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Dissociative Amnesia: Remembrances Under Cover

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Abstract

The existence or questionability of "repressed memories" can be discussed as being a matter of definition. It seems, however, far-fetched to consider all "lost" memories as caused by encoding problems, brain damage, forgetfulness, failure to disclose events, and so on. We argue that dissociative amnesia (DA) (or "psychogenic amnesia," or "functional amnesia," or, as we favor to call it, "mnestic block syndrome") is caused by psychic alterations, but ultimately they can be traced to changes in the physiology of the brain, as we are of the opinion that all memory processes—positive or negative—alter brain functions, sometimes more permanently, sometimes transiently. We have proven this idea using functional imaging techniques, in particular fluoro-deoxy-d-glucose positron emission tomography. Having investigated dozens of patients with severe and long-lasting DA conditions, we believe it to be disrespectful to many (but not to all) of the affected patients to question their disease condition, which can be proven to be not caused by feigning, malingering, or direct brain damage.

Keywords: Mnestic block syndrome; Neuropsychiatry; Autobiographical memory; Brain imaging; Dissociation; Dissociative disorders

1. Introduction

There is an ongoing debate on the old idea that memories can be repressed or suppressed (Dodier, Gilet, & Colombel, 2022; Erdelyi, 2006; Freud, 1898, 1899; Hartmann, 1930; Jung,

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1905; Kunzendorf & Moran, 1993/94; Loftus, 1993, 1994; Markowitsch, 2000; Otgaar et al., 2019; Suarez & Pittluck, 1975). We will argue for the existence of repressed memories on the basis of the dissociative condition named "dissociative amnesia" (DA) (Markowitsch & Staniloiu, 2016; Markowitsch, Staniloiu, Kordon, & Sarlon, 2018; Staniloiu & Markowitsch, 2014; Staniloiu & Markowitsch, 2022; Staniloiu, Markowitsch, & Kordon, 2018). By doing so, we will center on Tulving's (2002, 2005) and Semon's (1904) concept of the state dependency of memories, on the relation between stress and memory (Staniloiu, Kordon, & Markowitsch, 2020b), mechanisms by which DA is likely to occur ("Two-hit hypothesis") and differential diagnostic criteria for the occurrence of DA.

We are of the opinion that our arguments favor the existence of repressed memories in the context of DA and that there are cognitive and biological bases demonstrating that repressed memories are a valid entity in the context of DA.

While most lay people would consider their memories to be reliable and stable over time, research shows that this in fact may not be the case. Especially (but not exclusively) autobiographical memories are vulnerable with respect to influences both from within the memories' owner and by variables from outside (e.g., Kühnel, Woermann, Mertens, & Markowitsch, 2008; Loftus, 2005; Markowitsch & Staniloiu, 2022; Radulovic, Lee, & Ortony, 2018; Staniloiu, Kordon, & Markowitsch, 2020a; Wixted, Mickes, & Fisher, 2018). For memories which had been successfully encoded and consolidated in the past, but cannot be retrieved consciously in the present, the expressions *repression* and *suppression* have been used and are debated since their creation (see, e.g., the commentaries to the article of Erdelyi, 2006; *repression* seen as an unconscious and *suppression* as a conscious process, but see Panel 1 in Staniloiu & Markowitsch, 2014). Both concepts are especially linked to Sigmund Freud's work (Langnickel & Markowitsch, 2006) and were revived in more recent years in the context of DA (Markowitsch, 2000; Markowitsch & Staniloiu, 2016) as well as in neuroscience (Anderson & Floresco, 2022; Brand et al., 2009; Kikuchi et al., 2009; Kunii, Okano, Mashiko, Yabe, & Niwa, 2012; Ross, Homan, & Buck, 1994), but also with respect to court cases of trauma and sexual abuse (e.g., DePrince & Freyd, 1997).

Already in 1982, Loftus and Burns published a paper under the headline "Mental shock can produce retrograde amnesia," in which it was demonstrated that the perception of emotionally laden episodes—violence in a film—can lead to retrograde amnesia. (As Loftus and Burns stated initially in their paper: "Retrograde amnesia refers to the loss of memory for events that occur prior to some critical incident, such as a head injury, electroconvulsive stimulation, …"). Similarly, Anderson and Hulbert (2021) stated that "[m]emories are, at times, too accessible for our own good" (p. 2) and, therefore, may become repressed or suppressed from conscious access. It is, therefore, important, how the environment is perceived—which depends on the interpretation of previous similar situations (Tulving, 2002, 2005).

This condition is, in fact, seen in various—usually stressful—situations, starting with the simple "tip-of-the-tongue"-phenomenon, where access to a specific word, item, or expression may be blocked, though the person is aware of knowing it in principle (Schwartz & Metcalfe, 2011). In more complex stressful situations, acting alternatives may not come to mind and the personal past is inaccessible. Already the creator of the term "amnesia" in the medical field of the 18th century, Boissier de Sauvages, referred to a "pathematic" amnesic subcategory

due to "emotional suffering or afflictions of the spirit, following strong emotions such as fear, terror or chagrin" (Langer, 2019, p. 66).

2. Dissociative amnesia

The completest form of a memory block is so-called generalized DA which according to DSM-5 (2013) refers to an inability to recall important autobiographic or personal information of the *total* past (usually of a traumatic or stressful nature) that is inconsistent with ordinary forgetting (p. 397f). In the ICD-11 (2021), DA "is characterised by an inability to recall important autobiographical memories, typically of recent traumatic or stressful events, that is inconsistent with ordinary forgetting." (https://icd.who.int/browse11/l-m/en#/http://id.who.int/icd/entity/626975732). While generalized amnesia is considered a rarer form of DA, we have studied nearly 100 patients with the diagnosis of DA and had less than 10 who did not have the generalized form. Similarly, Pope, Schnabel, and Hudson (2023), in a bibliographic survey, found only seven out of 89 papers, published between 2011 and 2020, on DA to report localized or selective amnesia for specific events. Consequently, DA seems to be not infrequent and seems to be mostly general; some researchers consider it to be a "substitute term for repressed memory" (Otgaar et al., 2019, p. 1073). We termed this phenomenon "mnestic block syndrome" (e.g., Markowitsch, 2002; Markowitsch et al., 1999, 2000a) in order to indicate that the memories are not lost, but their retrieval is blocked.

3. Memory blockade and state-dependent memory

Tulving (1983, 1985, 1995) revived the concept of Semon (1904) on *state-dependent memory formation and retrieval* and combined it with the *encoding-specificity principle* (Staniloiu et al., 2020a; Tulving, 2002, 2005; Tulving & Thompson, 1973). "State-dependency" implies that the internal and external state contribute to the efficacy with which information is processed. For memory retrieval, optimal conditions apply when the environmental conditions and those of mood and physical state match those during encoding. The "encoding-specificity principle" implies that memories are linked to the context in which they are created. Another of Tulving's terms also originated from Semon's (1904) work and is closely related to the state-dependency—namely, the expression *ecphory* (Tulving, 1983, p. 175ff). "Ecphory" describes the process by which retrieval cues interact with stored information so that an image or a representation of the information in question appears. A mismatch between encoding and retrieval conditions may lead to a variety of memory retrieval disturbances, ranging from the common tip-of-the-tongue phenomena (see above) to complete pathological retrieval blockades.

These phenomena are strongly related to emotional processing. Already at the end of the 19th century, Sigmund Freud anticipated the concepts of ecphory and state-dependency in his descriptions, by emphasizing the importance of emotions (Freud, 1895/1950; Peper & Markowitsch, 2001).

4. Stress

Links between emotion and repressed memories or DA were already noted at the time of the first descriptions of DA—and named *hysteria* (Bauer, 1917; Breuer & Freud, 1895; Briquet, 1859; Mai, 1995). Initially, hysteria was strongly related to neuroticism and included as a disease in the first two editions of the *Diagnostic and Statistical Manual of Mental Diseases (DSM)*; thereafter, the name was replaced by "dissociative disorders" and a stress- or trauma-related etiology was linked to the disorders.

Other terms—especially for DA—are "psychogenic amnesia" (Markowitsch, 2003) and "functional amnesia" (Markowitsch & Staniloiu, 2016). The last term implies that the disorder serves a function for the patients—though they frequently appear handicapped with respect to certain features (e.g., autobiographical memory, self-consciousness; Markowitsch & Staniloiu, 2022)—they have "secondary gains" (e.g., no longer having to work, being taking care of, not having to be responsible for personal affairs). For an outsider, nevertheless, the adverse consequences of functional amnesias seem to outweigh those of leading an unimpaired life and, therefore, an answer to this paradox is required.

The simple, but probably true answer is that these individuals lack alternatives. They are unable to cope with an adverse environment—they lack resilience and they frequently have to deal with approach-avoidance behavior. For instance, children may be led to a double bind—the child needs protection and attachment to the caretaker, but is terrified and harmed by the caretaker. This then may lead to a lack of escape strategies aside from dissociation. This mechanism has affinities to the "learned helplessness"-concept of Seligman (1972), though it certainly goes beyond it. Schauer and Elbert (2010) pointed out that after repeated situations without escape, the individuals react with tonic immobility. Such situations are strengthened by a lack of social support, denial of trauma by one's social support system, and the like. Such consequences of lacking a proper, safe childhood and youth were described since Bettelheim (1950) (e.g., Hakamata et al., 2021; Lassri, Bregman-Hai, Soffer-Dudek, & Shahar, 2023; Y. Yang et al., 2022). That they are long-lasting, was, for example, described by Fries, Ziegler, Kurian, Jacoris, and Pollak (2005). These authors studied former orphans who had lived for their first years in poorly managed orphanages and thereafter were adopted by U.S.-American parents and then lived for the next 3−4 years together with the parents' biological children. The authors tested the release of two binding hormones—oxytocin and vasopressin—under resting conditions and while the mother interacted with the children. They found a—compared to the parents' biological children—reduced release of these binding hormones in the former orphans compared to the mother's own children.

The lack of escape strategies is accompanied by symptoms of depression, feelings of worthlessness, overgeneralized self-blaming, hopelessness, loss of interest and pleasure, and an overgeneral autobiographical memory effect ("semanticizing of personal events") (Becquet et al., 2021; Hakamata et al., 2021; Harrison et al., 2022; Sutin, Luchetti, Aschwanden, Stephan, & Terracciano, 2021; Williams et al., 2007). Of course, such an immobility in having behavioral alternatives is intimately linked to the concept of stress (Lupien, Juster, Raymond, & Marin, 2018).

Depression is also commonly found in patients with DA (Staniloiu & Markowitsch, 2014, e.g., their Panel 3: "Psychiatric history of depressive episodes" being suggestive of a diagnosis of DA; Staniloiu & Markowitsch, 2018), as, of course, is stress (Staniloiu et al., 2020b). Nevertheless, the reverse conclusion—that many depressed people should manifest DA—is not valid, as usually resilience factors counteract this idea (Staniloiu & Markowitsch, 2018).

5. Two-hit hypothesis of DA

The above-mentioned examples (e.g., Joy et al.: repeated flooding leading to learned helplessness) are in line with what Staniloiu and Markowitsch (2014) introduced as the *two-hit hypothesis*: This postulates an additive or synergistic interaction between psychological or physical incidents that may lead to DA. Zannas, Provençal, and Binder (2015); their fig. 1) elaborated from an epigenetic perspective on such repeated traumata which in the absence of proper resilience may lead to post-traumatic stress disorders—a frequent concomitant of DA. Huan Wang and coworkers (2022) found in a functional imaging study convincing evidence for the fact that "even mild ELS [early-life stress] might confer vulnerability to exposure to stressors later in adulthood" (p. 2123).

We found in almost all of our patients evidence for the existence of at least two "hits" which were likely to lead to DA (Fujiwara et al., 2008; Markowitsch et al., 1999; Staniloiu & Markowitsch, 2012; Staniloiu et al., 2018, 2020b). From analyzing the cases, we consider the hits to be crucial for the occurrence of DA, though, of course, other variables (e.g., depression, little satisfaction with current life circumstances, adverse environmental concomitants) contribute to the actual manifestation of DA. This also implies that counteractive variables (e.g., a "safe" environment during development, one or more reliable reference persons) can still prevent the development of DA. While these arguments appear very plausible in our eyes, they are, of course, only correlative, which lies in the nature of the findings.

6. Stress-related amnesia and the brain

Results from neuroanatomical studies point to numerous brain changes, accompanying stress conditions, and possibly also leading to amnesia. Studies, applying brain imaging, not always lead to consistent results, which, of course, was taken-up by the opponents of the hypothesis that stress can lead to DA and that DA implies repression of memories (Huntjens, Otgaar, Pijnenborg, & Wessel, 2022; Otgaar et al., 2019). However, when applying careful selection criteria both with respect to patients and methods, results from brain imaging become more consistent and uniform. The hippocampal formation is in the center of such studies, as it is the par excellence structure for memory processing (Tulving & Markowitsch, 1998), and numerous studies point to stress-related changes—such as volume reductions—in the hippocampus (e.g., Bremner & Wittbrodt, 2020; Weissman et al., 2022). The next important structure is the amygdala, because of its involvement in the processing of emotions (Adolphs, 1999) and its downregulation in stress-related disease conditions (e.g., Bryant

et al., 2022; Watson et al., 2022), which—for hysteria/DA—already in the 19th century was termed *belle indifference* by Janet (1892, 1893, and was confirmed in later studies such as in Reinhold & Markowitsch, 2009). Again, many studies found stress-related changes in this nuclear group (e.g., Caetano et al., 2022; Ford et al., 2022; Lippard & Nemeroff, 2020; Weissman et al., 2022). Studies on orphans with early institutional deprivation revealed changes in amygdala volumes (Mehta et al., 2009). Other brain regions, in particular the prefrontal cortex, react toward stress as well (Bremner et al., 1995; Hakamata et al., 2021; Meine, Meier, Meyer, & Wessa, 2021).

As mentioned initially with the citation of Boissier de Sauvages, extremely emotional situations may lead to amnesia. The mechanism by which this may occur was delineated already in Markowitsch (2000): Stressful life events can induce a rapid and vehement release of stress hormones (O'Brien, 1997; Shansky & Lipps, 2013)—glucocorticoids—which block the receptor channels of memory-processing regions, especially in the temporal lobes (hippocampus, amygdala) and other limbic system structures. In consequence, the access to stored engrams may be disrupted. Interestingly, the largest number of receptors for stress hormones in the brain are in the amygdala and hippocampus, and, therefore, in those areas where emotional memory is synchronized (Cahill, Babinsky, Markowitsch, & McGaugh, 1995; Markowitsch & Staniloiu, 2011a). We discussed these mechanisms, which lead to DA, under the heading "INABILITY OF ACCESS HYPOTHESIS" in Markowitsch and Staniloiu (2016).

In Markowitsch and Staniloiu (2016), we also refer to those brain regions which show the main alterations in patients with DA—the anterior temporal cortex (including the amygdala and portions of the hippocampus; Markowitsch, Emmans, Irle, Streicher, & Preilowski, 1985) and the ventrolateral prefrontal cortex of the right hemisphere. This so-called right-hemispheric temporo-frontal complex is active during retrieval of autobiographical memories (Audrain, Gilmore, Wilson, Schacter, & Martin, 2022; Fink et al., 1996; LaBar & Cabeza, 2006) and damage to it leads to retrograde autobiographical amnesia (Calabrese et al., 1996; Kroll, Markowitsch, Knight, & von Cramon, 1997; Markowitsch et al., 1993). A functional imaging study of 14 patients with DA, using [^{18}F] fluorodeoxyglucose positron emission tomography, revealed a hypometabolic zone in exactly this right-hemispheric temporo-frontal area which is active during episodic-autobiographical memory retrieval and which, when damaged, results in amnesia of the personal past (M. Brand et al., 2009). The hypometabolism is shown in fig. 1 of M. Brand et al. (2009) (or in fig. 5 of Staniloiu and Markowitsch (2014) or in fig. 36.4 of Markowitsch and Staniloiu (2016)). These results were confirmed in other studies of patients with DA with the same and different imaging techniques (Glisky et al., 2004; Henning-Fast et al., 2008; J.-C. Mitsui, Oyanagi, Kako, & Kusumi, 2019; Sellal, Manning, Seegmuller, Scheiber, & Schoenfelder, 2002; Tramoni et al., 2009; Yang et al., 2005; for a recent review, see Taïb, Yrond, Lemesle, Péran, & Pariente, 2023). They strongly underline the existence of distinct neuroanatomical correlates of repressed memories or DA. Even if taking into account the argument of Huntjens et al. (2022) (which referred to patients with dissociative identity disorders [DIDs] and to findings of structural brain changes) that patients with DA frequently have comorbidities, the sheer number of patients with corresponding metabolic brain changes, together with the corresponding results from normal individuals (e.g., Fink et al., 1996) and from patients with organic retrograde autobiographical number

(e.g., Kroll et al., 1997) speaks for a likely causal relation with respect to DA. Furthermore, comorbidities are characteristic for patients with DA (Staniloiu & Markowitsch, 2014).

The brain changes observed in patients with DA differ considerably from those found in individuals who simulated (Markowitsch et al., 2000b) or exhibited false memories (Kühnel et al., 2008; Risius et al., 2013).

The hypometabolic changes, which induce a desynchronization between anterior temporal and prefrontal areas (Beblo et al., 2006; Ford et al., 2022; Hanson et al., 2015), speak for a potential recovery from the amnesic state and indeed we found such recovery, which was therapy-induced and resulted in a reversal from a hypometabolic to a normal metabolic brain state (Markowitsch et al., 2000a; see their fig. 1 or fig. 4 in Staniloiu & Markowitsch, 2014) (see also the discussions on such imaging results in Staniloiu & Markowitsch, 2010, and in Staniloiu, Vitcu, & Markowitsch, 2012).

From studying patients with DA, several authors (B. L. Brand, Lanius, Vermetten, Loewenstein, & Spiegel, 2012; Kikuchi et al., 2009, Kunii et al., 2012, MacDonald & MacDonald, 2009) suggested that the prefrontal cortex may exert an inhibiting influence on the hippocampus in patients with DA, leading to memory repression in the sense that the affected individuals are unable to consciously retrieve past experiences with the assumption that these experiences are still present as engrams in the brain. (Evidence for their "unconscious" or repressed presence comes from measuring physiological or autonomic reactions, such as skin conductance changes, when confronted with such information; e.g., Denburg, Jones, & Tranel, 2009; Diamond, Mayes, & Meudell, 1996.)

We conclude, therefore, in line with Cuesta, Cossini, and Politis (2021)—who reviewed the neural basis of DA—that "[t]here is enough evidence to say that DA is an objectifiable biologically based pathology" (p. 11). Their view not only is paralleled by respective statements of others (e.g., MacDonald & MacDonald, 2009), but can also be traced back to corresponding opinions of scientists from the second last century (Flechsig, 1896; Maudsley, 1870; Meynert, 1884). Maudsley, for example, stated that "[m]ental disorders are neither more nor less than nervous diseases in which mental symptoms predominate, and their entire separation from other nervous diseases has been a sad hindrance to progress" (p. 41). (Mai, 1995, cited even earlier work of Briquet, 1859, stating on p. 105 that Briquet "believed that hysteria was caused by physical changes in the brain.") Markowitsch (1996) has taken-up and expanded this view in a review on organic and functional amnesias.

7. The distinct nature of DA

Patients with DA can be distinguished from other individuals with memory problems by a number of features:

1. They usually have no clear structurally measurable brain damage.
2. They do not malinger or feign memory deficits (or at least not predominantly).
3. They predominantly had stress- or trauma-related events in their past.
4. They may show additional symptoms (such as conversion symptoms).

5. The situation leading to DA may be described as "learned helplessness."
6. The personality of patients with DA can be described as frequently labile and influenceable.
7. There are distinct brain correlates, measurable by functional imaging studies.

1) The patients are clearly distinguishable from neurological patients with memory disturbances after traumatic brain injuries, tumors, degenerative brain diseases, infarcts, and so on. The only similarity to neurological patients stems from individuals with transient global amnesia (TGA), as roughly one-third of these patients are diagnosed with TGA after emotional stress (Bartsch & Deuschl, 2010) and, therefore, after a psychic event (similarly to patients with DA). The distinguishing factors are that TGA primarily results in anterograde amnesia and lasts usually less than a day.

2) There are a number of tests available that allow distinguishing patients with DA from those who malinger retrograde amnesia (Staniloiu, Markowitsch, Schröder, & Kordon, 2023) and tests like the Test of Memory Malingering (TOMM) (Tombaugh, 1996)—which we, together with further tests, usually apply to detect malingerers—have proven their effectiveness in distinguishing fakers from dissociative patients (e.g., Vissia et al., 2016; B. L. Brand, Webermann, Snyder, & Kaliush, 2019). Nevertheless, in rare instances, an overlap may occur (Barbarotto, Laiacona, & Cocchini, 1996; Staniloiu et al., 2018a, 2020b). Otherwise, as mentioned above, there are different patterns of brain activations in individuals who have DA and individuals who simulate (Markowitsch et al., 2000b) or produce false memories (Kühnel et al., 2008; Risius et al., 2013). (However, it still should be mentioned that faking or malingering requires different task demands compared to telling the truth; see, e.g., Gleaves, Smith, Butler, & Spiegel, 2004.)

3) The hypothesis that DA is caused by stress or trauma conditions is incorporated in the definitions of the two main manuals for mental and neurological diseases (DSM-5; ICD-11) and has been favored since long. Sargant and Slater (1941) studied soldiers who mainly had been evacuated from Dunkirk at the beginning of the II. World War. They found in 1000 serial admissions that the more stress the soldiers had experienced, the higher was their rate of being amnesic. Of those having experienced "severe stress," 35% became amnesic, of those with "moderate stress" 13%, and of those with "trifling stress" only 6%. In more recent years, several overview articles proposed the hypothesis that stressful or traumatic conditions favor the outbreak of DA (B. L. Brand et al., 2012; Dalenberg, 2006; Dalenberg et al., 2012, 2014; Loewenstein, 2018) and our patients generally confirm this view (e.g., Markowitsch et al., 1997a; Markowitsch, Fink, Thöne, Kessler, & Heiss, 1997b, 1998; Markowitsch, Thiel, Kessler, von Stockhausen, & Heiss, 1997c; Markowitsch et al., 2018; Staniloiu et al., 2018, 2020b). Similar findings were also obtained for patients with DID: Vissia et al. (2016), for example, tested several dozen of patients and controls on psychological trauma and fantasy measures and found that the genuine DID patients were not more fantasy-prone or suggestible and did not generate more false memories than the other individuals. It should be emphasized here that what a person interprets as a trauma, differs, based on life experiences and personal resilience (cf. the two-hit hypothesis above and the discussion in Radulovic et al., 2018); nevertheless, causality is difficult to verify.

Table 1
Stressful life experiences as triggers of DA

Stressful experiences	Trigger for DA
Suppression and humiliation (verbal abuse) by alcohol-dependent parents	Disturbed family life, financial problems
Suppression, humiliation (verbal abuse) and violence by father in childhood	Suicide of husband
Severe stress from early childhood on continuing into fifth decade of life (by parents and partner)	Financial problems
Severe accidents in childhood and youth, violent parents	Falling down a staircase
Violent parents, more than one dozen surgical interventions during the last 14 years	Surgery

Note that the later trigger for DA often in some way resembles or mimics elements of the earlier trauma that likely led to the development of dissociation as a way to cope with severe stress/abuse. Composed after table 3 of Markowitsch (2008).

Typical constellations of stress- and trauma-experiences are the following:

- A young man who at age 23 witnessed the outbreak of an open fire in his house and who—as a bystander with his mother at the age of 4 years—had observed a man burning to death in his car (Markowitsch, Kessler, Van der Ven, Weber-Luxenburger, & Heiss, 1998, 2000a).
- A middle-aged man, who banged with his head against a metal door, (probably) shortly losing consciousness, and thereafter panicking that his car, money, and so on were stolen. This event occurred twice with years apart (Markowitsch & Staniloiu, 2013).
- A middle-aged man grew up as an orphan and was as a child repeatedly sexually abused and was—prior to the outbreak of his DA—threatened to be killed (or at least seriously injured) because of his illegal business (Staniloiu et al., 2018).
- A girl with a multiethnic background who had a head concussion in school due to an accident during gymnastics and later in rehabilitation fell again on her head while walking down stone stairs and thereafter had continuing DA together with a conversion syndrome (inability to move her arm) (Staniloiu et al., 2020b).

Other examples are summarized in Table 1. While such case descriptions are not universally found, absence of evidence is not evidence of absence. It is, by nature, difficult to ask an individual with amnesia about his or her past. Furthermore, there is no normative, qualitative scale of what kinds of events are stressful or not—resilience, personality dimensions, genetic and epigenetic predispositions, and other variables determine what a person experiences as stressful or traumatic (e.g., Barczak-Scarboro et al., 2022; Daskalakis et al., 2021; Fries et al., 2005; Hakamata et al., 2021; Markowitsch, 2015; Mundy et al., 2021; Sep, Joëls, & Geuze, 2022; Womersley et al., 2022; R. Yang et al., 2021; Yehuda et al., 2007; Zannas et al., 2015). (There are, of course, scales on stress and on resilience, however, one cannot say that a given stimulus is stressful as such or not.)

Alternative interpretations of dissociative disorders ("sociocognitive model," "iatrogenic model," "fantasy model"; see, e.g., Giesbrecht, Lynn, Lilienfeld, & Merckelbach, 2008) are not in accordance with the great majority of clinical cases with DA (see Loewenstein, 2018; Spiegel et al., 2011; Vissia et al., 2016). For these cases with usually generalized amnesia, alternative interpretations—centering on variables such as spontaneous thoughts, mind wandering, daydreaming, sleep-related versus waking experiences, deficits in metacognitive functions, hyperassociation, emotional alterations—are peripheral for the development of DA (see, e.g., Lynn et al., 2022, for interpretations of disease etiologies in patients with DIDs or derealization/depersonalization disorders). Of course, as mentioned in part above, additional sociocognitive, cultural, developmental, and personality variables may enforce the outbreak of DAs.

4) As mentioned above, many patients with DA show additional symptoms—from *belle indifference* to paralytic conversion disorders. This cannot astonish, as the disease condition of DA is in itself attributable to a vulnerable personality (see Staniloiu & Markowitsch, 2018a). As we wrote before, experienced stress or trauma are necessary, but not sufficient conditions for the development of DA (Markowitsch & Staniloiu, 2011b). Janet's (1907) formulation of the mechanism of dissociation as "an inability of the personal self to bind together the various mental component in an integrated whole under its control" (p. 23) characterizes the insufficiency of these individuals which usually is attributable to a number of deviant personality variables and additional disease conditions (for details, see Staniloiu & Markowitsch, 2014, and Markowitsch & Staniloiu, 2016).

5) As mentioned and described above, *learned helplessness* can be seen as the crucial condition, inducing dissociative states, especially as it is accompanied by a number of symptoms and personality traits which characterize individuals with DA (e.g., downregulation of emotions).

6) There are many case reports of patients with DA that describe their lability and suggestibility. In fact, these features may induce the outbreak of the dissociative condition. This is obvious, for example, for the case described by Markowitsch et al. (1999), or by the case in Markowitsch et al. (1997b). The first case was strongly influenced by his wife throughout his married life, and the second case was first influenced by a dominant and authoritarian mother and then by a wife who in many respects resembled his mother. Also, during the time before entering a psychiatric clinic and during his stay there, he was under the direct influence of other persons, who told him to enter the clinic and suggested to him to start a new life in a totally different profession than he had before.

7) As described in detail above, there is now plenty of evidence for distinct brain correlates of DA. What still needs to be established is the time course of the neural changes: It can be assumed that a more transient blockade can result in complete memory recovery (as was the case for the two patients described by Lucchelli, Muggia, & Spinnler, 1995), while prolonged amnesia may permanently alter the neuropil (dendrites and axons) in the affected brain regions and then lead to incomplete or to no recovery at all (we had patients with amnesia lasting for decades). Already in 2009, we (M. Brand et al., 2009) suggested "that retrieval deficits in patients with DA are related to stress-associated dysfunctions in the inferolateral prefrontal section rather than to active and motivated forgetting of memories" (p. 37).

8. Conclusions

Repressed memories—defined as DA—are an entity whose existence has to be acknowledged, as other explanations fail to account for this disease which probably existed already in the old Rome as Goldsmith, Cheit, and Wood (2009) remarked, referring to Pliny the Elder (23–79 A.D.), who had mentioned that "fright" constitutes one of the causes of partial or total memory loss. Repression in its plain form is (temporary) forgetting (Brewin, 2021).

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