Review

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Disruptions in autobiographical memory processing in depression and the emergence of memory therapeutics

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Depression is characterized by distinct profiles of disturbance in ways autobiographical memories are represented, recalled, and maintained. We review four core domains of difficulty: systematic biases in favor of negative material; impoverished access and responses to positive memories; reduced access to the specific details of the personal past; and dysfunctional processes of rumination and avoidance around personal autobiographical material. These difficulties drive the onset and maintenance of depression; consequently, interventions targeted at these maladaptive processes have clinical potential. Memory therapeutics is the development of novel clinical techniques, translated from basic research, that target memory difficulties in those with emotional disorders. We discuss prototypical examples from this clinical domain including MEmory Specificity Training, positive memory elaboration, memory rescripting, and the method-of-loci (MoL).

Recollecting and reflecting upon our autobiographical past defines human mental life. Personal memories are the currency of social discourse, they mold and shape our emotions, help us plan our future, and provide candidate solutions for the problems that we face. Our library of autobiographical memories defines who we are, scaffolding our sense of self across time [1]. Systematic difficulties in the recollection of these past experiences, especially of emotionally evocative events, are a cardinal feature of affective disorders, and range from intrusive flashbacks of trauma in post-traumatic stress disorder (PTSD) to ruminations upon overgeneral negative personal themes in depression. These patterns not only define the mental lives of many patients but also drive the onset and maintenance of disorder [2,3]. Consequently, emerging clinical interventions that target and reverse these disrupted memory processes have enormous potential. In this review we discuss the often toxic problems faced by individuals with clinical depression (a description of depression is given in Box 1) in the way that they process the autobiographical past and outline recent advances in the translational science of memory therapeutics that seek to address these difficulties.

The four mnemonic horsemen of depression

Sufferers of depression remember the past differently to their never-depressed peers. Their autobiographical memory processing is compromised in at least four distinct but interrelated ways that combine and interact to help maintain depressive episodes once they have begun, and to confer vulnerability to new episodes when sufferers are in remission (Figure 1).

Biased recollection of negative memories

The most striking feature when engaging with individuals in the grip of depression is the pervasively negative tone that sounds throughout their discourse about the past. Depression appears to be characterized by a systematic autobiographical recollection bias that favors negative experiences [4,5], with faster access to negative personal memories when prompted and a greater tendency to generate negative memories when recall is unconstrained [6]. Unbidden intrusive memories of negative, often traumatic, past experiences also characterize the disorder [7]. This facilitated negative retrieval is likely to be complemented by biases at encoding as a function of selective attention to negative personal experiences [4] and skewed interpretation of ambiguous personal scenarios in favor of negative resolutions [8]. Such pervasive preferential access to negative personal memories in depression contributes to the felt sense of a profoundly negative self, world, and future that depressed individuals describe [9].

Impoverished positive memories

The day-to-day recollection of self-affirming positive experiences has been identified as a core adaptive emotion regulation strategy to counteract downturns in negative affect [10,11]. The biased recollection of negative memories in depression, described above, is also accompanied by impoverished access to such positive autobiographical past events [4]. Even when positive memories are successfully brought to mind, their recollection appears to have little

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Box 1. The nature of depression and cognitive theories of the disorder

What is depression?

In psychiatric terms, depression (defined as presence of a major depressive episode; MDE) is defined by the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-V) [70] as the presence of at least five symptoms from a set of nine, one of which must be consistent depressed mood or anhedonia. Additional symptoms may include changes in appetite or sleeping pattern, restlessness, fatigue, feelings of guilt or worthlessness, impaired concentration, and suicidal ideation. To fulfill criteria for an MDE the constellation of symptoms must be present for most of the day, nearly every day for a 2 week period or longer, and represent a change from previous levels of functioning. Symptoms must also interfere with functioning in social, occupational, or other important domains, or cause considerable distress to the individual.

Epidemiological studies have established depression as a major public health concern that tends to run a chronic course [71]. The lifetime prevalence rate is approximately 16% [72], with more than 80% of individuals experiencing multiple episodes [71]. Each recurring episode predicts a higher risk of future recurrence [73], even after successful treatment of the current episode [74,75]. Depression currently costs the UK exchequer more than £9 billion annually [76] and is predicted by the World Health Organisation (see http://www.who.int/whosis/whostat/2008/en/index.html) to be the second leading cause of disability worldwide by 2020 [77]. Depression is a growing problem at both individual and societal levels, underscoring the need for more effective interventions not only to target the acute phase of disorder but also to reduce the likelihood of relapse/recurrence.

Cognitive models of depression

Cognitive approaches to depression provide a framework for understanding the psychological mechanisms involved in the onset, maintenance, and recurrence of the disorder. Perhaps the most influential cognitive model was provided by Beck who proposed that depression results from the activation of underlying dysfunctional schemas* that represent negative mental constructions about the self, the world, and the future ('the negative cognitive triad' [62]). Schemas are claimed to drive negative thinking and other cognitive biases and distortions (including biases in autobiographical memory processing) that serve to maintain schema integrity and thereby support and consolidate the cognitive foundations that drive the disorder [62]. Beck's cognitive model and other related approaches [63] provide an overarching framework in which biases and distortions in a cognitive process such as memory are conceptualized as 'rational' and adaptive processes that are servicing maladaptive and dysfunctional underlying schemas. Cognitive behavior therapy (CBT), the intervention paradigm derived from such cognitive formulations of depression, seeks to identify and modify biases in thinking and cognitive processing and to reorganize and shift underlying schema to make them more adaptive and functional. The nascent memory therapeutics discussed here fall under the umbrella of this broad CBT approach.

*Schemas are proposed to be cognitive structures which provide an internal representation of aspects of the self, the world, and of others, that derive from a lifetime of experience in encountering relevant exemplars from these categories and that shape the encoding, organization, and retrieval of information [62].

beneficial impact on mood for those with a history of depression [12,13], and may even be detrimental [13]. This failure to improve mood may reflect the quality of recollected positive memories. For example, there is evidence that, when in a sad mood, individuals with a history of depression recall positive memories that are markedly less vivid [14] and less emotionally intense [15] than those retrieved by never-depressed peers. The lack of salient phenomenological memory features may very well make it more challenging for positive memory recall to confer emotional benefits (although whether this is also the case in currently depressed groups awaits confirmation). Another possibility is that reflecting on a past happier time, and making comparisons to current low mood, draws attention to the discrepancy between these states, thus spawning rumination that itself contributes to worsening mood [13]. There is some evidence supporting this account, with data showing that preventing rumination by instructing depressed and formerly depressed individuals to focus on the concrete and specific details of the memory leads to improved mood following memory recall [16].

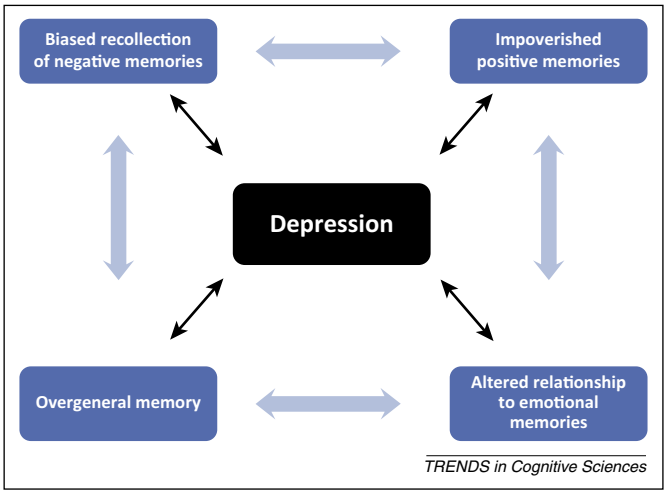

Figure 1. The four mnemonic horsemen of depression. These four processes, characteristic of depression, interact and combine in ways that maintain depression and elevate the risk of recurrence even after remission.

Categorical memory

A third striking feature of autobiographical recollection in depression is the focus on 'categorical' aspects of the past. In contrast to individual autobiographical episodes, these categorical recollections comprise general, often negatively-valent, themes that capture repetitions and regularities across many personal experiences. There is now good evidence that such categorical processing tends to override access to detailed memories of specific individual events in depression [3]. For example, on the widely-used autobiographical memory test (AMT) [17] – where specific, detailed memories are prompted by cue words – a depressed responder would be more likely to generate a categorical memory to a cue such as 'party' (e.g., 'Every birthday party I've ever hosted has been a disaster!') as opposed to the requisite recollection of a specific festive occasion.

One likely reason why categorical autobiographical recollection is so potent in depression is the highly consolidated nature of negative categorical themes that underpin the disorder – an idea that lies at the heart of cognitive theories of depression with their emphasis on the role of negative schemas (Box 1). We used a novel 'life chapters' task to elucidate these emotionally salient categorical autobiographical themes in depression [18]. Participants constructed autobiographical timelines, dividing their life into discrete chapters (e.g., 'student days'; 'intimate