship between the nature of the trauma memory and the appraisals of the trauma/its sequelae. When individuals with persistent PTSD recall the traumatic event, their recall is biased by their appraisals and they selectively retrieve

¹ With Rescorla (1988) we assume that this is an 'intelligent' process in that stimuli with a high information value (in terms of predicting the occurrence of the traumatic event) are particularly likely to become associated with danger. Note that the stimuli may not have a *meaningful* relationship with danger.

² In line with the hypothesis that these reexperiencing phenomena reflect strong S–S and S–R associative learning and a relative deficit in memory elaboration, Bechara et al. (1995) have demonstrated a dissociation between conditioning and declarative memory associated with amygdala and hippocampal functions.

³ This corresponds to LeDoux's finding from animal research that involvement of the cortex is necessary to unlearn conditioned fear responses (LeDoux, 1992).

information that is consistent with these appraisals. For example, a patient who thought that the trauma (an accident) showed that nobody cared about her, recalled unfriendly responses of nurses in hospital, but did not recall that several people had tried to help her after the accident. Such selective retrieval prevents individuals from remembering aspects of the traumatic event that contradict their appraisals and thus prevents change in the appraisals. When the patient remembered during imaginal reliving that others were trying to help after the accident, her belief that nobody cared about her decreased.

On the other hand, inability to remember details of the trauma can be appraised by individuals in a way that maintains the sense of current threat, for example, that the memory problem means something is seriously wrong with them (e.g. brain damage) or that something even worse must have happened during the trauma that would be unbearable if they knew what it was. Inability to remember the exact order of events can contribute to the erroneous appraisal of being responsible for the event.

Similarly, the 'here and now' quality of the emotions that are associated with the trauma memory can contribute to problematic appraisals. For example, many people feel extremely lonely during a traumatic event and reexperiencing these feelings in the company of significant others may be interpreted as a sign that they are unable to relate to other people or that their relationships with others have permanently changed for the worse.

Furthermore, it is proposed that in those people with persistent PTSD for whom the traumatic event has seriously threatened their view of themselves (e.g. as worthy or capable), the general organisation of their autobiographical memory knowledge base may be disturbed⁴ (an extreme case of a patient who developed complete retrograde amnesia for the past 6 years after a traumatic event is described by Markowitsch et al. (1998)). Such people seem unable to reorganise their previous and subsequent experiences in a way which produces a stable view of themselves and the context they live in (see Conway's idea that autobiographical knowledge grounds the self (Conway, 1997a; Conway & Pleydell-Pearce, 1997)). This will produce a sense of disorientation and will also have the effect that their retrieval from memory will be less filtered by current context and more cue-driven than the perceptions of other people with a strong sense of self in context. This is comparable to a person who has moved to a new town and keeps 'seeing' people from his previous home town by responding to vague physical similarity until he establishes a clear awareness of himself in a new environment. The disorganised autobiographical memory will therefore make cue-driven recollections of the traumatic event/affect more likely.

1.5. Maladaptive behavioural strategies and cognitive processing styles

When patients with persistent PTSD perceive a serious current threat and the accompanying symptoms, they try to control the threat and symptoms by a range of strategies. The strategy selected is meaningfully linked with the individual's appraisals of the trauma and/or its sequelae and their general beliefs about how best to deal with the trauma. Further examples

⁴ This may be reflected in the findings of poor retrieval of specific autobiographical memories in PTSD (Kuyken & Brewin, 1995; McNally et al., 1995).

are given in Table 2. The strategies intended to control the threat/symptoms are maladaptive because they maintain PTSD by three mechanisms:

1. Directly producing PTSD symptoms,
2. Preventing change in negative appraisals of the trauma and/or its sequelae,
3. Preventing change in the nature of the trauma memory.

An example of a maladaptive cognitive strategy that increases PTSD symptoms directly is *thought suppression*. If patients try hard to push thoughts about the trauma out of their mind, this will increase the frequency of unwanted intrusive recollection. Another common example is that *behaviours used to control* some of the *PTSD symptoms* may increase others, e.g. attempts to prevent nightmares by going to bed very late or getting up very early may increase symptoms of poor concentration, irritability and alienation. *Selective attention to threat cues*⁵ is another example of a cognitive process that may increase the frequency of intrusions and trauma-related emotions.

Among the strategies that prevent a change in the appraisal of the traumatic event or its sequelae are *safety behaviours*. These are actions individuals take to prevent or minimise anticipated further catastrophes (Salkovskis, 1996). Safety behaviours prevent disconfirmation of the belief that the feared catastrophe will occur if one does not engage in preventative action. For example, individuals may be extremely vigilant for possibly dangerous situations while driving in order to decrease the probability of another accident. Individuals who were assaulted in their homes may always sleep with a knife next to their bed in order to minimise the risk of being killed by another intruder.

Among the maladaptive strategies that prevent a change in the nature of the trauma memory is actively trying *not to think* about the event. Individuals with persistent PTSD try to keep their mind constantly occupied with other things or they try to think about the event in a non-emotional way (like giving a report to the police or a journalistic description), leaving out the parts with the largest emotional impact. These efforts can take elaborate forms. For example, a lorry driver who had been involved in a fatal accident kept occupying his mind with sexual fantasies when at work to prevent memories of the accident from popping back into his mind. Another patient spent hours cleaning her house to prevent being overwhelmed by memories. Efforts to not think about the event prevent individuals from elaborating the trauma memory and linking their experience with its context in time, space, previous and subsequent information and other autobiographical memories. They also prevent changes in appraisals about what would happen if they thought about the trauma (e.g. “I will go mad”).

Similarly, *avoidance of reminders of the trauma* maintains PTSD by preventing both a change in the problematic appraisals (e.g. “If I encounter . . . , the trauma will happen again”, see also Table 2) and a change in the nature of the memory. Avoidance of the site of the trauma commonly prevents correction of appraisals about how the event could have been avoided. As reminders of the trauma often provide retrieval cues for inaccessible details, avoidance of these

⁵ We talk about the dysfunctional behaviours and cognitive processes as strategies, but we do not assume that they always have an intentional quality. They may be performed in a habitual or reflexive fashion. For example, selective attention to threat and dissociation probably includes automatic as well as strategic responses. The former may represent part of the trauma memory that can be automatically triggered when reminders are present.

Table 2
Examples of appraisals with associated dysfunctional behavioural and cognitive strategies

Appraisal	Dysfunctional strategies
If I think about the trauma ...I will go mad ...I will fall apart ...I will lose control and hurt someone ...I will have a heart attack ...I will seriously damage my health	try hard not think about the trauma; keep mind occupied all the time; control feelings; drink alcohol/ take drugs
If I do not control my feelings tightly ...I will not be able to work and lose my job ...I will lose my temper and offend people	numb emotions; avoid anything that could cause negative or positive feelings
If I do not find out how this event could have been prevented ...something similar will happen again	ruminate about how event could have been prevented
If I do not find a way to punish the assailant he will have won and I will not be a proper man any longer	ruminate about how to get even with assailant
If I go to the site of the event, If I wear the same clothes again, ...I will have another accident ...I will have a nervous breakdown	avoid site of the event avoid wearing similar clothes
If I do not take extra precaution ...I will be attacked again	carry weapon; vigilant for dangerous people; avoid crowded places; make sure to stay close to exit
If I do not check the rear mirrors ...someone will drive into my car again	keep checking mirrors
If I make plans (such as for a holiday) ...the next awful thing is going to happen	do not make any plans for the future
If I see my friends ...they will ask me about the trauma and they will think that I am pathetic because I am still so upset	avoid seeing friends
If I do things that I used to enjoy ...I will be punished again ...I will be reminded of the trauma and will not be able to cope ...I will be overwhelmed by emotion	give up pleasant activities
If I show my face ...people will be disgusted because of my scars	avoid other people; cover face with hands; heavy make-up; look down

(continued on next page)

Table 2 (continued)

Appraisal	Dysfunctional strategies
If I go to sleep ...I will have nightmares ...I will not notice intruders	stay up until very late
If I have more stress ...I will have a heart attack ...I will have a nervous break-down	avoid anything that could be stressful

cues also interferes with the formation of a more elaborate trauma memory that links the experience to its context. Similarly, use of *alcohol or medication to control anxiety* will prevent a change in interpretations such as “I am going to lose control when I let my feelings come” and will also interfere with a change in the nature of the memory. Furthermore, it is common for people with persistent PTSD to *give up or avoid activities* that were important to them before the traumatic event, for example sports, hobbies or socialising. This prevents a change in their appraisals, e.g. that the trauma has made them a different person or that other people will respond negatively if they knew about the trauma and prevents them from reorganising their autobiographical memory knowledge base in a way that creates a continuous view of the self.

Another common example of a maladaptive cognitive processing style is *rumination* about the trauma and its consequences, for example about how it could have been prevented or about how justice/revenge can be achieved. At this stage, it is unclear what exactly the mechanisms are by which rumination maintains PTSD. It probably strengthens problematic appraisals of the trauma (e.g. “The trauma has ruined my life”) and is probably similar to cognitive avoidance in interfering with the formation of a more complete trauma memory because it focusses on ‘what if...’ questions rather than on the experience of the trauma as it actually happened. Finally, it may also directly increase feelings of nervous tension, dysphoria or hopelessness and, because it provides internal retrieval cues, intrusive memories of the traumatic event.

Note that the present model assumes that different mechanisms underlie rumination and reexperiencing symptoms (see also Joseph et al., 1997). Clinical descriptions of intrusive thoughts in PTSD have not always made this distinction. Rumination is thought to be driven by problematic appraisals whereas deficits in the trauma memory are seen as the cause of persistent reexperiencing symptoms. However, reexperiencing may lead to rumination and rumination may provide internal cues that trigger reexperiencing symptoms.

Dissociation when reminded of the trauma is an as yet poorly understood cognitive response that interferes with recovery. We speculate that the derealisation, depersonalisation and emotional numbing experienced during dissociation may impede the elaboration of the trauma memory and its integration into the autobiographical memory knowledge base (see also Foa & Hearst-Ikeda, 1996).

1.6. Cognitive processing during trauma

The two processes that lead to a sense of serious current threat in PTSD (appraisals of the trauma/its sequelae and the nature of the trauma memory) are themselves influenced by the type of cognitive processing during the traumatic event.

1.6.1. Influences on appraisal

An example of thought processes during the trauma that influence subsequent appraisals is mental defeat. Ehlers et al. (1998a); Dunmore, Clark and Ehlers (1997, 1998, 1999) and Ehlers, Maercker and Boos (in press) identified *mental defeat* as a correlate of chronic PTSD and poor response to exposure treatment. Mental defeat refers to the perceived loss of all psychological autonomy, accompanied by the sense of not being human any longer. Patients who experienced mental defeat are more likely than other victims to interpret the trauma as evidence for a negative view of themselves, for example, that they are unable to cope with stress, that they are not a worthy person or that they are permanently damaged by the trauma.

1.6.2. Influences on memory

The nature of the trauma memory depends on the quality of processing at encoding (see also Krystal, Bennett, Bremner, Southwick & Charney, 1995; Schacter et al., 1997; Siegel, 1995). An important dimension of encoding is conceptual vs. data-driven processing (Roediger, 1990). Some trauma victims describe that their thinking was extraordinarily clear and that they kept analysing the situation whereas others report confusion and overwhelming sensory impressions. It is suggested here that the latter group is more likely to suffer from persistent PTSD because the degree of conceptual processing (i.e. processing the meaning of the situation, processing it in an organized way and placing it into context) during a traumatic event determines the nature of the memory and thus the ability to intentionally retrieve information from this memory. If the individual lacks conceptual processing and engages mainly in data-driven processing (i.e. processing the sensory impressions), then the trauma memory will be relatively difficult to retrieve intentionally and at the same time there will be relatively strong perceptual priming for accompanying stimuli, in line with the results of experimental cognitive psychology (reviewed by Roediger (1990)). The resulting memory trace will be poorly discriminated from other memory traces (Baddeley, 1997), thus impairing stimulus discrimination between stimuli present during the trauma and harmless stimuli that bear some similarity to these.

Besides the role of conceptual vs. data-driven processing, the unorganised memories observed in persistent PTSD may in part result from an inability to establish a *self-referential perspective* while experiencing the trauma that can be integrated into the continuum of other autobiographic memories in time (see Wheeler, Stuss & Tulving, 1997).

It has been suggested that *dissociation* during trauma explains the fragmentation of traumatic memories (Spiegel, 1991; van der Kolk & Fisler, 1995). Dissociation is a complex concept that has several different components. Some of these may overlap with the concepts of conceptual vs. data-driven processing and lack of self-referential perspective when encoding. Emotional numbing may be a further factor that interferes with the formation of an organized memory of the traumatic event (see Foa & Hearst-Ikeda, 1996).

Another problem at encoding that may explain some features of the trauma memory stems

from observations that propositions are stored in long-term memory with a *default 'true' value* (Conway, 1997b). During a traumatic event, individuals may not have enough cognitive capacity to decide that some very threatening aspects of the trauma are not true. For example, a rape victim remained convinced that she was unattractive because the rapist had repeatedly told her she was ugly. The extreme distress and anxiety she experienced during the rape made it impossible for her to appreciate that these words were untrue and instead were simply a strategy that the rapist used to manipulate and humiliate her. She thus encoded his statements as true and the appraisal that she was unattractive continued to pose a current threat to her.

1.7. Trauma characteristics, previous experiences and beliefs, current state

The model takes into account several background factors that are likely to influence: cognitive processing during the traumatic event, the nature of the trauma memory, individuals' appraisals of the trauma/its sequelae and the strategies they use to control the perceived threat/symptoms (see Fig. 1). These background factors are considered neither necessary nor sufficient factors in the etiology of persistent PTSD and the examples given below are meant as illustrations rather than an exhaustive list.

Cognitive processing during a traumatic event will depend on a number of factors. *Characteristics of the trauma* such as duration and predictability may exert an influence. For example, a road traffic accident in which one is suddenly hit from the back is more difficult to conceptually process than an accident that one can see coming. Another example is that mental defeat is unlikely to be experienced during assault of very short duration (Ehlers et al., 1998a). *Previous experience of trauma* and coping styles used during these events may play a role. For example, victims of childhood sexual abuse may engage in little conceptual processing during a renewed trauma because the trauma reactivates memories of the abuse during which they primarily engaged in data-driven processing. Young children are particularly likely to engage in data-driven processing during abuse because it is difficult for them to conceptualise what is happening to them. *Low intellectual ability* may be related to a less conceptual and more data-driven processing (see McNally & Shin's, 1995, findings of an association of low intelligence and PTSD). *Prior beliefs* may play a role. For example, individuals who believe that no one could ever harm them may find it hard to understand what is going on when they are assaulted. *State factors* such as alcohol consumption, general exertion, degree of arousal and fear may influence the ability to process the situation in a conceptual and organized way (see also Foa & Riggs, 1993; van der Kolk & Fisler, 1995). The impact of high arousal and fear on trauma memory probably includes cognitive and biological pathways. For example, very high cortisol levels during extreme stress may interfere with the encoding of the memory for the event, thus impairing intentional recall (see also Newcomer et al., 1999).

Appraisals of the trauma and its sequelae will also in part be influenced by *characteristics* of the event and its sequelae. For example, if individuals perceived no control at all over the traumatic situation, they may interpret this situational lack of control as evidence that they have little control over their lives in general. Traumas that leave the individual with permanent health problems are more likely to lead to appraisals such as "My life is ruined" than traumas which inflicted reversible injuries. The quality of other people's reactions in the aftermath of the trauma (social support versus negative reactions) influences the probability of appraisals

such as “Nobody cares about me”. *Prior beliefs* will be important in that trauma victims with prior negative beliefs about themselves may see the trauma as a confirmation of these beliefs and those with extremely positive beliefs may find that the trauma shatters their trust in themselves or the world (see Foa & Riggs, 1993; Janoff-Bulman, 1992; Resick & Schnicke, 1993). Another example of the influence of prior beliefs is that people who think that they should always be in control of their emotions and thoughts may be especially likely to interpret the intrusive reexperiencing symptoms as a sign that they are falling apart, going mad or have a brain injury. *Prior experiences* can exert an influence in that previous negative experiences and traumas may be linked with the renewed trauma and may give it additional negative meaning. For example, a victim of child sexual abuse who is raped as an adult may interpret the rape as showing that she is the type of person who deserves no better or brings out the worst in other people. A renewed trauma may also act as a powerful cue for memories of earlier trauma if some of its sensory components overlap, so that it reactivates some of the emotional responses to this earlier experience. For example, a patient who had a relatively minor car accident was reminded by the sound of the impact of an earlier accident in which his mother was killed. He blamed himself for this earlier accident, but had overcome his initial distress and had managed not to think about it for many years. The second accident brought back intrusive memories of the first accident and strong feelings of guilt and the patient developed persistent PTSD.

Cognitive and behavioural strategies used to control PTSD symptoms and current threat are likely to be influenced by *prior experiences and beliefs*. For example, a person who thinks that people with emotional problems are inferior is more likely to use thought suppression when distressing intrusive recollections of the trauma occur than other people who do not hold this belief. The same would be true for someone who believes that there is only so much distress that an individual can tolerate before going mad or suffering ill health. People who were criticised or ridiculed when showing fear or sadness in their childhood may try to numb their emotions and avoid talking to others about the traumatic event.

2. Features of PTSD explained by the model

2.1. *Delayed onset of PTSD*

So far we have presented PTSD as a syndrome characterised by common initial symptoms, which persist in some individuals. While this is generally correct, there are individuals with persistent PTSD who report that they experienced few or even no symptoms in the first few weeks or months after the traumatic event and that the onset of PTSD did not occur till months or even years after the trauma. How does the model deal with delayed onset cases? In general, we assume that the delay occurs either because some later event gives the original trauma or its sequelae a much more threatening meaning (see also the phenomenon of UCS reevaluation, Davey, 1989) or because some of the stimuli that are particularly potent reminders of the traumatic event were not available until some time afterwards. A common example for the *change in meaning* process are individuals who witness horrific events as part of their profession (e.g. ambulance workers, police). They may experience delayed PTSD if the events

become relevant to their personal lives (see Clohessy & Ehlers, in press). For example, they may start reexperiencing removing the bodies of children from an accident site when their children reach the same age and shape as the dead children. A common example for the *exposure to potent reminders* process are individuals who are hospitalised for severe injuries after motor vehicle accidents. While in hospital, these individuals do not encounter reminders such as cars or the site of the accident and their minds are usually focussed on the physical injuries and medical procedures, rather than the event which caused them.

2.2. *Anniversary reactions*

Many people with persistent PTSD experience aggravation of symptoms around the anniversary of the event. These may be explained by a combination of the presence of reminders and appraisal of the PTSD symptoms. Around anniversaries, patients are confronted with many external reminders (such as weather and light conditions or other people asking about it) and they also generate internal retrieval cues by dwelling on what their lives were like before the traumatic event and about their feelings and experiences on the day, before the traumatic event happened. Furthermore, anniversaries often are taken as landmarks for negative appraisals of PTSD symptoms such as “I am inadequate because I am still not over it”. Such appraisals activate strategies (e.g. thought suppression) which prolong/intensify the symptoms.

2.3. *Frozen in time*

Patients with persistent PTSD say that they feel locked into the past (see also Herman, 1992). They seem unable to resume their former life or to start a new life. This is illustrated by McNally's, Lasko, Macklin and Pitman's (1995) description of Vietnam veterans who decades after the war still wear their uniform and other regalia. Patients with chronic PTSD feel disconnected from their former self and their life goals.

This state of being ‘frozen in time’ has three sources. First, it is related to appraisals of the trauma/its sequelae. For example, patients may think that they are permanently changed for the worse by the trauma and thus ‘life will never be the same again’. They may also believe that their former life goals are unimportant following such an extreme experience or irrelevant because another catastrophe is going to happen soon. Second, continually reexperiencing sensations and emotions they had at the time of the trauma in their original form, disconnects them from current reality. Third, giving up or avoiding activities that were important to the person before the traumatic event contributes to the sense that time has stood still at the point of the traumatic event.

2.4. *Sense of impending doom*

Intrusive memories of the traumatic event are often accompanied by a sense of ‘worse is to come’, comparable to anticipatory anxiety, that motivates suppression of the memories. At first sight, this appears paradoxical as the individual obviously knows what the outcome of the traumatic event was. The model explains the sense of worse is to come by the nature of the

trauma memory, i.e. sensory information and emotions are retrieved from the memory without the time-perspective of ‘remembered’ emotions, thus leading to the perception of *future* threat. Furthermore, we have suggested elsewhere that intrusive memories are about ‘warning signals’ that during the traumatic event actually predicted the occurrence of the worst moments (Ehlers, Hackmann, Steil, Clohessy & Wenninger, 1999). In addition, the poor ability to retrieve details or order of events during the trauma together with the intrusive nature of the memories, may be interpreted by individuals as indicating that something even worse happened that they will find unbearable or that it will be unbearable to face all the horrible events together.

2.5. *No benefit from talking/thinking about the trauma*

People with persistent PTSD often report that they constantly think and talk about the trauma, but that this has not helped them to feel any different. It is proposed that this is because *of the way* they think and talk about the event. First, thinking in these cases often takes the form of rumination about ‘what if...’ questions rather than going over in one’s mind about what exactly happened and how one felt and thought during the event. Second, talking is often done in a nonemotional way, as if giving a report to the police or aspects that the individual finds most distressing are left out. This prevents proper access to the meaning of the event and its contextualisation (see also Foa & Kozak, 1986; Pennebaker, 1989).

3. Treatment implications

When people talk about recovering from a traumatic experience, they often use the metaphor “I have put it in the past”. The current model suggests that in persistent PTSD, putting the trauma into the past requires change in three areas.

- The trauma memory needs to be elaborated and integrated into the context of the individual’s preceding and subsequent experience in order to reduce intrusive reexperiencing.
- Problematic appraisals of the trauma and/or its sequelae that maintain the sense of current threat need to be modified.
- Dysfunctional behavioural and cognitive strategies that prevent memory elaboration, exacerbate symptoms or hinder reassessment of problematic appraisals need to be dropped.

A wide range of cognitive-behavioural interventions could be used to achieve change in these three areas (see, for example, Foa & Rothbaum (1998), Joseph et al. (1997), Meichenbaum (1997); Resick & Schnicke (1993)). Future research will identify which interventions are most efficient.

Below we describe the procedures that the Oxford Cognitive Therapy Trauma Group⁶ have found particularly helpful in pilot work aimed at devising an efficient CBT intervention. Some of the procedures utilise techniques that are already well-known in the field. For these

⁶ David M. Clark, Anke Ehlers, Melanie Fennell, Ann Hackmann and Freda McManus.

techniques, we mainly focus on how the techniques should be implemented to maximise change in the three target areas.

3.1. Assessment

A key aim of the assessment interview is to identify the main cognitive themes that will be addressed in therapy. Completion of the Post-traumatic Cognitions Inventory (PTCI; Foa, Ehlers, Clark, Tolin & Orsillo, in press), which covers a wide range of potentially problematic appraisals, can be helpful. In addition, patients are asked to look back at the event and consider what are the worst things about it/the most painful moments. In both the assessment interview and subsequent therapy sessions, parts of the memory that currently elicit particularly strong distress ('hot spots') are explored to identify meanings, as are intrusive images and moments when the patient dissociates or withdraws from processing. The nature of the predominant emotions (e.g. guilt, anger, shame, sadness or fear) is also an invaluable clue to cognitive themes. To identify problematic appraisals of the trauma sequelae, it is useful to ask what has been most distressing/difficult since the event and to explore patients' beliefs about their symptoms, their future and other people's behaviour. In delayed onset cases, the therapist tries to identify posttrauma events that may have changed the meaning of the original trauma or its sequelae. To identify problematic behavioural and cognitive strategies, it is useful to enquire how patients are currently trying to put the event behind them, what they think is the best way of coping with the trauma, what they avoid, how they deal with intrusions, what they think will happen if they allow themselves to dwell on the trauma or get upset about it, whether they ruminate and what their ruminations consist of.

A further aim of the assessment interview is to start to characterise the nature of the trauma memory and the spontaneous intrusions. Key issues include the extent to which there are gaps in memory, whether the sequence of events seems muddled or confused and the extent to which the memory/intrusions have a 'here and now' quality and strong sensory and motor components. Some of this information only becomes fully clear when some form of reliving has been initiated (see below).

3.2. Rationale for treatment

Usually, the rationale for treatment has three elements. First, it is explained that PTSD symptoms (especially intrusions, numbing and hyperarousal) are a common initial reaction to an abnormal event. This point is emphasised by reviewing the patient's symptoms in detail and explaining how some of the most puzzling aspects of the symptoms (e.g. the 'here and now'-quality of memories or becoming emotional for no apparent reason) are hallmarks of the condition. Second, that many of the ways the patient has so far used to deal with the trauma memory may have been useful for coping with other, milder stressors in their life, but paradoxically may be maintaining their symptoms in this instance. Third, treatment involves fully processing the trauma and reversing their particular maintaining factors.

A key element of treatment will involve thinking about the trauma more and discussing it in detail. Various analogies can help explain this point. The therapist may compare the trauma memory to a cupboard in which many things have been thrown in quickly and in a

disorganised fashion, so it is impossible to fully close the door and things fall out at unpredictable times. Organising the cupboard will mean looking at each of the things and putting them into their place. Once this is done, the door can be closed and remains shut. Another useful analogy is that of a jigsaw puzzle that has been scattered all over the floor so that one will unexpectedly stumble over some of its pieces. Only when all the pieces have been looked at and put together, the puzzle can be filed away. Linked to these points, the therapist explains that the reexperiencing symptoms are isolated memory fragments that are triggered by matching cues and that they are experienced as if things were happening in the ‘here and now’ because they are not integrated with other autobiographical information.

3.3. Thought suppression experiment

For many patients who attempt to deal with intrusions by pushing them out of their mind, a thought suppression experiment can be a useful way of illustrating the problematic consequences of this strategy. For example, the therapist might say to the patient “It doesn’t matter what you think for the next few minutes as long as you don’t think about one particular thing. It is extremely important you don’t think about that thing... The thing is a fluorescent green bunny rabbit eating my hair!”. Most patients find they immediately get an image of the rabbit and have difficulty getting rid of it. Discussion then helps them see that an increase in the frequency of target thoughts is a normal consequence of thought suppression. This result can then be used to set up a homework assignment in which the patient is asked to collect data to test the idea that thought suppression may be enhancing intrusions. The experiment involves not trying to push the intrusions out of the mind, but instead just letting them come and go, watching them as though they were a train passing through a station. Often patients report that this simple experiment produces a decline in both the frequency of intrusions and the belief that intrusions are a sign of impending insanity or loss of control. A similar approach can be used for rumination.

3.4. Education

Education about police, ambulance and hospital procedures, medication and other matters can help correct many other problematic appraisals. For example, a patient thought that his body was permanently damaged by an accident despite negative medical investigations. His evidence for this conclusion was the fact that his urine had a very dark yellow colour for a few days after the accident. He was greatly relieved to learn that this had been the effect of the medication he had received.

3.5. Reclaiming one’s life

A corollary of the here and now sense of intrusions is that patients with persistent PTSD feel that their life is stuck at the time of the trauma (see Section Frozen in time). They often give up important activities or social contacts that used to give them a sense of meaning and well-being prior to the trauma. To help contextualise the memory and give patients the feeling that they are moving forward in their lives they are encouraged to ‘reclaim’ their former selves by

reinstating activities that have dropped out of their lives. Often quite minor changes (e.g. buying a new pair of trainers and going jogging again) can help reduce the feeling of being stuck in time. If long-term physical effects of the trauma prevent taking up the original activity, similar but manageable activities are explored. When planning the reactivation of activities, it is important to identify problematic beliefs that may prevent the patient from complying. For example, a patient who had a second motorbike accident after agreeing with his family that he would not ride again, avoided visiting them because he was concerned that they would reject him. Socratic questioning helped him see that this would not be the case.

3.6. Reliving with cognitive restructuring

Some form of reliving of the traumatic event is involved in most cognitive behavioural programmes for PTSD. Procedures that have been shown to be effective include reliving the experience in the presence of the therapist and putting this experience into words (e.g. Foa & Rothbaum, 1998) or writing a detailed account of the event (e.g. Resick & Schnicke, 1993). From the point of view of the present model, reliving has several important functions. First, it promotes the elaboration and contextualisation of the trauma memory (see also Foa & Riggs, 1993). Second, identifying and discussing hot spots during reliving is useful in identifying the idiosyncratic appraisals of the trauma. Third, for those patients who believe that they will go crazy, fall apart, lose control or die when thinking about the trauma in detail, imaginal reliving in itself is a powerful behavioural experiment to test this interpretation (see also Foa & Riggs, 1993).

Following careful explanation of the rationale for reliving (see overfull cupboard and other metaphors above), we have tended to follow the general style of reliving recommended by Foa and Rothbaum (1998), with some variants. Patients are instructed to relive the trauma in their mind's eye, making the image as realistic as possible and including their thoughts and feelings as well as what was happening. At the same time, they are asked to verbally describe the reliving and to do so in the present tense. To help patients to stay with the memory, the therapist asks questions such as “What do you see?”, “How does that feel?”, “Where do you feel that?”, “What is going through your mind?”. To help identify hot spots, patients rate their distress levels at different points during the reliving. Initially, reliving usually involves the whole event, starting just before the event and continuing until patients knew they were safe. As therapy progresses, reliving focuses more exclusively on hot spots and other problematic aspects of the memory.

After a reliving exercise, therapist and patient identify and discuss problematic thoughts and beliefs that are associated with the key moments of the trauma, using the relevant cognitive restructuring techniques. Once an alternative perspective has been identified, efforts are made to incorporate this information into the next reliving. This can be achieved by carefully reviewing the alternative interpretation before restarting reliving and practising answering one's own thoughts during the reliving. In some cases, special techniques may be required. For example, a patient who was devastated by the sexual response she experienced during a protracted rape by a stranger was helped to see that although involuntary, this response was probably the main reason why she was not killed and so could return to her husband and their normal life. She had difficulty incorporating this information at the relevant point during

reliving as she tended to dissociate. To get around this problem, she recorded her reappraisal on tape and played it back through headphones at the relevant moment.

As therapy progresses, the nature of the trauma memory often changes. The narrative tends to become more coherent, sensory components (e.g. smells, tastes and vivid images) and motor components (e.g. involuntary movements) tend to fade and the memory loses its here and now quality and becomes more like a normal recollection. For some patients, these changes occur simply as a function of repeated reliving with the relevant rationale. For others, considerable additional cognitive restructuring is required. Integrating reliving and cognitive restructuring can be a challenge but, in our experience, can substantially reduce the amount of reliving required for recovery. When integrating the two procedures, it is important to strike a balance between sensitively spotting and changing appraisals and ensuring enough reliving to fully activate the emotional components of the memory. Reliving is emotionally draining and care needs to be taken to ensure that restructuring is not conducted when the patient is too exhausted to benefit.

Patients who are particularly likely to require extensive verbal and imagery cognitive restructuring are those who: (1) experience anger, guilt or shame as a predominant emotion, (2) interpret their behaviour or emotions during the event as showing something negative about themselves (e.g. perpetrators of crime (Foa & Meadows, 1997), rape victims who experience mental defeat (Ehlers et al., 1998a)) or (3) experienced violence over a prolonged period of time. The latter group sometimes cannot help but assume the perpetrators' negative views about them to some extent, viewing themselves as criminals or deserving maltreatment (Saporta & van der Kolk, 1992; Reemtsma, 1997; Ehlers et al., in press). For some individuals in these categories, extensive cognitive restructuring may be required before imaginal reliving can be beneficial.

At this stage, it is unclear why reliving works. However, there are several ways in which it is likely to facilitate elaboration of the trauma memory. First, it links previously unconnected parts of the traumatic experience, thus giving them a context. This will reduce the probability that isolated parts of the memory are triggered. A woman whose young daughter died in a house fire while she was out, had frequent intrusions of seeing the curtains burning when she approached the house. At the time, she had thought that the daughter was burning alive and was in tremendous pain. However, the daughter had actually been upstairs at the time and the fire had not reached her (she had died from the fumes), a fact that the patient took great comfort in. She had for years avoided thinking about the event and had never connected the fact that the daughter was upstairs with the image of the curtains burning. When she connected the image of the curtains burning with the image of the daughter in the upstairs bedroom in imaginary, her intrusions of the burning curtains ceased.

Second, reliving (as well as in vivo inspection of the site of the trauma) facilitates the retrieval of elements of the trauma memory that are difficult for the patient to access otherwise. In some cases accessing the previously unretrieved information leads to immediate changes in the problematic appraisals. For example, a patient was extremely angry with the paramedics who rescued her from her car after an accident because they did not answer her question of whether she was going to be paralysed. At the time, she had interpreted this as meaning they did not regard her as a human being. During reliving, she realised that the paramedics were probably concerned about upsetting her because she had been very agitated

before and they had only just managed to calm her down as to try to get her out. Once she had accessed this information and changed her interpretation, her distress ratings during reliving changed dramatically and her intrusions of being trapped in the car ceased.

Third, patients may link information they received after the trauma to correct their impression and thoughts during the trauma so that the event poses less current threat to the self. For example, a bus driver who had run over an elderly lady and felt very guilty became increasingly aware during reliving that the lady had intended to commit suicide by stepping out in front of the bus and his intrusions of seeing the lady look at him shortly before the impact decreased.

Fourth, reliving facilitates the discrimination between the 'then' and 'now', i.e. discrimination of how the stimulus configuration during the traumatic event differed from those during other safe events (see also Foa & Rothbaum, 1998). Thus, with the elaboration a closer match between the original traumatic situation and current situations will be required for a memory to be triggered.

Fifth, the verbalisation of visual and other sensory cues may also make it more difficult to retrieve the original sensory impressions from memory⁷.

3.7. *In vivo exposure*

In vivo exposure to avoided reminders of the trauma (e.g. the site, similar situations, activities, feelings, smells and sounds) is a powerful way of helping patients to emotionally accept that the traumatic event is in the past. When revisiting the site of the event, discussion of similarities and differences between what the scene looked like during the trauma and what it looks like now helps the patient in establishing a time perspective and helps in discriminating the harmless stimuli that happened to coincide with the trauma from the dangerous stimuli encountered during the traumatic event. Revisiting the site can also provide new information which helps correct problematic appraisals (e.g. seeing the road layout and discovering that one could not have prevented an accident).

Overgeneralisation of danger (e.g. never going out at night or drinking alcohol after being raped on a night out) can be effectively challenged by setting up exposure to avoided activities as a behavioural experiment (see also Clark, 1999). Patients are asked to specify what is the worst they think could happen and how likely it seems before entering the avoided situation/engaging in the avoided activity. In order to maximise the possibility of disconfirmation, patients are also encouraged to drop any relevant safety behaviours. For example, a driver who repeatedly looked in the mirror, turned off the radio (to facilitate hyperattention to the road) and firmly gripped the steering wheel in order to prevent future accidents would be encouraged to drop all of these behaviours and return to a pre-accident driving pattern.

Appraisals of trauma sequelae can also be challenged by setting up in vivo exposure as a behavioural experiment. For example, a patient who found herself becoming emotional and irritable for no apparent reason after a severe road traffic accident in which she had been

⁷ Experiments have shown that giving verbal descriptions of pictures decreases the ability to identify the pictures (verbal overshadowing: Schooler & Engstler-Schooler, 1990).

trapped in her car, interpreted her reactions as meaning that she would go crazy if she put herself under stress again and, as a consequence, would become like her sister who suffered from schizophrenia. A behavioural experiment was set up that involved thinking about the accident in an emotional way while in a car wash (a strong reminder of being trapped in her car). Before the behavioural experiment, the patient believed 100% that thinking about the accident in the car wash would make her go crazy. Her belief changed dramatically when she found that the experience was tolerable and that there were no signs of her going crazy.

3.8. Identifying triggers of intrusive memories and emotions

The model suggests that one way by which the elaboration of the trauma memory reduces the probability of reexperiencing symptoms is by promoting a better discrimination between those stimuli that occurred around the time of the trauma and those encountered currently. This process can be enhanced by direct interventions aiming at better discrimination. First, patients may benefit from training in spotting triggers of intrusive memories or negative affect and physical sensations related to the trauma. This requires careful monitoring of occasions when intrusions occur and information about the likely nature of the triggers (e.g. physical cues that were temporally associated with the trauma, but may not have a strong semantic relationship to the trauma: lights, smells, touch, movement, etc). Once the patient has identified triggers, detailed discussion of the similarities and differences between the present and past (trauma-related) context of the triggers can be used to facilitate stimulus discrimination. For example, a rape victim reported that she had been feeling very uneasy when having sex with her husband, even though she was not recalling the rape at the time. Therapist and patient discussed in detail the way the rapist had behaved and her husband's behaviour during sex. It emerged that there were quite a few sensory similarities, e.g. the way both men touched certain parts of her body, both events taking place in the dark and being accompanied by talking. Next, they discussed the differences, with particular emphasis on the men's intentions and their attitude to her. In this way, the patient was able to see that the similar sensory cues had very different meanings in the two contexts. To help further promote discrimination between the two events she was instructed to pay particular attention to things that were dissimilar from the rape when having sex with her husband and to change some of the stimulus conditions (e.g. leaving light on) to facilitate discrimination.

3.9. Imagery techniques

Imagery techniques are also useful in elaborating and changing the meaning of the trauma memory. For example, a person whose friend was blown up was unable to mentally say goodbye to the friend until he visualised him dead but whole again. A man who was hit head-on by another car felt guilty because he believed that the other driver must have been in tremendous protracted agony in the awareness of impending death, outweighing any distress that he had experienced. When he visualised the accident from the other driver's perspective he became aware that she must have only seen his car very shortly before the impact and must have died immediately. Imagery also allows patients to explore the possible consequences of

actions that were not taken and to incorporate a spiritual viewpoint (Layden & Hackmann, in preparation).

4. Summary and empirical support

It is suggested that PTSD becomes persistent when individuals process the trauma in a way which produces a sense of serious, current threat. The sense of threat arises as a consequence of: (1) excessively negative appraisals of the trauma and/or its sequelae and (2) a disturbance of autobiographical memory characterised by poor elaboration and contextualisation, strong associative memory and strong perceptual priming. Change in the negative appraisals and the trauma memory are prevented by a series of problematic behavioural and cognitive strategies.

The proposed model is consistent with the main clinical features of PTSD, helps explain several apparently puzzling phenomena (the ‘here and now’ quality of the memory and intrusions; ‘affect without recollection’, delayed onset PTSD, problems in intentional recall and easily triggered reexperiencing) and provides a framework for treatment by identifying three key targets for change.

Many propositions in the model remain to be tested. However, it is encouraging to note that recent studies have provided support for several central features. In particular, (1) negative appraisals of the trauma (Dunmore et al., 1997, 1998, in press; Foa et al., in press), negative interpretations of initial PTSD symptoms (Ehlers & Steil, 1995; Dunmore et al., 1997, 1998, 1999; Ehlers, Mayou & Bryant, 1998; Clohessy & Ehlers, in press; Steil & Ehlers, in press) and negative interpretations of other people’s posttrauma responses (Dunmore et al., 1997, 1998, 1999; Ehlers et al., in press) have been shown to predict PTSD persistence; (2) Foa and colleagues found that degree of improvement during cognitive-behavioural treatment is related to the extent to which the trauma narrative becomes more organized and coherent (Amir et al., 1998; Foa et al., 1995); (3) Murray, Ehlers and Mayou (submitted) found that memory fragmentation predicted PTSD persistence; (4) analogue experiments demonstrated enhanced perceptual priming for stimuli that occur in a traumatic context (Ehlers, Michael & Chen, in preparation) and (5) several strategies highlighted in the model (thought suppression, rumination, safety behaviours and avoidance) have been shown to predict persistence (Dunmore et al., 1998, 1999; Ehlers et al., 1998a, 1998b; Clohessy & Ehlers, in press; Steil & Ehlers, in press; Murray et al., submitted for publication). It is hoped that future studies will further investigate the model and its implications for treatment.

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References

- Amir, N., Stafford, J., Freshman, M. S., & Foa, E. B. (1998). Relationship between trauma narratives and trauma pathology. *Journal of Traumatic Stress, 11*, 385–392.
- Baddeley, A. (1997). *Human memory. Theory and practice* (revised ed.). Hove, UK: Psychology Press.
- Bechara, A., Trandel, D., Damasio, H., Adolphs, R., Rockland, C., & Damasio, A. R. (1995). Double dissociation of conditioning and declarative knowledge relative to the amygdalae and hippocampus in humans. *Science, 269*, 1115–1118.
- Beck, A. T. (1976). *Cognitive therapy and the emotional disorders*. New York: International Universities Press.
- Brewin, C. R., Dalgleish, T., & Joseph, S. (1996). A dual representation theory of posttraumatic stress disorder. *Psychological Review, 103*, 670–686.
- Charney, D., Deutch, A. Y., Krystal, J. H., Southwick, S. M., & Davis, M. (1993). Psychobiological mechanisms of posttraumatic stress disorder. *Archives of General Psychiatry, 50*, 294–305.
- Clark, D. M. (1999). Anxiety disorders: why they persist and how to treat them. *Behaviour Research and Therapy, 37*, S5–S27.
- Clohessy, S. & Ehlers, A. (in press). PTSD symptoms, response to intrusive memories and coping in ambulance service workers. *British Journal of Clinical Psychology*.
- Conway, M. A. (1997a). Introduction: what are memories? In M. A. Conway, *Recovered memories and false memories* (pp. 1–22). Oxford, UK: Oxford University Press.
- Conway, M. A. (1997b). Past and present: recovered memories and false memories. In M. A. Conway, *Recovered memories and false memories* (pp. 150–191). Oxford, UK: Oxford University Press.
- Conway, M. A., & Pleydell-Pearce, C. W. (1997). *On the construction of autobiographical memories: the self-monitoring system and its neuroanatomical basis*.
- Davey, G. C. L. (1989). UCS revaluation and conditioning models of acquired fears. *Behaviour Research and Therapy, 27*, 521–528.
- Dunmore, E., Clark, D. M., & Ehlers, A. (1997). Cognitive factors in persistent versus recovered posttraumatic stress disorder after physical or sexual assault: a pilot study. *Behavioural and Cognitive Psychotherapy, 25*, 147–159.
- Dunmore, E., Clark, D. M. & Ehlers, A. (1998). The role of cognitive factors in posttraumatic stress disorder following physical or sexual assault: findings from retrospective and prospective investigations. Paper presented at Annual Conference of British Association of Behavioural and Cognitive Therapies. Durham, UK, July 9–11.
- Dunmore, E., Clark, D. M. & Ehlers, A. (1999). Cognitive factors involved in the onset and maintenance of PTSD. *Behaviour Research and Therapy, 37*, 809–829.
- Ehlers, A., Clark, D. M., Dunmore, E., Jaycox, L., Meadows, E., & Foa, E. B. (1998a). Predicting response to exposure treatment in PTSD: the role of mental defeat and alienation. *Journal of Traumatic Stress, 11*, 457–471.
- Ehlers, A., Hackmann, A., Steil, R., Clohessy, S. & Wenninger, K. (1999). On the nature of posttraumatic intrusions. Manuscript in preparation.
- Ehlers, A., Maercker, A. & Boos, A. (in press). PTSD following political imprisonment: The role of mental defeat, alienation and perceived permanent change. *Journal of Abnormal Psychology*.
- Ehlers, A., Mayou, R. A., & Bryant, B. (1998b). Psychological predictors of chronic posttraumatic stress disorder after motor vehicle accidents. *Journal of Abnormal Psychology, 107*, 508–519.
- Ehlers, A., Michael, T. & Chen, Y. P. (in preparation). Enhanced perceptual priming for stimuli that occur in a traumatic context.
- Ehlers, A., & Steil, R. (1995). Maintenance of intrusive memories in posttraumatic stress disorder: a cognitive approach. *Behavioural and Cognitive Psychotherapy, 23*, 217–249.

- Foa, E. B., Ehlers, A., Clark, D. M., Tolin, D. F. & Orsillo, S. M. (in press). The posttraumatic cognitions inventory (PTCI): development and validation. *Psychological Assessment*.
- Foa, E. B., & Hearst-Ikeda, D. (1996). Emotional dissociation in response to trauma: an information processing approach. In L. K. Michelson, & W. J. Ray, *Handbook of dissociation: theoretical, empirical and research perspectives* (pp. 207–224). New York: Plenum Press.
- Foa, E. B., & Kozak, M. J. (1986). Emotional processing of fear: exposure to corrective information. *Psychological Bulletin*, 99, 20–35.
- Foa, E. B., & Meadows, E. A. (1997). Psychosocial treatments for posttraumatic stress disorder: a critical review. *Annual Review of Psychology*, 48, 449–480.
- Foa, E. B., Molnar, C., & Cashman, L. (1995). Change in rape narratives during exposure therapy for posttraumatic stress disorder. *Journal of Traumatic Stress*, 8, 675–690.
- Foa, E. B., & Riggs, D. S. (1993). Post-traumatic stress disorder in rape victims. In J. Oldham, M. B. Riba, & A. Tasman, *Annual review of psychiatry, Vol. 12* (pp. 273–303). Washington, DC: American Psychiatric Association.
- Foa, E. B., & Rothbaum, B. O. (1998). *Treating the trauma of rape. Cognitive-behavior therapy for PTSD*. New York: Guilford.
- Foa, E. B., Steketee, G., & Rothbaum, B. O. (1989). Behavioural/cognitive conceptualisations of post-traumatic stress disorder. *Behaviour Therapy*, 20, 155–176.
- Herman, J. L. (1992). Complex PTSD: a syndrome in survivors of prolonged and repeated trauma. *Journal of Traumatic Stress*, 5, 377–391.
- Horowitz, M. J. (1997). *Stress response syndromes. PTSD, grief and adjustment disorders*. Northvale, NJ: Jason Arosen.
- Janoff-Bulman, R. (1992). *Shattered assumptions: toward a new psychology of trauma*. New York: The Free Press.
- Joseph, S., Williams, R., & Yule, W. (1997). *Understanding posttraumatic stress. A psychosocial perspective on PTSD and treatment*. Chichester, UK: Wiley.
- Jones, J. C., & Barlow, D. H. (1990). The etiology of posttraumatic stress disorder. *Clinical Psychology Review*, 10, 299–328.
- Keane, T. M., Zimering, R. T., & Caddell, J. M. (1985). A behavioral formulation of posttraumatic stress disorder. *The Behavior Therapist*, 8, 9–12.
- Kessler, R. C., Sonnega, A., Bromet, E., Hughes, M., & Nelson, C. B. (1995). Posttraumatic stress disorder in the National Comorbidity Survey. *Archives of General Psychiatry*, 52, 1048–1060.
- Koss, M. P., Figueredo, A. J., Bell, I., Tharan, M., & Tromp, S. (1996). Traumatic memory characteristics: a cross-validated mediational mode of response to rape among employed women. *Journal of Abnormal Psychology*, 105, 421–432.
- Krystal, J. H., Bennett, A. L., Bremner, J. D., Southwick, S. M., & Charney, D. S. (1995). Toward a cognitive neuroscience of dissociation and altered memory functions in posttraumatic stress disorder. In M. J. Friedman, D. S. Charney, & A. Y. Deutch, *Neurobiological and clinical consequences of stress: from normal adaptation to PTSD* (pp. 239–269). Philadelphia, PA: Lippincott-Raven Publishers.
- Kuyken, W., & Brewin, C. R. (1995). Autobiographical memory functioning in depression and reports of early abuse. *Journal of Abnormal Psychology*, 104, 585–591.
- Layden, M. & Hackmann, A. (in preparation). *Imagery and cognitive therapy*. Washington, DC: American Psychological Association.
- LeDoux, J. E. (1992). Emotion as memory: anatomical systems underlying indelible memory traces. In S. A. Christianson, *Handbook of emotion and memory* (pp. 269–288). Hillsdale, NJ: Erlbaum.
- Markowitsch, H. J. (1995). Which brain regions are critically involved on the retrieval of old episodic memory? *Brain Research Reviews*, 21, 117–127.
- Markowitsch, H. J. (1996). Organic and psychogenic retrograde amnesia: two sides of the same coin? *Neurocase*, 2, 357–371.
- Markowitsch, H. J., Kessler, J., Van der Ven, C., Weber-Luxemburger, G., Albers, M., & Heiss, W. D. (1998). Psychic trauma causing grossly reduced brain metabolism and cognitive deterioration. *Neuropsychologia*, 36, 77–82.
- McNally, R. J., Lasko, N. B., Macklin, M. L., & Pitman, R. K. (1995). Autobiographical memory disturbance in combat-related posttraumatic stress disorder. *Behaviour Research and Therapy*, 33, 619–630.

- McNally, R. J., & Shin, L. M. (1995). Association of intelligence with severity of posttraumatic stress disorder symptoms in Vietnam combat veterans. *American Journal of Psychiatry*, *152*, 936–938.
- Meichenbaum, D. (1997). *Treating posttraumatic stress disorder. A handbook and practice manual for therapy*. Chichester, UK: Wiley.
- Murray, J., Ehlers, A. & Mayou, R. M. (submitted for publication). Two prospective studies of PTSD following motor vehicle accidents.
- Newcomer, J. W., Selke, G., Melson, A. K., Hershey, T., Craft, S., Richards, K., & Alderson, A. L. (1999). Decreased memory performance in healthy humans induced by stress-level cortisol treatment. *Archives of General Psychiatry*, *56*, 527–533.
- Pennebaker, J. W. (1989). Confession, inhibition and disease. *Advances in Experimental Social Psychology*, *22*, 211–244.
- Reemtsma, J. P. (1997). *Im Keller* (In the cellar). Hamburg, Germany: Hamburger Edition.
- Rescorla, R. A. (1988). Pavlovian conditioning: it's not what you think it is. *American Psychologist*, *43*, 151–160.
- Resick, P. A., & Schnicke, M. K. (1993). *Cognitive processing therapy for rape victims*. Newbury Park, CA: Sage.
- Roediger, H. L. (1990). Implicit memory: retention without remembering. *American Psychologist*, *45*, 1043–1056.
- Rothbaum, B. O., Foa, E. B., Riggs, D. S., Murdock, T. B., & Walsh, W. (1992). A prospective examination of posttraumatic stress disorder in rape victims. *Journal of Traumatic Stress*, *5*, 455–475.
- Salkovskis, P. M. (1996). The cognitive approach to anxiety: threat beliefs, safety-seeking behaviour and the special case of health anxiety and obsessions. In P. M. Salkovskis, *Frontiers of cognitive therapy* (pp. 48–74). New York: Guilford.
- Saporta, J. A., & van der Kolk, B. A. (1992). Psychobiological consequences of severe trauma. In M. Basoglu, *Torture and its consequences* (pp. 151–181). Cambridge, UK: Cambridge University Press.
- Schacter, D. L., Norman, K. A., & Koutstaal, W. (1997). The recovered memories debate: A cognitive neuroscience perspective. In M. A. Conway, *Recovered memories and false memories* (pp. 63–99). Oxford, UK: Oxford University Press.
- Schooler, J. W., & Engstler-Schooler, T. Y. (1990). Verbal overshadowing of visual memories: some things are better left unsaid. *Cognitive Psychology*, *22*, 36–71.
- Siegel, D. J. (1995). Memory, trauma and psychotherapy: a cognitive science view. *Journal of Psychotherapy Practice and Research*, *4*, 93–122.
- Spiegel, D. (1991). Dissociation and trauma. In A. Tasman, & S. M. Goldfinger, *Annual review of psychiatry, Vol. 10* (pp. 261–275). Washington, DC: American Psychiatric Press.
- Steil, R. & Ehlers, A. (in press). Dysfunctional meaning of posttraumatic intrusions in chronic PTSD. *Behaviour Research and Therapy*.
- van der Kolk, B. A., & Fisler, R. (1995). Dissociation and the fragmentary nature of traumatic memories: overview and exploratory study. *Journal of Traumatic Stress*, *8*, 505–525.
- van der Kolk, B. A., & van der Hart, O. (1991). The intrusive past: the flexibility of memory and the engraving of trauma. *American Imago*, *48*, 425–454.
- Wheeler, A. M., Stuss, D. T., & Tulving, E. (1997). Toward a theory of episodic memory: the frontal lobes and autonoetic consciousness. *Psychological Bulletin*, *121*, 331–354.
- Wegner, D. M. (1989). *White bears and other unwanted thoughts: suppression, obsession and the psychology of mental control*. New York: Viking.