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Editorial Special Issue: Learning, memory and psychopathology.

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Editorial

Special issue: Learning, memory and psychopathology

Many clinical populations show a variety of memory peculiarities, two marked examples being “hypermnnesia” (i.e., intrusions, flashbacks, as in Posttraumatic Stress Disorder (PTSD)) and “hypomnesia” (disturbances in declarative (autobiographical) memory, mostly for neutral information). For example, patients with PTSD experience involuntary, vivid flashbacks in which they relive the traumatic event(s), but the same individuals may not be able to voluntarily retrieve detailed or vivid memories from (other) autobiographical events surrounding the trauma. In anxiety disorders like panic disorder, social phobia, and specific phobia’s non-threatening cues may activate memory representations of catastrophes, and overgeneral autobiographical memories have been reported in many stress-related disorders, including depression. Moreover, these memory derailments may severely impair social and professional functioning.

During the past years significant progress has been made in several research areas shedding new light on the processes underlying these dysfunctions. First, there is a strong research tradition relating stress and stress hormones to emotional memory. In the past 10 years, it has been shown that hormone related influences can lead to temporary and perhaps even structural changes in neural circuits (e.g., hippocampus, amygdale, and PFC) critically important for memory functioning. Second, exciting developments have taken place in the field of Pavlovian fear conditioning. Memorizing the probabilistic relation between a neutral stimulus (CS) and an aversive and potentially traumatic stimulus (US) is the nucleus of Pavlovian fear conditioning. In this, attention has shifted towards individual differences, the use of context cues in the acquisition and extinction of conditioned fear, and pharmacological facilitation of extinction learning. Third, from a hedonic perspective it may not be surprising that humans are motivated to block painful memories from conscious. Intriguing paradigms have been developed that allow for experimental unraveling how people are able to intentionally forget specific, emotional information (motivated forgetting). These developments, although so far mainly investigated in healthy

individuals, could be specifically relevant in understanding memory disturbances in clinical populations.

This special issue focuses on these three lines of memory research, all three being highly relevant to the understanding of some psychopathological conditions. To each of these three research lines, four papers are devoted, documenting the state-of-the-art.

The first contribution on the effects of stress and stress hormones on memory functioning is from Oliver Wolf who provides a comprehensive state-of-the-art review on the influence of stress hormones (related to the noradrenergic system and the HPA axis) on emotional memory, and discusses the relevance of these findings for psychopathological disorders, such as PTSD, depression, and specific phobia. Anda van Stegeren summarizes the elegant line of studies she conducted on the role of the noradrenergic system in emotional memory, and the relevance for understanding memory processes related to PTSD. As a clear example of how stress exposure may affect memory performance, Marieke Tollenaar and colleagues present data from an experimental study among healthy subjects on the acute effects of exposure to a public speaking task on memory retrieval, and how this may be mediated by stress hormones. Finally, Emily Holmes and Corin Bourne provide an excellent review on the studies Holmes and colleagues conducted using the Trauma film paradigm, as an analogue to study memories in PTSD.

As to classical conditioning, Susan Mineka and Katherine Oehlberg provide a scholarly overview of the contribution of classical conditioning research, concentrating on recent developments in animal and human studies and nicely detailing the clinical relevance of the insights gained. Joke Baas et al. and Iberico et al. both demonstrate the elegance of conditioning studies and their importance for understanding both the acquisition and extinction of cued fear. Both focus on individual differences and “context-conditioning” in the acquisition and extinction of conditioned fear. The most prevalent disorders in mental health care are the anxiety disorders, while the most prominent psychological treatment is “exposure therapy”, a clinical

application of extinction procedures. Bram Vervliet provides an overview of the fascinating studies, both animal and human, showing that extinction is facilitated by a single dose of D-cycloserine to be administered before or immediately after the extinction trial.

The section on motivated forgetting sets out with a comprehensive review by Elke Geraerts and Richard McNally on the various paradigms to measure directed forgetting and thought suppression, concentrating on laboratory studies involving attempts by individuals reporting trauma histories to forget emotionally negative material. Second, Benjamin Levy and Michael Anderson review their excellent basic research that addresses the cognitive and neurobiological mechanisms by which people try to control memory, and which individual differences may be related to these processes. Finally, two empirical contributions by Paula Hertel and Ali Moradi and colleagues nicely illustrate individual differences related to emotional memory, with Paula Hertel presenting a study on depression-related differences in learning and forgetting, while Ali Moradi and colleagues studied the specificity of autobiographical memory in relation to symptoms of posttraumatic Stress Disorder (PTSD).

Taken together, we think that the authors succeeded in providing beautiful examples and excellent overviews of the developments that, over the last decade have taken place in the field of the neurobiology of emotional memory, fear conditioning, and the empirical study on motivated forgetting. We hope that the state-of-the-art papers from these three research domains will inspire researchers to fresh new research lines. Some avenues are mentioned below.

First and perhaps most importantly, the three research domains of the neurobiology of emotional memory, fear conditioning, and the empirical study on motivated forgetting/overgeneral memory, are three independent fields, whereas the phenomena they are trying to explain are overlapping. Note that classical conditioning is a *memory* phenomenon, and this special issue deals with the interface between memory research and psychopathology. Integrating knowledge from the three research domains would be

a fascinating next step, for example, by investigating brain regions related to motivated forgetting in clinical samples, by further specifying the relation between intrusions and general autobiographical memories, by investigating in more detail the role of stress hormones in enhanced fear conditioning in clinical patients, just to name a few examples.

One promising direction that will, no doubt, be followed in the next 10 years is the clinical relevance and implications of the theoretical models that are put forward in this special issue. For example, can clinical interventions based on the model on intrusions provided by Holmes et al. improve the treatment of PTSD? Can black outs in clinical samples indeed be explained by enhanced cortisol levels during acute stress, as suggested by Tollenaar and Wolf? Can we enhance the effectiveness of behavior therapy for anxiety disorders by applying knowledge on the (neurobiological and environmental) variables that play a role in extinction learning (see Vervliet, Baas, Mineka, Vanssteenwegen)? Can individual differences with regard to forgetting (as put forward by Anderson, Hertel, Dalgleish) tell us something about vulnerability to develop psychopathology?

The editors hope to have illustrated that the experimental study of psychopathology is not only an intrinsically intriguing, but also an *important* endeavour.

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