

TRAUMA AND MEMORY

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This chapter reviews how memory develops through the lifetime, and how understanding these normal processes illuminates the effects of trauma on memory. It addresses controversies in memory research as well as how memory interacts with other neurological and interpersonal systems. This chapter identifies foundational concepts and important past research and also emphasizes new and updated studies on the cutting edge of this area of research.

GENERAL PRINCIPLES OF MEMORY DEVELOPMENT

Concerns regarding children's memory for traumatic events often occur within a forensic context. In a forensic context in which children are involved, much of the focus is on the reliability of children's memory. This is especially true in sexual abuse cases in which children's testimony is often the only evidence against the alleged perpetrator. It therefore is important to consider the conditions under which children's memory is more or less likely to be accurate. This chapter considers several of the forensically relevant factors that address this question.

It is important to differentiate between *memory suggestibility* and *false memory*, because if a child recalls information that did not actually occur, we need to consider the source of this memory. Following conceptual cognitive frameworks by Pezdek and Lam (2007), and Quas, Qin, Schaaf, and Goodman (1997), *suggestibility* refers to children's susceptibility to suggestions about nonexistent details of actually witnessed events; *false memories* refers

to children's memories of entirely new suggested events that never occurred.

In a typical suggestibility study, children first experience an event (e.g., a staged magic show in the lab) and, after a short or long delay, are given suggestions of specific details that occurred in that target event (e.g., the magician gave them a sticker). Accuracy and suggestibility are assessed by analyzing children's responses to free-recall questions and prompts (e.g., "What happened on the day you saw the show?"), focused nonleading questions (e.g., "Which trick did you like best?"), and misleading or suggestive questions (e.g., "The magician touched you on your arm, didn't he?"). Correct responses to questions determine children's accuracy. Suggestibility is determined by whether children recall suggested but not observed details or assent to the occurrence of target details that did occur.

On the other hand, in a typical false memory study, children are asked about true events (e.g., "What happened when you fell off your bicycle?") that parents reported to have occurred, as well as questions about a target event that did not occur (e.g., "What happened when you got your hand caught in a mousetrap?"). If children assent to a target-suggested false event or actually report details of the false event beyond those conveyed by the interviewer, it is concluded that they have developed a false memory for the event. Although this distinction between suggested memories and false memories seems like a subtle one in the cognitive literature, it is critical in forensic contexts because it is the difference between, for example, a child

actually being abused but erroneously recalling the sequence of events (i.e., suggestibility) and a child recalling having been sexually abused when he or she had not been (i.e., false memory). The first of these situations occurs more commonly; the second is much more unusual. Goodman (2012) noted in her extensive studies involving about 2,000 children that spontaneous false reports of sexual abuse were too few to study reliably.

Children's Age as an Individual Differences Factor in Memory Accuracy

A general trend in the cognitive development literature suggests that although many factors interact with age to influence memory accuracy, younger children are less accurate and more suggestible than are older children, and these two groups are less accurate and more suggestible than adults. Pezdek and Hinz (2002) confirmed this finding in a review of six programs of research specifically on the construction of false events in memory. For example, Pezdek and Hodge (1999) tested 5- to 7-year-olds and 9- to 12-year-olds about true and false autobiographical memories and reported that whereas 53% of the younger children developed a false memory for nonexperienced events, only 35% of older children did so. These percentages differed from the 15% of adults who developed a memory for a plausible false event in the study by Pezdek, Finger, and Hodge (1997).

Regarding age differences in memory for a traumatic event, Howe, Courage, and Peterson (1996) assessed children's memory for an accident that led to their emergency room treatment. Parents of 25 children brought to an emergency room for treatment were interviewed by the experimenter immediately and 6 months later. The children ranged in age from 17 months to 66 months at the time of the incident. Howe and colleagues reported, first, that for children older than 24 months of age, recall accuracy was high and commission errors were rare. Furthermore, they examined the rates of intrusion errors over time in the absence of specific suggestion. Intrusion errors were defined as recall of details from a different traumatic event that they had experienced. Overall, intrusion rates were higher in the 6-month delay test than in the immediate

test, but this difference was significant only for the youngest age-group ($M = 30$ months), and not for the other two age-groups ($M = 36$ months and 48 months). Thus, children's tendency to confuse two traumatic events with the passage of time is of concern primarily for children younger than 3 years of age. Research with maltreated children also shows that young children are more likely to provide incorrect responses to critical abuse-related questions than are older children (e.g., Eisen, Qin, Goodman, & Davis, 2002).

Furthermore, Howe and colleagues (1996) tested the predictions of *infantile amnesia*, a term used to describe the common finding that memories of events that occurred before the age of 2 years are short-lived and quickly become inaccessible. Consistent with the predicted infantile amnesia effect, they reported that children under 24-months provided incoherent accounts of what happened, using either free-recall or cued-recall techniques. Six months later, these younger children remembered having been involved in an accident, but their narrative accounts were fragmented and incomplete. The researchers interpreted this result as evidence that the development of a concept of self is a prerequisite to accurate autobiographical memory, and because a concept of self is not in place until approximately 24 months of age, this is the age at which accurate accounts of autobiographical memory become evident.

Effects of Acute Stress and Highly Emotional Events

In general, a major factor that affects children's memory accuracy and resistance to suggestion is the stress and emotional content of the memory, both at encoding and retrieval. The fact that acute stress impairs memory encoding is well supported in the research literature. In fact, an early article from Loftus and Burns was entitled "Mental Shock Can Produce Retrograde Amnesia" (1982). In one line of more recent research on this topic, Morgan and colleagues (2004) assessed eyewitness identification accuracy in 519 active-duty military personnel enrolled in military survival school training. The participants observed an interrogator for 40 minutes under high and low stress conditions and then were tested 24 hours later. Consistent across all measures,

recognition accuracy for the interrogator was *less accurate* in the high than the low stress condition. This effect is primarily attributed to the activation at encoding of the class of stress hormones known as glucocorticoids (GCs), notably, cortisol.

To examine the effects of stress on children's encoding and retrieval, Quas and Lench (2007) had children view a fearful film and recorded their arousal (indexed by heart rate) while watching the film and again 1 week later while being interviewed by either a supportive (warm and friendly demeanor) or unsupportive (cold and detached demeanor) interviewer. Children who exhibited increased arousal at encoding 1 week earlier made fewer errors in responses to focused misleading questioning than children who had been in a lower state of arousal during encoding. This finding suggests that memory was enhanced by a strong emotional reaction to the events in the film at encoding. This pattern changed, however, when arousal at retrieval was considered. In the unsupportive interview condition, children who exhibited increased arousal made more errors in response to focused questioning than children who exhibited lower arousal. In the supportive interview condition, the association between arousal and memory was not significant. Thus, even when a traumatic event is encoded strongly, the accuracy of its retrieval may be compromised when the social context is not optimal at retrieval.

The results of Quas and Lench (2007) are directly relevant to and consistent with findings regarding the effects of a stressful forensic environment on the completeness of children's responses. Participating in legal proceedings can be stressful to children; Goodman and colleagues (1998) reported that pretrial anxiety was higher for children expecting to testify in open court compared with closed-circuit television. Furthermore, in a naturalistic study, Goodman, Taub, and colleagues (1992) monitored 218 children who were involved in legal proceedings stemming from sexual abuse accusations, 55 of whom eventually testified in court. Children who reported greater distress at having to face the defendant were less likely to answer the prosecutor's questions than those who reported less distress. The completeness of the children's accounts

was compromised by the distressing experience, supporting the fact that stress impairs memory at retrieval as well as encoding.

In the context of traumatic experiences, an important social-emotional factor influencing children's memories is individual differences in attachment orientation. According to Goodman, Quas, and Ogle (2010), people who experience less supportive close relationships tend to show a high avoidant attachment style. These individuals may have experienced less emotional support from others to cope with stressful experiences. As a result, they tend to avoid or limit the processing of negative information. This style of processing turns out to be negatively associated with the accuracy of memory for traumatic events. Importantly, children whose parents display an avoidant attachment style also show similar deficits in memory accuracy for traumatic events. Melinder, Baugerud, Ovenstad, and Goodman (2013) reported a study of 3- to 12-year-old children's memories for the process of being removed from their home or school because of abuse allegations. Researchers accompanied child protective services personnel and documented the events during removal. Parents completed adult attachment measures and 1 week later, children's memory for the removal event was assessed. Results showed that children with parents who revealed avoidant attachment styles provided fewer correct answers to specific and misleading questions.

Victims' avoidant attachment styles also negatively affects memory of severe traumatic experiences. Edelstein and colleagues (2005) tested the memory of victims of child sexual abuse who had been part of a study about 14 years earlier. These victims' attachment scores were collected at the time of the renewed contact and used to predict long-term memory of the assault. These abuse experiences ranged from low severity (e.g., fondling) to high severity (e.g., rape at gunpoint). The critical finding was that whereas victims with low-attachment avoidance scores had more accurate memory for high- than for low-severity events, victims with high-attachment avoidance scores showed more accurate memory for low- than for high-severity events. According to Goodman's model, parents and their children learn to avoid thinking

and talking about negative experiences to cope with the stress of low support from close others. Avoidance has a negative effect on memory for the traumatic experience. Together, these results suggest that the accuracy of memory for highly traumatic events depends on the socioemotional context in which they occur (this topic will be discussed in more detail later in this chapter). Knowing that an event is stressful is not enough to predict accuracy.

Factors that affect the reliability of memories for nontraumatic events apply to memory for traumatic events as well. In a review of research on children's and adults' memories of traumatic experiences (e.g., medical procedures, natural disasters, sexual abuse), Pezdek and Taylor (2002) concluded that cognitive principles that apply to memories for nontraumatic events also apply to memories for traumatic events. This conclusion was based on the finding that, similar to memories for nontraumatic experiences, memories for traumatic events (a) suffer forgetting over time, (b) show an age-related pattern whereby accuracy and amount of detail increases with age, (c) are likely to be accurately remembered in gist but not veridical form, and (d) are susceptible to distortions under similar conditions.

Background Knowledge and Memory for Repeated Events

Some criminal acts against children, particularly sexual abuse, are not likely to occur in isolation (see Brubacher, Powell, & Roberts, 2014). Repetition of the same experience has been shown to strengthen event memory and consequently increase resistance to suggestibility. When an experience is repeated, children typically quite accurately recall the invariable details of the event and are resistant to suggestibility. Pezdek and Roe (1995) presented 4- and 10-year-old children a slide sequence of an event, including four target slides, each presented one or two times. Afterward, a narrative was read to the children that misled them about two target items. On a subsequent recognition memory test, for both age-groups, stronger memories (those viewed twice) were more resistant to suggestibility than weaker memories (those viewed once). Powell, Roberts, Ceci, and Hembrooke (1999) extended these findings to a real-world event that children experienced

once or six times over several weeks. They, too, reported that repetition increased memory for the event and resistance to suggestibility. In this study, repetition had a powerful effect on attenuating the detrimental effects of suggestibility, age, and delay on memory. These findings suggest that children's memory for repeated experiences is strong, and accounts based on those memories are likely to be accurate and resistant to suggestibility.

When individuals experience an event repeatedly, they develop background knowledge about the event, often in the form of semantic memory or a schema. We know, for example, that after visiting the dentist several times, we develop a schema for a dentist's visit into which we can better organize specific details of future visits. This process occurs for traumatic memories as well. Ornstein and colleagues (2006) found that, controlling for age, prior knowledge about routine doctors' visits was significantly associated with children's increased recall of a target pediatric examination. Prior knowledge appears to help children attend to, encode, and integrate relevant details of the events, resulting in a well-organized interconnected structure that is easily accessible during retrieval attempts (see the section "Schema Conflicts Make Encoding (and Retrieval) Less Efficient"). The presence of prior knowledge about an event increases the plausibility of an event as well, and as will be discussed, false memories are less likely to be planted if the event is implausible, and children have little prior knowledge of the event.

CONTROVERSIES REGARDING FALSE MEMORY

Numerous controversies persist in clouding the issues regarding false memories. This section reviews four of these controversies.

The Dangers of Confusing Different False Memory Paradigms: False Memories Are Not Just Deese, Roediger, and McDermott False Alarms

Pezdek and Lam (2007) conducted a systematic search of the research literature on *false memory* to examine the paradigms that were being used to

study the concept. The research examined whether, in fact, the term was being used in a consistent way across studies. Specifically, the authors conducted a PsycINFO search for the time period from 1872 (the first study identified, in fact, was published in 1994) through the first week of January 2004 using the subject heading *false memory*. The origin of the use of the term *false memory* by cognitive psychologists can be traced to a symposium at the 1992 meeting of the American Psychological Society (APS) on the topic, "Remembering 'Repressed' Abuse: Initial Research, Theoretical Analysis and Evaluation of the Claims." Elizabeth Loftus (1992) was the symposium discussant and presented her research on planting false childhood memories for being lost in a mall in adults (later published by Loftus & Pickrell, 1995). She drew generalizations from this research to the real-world issue of assessing whether memories for incidents of childhood sexual abuse may be planted suggestively and thus be *false memories*. The False Memory Syndrome Foundation, which coined the phrase "false memory syndrome," was founded that same year and Loftus and two other members of the APS symposium were members of the foundation's board of directors. This symposium was followed by a lead article in the *American Psychologist* by Loftus entitled "The Reality of Repressed Memory" (1993). In both the symposium and the subsequent article, the use of the term *false memory* was intended specifically to refer to memory for an entirely new event, that is, an event or a specific episode of an event that was never experienced by an individual in his or her lifetime, but nonetheless, came to reside in the individual's memory.

In this literature search, Pezdek and Lam (2007) identified a total of 198 articles and then categorized these according to the principal methodology that was used in each. The authors primarily were interested in the percent of these articles that involved planting memories for entirely new events that were never experienced by participants in their lifetime. Although over this decade there was an apparent false memory research bandwagon in cognitive psychology, few researchers—only 13.1% ($N = 26$) of the articles—actually studied false memory as the term originally was intended to specifically refer to planting memory for an entirely

new event that never was experienced in an individual's lifetime.

The largest single category of these articles on false memory were those that used the Deese, Roediger, and McDermott (DRM) procedure (Deese, 1959; Roediger & McDermott, 1995). This category accounted for 41.4% ($N = 82$) of the articles. In the DRM paradigm, participants typically were presented lists of semantically related words (e.g., bed, rest, awake) in which one highly associated critical lure word (e.g., sleep) is excluded. In a subsequent recognition or recall memory test, participants produce a high rate of false alarms to the critical lure word that was not presented. Essentially, these are semantically related *intrusion errors*.

The DRM task is appealing because it is a fail-safe semantic priming task that consistently produces memory intrusion errors across many contexts (Gallo, 2010). The cognitive mechanisms that account for the DRM findings, however, do not apply to planting entirely new events in memory, specifically memory for child sexual abuse. Freyd and Gleaves (1996) articulated critical differences between the task used by Roediger and McDermott (1995) and memory for child sexual abuse; they concluded that these differences were sufficient to limit the generalizability of the findings using the DRM task to the planting of entirely new events in memory. In particular, Freyd and Gleaves pointed out that in Roediger and McDermott's own study (see Table 1 in Roediger & McDermott, 1995, p. 806), although lures related to learned words were likely to be erroneously remembered as having been presented, unrelated lures were not. Thus, using the example by Freyd and Gleaves, although *shoe* in a list of to-be-learned words is likely to prime *foot*, *shoe* is not likely to prime the unrelated word *penis*. Similarly, although *birthday party* might semantically prime *eating apple pie*, *birthday party* is not likely to prime *sexual abuse*. In response, Roediger and McDermott (1996) acknowledged that their results should not be "generalize[d] to the controversy about possible false memories arising from certain therapeutic practices" (p. 816).

In fact, the relationship between DRM illusions and errors in autobiographical memory has not been established convincingly, performance on these two

tasks is correlational at best, and the data may suggest different mechanisms (Gallo, 2010). Although some studies of naturally occurring events show that people who recover memories of childhood abuse in suggestive therapy are more prone to DRM illusions than other groups (Geraerts et al., 2009), laboratory studies in which the veracity of to-be-planted childhood events were established more directly show no relationship between DRM illusion results and mistaken memories of childhood events (Qin, Ogle, & Goodman, 2008). We still have a great deal to learn about the conditions under which false autobiographical events can be planted in memory and the cognitive mechanisms that underlie these false memories. Because researchers continue to use the term *false memories* to refer to these two different phenomena, possibly erroneous generalizations about the ease of planting false memories for childhood sexual abuse continue to follow on the basis of the flood of word list–learning research studies using the DRM paradigm. The Pezdek and Lam (2007) data point to an important reality: cognitive scientists have focused on studying that which is easy to study, that is, illusions in list learning paradigms. Planting false memories of childhood events is much more difficult to study because it is difficult to implement successfully, and ethical issues abound. Unfortunately, critical questions about false memories are being misinformed by imprecise language usage in the research literature.

How Easy Is It to Plant False Memories for Traumatic Events and Under What Conditions Is This More Likely to Occur?

Although many people have concluded from the false memory research that it is relatively easy to plant false events in memory, the data suggest that it is not. Lindsay, Hagen, Read, Wade, and Garry (2004) reviewed the findings in six published studies that prompted false memories using what has become known as the familial-informant false-narrative procedure (Hyman & Billings, 1998; Hyman, Husband, & Billings, 1995; Hyman & Pentland, 1996; Loftus & Pickrell, 1995; Pezdek et al., 1997; Porter, Yuille, & Lehman, 1999). In this procedure, participants are read descriptions of some true events (collected from a parent or

close family member) along with some false events (drafted by the researcher). For each event, participants are told that this is what their parent recalled about the event. They then are asked what they recall about it. Across these studies, 31% of the total 374 participants were scored as having a false memory (the range across conditions was 0% to 56%). Some of these studies distinguished between *partial* false memories (i.e., recalled only the information included in the researcher's description) and *complete* false memories (i.e., recalled additional information that supplemented the researcher's description). This distinction is important because only with a complete false memory do we know that an individual is not simply complying with the experimenter to affirm the suggested information. In the studies that made this distinction, only 20% of the participants were classified as having complete false memories.

In the previously reviewed studies, however, the suggested events were, for example, getting lost in a mall while shopping or tipping over a punch bowl at a wedding. These are relatively plausible events for which script-relevant knowledge is likely to exist in most people's memory, and even with these events, only a minority of participants had complete memories for the suggested false event. More important is the question of whether results from these studies generalize to real-world cases of sexual abuse, an event that is implausible for most people and for which script-relevant knowledge is less likely to exist in memory. Pezdek and colleagues (1997) addressed this question and tested a model regarding how suggested false events become planted in memory. According to this model, an asserted event must first be evaluated as true before it can be incorporated into autobiographical memory, and if an event is implausible, it is not likely to be evaluated as true. Furthermore, it is easier to form a memory trace for an event that is plausible and about which one has a well-developed generic script than to form a memory trace for an event that is implausible and about which one does not have a generic script.

In Experiment 1 of the Pezdek and colleague's (1997) study, 22 Jewish and 29 Catholic high school students were read descriptions of three true events (from mothers' reports) and two false

events reported to have occurred when they were 8 years old. One false event described a Jewish ritual; one described a Catholic ritual. After being read each description, each participant was asked what he or she remembered about the event. Results for the false events showed the predicted asymmetry: Whereas 7 Catholics but 0 Jews remembered only the Catholic false event, 3 Jews but only 1 Catholic remembered only the Jewish false event. Two participants recalled both events. The plausibility hypothesis was further tested in Experiment 2 in which it was reported that a plausible event (being lost in a shopping mall) was more likely to be suggestively planted in memory than an implausible event (receiving a rectal enema). In fact, among the 22 participants who participated in Experiment 2, only three (14% of participants) remembered one of the false target events and all three of these were the plausible event.

Similar findings were reported by Pezdek, Blandón-Gitlin, and Gabbay (2006), when plausibility was manipulated simply by telling individuals differing statistics about the prevalence of specific life events (i.e., 9% or 91% of 1,000 students previously surveyed had reported that the specific event had happened to them before the age of 10 years old). Using a slightly different methodology, this effect of plausibility on the creation of false memories was replicated by van Golde, Sharman, and Candel (2010) and by Blandón-Gitlin and Gerkens (2010). Similarly, Laney and Takarangi (2013) found that rates of false memories of aggressive acts were higher in individuals who reported having aggressive tendencies, underscoring the importance of plausible self-schema in the development of false memories. The effect of plausibility on false memories also has been reported with 5- to 7-year-olds and 9- to 12-year-olds (Pezdek & Hodge, 1999). Together, these findings suggest that all memories are not equally likely to be suggestively planted in memory, and the plausibility of a suggested item is a significant factor that affects assent rates to suggested false events. It should be easier to plant false memories of sexual abuse during childhood with people for whom sexual contact with an adult during their childhood is more plausible than with people for whom sexual contact with an adult during their childhood is less plausible.

Planting New False Memories Versus Changing or Erasing Old True Memories

The issue upon which the term *false memory* originated was the authenticity of memories of sexual abuse. That is, if a child was not abused, where did the abuse memory come from, and how easy is it to plant false memories for entirely new events? Related issues are how easy is it to (a) erase a memory, that is, convince someone that something did not occur if it did; or (b) change a memory, that is, convince someone that a real event occurred differently than she or he remembers it? As reported in the study by Pezdek and Lam (2007), only 13.1% ($N = 26$) of the research articles on false memory actually studied false memory in the sense of planting memory for an entirely new event that was never experienced in an individual's lifetime. In our search, we found that 16.2% ($N = 32$) of the false memory articles presented research in which new or changed memory details resulted from misinformation or suggestive sources (e.g., suggesting that a stop sign was really a yield sign). Much of the research on the suggestibility of memory is of this type, and after 1992, but not before 1992, most of the studies on memory suggestibility have used false memory as a subject heading. But how does the ease with which memories for real events can be changed compare to the ease with which memories can be planted for completely new events or erased for real events?

Pezdek and Roe (1997) specifically compared the relative vulnerability to suggestibility of changed, planted, and erased memories. Four-year-olds and 10-year-olds participated in a study in which they were either touched in a specific way or were not touched at all, and it was later suggested that a different touch, a completely new touch, or no touch at all had occurred. They found that although it was relatively easy to suggest to a child a change in the event that was experienced, it was less likely that the event could be planted in memory if it had not occurred, or to be erased from memory if it had occurred.

These findings suggest that there are clear differences in the cognitive mechanisms underlying suggestively planting versus erasing or changing memories. These two separate processes should be

treated as such (Dalenberg, 2006). Source-monitoring literature provides extensive documentation that memory errors are more likely to occur when a close semantic relationship exists between the recalled information and the real experience (Lindsay, 2008). False information that is related semantically to the real experience will be confused more easily as externally derived than deliberately created thoughts and images (Johnson, Raye, Mitchell, & Ankudowich, 2011). In the former case, few cues signal a nonexperienced event. In the latter case, however, the cognitive operations encoded when deliberately creating the images and thoughts might serve as cues to source, thus reducing the possibility of misattribution. Given the potential differences in cognitive mechanisms underlying these various memory phenomena, it is inappropriate at this time to generalize directly from false memory research that did not involve planting entirely new events in memory to real-world situations that involve attempts to change or erase memories. In a recent article in *Psychology Today*, Loftus is quoted as saying, "We've done hundreds of experiments involving thousands of subjects showing that it's relatively easy to change people's memory of the details of an event that they've actually experienced" (Vitelli, 2012, para. 9). This statement should not be taken to suggest that memories for completely new false events are easily planted.

Can Accounts of False Events Be Differentiated From Accounts of True Events?

Because strong claims have been made about the ease with which false memories can be created and the persistence of these memories over time, it is important to assess whether, once recalled, memories for true and false events can be differentiated. In terms of physiological research on this topic, the bulk of the studies involve episodic laboratory-based memories; less has been done with naturalistic autobiographical memories (but see Cabeza et al., 2004). This difference in task choice has important implications for our understanding of false memories of autobiographical events, as the neural substrates that are activated with these two memory tasks generally are nonoverlapping (see

McDermott, Szpunar, & Christ, 2009). Nonetheless, Schacter and Slotnick (2004) reviewed the relevant neuroimaging and electrophysiological studies and reported a consistent pattern that sensory activation is greater for experienced than nonexperienced events. For example, Okado and Stark (2003) had individuals encode items that either were presented with an actual picture or participants had imagined a picture. They then were scanned during a recognition memory test. True memories for seen pictures showed greater activation in occipital cortex (primary visual cortex) than memories for imagined items. This result is consistent with results reported by Johnson, Foley, Suengas, and Raye (1988) that self-reports of thoughts about real autobiographical events contained more contextual and perceptual information than thoughts about imagined false autobiographical events.

Relevant data can be drawn from another source as well. If we consider the studies that involve planting false memories for entirely new events, and specifically look at individuals' descriptions of (a) events that we know occurred and (b) events that we know did not occur, we can assess whether diagnostic differences are evident in the phenomenological qualities of these two sets of descriptions. Are descriptions of false events discriminable from descriptions of true events? To address this question, we examined the responses of participants in two of our studies (Pezdek et al., 1997; Pezdek & Hodge, 1999) as well as in classic studies by Loftus and Pickrell (1995) and by Hyman and Pentland (1996). In these studies, when participants affirmed the occurrence of a true or false event, they described what they remembered about the event and rated the clarity of their memory and their confidence (typically, "How confident are you that you could remember more about this event if given more time to think about it?"). First, in three of these four studies (Hyman et al., 1995, did not report verbosity data), descriptions of true events contained about twice as many words as did descriptions of false events, with the biggest difference in the results of Loftus and Pickrell (1995; true events: 138 words; false events: 49.9 words). Second, self-reports of memory clarity and confidence were also higher for true than for false events. Thus, although

people may erroneously report some false events as true, their descriptions of true events contain more words, and they are reported with a greater clarity of perceptual details and are held more confidently. Also, and consistent with the cognitive model proposed by Pezdek and colleagues (1997), whereas memories for remembered true events contain information presented by the researcher in the described event, schema-relevant information associated in memory, and episode-specific memory for the event, memories for false events typically contain only the information presented by the researcher in the description and associated information from schema-relevant knowledge in memory.

HOW TRAUMA DISRUPTS MEMORY IN ADULTS

Trauma can disrupt and affect memory in many ways. Researchers have long known that events such as natural disasters and combat can lead to impaired memory even in the absence of physical damage to the brain (Arrigo & Pezdek, 1997). Some of the earliest scientific reports of memory impairment come from combat veterans who displayed amnesia for events in war (Sargant & Slater, 1941). In a study of Gulf War veterans, 70% recalled an event after 2 years that they had not remembered 1 month after returning from war (Southwick, Morgan, Nicolaou, & Charney, 1997). Many studies have demonstrated evidence that it is common to forget, and later remember, parts or all of serious traumatic events such as child sexual abuse (Wilsnack, Wonderlich, Kristjanson, Vogeltanz-Holm, & Wilsnack, 2002).

The next section discusses long-term autobiographical memory, focusing mainly on data from adults. It discusses how mechanisms of normal constructive memory are affected by trauma, and how dissociation and trauma can interrupt common memory processes. Severe trauma can interact with memory at any one or more of the four stages of memory: encoding, consolidation, storage, and retrieval.

Encoding Interruptions

Fear, language, and the brain. Rauch and colleagues (1996) proposed that the disabling of Broca's area is partially responsible for the difficulty

of retrieving memories of trauma. Broca's area is involved in producing speech with fluid rapidity. Patients with damage to this part of the brain produce sentences that contain meaning but that are disjointed and nonfluent. When this area has reduced activation, traumatic memories are encoded without words and are difficult to access verbally. This reduction in Broca's area activity, leading to an emotional rather than verbal encoding of memories, can partially explain the phenomenon of flashbacks in posttraumatic stress disorder (PTSD), where memories are re-experienced as if in real time (Rauch et al., 1996; see also Brewin, 2014). The finding of lower activation of Broca's area when trauma information is presented has been replicated several times in PTSD samples (e.g., Shin et al., 1997). Brain structure and function as they relate to trauma, however, can be difficult to study because different types of trauma (e.g., combat, child abuse, adult rape) and different ages when trauma occurs can produce different brain effects (Hull, 2002). Several studies have shown that exposure to substantial verbal abuse by parents before the age of 21 years old, in the absence of other forms of abuse, is associated with abnormal development in Wernicke's area and other brain areas (Tomoda et al., 2011) and that childhood sexual abuse disrupts the development of visual association areas in participants who were chosen based on exposure to abuse rather than symptoms (Tomoda, Navalta, Polcari, Sadato, & Teicher, 2009).

Reduced Broca's area activity means that traumatic memories may not be encoded in language, and reduced hippocampal activity makes those memories vulnerable to disruption and difficult to access later. The hippocampus has been a frequent target for PTSD research, because the hippocampus aids in consolidating new episodic long-term memories and in feature binding. It is also vulnerable to damage from stress hormones (McEwen, 2004). A review of this line of research showed that hippocampal volume is frequently smaller in trauma survivors with PTSD, compared with the brains of people without trauma (O'Doherty, Chitty, Saddiqui, Bennett, & Lagopoulos, 2015). Reduced hippocampal volume is implicated in the development of flashbacks (O'Doherty et al., 2015;

see also Brewin, 2014). Severity of flashbacks may be inversely related to size of hippocampus. Treatment with a selective serotonin reuptake inhibitor medication may increase hippocampus size and cognitive function (Bremner, 2006). Hippocampal volume also may be reduced in trauma survivors with dissociative identity disorder (DID; Vermetten, Schmahl, Lindner, Loewenstein, & Bremner, 2006), which is frequently comorbid with symptoms of PTSD (see Chapter 13, this volume). One study has shown that DID not only was associated with smaller hippocampal volume but also with an abnormal shape of the hippocampus (Chalavi et al., 2015).

Patients with PTSD may have different connectivity among various areas of the brain than do traumatized people without PTSD (Lanius et al., 2004). PTSD patients also have unique patterns of hormonal activation, particularly in the effects of glucocorticoids on the hypothalamic-pituitary-adrenal axis (Marin et al., 2011). They may respond to traumatic memory cues with highly sensory memories (flashbacks) that are not integrated with the sense of self (Brewin, 2014). In contrast, trauma survivors without PTSD showed greater activation in verbal-language networks when recalling episodic memories and less activation of right-side emotional processing (Lanius et al., 2004). This distinction may be affected by subtypes of PTSD (Pain, Bluhm, & Lanius, 2009). Similar patterns of disorganized memories with acute stress disorder have been found in children who experienced assaults and motor vehicle accidents (Salmond et al., 2011) and in cross-cultural studies of PTSD (Jobson, Moradi, Rahimi-Movaghar, Conway, & Dalgleish, 2014).

When language is not connected with memory, the arrangement and qualities of memory can differ substantially from more everyday memory (N. Yehuda, 2005). Pasupathi (2007) found that participants discussed previously disclosed and never-disclosed events differently. Discussion of previously disclosed events featured greater emphasis on others than on self, which points to a process of arranging memory deliberately to form a story. Memories that were shared also were more integrated into participants' sense of self. Language surrounding memory varied based on the purpose of disclosing the memory. Participants used more

elaboration if the purpose of disclosure was to share meaning they had found in their stories (Pasupathi, 2007).

These and other studies have demonstrated that sharing a memory in language can affect the organization of the memory, making it more linear and verbal (Freyd, 1983). People change which details to share depending on the audience, which in turn affects their own memory of events (Tversky & Marsh, 2000). Listener response to disclosure also affects the organization of disclosed memories. If listeners are responsive, the memory being disclosed is more integrated into the sense of self than if listeners are distracted (Weeks & Pasupathi, 2011). Traumatic memories, however, are frequently not shared for years after the event, if ever (Hébert, Tourigny, Cyr, McDuff, & Joly, 2009), which makes it likely that these memories are fragmented, nonverbal, and not well integrated with other memories (Brewin, 2014).

Escape situations lead to poor encoding. A classic study found that students who had to get a vaccination from a nurse had much poorer recall and recognition memory for the identity of the nurse who gave the needle than for the identity of a neutral helper who took their pulses. Students with the worst memory also had the highest heart rates, indicating the largest fight-or-flight reaction. In treating the situation as one requiring vigilance and escape, they were not able to engage in deep levels of processing (Deffenbacher, Bornstein, Penrod, & McGorty, 2004). In fact, many people consciously turn away from needles, leading to a much lower chance of being able to report events that occurred in that visual area.

Similar dynamics may happen during traumatic events. Depersonalization and derealization are common responses to traumatic situations such as combat, motor vehicle accidents, and assault. They also can be present in everyday situations, particularly in people who previously have been traumatized or who have a diagnosed mental disorder (Sar, 2006). Absenting the self from the current situation leads to poor encoding of events, emotions, and sensations surrounding those events. Inhibition of processing at the time of encoding has been demonstrated in many studies, with resultant deficits in

later recall of the inhibited memories (Anderson & Hanslmayr, 2014).

Experimental evidence demonstrates that the feeling of depersonalization or being “out-of-body” during an interpersonal interaction also can impede encoding of the event, leading to impaired recall of the event later. When attempting to recall out-of-body experiences, participants in one study showed decreased activation of hippocampal areas responsible for binding sensory and identity aspects of episodic memories (Bergouignan, Nyberg, & Ehrsson, 2014). The authors concluded that, to effectively encode episodic events into memory, those events must be experienced from within a first-person perspective (Bergouignan et al., 2014). This finding helps explain existing research that shows that patients with depersonalization disorder experience deficits on immediate visual and verbal recall (Guralnik, Giesbrecht, Knutelska, Sirroff, & Simeon, 2007). This area is ripe for further research because these effects may have more to do with attention and distractibility than with depersonalization itself (Guralnik et al., 2007).

Schema conflicts make encoding (and retrieval) less efficient. As mentioned earlier, schemas are structures of knowledge that guide information processing, storage, and retrieval (Tversky & Marsh, 2000). When an event conflicts with an existing schema, it can be difficult to encode effectively because of lack of background knowledge and therefore can be difficult to remember. When it is consistent with established schemas, the information is actually easier to remember (Brewer, 1997). Traumatic events that intrude on daily life may have no warning or precedent. Abuse by a supposedly loving parent, betrayal by a theoretically beneficent institution, or rape by a purported friend all conflict strongly with expectations and oppose existing schemas about benevolent relationships. Unfortunately, chronic trauma may become a new schema and turn into an expectation (Brewin, 2011), which strengthens the memory of having been traumatized and makes it easy to recall general events, but makes it harder to recall any one particular instance of the schema (Brewer, 1997). This phenomenon has been demonstrated in children’s

memories of physical abuse (Greenhoot & Bunnell, 2009). Teenagers who were chronically exposed to severe violence growing up readily reported less severe violent acts, but they did not remember the most violent acts perpetrated against them (Greenhoot & Bunnell, 2009).

Because schemas also guide retrieval, particularly for events that are not well recalled, they can affect memory at several different points in the encoding and retrieval process (Kleider, Pezdek, Goldinger, & Kirk, 2008). Over time, people build self-schemas that describe themselves and delineate what is and is not relevant to the self. Information that is viewed as relevant to the self is easier both to encode and to recall (Valentino, Cicchetti, Rogosch, & Toth, 2008). These schemas become more stable and more elaborate with age (Valentino et al., 2008).

When deciding whether a memory is true, people consult their schemas. How plausible an event or memory seems depends on what people think the prevalence rate is for similar people (Pezdek & Blandón-Gitlin, 2009). New research demonstrates that survivors of childhood abuse implicitly add abuse to their schema of the self as betrayed. Although they may not consciously define themselves as having been betrayed, this schema about the self continues to guide information processing in adulthood (Delker & Freyd, 2015).

Unpleasant events may be rehearsed less often.

Multiple studies have reported that traumatic events are rehearsed in memory less than are neutral or positive events (Hardt & Rutter, 2004). Inhibiting rehearsal of certain memories is a process that may occur frequently and automatically to maintain the current sense of self (Conway, 2005). The memories people choose to rehearse also are influenced by schemas about who they are and what their life is like (Tversky & Marsh, 2000).

Consolidation Interruptions

Consolidation of new experiences into long-term episodic memory is a process that continues for several days after the new event and relies on the hippocampus. Interruptions of the consolidation process can come from traumatic brain injury

(see Chapter 17, this volume), subtle hippocampal damage, and lack of sleep, among other problems.

Sleep is necessary for consolidation of learning and memory in the brain. Numerous trauma sequelae such as nightmares, hypervigilance, and substance use can interrupt sleep cycles in the aftermath of trauma and even years later. Lack of sleep is a fact of life during combat situations or any time when danger is ongoing. Preventing or interrupting sleep is also a method of torture used in war and in domestic abuse situations. Given that lack of sleep is correlated with dissociative symptoms (Watson, 2001) and may even induce dissociation (Giesbrecht, Smeets, Leppink, Jelicic, & Merckelbach, 2007), interruption of consolidation time may contribute to many memory dysfunctions in trauma survivors.

Storage Interruptions

Although memories are stored in the brain, they continue to be affected by events. Normal aging of the brain, forgetting over time, strokes, injuries, and anything else that affects the brain's structure or function also can destroy or alter memories in storage. Schemas may change over time, affecting how the information is arranged in memory (Tversky & Marsh, 2000; Valentino et al., 2008). Reinterpretation of past events based on new knowledge or understanding also can change the representation of events stored in memory (Sivers, Schooler, & Freyd, 2002).

Retrieval Interruptions

Suppressing and avoiding memory. Repression in the Freudian sense is difficult to study in a controlled manner as it is, by definition, not accessible to conscious awareness. In the Freudian sense, memories that are repressed to protect against emotional pain still can influence the repressor's life (Sivers et al., 2002). Repression in the purest sense is not widely accepted as a mechanism for forgetting, and strong laboratory evidence has been sparse. Laboratory research on executive control, however, can demonstrate deliberate suppression of unwanted memories and subsequent effects on the memory itself (Anderson & Green, 2001).

Retrieval-induced forgetting and trauma. In a long-running line of research, Anderson and colleagues have demonstrated the phenomenon of

retrieval-induced forgetting (RIF). The RIF effect occurs when participants deliberately practice suppressing memories of previously overlearned material. After the suppression, the memory is then much more difficult to access, even in the face of high motivation and potential reward. Each time the memory is suppressed, it becomes harder to access (Anderson & Green, 2001). Encountering any cues related to the memory further reinforces the suppression, which is long-lasting (Anderson, Bjork, & Bjork, 1994). The authors noted, "These findings suggest the surprising conclusion that highly accessible items will be the most vulnerable to retrieval-induced forgetting" (p. 1078). Conjointly, memories that participants practice retrieving (instead of suppressing) become strengthened and, in turn, inhibit recall of related but suppressed incidents. These findings are related to rehearsal effects discussed earlier, although they are triggered specifically by retrieval and show up during the retrieval process. A reduction in hippocampal activity, mediated by the dorsolateral prefrontal cortex, is implicated in demonstrating this effect, which is a good model for active mental processes that help people avoid memories of trauma (Anderson et al., 2004).

The generalizability of these findings outside the lab is demonstrated in part by a study that shows that RIF also affects people's social behavior. Participants who showed RIF for positive traits about a person chose to sit further away from a stranger than did participants who had not practiced forgetting positive traits (Fernandes & Saunders, 2013). The inhibitory explanation for this effect is that inhibiting supposedly irrelevant information aids in memory for relevant information; however, RIF makes it harder to bring that information to mind if it is needed in the future. If RIF is present for traumatic events, it then may shape schemas that guide further memory, information processing, and social behavior (Fernandes & Saunders, 2013). It is possible that brief, acute social stress may reduce or eliminate the RIF effect, at least when tested using word list learning (Koessler, Engler, Riether, & Kissler, 2009). Future research is needed at the intersection of emotion, social interaction, and RIF.

Others have extended this research to encompass specifically emotional autobiographical memories,

thereby increasing the generalizability of previous studies that used word list learning. One study reported that, regardless of emotional valence, the RIF effect was demonstrated on memories from participants' personal lives. Memories that were practiced during the experiment were easier to retrieve, and memories that participants had suppressed were harder to retrieve because they were suppressed by similar memories that shared a category (Barnier, Hung, & Conway, 2004).

Avoidance. Avoidance of thoughts and memories about trauma is thought to reinforce the development and maintenance of PTSD symptoms (Brewin, 2011). Frequent avoidance of traumatic reminders and traumatic memories reinforces itself through control from the prefrontal cortex that makes avoided memories harder to recall in the future (Anderson & Hanslmayr, 2014).

Phenomenological qualities of the memory also may be related to symptoms in trauma survivors. For example, Kenny and colleagues (2009) found that participants who recalled their traumatic car accidents from the point of view of an observer (outside themselves) had more PTSD symptoms both 1 month and 1 year postaccident than did those who viewed their traumas from a first-person viewpoint (Kenny et al., 2009). They proposed that distancing of the self in memory was a form of avoidance that helped to regulate aversive emotions. Avoiding reminders of traumatic memory perpetuates PTSD (Brewin, 2011) and does not enable linear, verbal reprocessing. Survivors of car accidents who had more acute stress disorder symptoms also had dissociation and more disorganized memory than did survivors with fewer symptoms (Harvey & Bryant, 1999; see also Chapter 10, this volume).

Inhibition. Several studies show that survivors of childhood sexual abuse have difficulties inhibiting information that is irrelevant to the laboratory task at hand (Navalta, Polcari, Webster, Boghossian, & Teicher, 2006). This information in turn makes it more difficult to retrieve relevant, on-task information in laboratory situations and perhaps also in real life. This effect may be compounded by PTSD symptoms of distractibility and hypervigilance. Navalta

and colleagues (2006) found that abuse survivors not only had inhibitory deficits but also may have had problems with hemispheric integration. The authors reviewed evidence that early trauma impairs myelination in the brain as well as development of the corpus callosum. To the extent that trauma survivors' brains are functionally different from people without trauma, these effects may be shown in diverse ways in different people. General problems with inhibiting unwanted, intrusive memories have been shown in people with PTSD (Catarino, Küpper, Werner-Seidler, Dalgleish, & Anderson, 2015).

Dissociation may contribute to problems inhibiting unwanted or irrelevant information from attentional processing, awareness, and memory (Elzinga, de Beurs, Sergeant, Van Dyck, & Phaf, 2000). Using nonclinical samples, Chiu and colleagues (2010) have found that participants with the highest level of dissociation had weakened inhibition of to-be-forgotten information. Other, less dissociative, participants unintentionally suppressed this information in a RIF laboratory task. The high-dissociation group's memory for information they had practiced retrieving was equal to other groups; deficits were shown only in inhibition and may be related to other cognitive failures. The high-dissociation group also had higher levels of betrayal trauma (Chiu et al., 2010). In participants with clinical DID, inhibition difficulties may arise mostly under conditions of high anxiety (Dorahy, McCusker, Loewenstein, Colbert, & Mulholland, 2006). Laboratory tasks induce varying levels of anxiety in different people, which makes this effect more difficult to study.

Implicit and explicit access. Memories that are difficult to access explicitly may be available to implicit access. For example, although patients with DID often report explicit amnesia barriers between certain parts of the personality, emotional information may pass between these amnesic parts implicitly (Huntjens et al., 2005). Implicit priming may or may not pass among amnesic parts, depending on the task and setting (Huntjens et al., 2002). In a study of 30 participants with DID, van der Hart, Bolt, and van der Kolk (2005) reported that

participants not only reported amnesia for childhood trauma but also reported amnesia for other events that were emotionally significant but not traumatic. In addition to having somatosensory flashbacks (or *body memories*) for traumatic events, participants also recalled their nontraumatic important events through their bodies, for example, as sensory fragments (van der Hart, Bolt, & van der Kolk, 2005).

Both implicit and explicit memory processes have been shown to perpetuate ongoing symptoms in survivors of chronic interpersonal violence such as child abuse and domestic violence (Minshew & D'Andrea, 2015). Adult survivors in Minshew and D'Andrea's study showed strong memory for trauma-related words when measured implicitly as well as explicitly. Implicitly, they also responded more strongly to general threat words than to neutral words. The authors suggested that priming and self-schemas give trauma words greater weight in memory. Lyttle, Dorahy, Hanna, and Huntjens (2010) also found that trauma survivors with PTSD showed enhanced perceptual priming for trauma-related stimuli, which was positively correlated with severity of symptoms. In children, implicit memory of traumatic events may be demonstrated in play behaviors that replay the trauma, rather than in language (Terr, 1988).

Culture and social effects and retrieval. Cultural factors may influence how memory is organized and used. In line with prior research, Jobson and colleagues (2014) found that trauma survivors from individualistic cultures (British and mainstream Australian) provided more detailed and specific autobiographical memories in response to cues than did survivors from a more collectivist culture (Iranian). Participants from collectivist cultures also may have rehearsed their traumatic memories more than did those from individualistic cultures and may have placed less emphasis on their uniqueness of experience when examining their own memories (Jobson et al., 2014).

Parents teach children how to use language to describe their experiences and thus scaffold memory (Nelson & Fivush, 2004). In a well-conducted study of children undergoing an invasive and

embarrassing medical procedure, researchers tested not only children's memories for the procedures but also the extent to which parents discussed the procedure with their children (Goodman, Quas, Batterman-Faunce, Riddlesberger, & Kuhn, 1994). They found that the amount of memory in children was related positively to age, with older children having more background knowledge in which to situate their new memories. Memory was also positively related to the amount of discussion that occurred between parents and children about the procedure and to the children's understanding of the event, its purpose, and its steps (Goodman et al., 1994). Traumatized or abusive parents may not be able or willing to use emotion language with their children, however, leading to children's difficulty expressing their memories in language (N. Yehuda, 2005).

Another social or cultural factor that affects memory is power hierarchies. Actors who portray confidence in their own statements can sway less-confident or low-power participants to doubt or distort their memories to fit in with others' statements (Skagerberg & Wright, 2008). Social power not only dictates what is appropriate to say out loud, but even what it is appropriate to remember. People in situations of low power pay close attention to people further up in the hierarchy, devoting cognitive resources to monitoring and appeasing the other people. These cognitive resources are then less available, leading to decrements in performance, attention, and working memory (Skagerberg & Wright, 2008). In one study, participants saw a series of faces and then were put in a situation in which one participant had power over another. In recognition tests, participants in the low-power situation were likely to change their results to conform to the answer of participants in the high-power situation (Skagerberg & Wright, 2008). High-power participants were not influenced by low-power participants' memories. The results of such research are applicable not only to therapy and laboratory situations but also to situations within families (Skagerberg & Wright, 2008). Parents have power over their children in tangible and intangible ways. When parents, or any institutions of power, make it clear that trauma is not to be talked about or even thought about, memory can decline.

Adults can even influence children to forget important details of events they understood and participated in and that followed a common script. Using a cover-up procedure, S.-J. Williams, Wright, and Freeman (2002) found that talking to children about only some aspects of their experience while omitting other aspects led to a decline in children's reported memory for the omitted event. The authors noted that this procedure is similar to research in adults, and is a strong analog for abuse situations. Perpetrators or other adults may talk with a child on a regular basis about some details of their experience, while leaving out important other details. This process can make salient details harder for the victims to remember later (S.-J. Williams et al., 2002).

Betrayal trauma theory (Freyd, 1996) starts with betrayal blindness. In certain situations in which the victim of abuse depends on the perpetrator, it is adaptive to remain unaware of the abuse to maintain a necessary attachment relationship. This subconscious or unconscious blindness can affect memory, social relationships, and the therapeutic process (Goldsmith, Barlow, & Freyd, 2004). It also can contribute to unawareness for important warning signs of further abuse toward oneself or one's children (Hulette, Kaehler, & Freyd, 2011). Betrayal can contribute to avoiding memories or reminders of a traumatic event, even when controlling for amount of fear (Kelley, Weathers, Mason, & Pruneau, 2012).

Repeated research findings have shown that memory for abusive events is impaired when the victim was emotionally or otherwise dependent on the perpetrator (Schultz, Passmore, & Yoder, 2002). Betrayal can occur in familial situations such as child abuse (Freyd, DePrince, & Zurbriggen, 2001). It also can have deleterious effects on mental and physical health when individuals are betrayed by institutions, such as schools, churches, or the military (Smith & Freyd, 2014).

INTRUSIONS OF UNWANTED MEMORIES

In PTSD and other conditions, trauma survivors face a memory disruption that seems to involve excessive remembering, rather than forgetting (see Chapter 10, this volume). Intrusions of unwanted

or traumatic memories have been studied in PTSD (Amstadter & Vernon, 2006), obsessive-compulsive disorder (Najmi et al., 2010), and nonclinical (Barlow & Goldsmith, 2014) samples. Intrusive memories in PTSD may be due to inhibitory deficits in brain systems that suppress unwanted memories (Catarino et al., 2015) and to different attentional focus compared with trauma survivors without PTSD (Brewin, 2014).

Any memory can be intrusive, but intrusions are studied most frequently in regard to involuntary memories of upsetting or traumatic events. Although intrusions share some similarities to regular memories (Hellawell & Brewin, 2002), intrusions can be distinguished from ordinary memory by their greater amount of sensory detail and lack of connection to context (Brewin, 2014; Hellawell & Brewin, 2004). Flashbacks in PTSD are also different from intrusive memories in other conditions because they invoke a sense of reliving, rather than merely remembering (Brewin, 2014).

Flashbacks, or reliving memories, are a key component of PTSD. They have been conceptualized as a dissociative type of remembering (Waelde, Silvern, Carlson, Fairbank, & Kletter, 2009) in which sensory and episodic memory do not coincide and may even compete with each other (Brewin, 2014). When verbal episodic memory processing is not engaged because of a stressful situation, the memory that forms may be fragmented and disconnected from context. In such cases, environmental cues can trigger a memory to return without conscious awareness of the cue, leaving the person who remembers unable to articulate the memory (Brewin, 2014).

One way to reconcile the previous discussion on forgetting with findings such as intrusive memories is by examining retrieval cues from the environment or from seemingly unrelated items. When an unwanted thought occurs, people make a variety of choices. If they distract themselves from the thought by focusing on something in the environment instead, these (internal or external) environmental cues then can become associated with the avoided thought, cueing the thought to spring to mind whenever the same context is encountered (Koutstaal & Schacter, 1997). Survivors of

interpersonal trauma also often have difficulties with emotion regulation, which affects intrusive symptoms (Goldsmith, Chesney, Heath, & Barlow, 2013). In fact, numerous studies support the finding that attempting to suppress emotional expression leads to poorer memory (Richards & Gross, 2000).

Sudden intrusions of previously unavailable memories also has been called *recovery* of memory. Recovered memories are those memories that have been forgotten for a period and then remembered. Substantial research examining both naturalistic and laboratory situations has demonstrated that recovered memories are equally likely to be accurate as are continuous, never-forgotten memories. Chu, Frey, Ganzel, and Matthews (1999) and colleagues examined 90 women in an inpatient mental health unit, most of whom had experienced childhood trauma. They found that most of the participants who recovered previously forgotten memories of childhood sexual abuse attempted to find corroborating evidence to support their memories. Of those who sought corroboration, 89% of participants found this evidence (Chu et al., 1999). Similarly, a large majority (74%) of patients in another study sought corroboration of their recovered memories of child sexual abuse and did find confirmation, with an additional 9% finding evidence that was suggestive but not conclusive (Herman & Schatzow, 1987).

One of the best studies of recovered memory is a longitudinal study conducted by L. M. Williams (1995). L. M. Williams used emergency room records of girls, mostly African American, who had at least one case of sexual assault before the age of 13 years. Approximately 17 years later, the women were asked about a variety of life experiences and other health questions. Of the women who recalled their assault during the interview, some had had periods of amnesia, and some women did not recall their childhood abuse at all. Comparing women's reports to records from the time of the abuse, L. M. Williams (1995) found that recovered versus continually available memories did not differ in the number of inconsistencies with the contemporaneous evidence.

Finally, Dalenberg (2006) has tied together evidence from these and many other sources to

conclude that recovered memory for trauma is just as accurate as any other kind of human memory. Across many studies, approximately 75–79% of the details in human memory for trauma *and for many other types of life events* are accurate (Dalenberg, 2006).

MEMORY AND DISSOCIATION

Dissociation and DID affect memory in so many ways that it is beyond the scope of this chapter to explain them all (see Chapter 13, this volume). For further review of dissociation as an information processing style, see Barlow and Freyd (2009).

Numerous studies have examined memory performance in people with diagnosed DID and in nonclinical samples. Findings show that highly dissociative people have advantages in dividing their attention, and thus they have better memory for neutral information in such a situation, although they also showed impaired memory for trauma-relevant information (DePrince & Freyd, 2001). Veltman and colleagues (2005) found that those who exhibited high dissociation performed better than those who exhibited low dissociations on two different working memory tasks. In addition, those with high levels of dissociation recruited relevant brain networks more highly during the tasks than did those with low levels of dissociation (Veltman et al., 2005).

People with DID may show a similar bias to people with PTSD in that they are differentially attuned to the processing of potentially threatening negative information (Dorahy et al., 2014). Some evidence indicates overgeneral memory in DID, along with evidence that people with DID have difficulty encoding details (but not gist) of emotionally negative information (Barlow, 2010). Individuals with high levels of dissociation often report difficulties in executive functioning, although this reported difficulty may reflect a distorted metacognition that contrasts with their actual (normal) performance on executive control tasks (Bruce, Ray, Bruce, Arnett, & Carlson, 2007). In addition, DID patients' reports of amnesia may arise mostly from disruptions of metacognition (Buck, Kindt, & van den Hout, 2006). Although they report that

they cannot remember information explicitly and that there are amnesic barriers among identities, information often does transfer (Kong, Allen, & Glisky, 2008). Unexpected transfer of information may arise from active processing via reappraisal, which has been shown to be associated with childhood trauma and adult dissociation (Barlow & Goldsmith, 2014).

MEMORY IN THE AGING BRAIN

Trauma survivors experience normal aging processes that affect memory, such as an increase in reaction time and general cognitive slowdown. Elderly participants may experience declines in the effectiveness of their inhibition of irrelevant information in working memory (Collette, Germain, Hogge, & Van der Linden, 2009). This effect, however, may be due to strategy selection, and improved strategies can reduce the difference between younger and older adults (Murray, Anderson, & Kensinger, 2015).

Many studies of aging and trauma have focused on survivors of the Nazi Holocaust, which left many people deeply affected for the rest of their lives and continued to affect subsequent generations. A general pattern has been shown that dissociation and symptoms of PTSD decline with age, and as PTSD symptoms decline in Holocaust survivors, the ability to use long-term memory potentially may improve (Labinsky, Blair, & Yehuda, 2006). Overall, however, PTSD and chronic stress both complicate symptoms of aging, resulting in accelerated cognitive decline (Marin et al., 2011). Holocaust survivors with PTSD may show deficits in verbal learning and in some memory tests, demonstrating a complex interaction among aging, trauma exposure, and PTSD symptoms (R. Yehuda, Golier, Halligan, & Harvey, 2004).

CONCLUSION

On the basis of an understanding of cognitive psychology and cognitive development, this chapter has outlined how trauma interacts with memory in myriad ways. It has shown how understanding memory for traumatic events does not require proposing

any special mechanisms of memory that act differently than normal psychological mechanisms and processes. The cognitive processes that underlie everyday memory are the same processes that lead to errors in processing traumatic memories (Sivers et al., 2002). Like any memory, the availability of memory for traumatic events depends on how it is assessed.

Acute stress impairs memory encoding or retrieval for children and adults. Dissociation can severely affect what is explicitly retrieved, although memory may be well represented in storage. Further research is needed to untangle the memory systems of trauma survivors with DID, and the structures they use to organize both memory and self (Barlow & Chu, 2014). Survivors of childhood abuse, along with patients who have generalized depression and anxiety, demonstrate reduced specificity in recalling autobiographical events (Henderson, Hargreaves, Gregory, & Williams, 2002). Social-emotional factors also can impair memory. In both children and adults, events that are repeated over time tend to be well remembered in general details, but each individual event may be hard to remember distinct from others like it. This understanding about memory is important because traumatic events are often chronic and do not occur in isolation (Felitti et al., 1998). Repeated research has shown that adverse childhood events (such as abuse, neglect, substance use, or violence in the home) are both common and related. One study showed that having one event in childhood increased by a factor of 2 to 17 the odds of having at least one additional event (Dong et al., 2004).

When researching false memory, it is crucial to be clear about what methodology is being used and how it may or may not generalize beyond word list learning. In general, false memories of uncommon events are difficult to implant in adults, although it is easier to do so in children. It is also difficult to change existing memories, although they may be forgotten. L. M. Williams's (1994) groundbreaking studies showed that even documented, unambiguous abuse severe enough to send the victims to the emergency room could be forgotten for a period of years or decades. Importantly, parental and other social relationships can affect memory by applying

strong pressure to report that nothing bad occurred, when in fact it did. This type of memory error is rarely studied; it is likely that false negatives are much more frequent than false positives in research about the prevalence of child abuse (Hardt & Rutter, 2004). War veterans' accounts of forgetting and later remembering combat experiences have never been as controversial as similar accounts in survivors of child abuse. Herman (1992) has written eloquently about societal forgetting, which is a topic beyond the scope of this chapter but nonetheless vital to keep in mind.

Traumatic events can impair memory at many stages and are highly interactive with other cognitive and social processes. Whether memories are forgotten, dissociated, or intrusive, cognitive and clinical researchers are expanding knowledge of how diagnosed and normal processes interact. Cultural factors must not be left out of these analyses. Thus, it is important to take a complex approach to understanding trauma and memory in clinical and nonclinical populations.

References

- Amstadter, A. B., & Vernon, L. L. (2006). Suppression of neutral and trauma targets: Implications for posttraumatic stress disorder. *Journal of Traumatic Stress, 19*, 517–526. <http://dx.doi.org/10.1002/jts.20142>
- Anderson, M. C., Bjork, R. A., & Bjork, E. L. (1994). Remembering can cause forgetting: Retrieval dynamics in long-term memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 20*, 1063–1087. <http://dx.doi.org/10.1037/0278-7393.20.5.1063>
- Anderson, M. C., & Green, C. (2001). Suppressing unwanted memories by executive control. *Nature, 410*, 366–369. <http://dx.doi.org/10.1038/35066572>
- Anderson, M. C., & Hanslmayr, S. (2014). Neural mechanisms of motivated forgetting. *Trends in Cognitive Sciences, 18*, 279–292. <http://dx.doi.org/10.1016/j.tics.2014.03.002>
- Anderson, M. C., Ochsner, K. N., Kuhl, B., Cooper, J., Robertson, E., Gabrieli, S. W., . . . Gabrieli, J. D. (2004). Neural systems underlying the suppression of unwanted memories. *Science, 303*, 232–235. <http://dx.doi.org/10.1126/science.1089504>
- Arrigo, J. M., & Pezdek, K. (1997). Lessons from the study of psychogenic amnesia. *Current Directions in Psychological Science, 6*, 148–152. <http://dx.doi.org/10.1111/1467-8721.ep10772916>
- Barlow, M. R. (2010). Memory for complex emotional material in dissociative identity disorder. *Journal of Trauma and Dissociation, 12*, 53–66. <http://dx.doi.org/10.1080/15299732.2010.496144>
- Barlow, M. R., & Chu, J. A. (2014). Measuring fragmentation in dissociative identity disorder: The integration measure and relationship to switching and time in therapy. *European Journal of Psychotraumatology, 5*, 22250.
- Barlow, M. R., & Freyd, J. J. (2009). Adaptive dissociation: Information processing and response to betrayal. In P. F. Dell & J. A. O'Neil (Eds.), *Dissociation and the dissociative disorders: DSM-5 and beyond* (pp. 93–105). New York, NY: Routledge.
- Barlow, M. R., & Goldsmith, R. E. (2014). Childhood trauma and active mental processes: Dissociation and metacognition influence control of negative thoughts. *Journal of Child and Adolescent Trauma, 7*, 131–140. <http://dx.doi.org/10.1007/s40653-014-0010-3>
- Barnier, A. J., Hung, L., & Conway, M. A. (2004). Retrieval-induced forgetting of emotional and unemotional autobiographical memories. *Cognition and Emotion, 18*, 457–477. <http://dx.doi.org/10.1080/0269993034000392>
- Bergouignan, L., Nyberg, L., & Ehrsson, H. H. (2014). Out-of-body-induced hippocampal amnesia. *Proceedings of the National Academy of Sciences of the United States of America, 111*, 4421–4426. <http://dx.doi.org/10.1073/pnas.1318801111>
- Blandón-Gitlin, I., & Gerkens, D. (2010). The effects of photographs and event plausibility in creating false beliefs. *Acta Psychologica, 135*, 330–334. <http://dx.doi.org/10.1016/j.actpsy.2010.08.008>
- Bremner, J. D. (2006). The relationship between cognitive and brain changes in posttraumatic stress disorder. *Annals of the New York Academy of Sciences, 1071*, 80–86. <http://dx.doi.org/10.1196/annals.1364.008>
- Brewer, W. F. (1997). Children's eyewitness memory research: Implications from schema memory and autobiographical memory research. In N. L. Stein, P. A. Ornstein, B. Tversky, & C. Brainerd (Eds.), *Memory for everyday and emotional events* (pp. 453–466). Mahwah, NJ: Erlbaum.
- Brewin, C. R. (2011). The nature and significance of memory disturbance in posttraumatic stress disorder. *Annual Review of Clinical Psychology, 7*, 203–227. <http://dx.doi.org/10.1146/annurev-clinpsy-032210-104544>
- Brewin, C. R. (2014). Episodic memory, perceptual memory, and their interaction: Foundations for a theory of posttraumatic stress disorder. *Psychological Bulletin, 140*, 69–97. <http://dx.doi.org/10.1037/a0033722>
- Brubacher, S. P., Powell, M. B., & Roberts, K. P. (2014). Recommendations for interviewing children about

- repeated experiences. *Psychology, Public Policy, and Law*, 20, 325–335. <http://dx.doi.org/10.1037/law0000011>
- Bruce, A. S., Ray, W. J., Bruce, J. M., Arnett, P. A., & Carlson, R. A. (2007). The relationship between executive functioning and dissociation. *Journal of Clinical and Experimental Neuropsychology*, 29, 626–633. <http://dx.doi.org/10.1080/13803390600878901>
- Buck, N., Kindt, M., & van den Hout, M. (2006). Effects of state dissociation on objectively and subjectively assessed memory disturbances. *Behavioural and Cognitive Psychotherapy*, 34, 319–331. <http://dx.doi.org/10.1017/S1352465806002827>
- Cabeza, R., Prince, S. E., Daselaar, S. M., Greenberg, D. L., Budde, M., Dolcos, F., . . . Rubin, D. C. (2004). Brain activity during episodic retrieval of autobiographical and laboratory events: An fMRI study using a novel photo paradigm. *Journal of Cognitive Neuroscience*, 16, 1583–1594. <http://dx.doi.org/10.1162/0898929042568578>
- Catarino, A., Küpper, C. S., Werner-Seidler, A., Dalgleish, T., & Anderson, M. C. (2015). Failing to forget: Inhibitory-control deficits compromise memory suppression in posttraumatic stress disorder. *Psychological Science*, 26, 604–616. <http://dx.doi.org/10.1177/0956797615569889>
- Chalavi, S., Vissia, E. M., Giesen, M. E., Nijenhuis, E. R. S., Draijer, N., Cole, J. H., . . . Reinders, A. A. (2015). Abnormal hippocampal morphology in dissociative identity disorder and post-traumatic stress disorder correlates with childhood trauma and dissociative symptoms. *Human Brain Mapping*, 36, 1692–1704. <http://dx.doi.org/10.1002/hbm.22730>
- Chiu, C.-D., Yeh, Y.-Y., Huang, C.-L., Wu, Y.-C., Chiu, Y.-C., & Lin, C.-C. (2010). Unintentional memory inhibition is weakened in non-clinical dissociators. *Journal of Behavior Therapy and Experimental Psychiatry*, 41, 117–124. <http://dx.doi.org/10.1016/j.jbtep.2009.11.003>
- Chu, J. A., Frey, L. M., Ganzel, B. L., & Matthews, J. A. (1999). Memories of childhood abuse: Dissociation, amnesia, and corroboration. *American Journal of Psychiatry*, 156, 749–755.
- Collette, F., Germain, S., Hogge, M., & Van der Linden, M. (2009). Inhibitory control of memory in normal ageing: Dissociation between impaired intentional and preserved unintentional processes. *Memory*, 17, 104–122. <http://dx.doi.org/10.1080/09658210802574146>
- Conway, M. A. (2005). Memory and the self. *Journal of Memory and Language*, 53, 594–628. <http://dx.doi.org/10.1016/j.jml.2005.08.005>
- Dalenberg, C. (2006). Recovered memory and the Daubert criteria: Recovered memory as professionally tested, peer reviewed, and accepted in the relevant scientific community. *Trauma, Violence, and Abuse*, 7, 274–310. <http://dx.doi.org/10.1177/1524838006294572>
- Deese, J. (1959). On the prediction of occurrence of particular verbal intrusions in immediate recall. *Journal of Experimental Psychology*, 58, 17–22. <http://dx.doi.org/10.1037/h0046671>
- Deffenbacher, K. A., Bornstein, B. H., Penrod, S. D., & McGorty, E. K. (2004). A meta-analytic review of the effects of high stress on eyewitness memory. *Law and Human Behavior*, 28, 687–706.
- Delker, B. C., & Freyd, J. J. (2015). *Betrayed? Not me: Discrepant explicit and implicit associations in those exposed to childhood trauma*. Manuscript submitted for publication.
- DePrince, A. P., & Freyd, J. J. (2001). Memory and dissociative tendencies: The roles of attentional context and word meaning in a directed forgetting task. *Journal of Trauma and Dissociation*, 2, 67–82. http://dx.doi.org/10.1300/J229v02n02_06
- Dong, M., Anda, R. F., Felitti, V. J., Dube, S. R., Williamson, D. F., Thompson, T. J., . . . Giles, W. H. (2004). The interrelatedness of multiple forms of childhood abuse, neglect, and household dysfunction. *Child Abuse and Neglect*, 28, 771–784. <http://dx.doi.org/10.1016/j.chiabu.2004.01.008>
- Dorahy, M. J., Brand, B. L., Sar, V., Krüger, C., Stavropoulos, P., Martínez-Taboas, A., . . . Middleton, W. (2014). Dissociative identity disorder: An empirical overview. *Australian and New Zealand Journal of Psychiatry*, 48, 402–417. <http://dx.doi.org/10.1177/0004867414527523>
- Dorahy, M. J., McCusker, C. G., Loewenstein, R. J., Colbert, K., & Mulholland, C. (2006). Cognitive inhibition and interference in dissociative identity disorder: The effects of anxiety on specific executive functions. *Behaviour Research and Therapy*, 44, 749–764. <http://dx.doi.org/10.1016/j.brat.2005.05.009>
- Edelstein, R., Ghetti, S., Quas, J. A., Goodman, G. S., Alexander, K., Redlich, A., & Cordon, I. (2005). Individual differences in emotional memory: Adult attachment and long-term memory for child sexual abuse. *Personality and Social Psychology Bulletin*, 31, 1537–1548. <http://dx.doi.org/10.1177/0146167205277095>
- Eisen, M. L., Qin, J., Goodman, G. S., & Davis, S. L. (2002). Memory and suggestibility in maltreated children: Age, stress arousal, dissociation, and psychopathology. *Journal of Experimental Child Psychology*, 83, 167–212. [http://dx.doi.org/10.1016/S0022-0965\(02\)00126-1](http://dx.doi.org/10.1016/S0022-0965(02)00126-1)
- Elzinga, B. M., de Beurs, E., Sergeant, J. A., Van Dyck, R., & Phaf, R. H. (2000). Dissociative style and directed forgetting. *Cognitive Therapy and Research*, 24, 279–295. <http://dx.doi.org/10.1023/A:1005559203356>

- Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., . . . Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine*, 14, 245–258. [http://dx.doi.org/10.1016/S0749-3797\(98\)00017-8](http://dx.doi.org/10.1016/S0749-3797(98)00017-8)
- Fernandes, M., & Saunders, J. (2013). Does retrieval-induced forgetting affect future social behavior? *Acta Psychologica*, 144, 1–5. <http://dx.doi.org/10.1016/j.actpsy.2013.04.017>
- Freyd, J. J. (1983). Shareability: The social psychology of epistemology. *Cognitive Science*, 7, 191–210. http://dx.doi.org/10.1207/s15516709cog0703_2
- Freyd, J. J. (1996). *Betrayal trauma: The logic of forgetting childhood abuse*. Cambridge, MA: Harvard University Press.
- Freyd, J. J., DePrince, A. P., & Zurbriggen, E. L. (2001). Self-reported memory for abuse depends upon victim-perpetrator relationship. *Journal of Trauma and Dissociation*, 2, 5–15. http://dx.doi.org/10.1300/J229v02n03_02
- Freyd, J. J., & Gleaves, D. H. (1996). “Remembering” words not presented in lists: Relevance to the current recovered/false memory controversy. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 22, 811–813. <http://dx.doi.org/10.1037/0278-7393.22.3.811>
- Gallo, D. A. (2010). False memories and fantastic beliefs: 15 years of the DRM illusion. *Memory and Cognition*, 38, 833–848. <http://dx.doi.org/10.3758/MC.38.7.833>
- Geraerts, E., Lindsay, D. S., Merckelbach, H., Jelicic, M., Raymaekers, L., Arnold, M. M., & Schooler, J. W. (2009). Cognitive mechanisms underlying recovered-memory experiences of childhood sexual abuse. *Psychological Science*, 20, 92–98. <http://dx.doi.org/10.1111/j.1467-9280.2008.02247.x>
- Giesbrecht, T., Smeets, T., Leppink, J., Jelicic, M., & Merckelbach, H. (2007). Acute dissociation after 1 night of sleep loss. *Journal of Abnormal Psychology*, 116, 599–606. <http://dx.doi.org/10.1037/0021-843X.116.3.599>
- Goldsmith, R. E., Barlow, M. R., & Freyd, J. J. (2004). Knowing and not knowing about trauma: Implications for therapy. *Psychotherapy: Theory, Research, Practice, Training*, 41, 448–463. <http://dx.doi.org/10.1037/0033-3204.41.4.448>
- Goldsmith, R. E., Chesney, S. A., Heath, N. M., & Barlow, M. R. (2013). Emotion regulation difficulties mediate associations between betrayal trauma and symptoms of posttraumatic stress, depression, and anxiety. *Journal of Traumatic Stress*, 26, 376–384. <http://dx.doi.org/10.1002/jts.21819>
- Goodman, G. S. (2012, May). *James McKeen Cattell Award invited address*. Invited address. Association for Psychological Science Convention, Chicago, IL.
- Goodman, G. S., Quas, J. A., Batterman-Faunce, J. M., Riddlesberger, M. M., & Kuhn, J. (1994). Predictors of accurate and inaccurate memories of traumatic events experienced in childhood. *Consciousness and Cognition*, 3, 269–294. <http://dx.doi.org/10.1006/ccog.1994.1016>
- Goodman, G. S., Quas, J. A., & Ogle, C. M. (2010). Child maltreatment and memory. *Annual Review of Psychology*, 61, 325–351. <http://dx.doi.org/10.1146/annurev.psych.093008.100403>
- Goodman, G. S., Taub, E. P., Jones, D. P., England, P., Port, L. K., Rudy, L., . . . Melton, G. B. (1992). Testifying in criminal court: Emotional effects on child sexual assault victims. *Monographs of the Society for Research in Child Development*, 57, i–iii, v, 1–159. <http://dx.doi.org/10.2307/1166127>
- Goodman, G. S., Tobey, A. E., Batterman-Faunce, J. M., Orcutt, H., Thomas, S., Shapiro, C., & Sachsenmaier, T. (1998). Face-to-face confrontation: Effects of closed-circuit technology on children’s eyewitness testimony and jurors’ decisions. *Law and Human Behavior*, 22, 165–203. <http://dx.doi.org/10.1023/A:1025742119977>
- Greenhoot, A. F., & Bunnell, S. L. (2009). Trauma and memory. In B. L. Bottoms, C. J. Najdowski, & G. S. Goodman (Eds.), *Children as victims, witnesses, and offenders: Psychological science and the law* (pp. 36–56). New York, NY: Guilford Press.
- Guralnik, O., Giesbrecht, T., Knutelska, M., Sirroff, B., & Simeon, D. (2007). Cognitive functioning in depersonalization disorder. *Journal of Nervous and Mental Disease*, 195, 983–988. <http://dx.doi.org/10.1097/NMD.0b013e31815c19cd>
- Hardt, J., & Rutter, M. (2004). Validity of adult retrospective reports of adverse childhood experiences: Review of the evidence. *Journal of Child Psychology and Psychiatry*, 45, 260–273. <http://dx.doi.org/10.1111/j.1469-7610.2004.00218.x>
- Harvey, A. G., & Bryant, R. A. (1999). A qualitative investigation of the organization of traumatic memories. *British Journal of Clinical Psychology*, 38, 401–405. <http://dx.doi.org/10.1348/014466599162999>
- Hébert, M., Tourigny, M., Cyr, M., McDuff, P., & Joly, J. (2009). Prevalence of childhood sexual abuse and timing of disclosure in a representative sample of adults from Quebec. *Canadian Journal of Psychiatry*, 54, 631–636.
- Hellawell, S. J., & Brewin, C. R. (2002). A comparison of flashbacks and ordinary autobiographical memories of trauma: Cognitive resources and behavioural observations. *Behaviour Research and Therapy*,

- 40, 1143–1156. [http://dx.doi.org/10.1016/S0005-7967\(01\)00080-8](http://dx.doi.org/10.1016/S0005-7967(01)00080-8)
- Hellawell, S. J., & Brewin, C. R. (2004). A comparison of flashbacks and ordinary autobiographical memories of trauma: Content and language. *Behaviour Research and Therapy*, 42, 1–12. [http://dx.doi.org/10.1016/S0005-7967\(03\)00088-3](http://dx.doi.org/10.1016/S0005-7967(03)00088-3)
- Henderson, D., Hargreaves, I., Gregory, S., & Williams, J. M. G. (2002). Autobiographical memory and emotion in a non-clinical sample of women with and without a reported history of childhood sexual abuse. *British Journal of Clinical Psychology*, 41, 129–141. <http://dx.doi.org/10.1348/014466502163921>
- Herman, J. L. (1992). *Trauma and recovery*. New York, NY: Basic Books.
- Herman, J. L., & Schatzow, E. (1987). Recovery and verification of memories of childhood sexual trauma. *Psychoanalytic Psychology*, 4, 1–14. <http://dx.doi.org/10.1037/h0079126>
- Howe, M. L., Courage, M. L., & Peterson, C. (1996). How can I remember when 'I' wasn't there: Long-term retention of traumatic experiences and emergence of the cognitive self. In K. Pezdek & W. P. Banks (Eds.), *The recovered memory/false memory debate* (pp. 121–149). San Diego, CA: Academic Press.
- Hulette, A. C., Kaehler, L. A., & Freyd, J. J. (2011). Intergenerational associations between trauma and dissociation. *Journal of Family Violence*, 26, 217–225. <http://dx.doi.org/10.1007/s10896-011-9357-5>
- Hull, A. M. (2002). Neuroimaging findings in post-traumatic stress disorder. Systematic review. *British Journal of Psychiatry*, 181, 102–110.
- Huntjens, R. J. C., Peters, M. L., Postma, A., Woertman, L., Effting, M., & van der Hart, O. (2005). Transfer of newly acquired stimulus valence between identities in dissociative identity disorder (DID). *Behaviour Research and Therapy*, 43, 243–255. <http://dx.doi.org/10.1016/j.brat.2004.01.007>
- Huntjens, R. J. C., Postma, A., Hamaker, E. L., Woertman, L., van der Hart, O., & Peters, M. (2002). Perceptual and conceptual priming in patients with dissociative identity disorder. *Memory and Cognition*, 30, 1033–1043. <http://dx.doi.org/10.3758/BF03194321>
- Hyman, I. E., & Billings, F. J., Jr. (1998). Individual differences and the creation of false childhood memories. *Memory*, 6, 1–20. <http://dx.doi.org/10.1080/741941598>
- Hyman, I. E., Husband, T. H., & Billings, F. J. (1995). False memories of childhood experiences. *Applied Cognitive Psychology*, 9, 181–197. <http://dx.doi.org/10.1002/acp.2350090302>
- Hyman, I. E., & Pentland, J. (1996). The role of mental imagery in the creation of false childhood memories. *Journal of Memory and Language*, 35, 101–117. <http://dx.doi.org/10.1006/jmla.1996.0006>
- Jobson, L., Moradi, A. R., Rahimi-Movaghar, V., Conway, M. A., & Dalgleish, T. (2014). Culture and the remembering of trauma. *Clinical Psychological Science*, 2, 696–713. <http://dx.doi.org/10.1177/2167702614529763>
- Johnson, M. K., Foley, M. A., Suengas, A. G., & Raye, C. L. (1988). Phenomenal characteristics of memories for perceived and imagined autobiographical events. *Journal of Experimental Psychology: General*, 117, 371–376. <http://dx.doi.org/10.1037/0096-3445.117.4.371>
- Johnson, M. K., Raye, C. L., Mitchell, K. J., & Ankudowich, E. (2011). The cognitive neuroscience of true and false memories. In Belli, R. F. (Ed.), *True and false recovered memories: Toward a reconciliation of the debate: Vol. 58. Nebraska Symposium on Motivation* (pp. 15–52). http://dx.doi.org/10.1007/978-1-4614-1195-6_2
- Kelley, L. P., Weathers, F. W., Mason, E. A., & Pruneau, G. M. (2012). Association of life threat and betrayal with posttraumatic stress disorder symptom severity. *Journal of Traumatic Stress*, 25, 408–415. <http://dx.doi.org/10.1002/jts.21727>
- Kenny, L. M., Bryant, R. A., Silove, D., Creamer, M., O'Donnell, M., & McFarlane, A. C. (2009). Distant memories: A prospective study of vantage point of trauma memories. *Psychological Science*, 20, 1049–1052. <http://dx.doi.org/10.1111/j.1467-9280.2009.02393.x>
- Kleider, H. M., Pezdek, K., Goldinger, S. D., & Kirk, A. (2008). Schema-driven source misattribution errors: Remembering the expected from a witnessed event. *Applied Cognitive Psychology*, 22, 1–20. <http://dx.doi.org/10.1002/acp.1361>
- Koessler, S., Engler, H., Riether, C., & Kissler, J. (2009). No retrieval-induced forgetting under stress. *Psychological Science*, 20, 1356–1363. <http://dx.doi.org/10.1111/j.1467-9280.2009.02450.x>
- Kong, L. L., Allen, J. J. B., & Glisky, E. L. (2008). Interidentity memory transfer in dissociative identity disorder. *Journal of Abnormal Psychology*, 117, 686–692. <http://dx.doi.org/10.1037/0021-843X.117.3.686>
- Koutstaal, W., & Schacter, D. L. (1997). Intentional forgetting and voluntary thought suppression: Two potential methods for coping with childhood trauma. In L. J. Dickstein, M. B. Riba, & J. M. Oldham (Eds.), *American Psychiatric Press review of psychiatry* (Vol. 16, pp. II-79–II-121). Washington, DC: American Psychiatric Association.
- Labinsky, E., Blair, W., & Yehuda, R. (2006). Longitudinal assessment of dissociation in Holocaust survivors with and without PTSD and nonexposed aged Jewish adults. In R. Yehuda (Ed.), *Psychobiology*

- of posttraumatic stress disorders: A decade of progress (pp. 459–462). Malden, MA: Blackwell.
- Laney, C., & Takarangi, M. K. (2013). False memories for aggressive acts. *Acta Psychologica*, 143, 227–234. <http://dx.doi.org/10.1016/j.actpsy.2013.04.001>
- Lanius, R. A., Williamson, P. C., Densmore, M., Boksman, K., Neufeld, R. W., Gati, J. S., & Menon, R. S. (2004). The nature of traumatic memories: A 4-T FMRI functional connectivity analysis. *American Journal of Psychiatry*, 161, 36–44. <http://dx.doi.org/10.1176/appi.ajp.161.1.36>
- Lindsay, D. S. (2008). Source monitoring. In J. Byrne (Series Ed.) & H. L. Roediger III (Vol. Ed.), *Learning and memory: A comprehensive reference: Vol. 2. Cognitive psychology of memory* (pp. 325–347). <http://dx.doi.org/10.1016/B978-012370509-9.00175-3>
- Lindsay, D. S., Hagen, L., Read, J. D., Wade, K. A., & Garry, M. (2004). True photographs and false memories. *Psychological Science*, 15, 149–154. <http://dx.doi.org/10.1111/j.0956-7976.2004.01503002.x>
- Loftus, E. F. (1992, June). *Remembering “repressed” abuse: Initial research, theoretical analysis, and evaluation of the claims*. Paper presented at the Fourth Annual Meeting of the American Psychological Society, San Diego, CA.
- Loftus, E. F. (1993). The reality of repressed memories. *American Psychologist*, 48, 518–537. <http://dx.doi.org/10.1037/0003-066X.48.5.518>
- Loftus, E. F., & Burns, T. E. (1982). Mental shock can produce retrograde amnesia. *Memory and Cognition*, 10, 318–323. <http://dx.doi.org/10.3758/BF03202423>
- Loftus, E. F., & Pickrell, J. E. (1995). The formation of false memories. *Psychiatric Annals*, 25, 720–725. <http://dx.doi.org/10.3928/0048-5713-19951201-07>
- Lyttle, N., Dorahy, M. J., Hanna, D., & Huntjens, R. J. C. (2010). Conceptual and perceptual priming and dissociation in chronic posttraumatic stress disorder. *Journal of Abnormal Psychology*, 119, 777–790. <http://dx.doi.org/10.1037/a0020894>
- Marin, M.-F., Lord, C., Andrews, J., Juster, R.-P., Sindi, S., Arseneault-Lapierre, G., . . . Lupien, S. J. (2011). Chronic stress, cognitive functioning and mental health. *Neurobiology of Learning and Memory*, 96, 583–595. <http://dx.doi.org/10.1016/j.nlm.2011.02.016>
- McDermott, K. B., Szpunar, K. K., & Christ, S. E. (2009). Laboratory-based and autobiographical retrieval tasks differ substantially in their neural substrates. *Neuropsychologia*, 47, 2290–2298. <http://dx.doi.org/10.1016/j.neuropsychologia.2008.12.025>
- McEwen, B. S. (2004). Protection and damage from acute and chronic stress: Allostasis and allostatic overload and relevance to the pathophysiology of psychiatric disorders. In R. Yehuda & B. McEwen (Eds.), *Biobehavioral stress response: Protective and damaging effects* (pp. 1–7). <http://dx.doi.org/10.1196/annals.1314.001>
- Melinder, A., Baugerud, G. A., Ovenstad, K. S., & Goodman, G. S. (2013). Children’s memories of removal: A test of attachment theory. *Journal of Traumatic Stress*, 26, 125–133. <http://dx.doi.org/10.1002/jts.21784>
- Minshew, R., & D’Andrea, W. (2015). Implicit and explicit memory in survivors of chronic interpersonal violence. *Psychological Trauma: Theory, Research, Practice, and Policy*, 7, 67–75. <http://dx.doi.org/10.1037/a0036787>
- Morgan, C. A., III, Hazlett, G., Doran, A., Garrett, S., Hoyt, G., Thomas, P., . . . Southwick, S. M. (2004). Accuracy of eyewitness memory for persons encountered during exposure to highly intense stress. *International Journal of Law and Psychiatry*, 27, 265–279. <http://dx.doi.org/10.1016/j.ijlp.2004.03.004>
- Murray, B. D., Anderson, M. C., & Kensinger, E. A. (2015). Older adults can suppress unwanted memories when given an appropriate strategy. *Psychology and Aging*, 30, 9–25. <http://dx.doi.org/10.1037/a0038611>
- Najmi, S., Reese, H., Wilhelm, S., Fama, J., Beck, C., & Wegner, D. M. (2010). Learning the futility of the thought suppression enterprise in normal experience and in obsessive compulsive disorder. *Behavioural and Cognitive Psychotherapy*, 38, 1–14. <http://dx.doi.org/10.1017/S1352465809990439>
- Navalta, C. P., Polcari, A., Webster, D. M., Boghossian, A., & Teicher, M. H. (2006). Effects of childhood sexual abuse on neuropsychological and cognitive function in college women. *Journal of Neuropsychiatry and Clinical Neurosciences*, 18, 45–53. <http://dx.doi.org/10.1176/jnp.18.1.45>
- Nelson, K., & Fivush, R. (2004). The emergence of autobiographical memory: A social cultural developmental theory. *Psychological Review*, 111, 486–511. <http://dx.doi.org/10.1037/0033-295X.111.2.486>
- O’Doherty, D. C. M., Chitty, K. M., Saddiqui, S., Bennett, M. R., & Lagopoulos, J. (2015). A systematic review and meta-analysis of magnetic resonance imaging measurement of structural volumes in posttraumatic stress disorder. *Psychiatry Research: Neuroimaging*, 232, 1–33. <http://dx.doi.org/10.1016/j.psychresns.2015.01.002>
- Okado, Y., & Stark, C. (2003). Neural processing associated with true and false memory retrieval. *Cognitive, Affective, and Behavioral Neuroscience*, 3, 323–334. <http://dx.doi.org/10.3758/CABN.3.4.323>
- Ornstein, P. A., Baker-Ward, L., Gordon, B. N., Pelphrey, K. A., Tyler, C. S., & Gramzow, E. (2006). The influence of prior knowledge and repeated questioning on children’s long-term retention of the details of a pediatric examination. *Developmental*

- Psychology*, 42, 332–344. <http://dx.doi.org/10.1037/0012-1649.42.2.332>
- Pain, C., Bluhm, R. L., & Lanius, R. A. (2009). Dissociation in patients with chronic PTSD: Hyperactivation and hypoactivation patterns, clinical and neuroimaging perspectives. In P. F. Dell & J. A. O'Neil (Eds.), *Dissociation and the dissociative disorders: DSM-5 and beyond* (pp. 373–380). New York, NY: Routledge.
- Pasupathi, M. (2007). Telling and the remembered self: Linguistic differences in memories for previously disclosed and previously undisclosed events. *Memory*, 15, 258–270. <http://dx.doi.org/10.1080/09658210701256456>
- Pezdek, K., & Blandón-Gitlin, I. (2009). Planting false memories for childhood sexual abuse only happens to emotionally disturbed people. . . not me or my friends. *Applied Cognitive Psychology*, 23, 162–169. <http://dx.doi.org/10.1002/acp.1466>
- Pezdek, K., Blandón-Gitlin, I., & Gabbay, P. (2006). Imagination and memory: Does imagining implausible events lead to false autobiographical memories? *Psychonomic Bulletin and Review*, 13, 764–769. <http://dx.doi.org/10.3758/BF03193994>
- Pezdek, K., Finger, K., & Hodge, D. (1997). Planting false childhood memories: The role of event plausibility. *Psychological Science*, 8, 437–441. <http://dx.doi.org/10.1111/j.1467-9280.1997.tb00457.x>
- Pezdek, K., & Hinz, T. (2002). The construction of false events in memory. In H. Wescott, G. Davies, & R. Bull (Eds.), *Children's testimony: A handbook of psychological research and forensic practice* (pp. 99–116). <http://dx.doi.org/10.1002/9780470713679.ch7>
- Pezdek, K., & Hodge, D. (1999). Planting false childhood memories in children: The role of event plausibility. *Child Development*, 70, 887–895. <http://dx.doi.org/10.1111/1467-8624.00064>
- Pezdek, K., & Lam, S. (2007). What research paradigms have cognitive psychologists used to study “false memory,” and what are the implications of these choices? *Consciousness and Cognition*, 16, 2–17. <http://dx.doi.org/10.1016/j.concog.2005.06.006>
- Pezdek, K., & Roe, C. (1995). The effect of memory trace strength on suggestibility. *Journal of Experimental Child Psychology*, 60, 116–128. <http://dx.doi.org/10.1006/jecp.1995.1034>
- Pezdek, K., & Roe, C. (1997). The suggestibility of children's memory for being touched: Planting, erasing, and changing memories. *Law and Human Behavior*, 21, 95–106. <http://dx.doi.org/10.1023/A:1024870127516>
- Pezdek, K., & Taylor, J. (2002). Memory for traumatic events in children and adults. In M. L. Eisen, J. A. Quas, & G. S. Goodman (Eds.), *Memory and suggestibility in the forensic interview* (pp. 165–183). Mahwah, NJ: Erlbaum.
- Porter, S., Yuille, J. C., & Lehman, D. R. (1999). The nature of real, implanted, and fabricated memories for emotional childhood events: Implications for the recovered memory debate. *Law and Human Behavior*, 23, 517–537. <http://dx.doi.org/10.1023/A:1022344128649>
- Powell, M. B., Roberts, K. P., Ceci, S. J., & Hembrooke, H. (1999). The effects of repeated experience on children's suggestibility. *Developmental Psychology*, 35, 1462–1477. <http://dx.doi.org/10.1037/0012-1649.35.6.1462>
- Qin, J., Ogle, C. M., & Goodman, G. S. (2008). Adults' memories of childhood: True and false reports. *Journal of Experimental Psychology: Applied*, 14, 373–391. <http://dx.doi.org/10.1037/a0014309>
- Quas, J. A., & Lench, H. C. (2007). Arousal at encoding, arousal at retrieval, interviewer support, and children's memory for a mild stressor. *Applied Cognitive Psychology*, 21, 289–305. <http://dx.doi.org/10.1002/acp.1279>
- Quas, J. A., Qin, J., Schaaf, J., & Goodman, G. S. (1997). Individual differences in children's and adults' suggestibility and false event memory. *Learning and Individual Differences*, 9, 359–390. [http://dx.doi.org/10.1016/S1041-6080\(97\)90014-5](http://dx.doi.org/10.1016/S1041-6080(97)90014-5)
- Rauch, S. L., van der Kolk, B. A., Fisler, R. E., Alpert, N. M., Orr, S. P., Savage, C. R., . . . Pitman, R. K. (1996). A symptom provocation study of posttraumatic stress disorder using positron emission tomography and script-driven imagery. *Archives of General Psychiatry*, 53, 380–387. <http://dx.doi.org/10.1001/archpsyc.1996.018300500014003>
- Richards, J. M., & Gross, J. J. (2000). Emotion regulation and memory: The cognitive costs of keeping one's cool. *Journal of Personality and Social Psychology*, 79, 410–424. <http://dx.doi.org/10.1037/0022-3514.79.3.410>
- Roediger, H. L., & McDermott, K. B. (1995). Creating false memories: Remembering words not presented in lists. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 21, 803–814. <http://dx.doi.org/10.1037/0278-7393.21.4.803>
- Roediger, H. L., & McDermott, K. B. (1996). False perceptions of false memories. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 22, 814–816. <http://dx.doi.org/10.1037/0278-7393.22.3.814>
- Salmond, C. H., Meiser-Stedman, R., Glucksman, E., Thompson, P., Dalgleish, T., & Smith, P. (2011). The nature of trauma memories in acute stress disorder in children and adolescents. *Journal of Child Psychology and Psychiatry*, 52, 560–570. <http://dx.doi.org/10.1111/j.1469-7610.2010.02340.x>
- Sar, V. (2006). The scope of dissociative disorders: An international perspective. *Psychiatric Clinics of North*

- America*, 29, 227–244. <http://dx.doi.org/10.1016/j.psc.2005.10.007>
- Sargant, W., & Slater, E. (1941). Amnesic syndromes in war. *Proceedings of the Royal Society of Medicine*, 34, 757–764.
- Schacter, D. L., & Slotnick, S. D. (2004). The cognitive neuroscience of memory distortion. *Neuron*, 44, 149–160. <http://dx.doi.org/10.1016/j.neuron.2004.08.017>
- Schultz, T., Passmore, J. L., & Yoder, C. Y. (2002). Emotional closeness with perpetrators and amnesia for child sexual abuse. *Journal of Child Sexual Abuse*, 12, 67–88. http://dx.doi.org/10.1300/J070v12n01_04
- Shin, L. M., McNally, R. J., Kosslyn, S. M., Thompson, W. L., Rauch, S. L., Alpert, N. M., . . . Pitman, R. K. (1997). A positron emission tomographic study of symptom provocation in PTSD. *Annals of the New York Academy of Sciences*, 821, 521–523. <http://dx.doi.org/10.1111/j.1749-6632.1997.tb48320.x>
- Sivers, H., Schooler, J., & Freyd, J. J. (2002). Recovered memories. In V. S. Ramachandran (Ed.), *Encyclopedia of the human brain* (Vol. 4, pp. 169–184). <http://dx.doi.org/10.1016/B0-12-227210-2/00299-5>
- Skagerberg, E. M., & Wright, D. B. (2008). Manipulating power can affect memory conformity. *Applied Cognitive Psychology*, 22, 207–216. <http://dx.doi.org/10.1002/acp.1353>
- Smith, C. P., & Freyd, J. J. (2014). Institutional betrayal. *American Psychologist*, 69, 575–587. <http://dx.doi.org/10.1037/a0037564>
- Southwick, S. M., Morgan, C. A., III, Nicolaou, A. L., & Charney, D. S. (1997). Consistency of memory for combat-related traumatic events in veterans of Operation Desert Storm. *American Journal of Psychiatry*, 154, 173–177. <http://dx.doi.org/10.1176/ajp.154.2.173>
- Terr, L. (1988). What happens to early memories of trauma? A study of twenty children under age five at the time of documented traumatic events. *Journal of the American Academy of Child and Adolescent Psychiatry*, 27, 96–104. <http://dx.doi.org/10.1097/00004583-198801000-00015>
- Tomoda, A., Navalta, C. P., Polcari, A., Sadato, N., & Teicher, M. H. (2009). Childhood sexual abuse is associated with reduced gray matter volume in visual cortex of young women. *Biological Psychiatry*, 66, 642–648. <http://dx.doi.org/10.1016/j.biopsych.2009.04.021>
- Tomoda, A., Sheu, Y.-S., Rabi, K., Suzuki, H., Navalta, C. P., Polcari, A., & Teicher, M. H. (2011). Exposure to parental verbal abuse is associated with increased gray matter volume in superior temporal gyrus. *NeuroImage*, 54(Suppl. 1), S280–S286. <http://dx.doi.org/10.1016/j.neuroimage.2010.05.027>
- Tversky, B., & Marsh, E. J. (2000). Biased retellings of events yield biased memories. *Cognitive Psychology*, 40, 1–38. <http://dx.doi.org/10.1006/cogp.1999.0720>
- Valentino, K., Cicchetti, D., Rogosch, F. A., & Toth, S. L. (2008). True and false recall and dissociation among maltreated children: The role of self-schema. *Development and Psychopathology*, 20, 213–232. <http://dx.doi.org/10.1017/S0954579408000102>
- van der Hart, O., Bolt, H., & van der Kolk, B. A. (2005). Memory fragmentation in dissociative identity disorder. *Journal of Trauma and Dissociation*, 6, 55–70. http://dx.doi.org/10.1300/J229v06n01_04
- van Golde, C., Sharman, S. J., & Candel, I. (2010). High prevalence information from different sources affects the development of false beliefs. *Applied Cognitive Psychology*, 24, 152–163. <http://dx.doi.org/10.1002/acp.1558>
- Veltman, D. J., de Ruiter, M. B., Rombouts, S. A., Lazerou, R. H., Barkhof, F., van Dyck, R., . . . Phaf, R. H. (2005). Neurophysiological correlates of increased verbal working memory in high-dissociative participants: A functional MRI study. *Psychological Medicine*, 35, 175–185. <http://dx.doi.org/10.1017/S0033291704002971>
- Vermetten, E., Schmah, C., Lindner, S., Loewenstein, R. J., & Bremner, J. D. (2006). Hippocampal and amygdalar volumes in dissociative identity disorder. *American Journal of Psychiatry*, 163, 630–636. <http://dx.doi.org/10.1176/ajp.2006.163.4.630>
- Vitelli, R. (2012, November). Implanting false memories: How reliable are memories of abuse “recovered” during psychotherapy? *Psychology Today*. Retrieved from <http://www.psychologytoday.com/node/110105>
- Waelde, L. C., Silvern, L., Carlson, E., Fairbank, J. A., & Kletter, H. (2009). Dissociation in PTSD. In P. F. Dell & J. A. O’Neil (Eds.), *Dissociation and the dissociative disorders: DSM-5 and beyond* (pp. 447–456). New York, NY: Routledge.
- Watson, D. (2001). Dissociations of the night: Individual differences in sleep-related experiences and their relation to dissociation and schizotypy. *Journal of Abnormal Psychology*, 110, 526–535. <http://dx.doi.org/10.1037/0021-843X.110.4.526>
- Weeks, T. L., & Pasupathi, M. (2011). Stability and change self-integration for negative events: The role of listener responsiveness and elaboration. *Journal of Personality*, 79, 469–498. <http://dx.doi.org/10.1111/j.1467-6494.2011.00685.x>
- Williams, L. M. (1994). Recall of childhood trauma: A prospective study of women’s memories of child sexual abuse. *Journal of Consulting and Clinical Psychology*, 62, 1167–1176. <http://dx.doi.org/10.1037/0022-006X.62.6.1167>
- Williams, L. M. (1995). Recovered memories of abuse in women with documented child sexual victimization

- histories. *Journal of Traumatic Stress*, 8, 649–673. <http://dx.doi.org/10.1002/jts.2490080408>
- Williams, S.-J., Wright, D. B., & Freeman, N. H. (2002). Inhibiting children's memory of an interactive event: The effectiveness of a cover-up. *Applied Cognitive Psychology*, 16, 651–664. <http://dx.doi.org/10.1002/acp.821>
- Wilsnack, S. C., Wonderlich, S. A., Kristjanson, A. F., Vogeltanz-Holm, N. D., & Wilsnack, R. W. (2002). Self-reports of forgetting and remembering childhood sexual abuse in a nationally representative sample of U.S. women. *Child Abuse and Neglect*, 26, 139–147. [http://dx.doi.org/10.1016/S0145-2134\(01\)00313-1](http://dx.doi.org/10.1016/S0145-2134(01)00313-1)
- Yehuda, N. (2005). The language of dissociation. *Journal of Trauma and Dissociation*, 6, 9–29. http://dx.doi.org/10.1300/J229v06n01_02
- Yehuda, R., Golier, J. A., Halligan, S. L., & Harvey, P. D. (2004). Learning and memory in Holocaust survivors with posttraumatic stress disorder. *Biological Psychiatry*, 55, 291–295. [http://dx.doi.org/10.1016/S0006-3223\(03\)00641-3](http://dx.doi.org/10.1016/S0006-3223(03)00641-3)