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Combining clinical studies and analogue experiments to investigate cognitive mechanisms in posttraumatic stress disorder

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Abstract

Research into cognitive mechanisms in posttraumatic stress disorder (PTSD) typically comprises two types of studies. The first group of studies is conducted with survivors of traumatic events and assesses the association between PTSD and cognitive variables with questionnaires and/or information processing paradigms. In the second group of studies, healthy non-traumatized individuals are exposed to an analogue stressor (e.g., a stressful film) and cognitive variables of interest are usually experimentally manipulated to investigate their effects on analogue PTSD symptoms. This review illustrates how studies of trauma survivors and analogue studies with non-traumatized populations can be usefully combined. Two examples for this approach are presented: (1) research into the role of perceptual priming for trauma-related stimuli and (2) research into trauma-related rumination. The advantages and limitations of both types of studies are discussed and it is argued that a combination of both approaches is needed to investigate cognitive mechanisms in PTSD.

Psychological theories of posttraumatic stress disorder (PTSD) emphasize the role of cognitive factors in the development and maintenance of PTSD (see Dalgleish, 2004). In the past two decades, a large number of empirical studies have been conducted testing hypotheses derived from these models. The majority of these studies fall into two broad groups, studies with survivors of real-life traumatic events on the one hand and analogue studies with non-traumatized healthy participants who are exposed to experimentally induced “trauma” on the other hand. In this article, we will review the advantages and disadvantages of both types of studies and present a general framework on how they can be combined. This approach will be illustrated using examples of research into (1) perceptual priming for trauma-related stimuli and (2) rumination.

Two Types of Studies Investigating Cognitive Factors in PTSD

Studies With Traumatized Samples

Information-processing paradigms and questionnaires have been used with trauma survivors in order to establish correlations between cognitive variables and PTSD. Among other factors, results show that PTSD in trauma survivors is related to negative trauma-related appraisals (e.g., Engelhard, Huijding, van den Hout, & de Jong, 2007; Foa, Ehlers, Clark, Tolin & Orsillo, 1999), attentional biases (e.g., Pineles, Shipherd, Welch, & Yovel, 2007), disorganized memory representations of the trauma (e.g., Halligan, Michael, Clark, & Ehlers, 2003), overgeneral autobiographical memory (e.g., Kleim & Ehlers, 2008), and

dysfunctional coping strategies such as thought suppression and rumination (e.g., Ehlers, Mayou, & Bryant, 1998). Importantly, several studies have also found that cognitive factors predict over and above initial symptom severity and thus contribute to the maintenance of PTSD (e.g., Ehlers et al., 1998; Halligan et al., 2003; Kleim & Ehlers, 2008).

Although these studies provide valuable information about cognitive factors that are correlated with PTSD, they also show a number of limitations. First, research with clinical groups is largely correlational and therefore does not allow drawing conclusions regarding the causal nature of cognitive variables. The use of truly experimental designs is limited in studies with trauma survivors. For example, a key variable described in cognitive models of PTSD concerns the way in which the trauma is cognitively processed during the event (e.g., Ehlers & Clark, 2000). For both practical and ethical reasons, it appears very difficult to experimentally manipulate the way in which traumatic events are processed while they are unfolding. This limits research on these processes to trauma survivors' retrospective reports, which may be biased by existing symptom severities. In addition, in most cases, little objective information about the stimuli present during the trauma and the exact sequence of events is available, which limits the feasibility and validity of measuring trauma memory characteristics.

Analogue Studies with Healthy Non-Traumatized Participants

In order to overcome the problems related to studying traumatized samples, a second group of studies have used experimental analogue designs to investigate the role of cognitive factors in the development of PTSD symptoms. In these studies, healthy participants who have not experienced a traumatic event are exposed to a distressing film or picture stories depicting violence or accidents (e.g., Horowitz, 1969). These analogue stressors have been shown to reliably produce short-term negative mood, arousal and intrusive memories of their content (for an overview see Holmes & Bourne, 2008) and therefore appear suitable as a laboratory analogue for studying the development and modulation of PTSD symptoms. For example, Holmes and colleagues showed that the number of intrusive memories produced by a trauma film can be reduced by inducing a concurrent visuospatial task (Holmes, Brewin, & Hennessy, 2004). The trauma film paradigm has also been used to investigate the effects of cognitive strategies, such as thought suppression, induced after the stressor on the number of intrusive memories (e.g., Nixon, Cain, Nehmy, & Seymour, 2009).

A key advantage of using analogue designs is that the experimenter has control over the analogue trauma and can experimentally manipulate peri- and posttraumatic cognitive processes. This makes it possible to assess characteristics of the trauma memory objectively and to investigate causal mechanisms involved in the development of intrusive memories. However, analogue studies also have disadvantages. First, the assumption that the mechanisms underlying PTSD symptoms are in principle the same as those underlying the reactions to the analogue stressor has been questioned by some authors (e.g., van der Kolk & Fisler, 1995). It appears that the suitability of analogue designs largely depends on the processes under investigation. Given the ubiquity of intrusive memories of negative experiences, it appears justified to study memory processes underlying intrusive memories in analogue samples (see Brewin, Gregory, Lipton, & Burgess, 2010; Holmes & Bourne, 2008). However, the question of whether results from analogue studies can be generalized to clinical populations is of course ultimately an empirical one (see also van den Hout, 1999). It is therefore necessary to replicate findings from analogue studies in clinical populations before definite conclusions are drawn.

A second limitation of analogue stressors concerns their time-limited effects. Theorists of PTSD have emphasized the need to distinguish between variables involved in the initial development of PTSD versus those related to the maintenance of the disorder (e.g., Ehlers &

Clark, 2000). Because of the low intensity of the stressor, the impact of experimental manipulations on symptoms can typically only be assessed in the short-term (i.e., hours or days after the manipulation), which makes it difficult to distinguish between factors involved in the development versus maintenance of symptoms. It may also limit the usefulness of analogue designs for intervention studies.

A Framework for Studying Cognitive Factors in PTSD

It can be concluded that studies using cognitive measures in trauma survivors and studies inducing analogue stressors in healthy populations show different patterns of advantages and disadvantages and may usefully complement each other. It therefore appears that the best way for studying cognitive processes in PTSD is to systematically combine both types of studies.

As a general framework, we suggest that research into the role of cognitive factors in PTSD comprises five different steps. In the first step, phenomenological observations are used to identify cognitive variables that may play a role in the onset or maintenance of PTSD. In the second step, studies of trauma survivors are needed to establish a correlation between PTSD and the cognitive variable, using questionnaire measures and/or information processing paradigms. Research into hypothesized maintaining factors will need to include a longitudinal design that allows testing prospective associations between cognitive variables and future PTSD, controlling for initial symptoms. For some variables such as negative appraisals, longitudinal studies in high-risk groups (e.g., soldiers, firemen) that allow for a pre-trauma assessment of cognitive factors are especially informative (for examples see Bryant & Guthrie, 2007; Engelhard et al., 2007). Once the association between a certain cognitive variable and PTSD is established, a third step is required to test the causal nature of the association with experimental studies. Experimental analogue studies play an important role at this step because of the restrictions of studies of traumatized populations discussed above. If the first three steps provide supportive evidence, a fourth step explores the clinical implications of the findings by designing specific interventions to change the problematic cognitive process. The fifth and final step tests whether the new interventions reduce PTSD symptoms and whether they operate by changing the cognitive process that they are designed to target.

In the following sections, we will use two examples from our own research to illustrate this general approach in greater detail and discuss the promises and challenges of combining studies of trauma survivors with analogue studies. The first example, perceptual priming for trauma-related stimuli, concerns a variable hypothesized to be involved in the *development* of PTSD, whereas the second example, trauma-related rumination, concerns a variable expected to contribute to the *maintenance* of the disorder.

Example 1: Perceptual Priming for Trauma-Related Stimuli

Phenomenological Observations and Generation of Hypothesis (Step 1)

Reexperiencing symptoms are among the core symptoms of PTSD. Results from phenomenological studies show that reexperiencing often takes the form of vivid sensory fragments of the trauma that may suddenly pop into one's mind, as if appearing "out of the blue", and that can cause great distress (e.g., Michael, Ehlers, Halligan, & Clark, 2005; Speckens, Ehlers, Hackmann, Ruths, & Clark, 2007). Although reexperiencing symptoms often consist of conscious recollections of the trauma, this is not always the case. Instead, it sometimes also involves physiological or emotional responses to trauma reminders that resemble those experienced during the trauma in the absence of conscious recollection of the trauma. Importantly, it has been shown that in PTSD a wide range of stimuli can trigger

involuntary reexperiencing (Ehlers, Hackmann, & Michael, 2004). A key question therefore concerns how and why reexperiencing is easily triggered in PTSD. In their cognitive model of PTSD, Ehlers and Clark (2000) suggested that perceptual priming may be an implicit memory process involved in the easy triggering of reexperiencing. Perceptual priming comprises facilitated processing of a stimulus because the same stimulus, or a related one, has been processed before (Schacter, Dobbins, & Schnyder, 2004). It is suggested that priming influences reexperiencing in PTSD in two ways. First, some trauma survivors may show greater priming for stimuli that are present *during* trauma than other survivors. Enhanced perceptual priming for stimuli encountered during trauma is thought to result in a lowered perceptual threshold and a processing advantage for similar stimuli. This may contribute to re-experiencing symptoms as such stimuli can then directly trigger intrusive memories (see Ehlers & Clark, 2000). Second, *after the trauma*, further priming of cues that are related to the trauma may lead to an extension of stimuli that are preferentially processed and thus to a generalization of the stimuli that can trigger reexperiencing.

Research in Traumatized Samples (Step 2)

A number of studies with traumatized samples have investigated whether people with PTSD show enhanced perceptual priming for trauma-related material. The majority of these studies have focused on priming *post-trauma*, i.e. trauma-related and control stimuli were presented during the experiment in an initial encoding phase and perceptual priming for these stimuli was tested later. Results from a series of cross-sectional studies using a range of different paradigms (e.g., word-stem completion test; perceptual word identification paradigm; white noise paradigm) supported the perceptual priming hypothesis in that trauma survivors with PTSD showed greater priming for trauma-related stimuli compared to priming for neutral stimuli, whereas trauma survivors without PTSD did not show differential priming (e.g., Amir, McNally, & Wiegartz, 1996; Michael, Ehlers, & Halligan, 2005). Importantly, results of two longitudinal studies showed that enhanced priming for trauma-related stimuli in a word-stem completion task also predicted PTSD symptom severity 6 months later (Ehring & Ehlers, submitted; Michael, Ehlers, & Halligan, 2005).

However, the above findings used verbal stimuli and are therefore of somewhat limited ecological validity, as intrusive trauma memories and their triggers appear to be primarily visual (Ehlers et al., 2002). Trauma-related words are only proxies of such stimuli, which may also explain the negative results of another study that found no evidence for enhanced priming in PTSD (McNally & Amir, 1996). More recent studies have investigated perceptual priming for trauma-related pictorial stimuli in trauma survivors. Amir et al. (2010) used picture clarity ratings as a measure of implicit memory for previously encoded trauma-related, negative and neutral pictures. In line with the perceptual priming hypothesis, trauma survivors with PTSD showed greater priming for trauma-related relative to neutral pictures, whereas this was not the case in participants without PTSD.

The above studies tested *post-trauma* priming for trauma-related stimuli that may account for the generalization of stimuli that may trigger PTSD symptoms. Two other studies tested the hypothesis that in PTSD trauma-related material has been primed more strongly *during the trauma* and thus has a processing advantage when encountered in the aftermath of the trauma. Accident or assault survivors saw blurred pictures of stimuli that they may have encountered during their trauma (e.g., ambulance, stretcher, smashed car, weapon) as well as blurred general threat and neutral pictures (Kleim, Ehring, & Ehlers, submitted). In line with the perceptual priming hypothesis, trauma survivors with acute stress disorder or PTSD identified blurred trauma-related pictures better than neutral pictures, whereas those without PTSD identified trauma-related and neutral pictures equally well. Neither group showed enhanced identification of general threat pictures compared to neutral pictures. Enhanced

identification of trauma-related cues was related to more frequent and more distressing intrusions, and predicted intrusive re-experiencing at 6-months follow-up.

In sum, studies of traumatized samples provide correlational evidence for an association between enhanced perceptual priming for trauma-related stimuli and PTSD. Results from two prospective studies show that enhanced priming also predicted subsequent reexperiencing symptoms further supports the hypothesis that perceptual priming contributes to the easy triggering of these symptoms. However, the priming studies in traumatized populations also have clear limitations. Most importantly, studies of traumatized samples are confined to testing *post-trauma* priming for stimuli selected by the experimenter as potentially related to the trauma. As described above, two recent studies also showed evidence *for a processing advantage for stimuli* that participants were likely to have encountered *during* the traumatic event. However, one cannot be unambiguously infer that this processing advantage is due to perceptual priming during trauma. Experimental analogue studies allow for standardized presentations of perceptual stimuli before and during an analogue traumatic stressor and are thus better suited for assessing priming for stimuli present at the time of trauma.

Experimental Analogue Studies With Healthy Non-Traumatized Participants (Step 3)

Several analogue studies tested the hypothesis that stimuli that are perceived in the context of trauma are more strongly primed than those occurring in a neutral context. Visual stimuli were embedded in traumatic and neutral picture stories, and perceptual priming was assessed later with a blurred picture identification task where priming shows in enhanced identification rates of the previously presented stimuli compared to new stimuli. For example, two studies presented participants with several traumatic picture stories and parallel neutral stories. Priming for objects that were embedded in the slides that preceded the key traumatic scene in each story was compared with priming for parallel objects from the neutral stories (Ehlers, Michael, Chen, Payne, & Shan, 2006; Michael & Ehlers, 2007; Ehlers & Mauchnik, submitted). The studies consistently found enhanced priming for objects from the traumatic stories when compared to parallel objects. Arntz, de Groot, and Kindt (2005) obtained similar findings for objects embedded in a traumatic picture story compared to objects from a parallel neutral story. Priming was assessed with a perceptual identification task, in which participants had to identify objects from the picture stories that were presented in a degraded form.

Ehlers et al. (2006) and Michael and Ehlers (2007) further found that greater perceptual priming predicted the frequency of subsequent analogue intrusive memories. These findings support the proposed clinical significance of perceptual priming in the development of reexperiencing symptoms. As predicted by cognitive theories, Ehlers et al. (2006) also showed that greater perceptual priming was associated with data-driven processing during processing the picture story. Together, these analogue studies confirm the hypotheses that trauma facilitates perceptual priming and that enhanced perceptual priming for trauma-related material predicts intrusive memories.

Developing and Evaluating Clinical Interventions (Steps 4 and 5)

Together, studies of trauma survivors and experimental analogue studies support the role of perceptual priming in the development of intrusive memories in trauma survivors and healthy controls. The studies consistently found that perceptual priming for stimuli associated with the trauma predicted reexperiencing. While the studies of trauma survivors support the clinical relevance of these findings, they do not allow assessing priming for stimuli that were present *during* the trauma and whether priming is related to styles of cognitive processing during trauma, as suggested by cognitive models. The analogue studies

are more conclusive in this respect. These studies showed that priming was enhanced for stimuli that occur in a traumatic compared to a neutral context, and that the degree of priming was associated with data-driven processing and later intrusive memories.

The evidence described above has led to the development of interventions addressing enhanced priming for stimuli associated with the trauma in Cognitive Therapy for PTSD (Ehlers, Clark, Hackmann, McManus, & Fennell, 2005). One of the strategies employed during this therapy program is a discrimination training, which involves providing information about the perceptual nature of many triggers of reexperiencing, training clients to identify such triggers and training them then to focus on the differences between the triggers and their current context from the stimuli encountered during the trauma to take in their differences (Ehlers et al., 2005). In addition, the Cognitive Therapy program includes procedures that aim at elaborating the memory of the worst moments of the trauma and linking them with other autobiographical information that makes their meaning less threatening. Although Cognitive Therapy for PTSD has been found to be highly effective (Ehlers et al., 2005), it remains unclear from the results of the randomized controlled trials whether the treatment exerts its effect by reducing perceptual priming. However, two experiments used the analogue paradigm described above to manipulate the way participants processed the picture stories after they had seen them (Ehlers & Mauchnik, submitted; Michael & Ehlers, 2007). A writing task designed to enhance elaboration of the autobiographical memory for the experiment, which was modelled on procedures of the treatment program, was compared with a distraction task. The writing task reduced the enhanced perceptual priming for objects from trauma stories, and also reduced the number of intrusive memories following the experiment.

Example 2: Trauma-Related Rumination

Phenomenological Observations and Generation of Hypothesis (Step 1)

Results from phenomenological studies show that individuals with PTSD show excessive and repeated rumination related to the trauma and/or its consequences (e.g., Ehring, Frank, & Ehlers, 2008; Michael, Halligan, Clark, & Ehlers, 2007). Trauma-related rumination can be distinguished from intrusive memories regarding its phenomenology, including its content (elaborating thoughts vs. memories), type of cognition (verbal thoughts vs. sensory perceptions) and duration (minutes to hours vs. seconds to minutes) (e.g., Evans, Ehlers, Mezey, & Clark, 2007; Speckens et al., 2007). It has been suggested that excessive and repeated rumination contributes to the maintenance of PTSD symptoms (Ehlers & Clark, 2000; Wells et al., 2008).

Research in Traumatized Samples (Step 2)

Results from cross-sectional studies using a self-report questionnaire of trauma-related rumination show that rumination is significantly correlated with PTSD symptom severity and associated with a PTSD diagnosis (e.g., Clohessy & Ehlers, 1999; Ehring et al., 2008; Michael et al., 2007; Moore, Zoellner, & Mollenholt, 2008). Longitudinal studies are needed to support the hypothesis that rumination maintains PTSD. In line with the hypothesis, rumination was found to significantly predict future PTSD in a series of prospective longitudinal studies (e.g., Ehlers et al., 1998; Ehring et al., 2008; Kleim, Ehlers, & Glucksman, 2007; Michael et al., 2007; Murray, Ehlers, & Mayou, 2002). Importantly, rumination still predicted future PTSD when initial symptom levels were statistically controlled (Ehring et al., 2008; Kleim et al., 2007; Michael et al., 2007).

The cross-sectional and prospective relationship between rumination and PTSD was also replicated when using an adapted version of the *Catastrophizing Interview (CI)* as an objective indicator of repetitive thinking (Ehring et al., 2008). The CI assesses perseverative

thinking about a worrisome topic in an iterative procedure by asking participants to elaborate their concerns repeatedly, whereby the degree of repetitive thinking is operationalized as the number of steps completed in the interview. Finally, Michael et al. (2007) identified a number of characteristics of trauma-related rumination that predicted PTSD in a prospective study, including the compulsion to continue rumination, 'why' and 'what if' type questions and the degree of negative emotions before and after rumination.

An important issue in the rumination literature concerns the question of how maladaptive rumination can be distinguished from adaptive forms of repeated thinking. It has been suggested that dysfunctional rumination is characterized by abstract thinking, defined as decontextualized, aggregated and ambiguous, whereas functional forms of processing are more concrete, defined as experiential, specific and unambiguous (see Ehring & Watkins, 2008; Watkins, 2008). In order to test this hypothesis, Ehring et al. (2008) obtained blind ratings of the answers participants gave to the modified Catastrophic Interview described above. The combination of abstractness of ruminative thinking and self-reported frequency of rumination was found to predict symptom severities better than rumination frequency alone.

In sum, there is extensive evidence showing that trauma-related rumination is associated with current and future PTSD and that it predicts the maintenance of the disorder. In addition, preliminary findings suggest that the abstractness of ruminative thinking may contribute to its dysfunctional effects. However, in order to establish the causal nature of the association between rumination and PTSD, experimental studies are needed that induce rumination and assess its effects on PTSD symptoms. The induction of a dysfunctional processing style in clinical samples poses a number of ethical questions. Therefore, analogue studies provide a useful paradigm for studying trauma-related rumination experimentally.

Experimental Analogue Studies With Healthy Non-Traumatized Participants (Step 3)

The hypothesis that rumination is causally involved in the maintenance of PTSD symptoms was tested in a number of analogue studies using the trauma film paradigm in healthy non-traumatized participants. After watching the film, participants were randomly assigned to either a condition in which rumination was induced or a number of different control conditions (e.g., distraction, imagery, memory integration). In line with the hypotheses, all studies showed that rumination led to significantly more analogue PTSD symptoms and/or a significantly slower recovery from the film than the control conditions (Butler, Wells, & Dewick, 1995; Wells & Papageorgiou, 1995; Zetsche, Ehring, & Ehlers, 2009). A subsequent study aimed to experimentally test the reduced concreteness theory of trauma-related rumination in addition to replicating earlier findings (Ehring, Szeimies, & Schaffrick, 2009). Participants were randomly assigned to either an abstract rumination condition, a condition that induced concrete thinking about the same content, or a distraction condition. Results showed that abstract rumination led to a significantly longer maintenance of negative mood and arousal triggered by a trauma film than concrete thinking and distraction, which is in line with the reduced concreteness hypothesis.

Although it appears possible to test the effects of rumination on analogue PTSD symptoms, it remains unclear whether the results generalize to rumination about real-life experiences that have a higher level of self-reference. Therefore, a subsequent study was conducted with individuals who had experienced a negative life event (e.g., relationship breakup, death of a loved one) (Ehring, Fuchs, & Kläsener, 2009). Participants were first asked to provide a detailed narrative of the distressing event and were then randomly assigned to either a rumination or a distraction condition. Results showed that induced rumination led to a longer maintenance of intrusive memories and negative mood produced by the narrative task than distraction.

In sum, results from experimental analogue studies show that induced rumination maintains analogue symptoms. Interestingly, however, rumination did not impact equally on different dependent variables in the analogue studies. Whereas the effects of experimentally induced rumination on mood and arousal were found to be stable across studies, results for the effect of rumination on intrusive memories were mixed. Some studies found induced rumination to lead to more intrusive memories about the analogue stressor than control conditions, this finding was not replicated in another study (Ehring, Szeimies & Schaffrick, 2009) and another study found that sex moderated this relationship (Zetsche et al., 2009). Therefore, more research is needed to investigate the effects of experimentally induced rumination on intrusive memories in greater detail.

Developing and Evaluating Clinical Interventions Targeting Rumination (Steps 4 and 5)

Based on the evidence supporting the role of rumination in the maintenance of PTSD, interventions that directly address rumination have been developed in Cognitive Therapy for PTSD (Ehlers, Clark, Hackmann, McManus, & Fennell, 2005). These strategies include discussing advantages and disadvantages of rumination and helping the client with spotting and disengaging from rumination. As Cognitive Therapy for PTSD includes a range of interventions that target different cognitive processes, one cannot conclude from the efficacy of the treatment in randomized controlled trials that each of its components is effective. Future studies should therefore test whether targeting rumination alone leads to a significant reduction in PTSD symptoms. Results from an open trial into metacognitive therapy for PTSD, which targets trauma-related rumination, attentional biases and safety behaviors, appears promising in this regard (Wells et al., 2008).

Conclusions and Recommendations for Future Research

In this article, we have used two lines of research as examples for how correlational studies with trauma survivors can be combined with experimental analogue studies with non-traumatized healthy participants to investigate cognitive mechanisms in PTSD. It should be noted that a similar combination of approaches has been used by a number of authors to study other cognitive factors, including research into trauma memory disorganization (e.g., Halligan et al., 2003; Kindt & Van den Hout, 2003), the role of perceptual versus conceptual processing during the traumatic event (e.g., Buck, Kindt, van den Hout, Steens, & Linders, 2007; Halligan, Clark & Ehlers, 2002; Halligan et al., 2003; Holmes et al., 2004) or thought suppression (e.g., Clohessy & Ehlers, 1999; Nixon et al., 2009).

As discussed throughout this article, both types of studies have different advantages and limitations. It therefore appears that the combination of both types of studies provides more conclusive evidence than the exclusive use of one of the approaches. Studies with trauma survivors appear indispensable as they allow establishing the necessary correlation between the cognitive factor of interest and a PTSD diagnosis and/or symptom severity. On the other hand, these studies are restricted in establishing causal relationships because room for experimental manipulation is limited for ethical reasons, because the trauma has already happened and because the stimuli involved in trauma vary widely between individuals. This limits, for example, the possibilities of investigating cognitive processing during trauma and the experimental study of trauma memories in clinical samples. Experimental analogue studies can address the gaps in clinical studies but are necessarily reductionist, hence reducing the generalizability of findings from these studies to real-life traumas.

In this article, we have presented a general framework for research into cognitive variables involved in PTSD consisting of five steps. Based on this framework and our, albeit selective, review of the literature, a number of suggestions for future research can be made. First, because of the complementary nature of studies with traumatized samples and experimental

analogue studies, researchers should aim to combine these two approaches more systematically by testing the same hypotheses and using similar operationalizations across both types of studies. Second, whereas experimental research into peritraumatic processes is difficult to realize in traumatized samples for practical and ethical reasons, there is room for experimental clinical studies testing post-trauma variables suggested to be involved in the maintenance of the disorder (e.g., rumination, thought suppression). Researchers should therefore try to replicate the findings from analogue studies in this area using experimental designs with trauma survivors (see for example, Shipherd & Beck, 2005, on thought suppression). Finally, research aimed at translating basic findings on cognitive factors in PTSD into treatment strategies is still sparse. Most importantly, experimental studies are needed to test whether specific therapeutic strategies indeed impact on the cognitive processes they are targeting and significantly reduce PTSD symptoms. In this way, research into cognitive factors in PTSD has the potential to further improve treatment for PTSD.

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