Generalized dissociative amnesia: episodic, semantic and procedural memories lost and found*

Onno van der Hart, Ellert Nijenhuis

Objective: This review tests Ribot's classic twofold categorization of generalized amnesia (GA) into Type I, total loss of episodic memory, and Type II, additional more or less extensive loss of semantic and/or procedural memory. It also explores his law of regression, according to which, cast in modern terms, recovery of lost procedural and semantic memories precedes recovery of episodic memory, as well as reported aetiological factors. Method: Clinically and formally assessed cases of GA, published since 1845, were surveyed and further analyzed.
Results: Over and above authentic episodic memory loss, cases differed widely in the extent of impairment of semantic and procedural memory. Recovery of semantic and procedural memory often preceded recovery of episodic memory. This particularly applied to authenticated trauma memories. To an extent, lost memories affected current functioning, and in some cases were associated with alternating dissociative personalities. Severe memory distortions upon memory recovery were not reported. Most cases were trauma or stress related, while in some cases the aetiology remained unknown.
Conclusions: Contrary to the view expressed in DSM-IV, which states that dissociative amnesia pertains to an inability to recall personal information, GA may also involve loss and recovery of semantic and procedural memories. Since the loss of various memory types in GA is dimensional rather than categorical, Ribot's typological distinction does not hold. Some of the reviewed cases suggest a trauma-related aetiology. Generalized amnesia of varying degrees of severity can involve delayed retrieval of trauma memories, as well as the loss and delayed retrieval of the premorbid personality.
Key words: amnesia, dissociation, dissociative amnesia, dissociative disorders, trauma.

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Generalized amnesia (GA), the most extreme form of dissociative amnesia [1,2], refers to failure of recall of one's entire life. With the exception of the World War I psychiatric literature [3], this uncommon disorder until recently has attracted very little scientific or clinical attention. This neglect is regrettable, because as the limiting member of its class, GA offers one of the best opportunities to study dissociative amnesia, particularly the extent to which various memory systems can be involved. If it could be demonstrated that episodic, semantic and procedural memory, to be described below, may be affected in GA, then the same might be found to hold for other dissociative disorders.

Variation in the extent of GA was first noted over a century ago. One of the first psychologists studying this particular type of `disease of memory' was Théodule Armand Ribot (1839-1916), one of Pierre Janet's mentors and his predecessor as Professor of Psychology at the prestigious Collège de France in Paris. Inspired by the ideas of Hughlings Jackson (as discussed in [4]), Ribot developed a hierarchical model of brain-mind function. According to his famous `law of regression' (now called Ribot's law), organic as well as psychological trauma cause human functions which have evolved most recently both in the phylogenic and in the ontogenetic sense - to be lost and regained first [5,6].

With regard to GA, Ribot [5,7] distinguished two subtypes. In the most common type - which we call GA Type I - `The pathological destruction is limited to the highest and most unstable forms of memory, those which have a personal character and which, accompanied by consciousness and localization in time, constitute ... psychological memory' [5, p.72]. Memory remains for habits and faculties such as the ability to read or write. Thus in GA Type I `memory, in its organized or semi-organized forms, remains intact' [8, p.95] In the rarer form - GA Type II - memory is affected in all its manifestations.

The validity of Ribot's distinction has not yet been evaluated. To test it, in this paper we explore the involvement of multiple memory systems in most of the published 19th and 20th century clinical case reports and experimental single case studies that we were able to find (for additional cases see [8-12]). More specifically, we investigate whether memories that are manifestations of various memory systems are lost and regained in the predicted order, and whether lost memories, including a premorbid sense of self, are indeed totally inaccessible during the amnesic phase. Additional cases are presented in the literature.

Multiple memory systems

Ribot [5,7] distinguished various memory systems: `conscious' memory (i.e. memory in its `less automatic' or `less organized' forms); `semiorganized' memory; and `organized' memory. Because not enough was known about memory in Ribot's time, he had difficulty formulating a precise hypothesis about hierarchically determined memory loss. We believe, nevertheless, that his early classification of memory forms may be translated in the classification of memory that Endel Tulving developed a century later. Based on this classification, Meares [4,6] developed a developmental hierarchy of memory, which we adopt here and use as an instrument to analyze a possible hierarchy in reported cases of GA memory loss and recovery.

Tulving [131 distinguished between episodic and semantic forms of memory. Episodic memory concerns memories of events that we recall in an almost scenic or cinematic way. It involves a double awareness in that apart from the content of a memory, there is also the knowledge that this experience comes from one's past. Tulving [141 called this form of memory `autonoetic', which, because `noesis' refers to mental activity, means an awareness of this activity (see also [15]). Semantic memory is merely 'noetic' in that it lacks this reflective aspect: one knows something to be a fact, but one does not link a personal episode to this knowledge. The word 'semantic' in Tulving's usage refers both to words and to knowledge of the world. Still other forms of memory are 'nonconscious' or `anoetic.' They include the perceptual representation system (PSR) [16], on which priming depends, and `procedural memory', which concerns motor repertoires. These two forms are operative very early in life. The working of PSR is evident at birth or even earlier. Episodic and semantic memory systems emerge later in life [6].

Comparing Tulving's classification of memory systems with Ribot's forms, we may roughly equate Tulving's `autonoetic, episodic memory' with Ribot's `less automatic or less organized forms', his `noetic, semantic memory' with Ribot's `semiorganized forms', and his PSR and procedural memory as Ribot's `organized forms.' Other distinctions among memory systems have recently been proposed (see Table 1 for a comparison). Adopting Tulving's classification of memory systems and consciousness, we will subsume his PRS, for the sake of simplicity, under the general label procedural memory.

Clinical reports on generalized amnesia

The following selection of case reports (1-5) is characterized by complete loss of episodic memory, and varying degrees of semantic and/or procedural memory loss.

Case 1

Myers [20] described a British soldier during World War I. He was unable to identify himself or give his regiment or number. His past was a complete blank. He appeared depressed. The left side of his body was *hypoalgesic,* and he complained of numbness over the occiput. He reported a nightmare of the trenches, in which he was hit in the nape of the neck by a German shell. Recall of this dream under hypnosis was accompanied by arduous recovery of further episodic details. Gradually, he was able to recall his name, regiment and number. Finally, he was persuaded to fully describe what had happened under (actual) shelling. His entire expression changed. His pupils became large, and his despondency disappeared. The occipital numbness and left-sided *hypoalgesia* vanished. With re-hypnosis, posthypnotic suggestion for permanent and complete recall was effective.

Table l. Distinctions of memory and consciousness

	Ribot [5,7]	**Graf and Schacter [17] Schacter [18]**	**Cohen and Squire [19]**	**Tulving [14]**
Less automatic, less organized forms	Explicit	Declarative	Episodic	Autonoetic
Semiorganized	Explicit	Declarative	Semantic	Noetic
Organized	Implicit	Procedural	PRS procedural	Anoetic

Analysis

This case involved brief, trauma-induced, total loss of episodic memory. The lost memories were accessible under hypnosis, indicating that amnesic barriers can be permeable and that the amnesia was not caused by organic factors. Regarding hypoalgesia and occipital numbness as dissociated, somatoform, trauma-related responses, permeability also applied to procedural memory. Loss of semantic memory was not observed.

Case 2

Pratt [211 investigated a 45-year-old male inpatient, with a 15-year history of `fits', loss of premorbid personality, and persisting amnesia for his past life. Since his identity did not correspond to any notified missing person he selected the name of a shop opposite the hospital, James Williamson. He rapidly relearned general information, and after 2 years was able to hold a foreman engineering post. Eventually, he was found by his brother, and learned that his real name was William Jameson. The episodic amnesic gap

persisted until 3 years later, when at his mother's deathbed, the memory of his former life returned in full.

Analysis

Semantic memory for impersonal general information was rapidly reinstalled. However, full recovery of episodic memory only occurred when the patient experienced his mother's death. Amnesic leakage with partial recovery of episodic knowledge was suggested by the choice of the name, James Williamson. William James [22] described a comparable case.

Case 3

Mary Reynolds represents the earliest recorded example of GA [23]. She is also reported as the first North American case of dissociative identity disorder (DID [24-27]). French psychiatrists re-examining her case towards the end of the 19th century, considered her differential diagnosis either in terms of DID [28-311 or GA [5,7,32). Mary Reynolds was a reserved and sad child but intelligent and in good physical health. At 18 she suffered syncope and hysterical `attacks'. In the spring of 1811, following an exceptionally violent episode, she remained blind and deaf. Some 6 weeks later her senses gradually returned, but she again sank into a profound sleep for 20 hours. When she awoke, she had lost all memory. Only instinctive but senseless utterance of a few words was retained. She did not recognize anybody or anything, and she had to learn all anew. Eventually, the original personality reappeared, amnesic for the period of this childlike state. Two personalities subsequently alternated, the second having originated when her overt condition was one of GA.

Analysis

Mary Reynolds combined near total loss of procedural, semantic, and episodic memory, and severe somatoform dissociation in the form of dissociative blindness and deafness. Restoration of episodic memory was slow and remained incomplete. Re-teaching lost skills, such as reading and writing, followed a much more rapid course [22]. Both procedural and semantic knowledge relearned in the first dissociative state became available to the second [33]. To a degree, this also applied to episodic knowledge. However, in the second state, Mary did not grasp the origins of these skills and this knowledge, a phenomenon known as source amnesia.

Case 4

Sidis and Goodhart [34] presented Thomas Hannah, a *young* clergyman in sound health, who suffered a heavy

fall and was put to bed still unconscious. Some hours later he sat up, and three medical attendants were required to restrain him. From that moment, he acted like an infant. He did not understand speech, had little capacity for voluntary movement, and unrestrainedly responded to calls of nature. His affect was flat. Nevertheless, his curiosity was keen and he learned very rapidly. Unfamiliar with the banjo before the accident, he acquired the skill in but a few hours. The patient reported dreams populated by strange and novel people and places, readily identified by his friends as his social circle and his frequent haunts. Hypnosis elicited `automatic' verbalizations and visualizations originating in his lost, dissociative personality, that frightened him. Two months after the accident, the patient returned to his lost personality, but remained completely amnesic for what had since happened. The following day he returned to the personality that was amnesic for the patient's prior life. Both personalities subsequently alternated, until the dissociation was resolved. Thenceforth he was able to command memories from both personalities.

Analysis

In this patient, all forms of memory obtruded into the amnesic personality, unrecognized by him as prior knowledge. Thus, his awareness of these memories was noetic in nature. In DID, some dissociative personalities have access to episodic memory/knowledge from other personalities. Hannah's case thus represents an intermediate form between GA and DID.

Case 5

Modai [35] reported the case of OK, an 58-year-old hidden child survivor in Israel with GA for her whole childhood including the Holocaust, who sought help for depression. She suffered from inability to function, low self-esteem, lack of concentration, insomnia, suicidal ideation, withdrawal and guilt feelings. OK heard some details about her childhood from a cousin in Israel who witnessed her childhood hardships. She was born in Hungary, an only child to a Jewish couple. When she was 8 years old, the Germans first took her father, then a few months later, arrested her mother. She was left with her grandmother who died a few days afterwards. The neighbours found her sitting by her dead grandmother and put her in a monastery. After the war, she was collected by her parents who survived concentration camps and sent to a Jewish religious school. When she was 14-year-old, she immigrated to Israel with her parents. The immigration ship was arrested by the British authorities and all immigrants were taken to a camp in Cyprus. In Israel she was put in a kibbutz

She suffered from total amnesia of her childhood in Hungary and of everything that happened to her during the Holocaust. When talking about it in an intellectual manner, no feelings were aroused. She could only cognitively imagine a sad story of another child going through all these hardships but without actually feeling anything. Also, she did not dream about any event that happened to her during these hard times. The information she received from her cousin did not revive her memory. Childhood was completely dissociated from the course of her life. An attempt to confront her with actual objects from her past, for instance, sending her to visit the immigrant ship, triggered an immediate manic episode followed by a deep depression and a dangerous suicidal attempt. [35, pp.69,70]

Analysis

This is one of several Holocaust-related cases of GA (cf. 11,36]). OK responded with severe stress to reminders of her ordeals, but she was not aware of the personal relevance of these stimuli. Hence, her awareness of these stimuli remained anoetic in nature.

All together, these clinical case reports, as well as others not included here (e.g. [21,37-39]), fail to support Ribot's dichotomy of exclusive loss of episodic memory, GA Type I, versus additional loss of procedural and semantic memory, GA Type II. Rather, they indicate a continuum of involvement of the various memory systems. The evidence from experimental approaches is considered next.

Formal assessment of generalized amnesia

Several recent studies of GA have included case reports with data derived from formal neuropsychological and neurobiological memory testing.

Case 6

Against a matched control, Schacter et al. [40] tested a 21-year-old man presenting with GA and fugue. The patient recognized faces and names of famous contemporaries. Semantic memory for recent information was thus intact. However, apart from a few exceptions, the patient was unable to retrieve episodic memories for the fugue. Response latencies in the index patient were much longer than in the control. Neurological examination was unremarkable.

Case 7

Following loss of episodic memory, Mr. X [41] was referred to a psychiatric hospital. Psychological testing

revealed severe memory deficits, mainly in the areas of personal and current information, and orientation in time and place. Logical memory was also impaired but short-term memory was comparatively intact. With treatment, memory performance improved, and this was confirmed by further psychological testing. Memories of his previous life, in particular of the recent death of his wife and of his subsequent intended suicide, were evoked by gradual re-exposure to familiar people and places.

Case 8

Markowitsch *et al.* [42] tested for dissociative amnesia in a 30-year-old man manifesting memory loss for his entire lifespan. Formal neuropsychological testing revealed significant semantic and episodic memory defects. Thorough clinical neurological examination was normal, but subsequent PET scanning showed aberrant differential brain activation, correlating with impaired episodic memory retrieval [43]. Single photon emission computed tomography (SPECT) demonstrated reduced perfusion of the right temporal and frontal areas, regions critical for retrieval of episodic memory. By 6 months the patient had retrieved portions from the past, but his episodic memory was poetic rather than autonoetic. SPECT results were consistent with Wheeler *et al.'s* view [15] that poetic and autonoetic consciousness are associated with left and right prefrontal brain activity respectively. They also validated the view linking the conjoint action of the inferior prefrontal and anterior temporal regions with retrieval of old memories [44].

Case 9

Markowitsch *et al.* [45] described dissociative amnesia in a 37-year-old patient with permanent loss of sense of self. Episodic knowledge was unavailable, but semantic memory remained accessible. Anterograde memory remained relatively intact, but his wife was alien to him, and recent memory for personal facts and events was associated with an emotional flatness. Psychological tests rendered dissimulation unlikely. Neurological examination, including magnetic resonance imaging (MRI), was unremarkable. Functional positron emission tomography (PET) scanning revealed that processing of episodic information for episodes before and after the onset of amnesia mainly produced central- and left-hemispheric activation, whereas controls showed predominantly right-hemisphere activation. According to Markowitsch *et al.*, these findings suggest that the patient treated all incoming episodic information in a neutral, `semantic' (i.e. poetic) way.

These tests confirm clinical observations that GA involves genuine inaccessibility of episodic memory. In cases 7 and 8 there was also loss of semantic memory, and in case 7, additional loss of procedural memory. Tests also demonstrated leakage of lost affect into the amnesic state. Thus, in case 7, severe depression could be detected in projective test results. Finally, cases 8 and 9 reveal impairment of autonoetic consciousness and episodic memory. Using neuroimaging techniques, Markowitsch *et al.* [45] found evidence suggesting that some GA patients fail to activate brain structures essential for awareness of episodic information.

To conclude, formal testing confirms the clinically observed, wide variation in the degree of involvement of semantic and procedural memory in GA, from entirely absent in case 1, to broad and extreme loss in case 4. Thus it appears that Ribot's typological dichotomy is not upheld, and that GA Types I and II represent extremes on a continuum. Since these case descriptions are based on studies that vary in regard to the methodological precision of data gathering on the various memory systems, systematic study would be required to draw firmer conclusions. Formal memory tests were performed in only a few cases, and formal assessments of procedural memory loss in GA largely remain lacking. For the time being, we suggest that Ribot's types be regarded as practical and heuristic prototypes indicating a functional continuum rather than precise markers for different nosological categories.

Event-related potentials in generalized amnesia

Kirino *et al.* [46] reported a case of probable GA who showed a deficit involving electroencephalogram (EEG) changes, more specifically a deficient auditory P300 during the amnesic period. P300 is considered to relate to updating and processing of memory. Fukuzako *et al.* [47] observed EEG changes that were limited to the acute phase of amnesia in some individuals. In a recent controlled study with six cases of probable GA, and 12 age and gender matched healthy controls, Fukuzako *et al.* [48] reported P300 amplitudes in acute-stage recordings that were lower than those in controls. However, recovery from GA was associated with a significant increase in P300 amplitude. This study adds to the evidence produced by Markowitsch *et al.* [45] that impaired cognitive and affective memory functions in GA can be objectified using neurophysiologic measures.

Dissociation of the personality in generalized amnesia

According to Pierre Janet [29,32,49-51], dissociative disorders are characterized by the dissociation from ordinary consciousness and memory of `systems of ideas and functions that constitute personality' [36, p.332]. Such systems escape personal awareness and control. In his view, lost memories are relegated to parallel dissociative mental states or dissociative states. Subsequent authors have argued that the dissociated mental systems and functions do not exist without their own sense of self [12,52]: 'if normally an

experience that passes out of consciousness, it is as a psychical disposition of *some* personality' [52, p. 1131. The extensive memory loss in GA could imply the loss of the premorbid personality (i.e. the `lost dissociated personality'), as well as the gain of a new functional mental system and associated sense of self that could be referred to as the `amnesic' personality.

`Personality' is a problematic term, but it underscores the fact that dissociation may either involve a singular psychophysiological state, or a system of states each endowed with a separate sense of self. Thus, cases 2-4 clearly demonstrate that loss of personal memory is invariably associated with varying degrees of sense of self, with the challenge of either having to recover this or develop another. The switches between states displayed in GA cases 3 and 4 can be interpreted in terms of dissociation of personalities. In both cases, the lost dissociative personality took control of consciousness and behaviour, failing to integrate information (re)learned during the amnesic period. The rather sudden recovery of episodic memory, and the speed of regaining semantic and procedural memory in some cases (see [53], for another example) further indicate that the lost material exists in a dispositionally organized way [5,7,32].

Personality dissociation in dissociative disorders is often incomplete. Dissociated personalities often share access to a range of episodic, semantic or procedural memories, e.g. ensuring the capacity to speak. Lost procedural or episodic and semantic memories associated with the lost dissociated personality may still exert an influence on the amnesic personality. In case 5, the amnesic personality's crisis following her visit to the immigration ship was thus related to dissociated memories related to her stay on this ship. In a GA case reported by Dunn [38], the amnesic personality's fear of water was based upon dissociated traumatic memories of near drowning. Lyon [54] described a case of GA who consistently but unwittingly dialed her mother's telephone number when asked to dial a random number. This type of leakage is particularly common in DID and dissociative disorder not otherwise specified (DDNOS), where memories associated with one dissociative personality may intrude upon another. In cases of trauma-related amnesia, flashbacks, nightmares and re-experiencing of dissociated events are further examples of these phenomena.

In various cases (e.g. cases 3-5) the amnesic personalities did not grasp the nature, source or meaning of procedural, semantic or episodic memory leakage. The most extreme form of `leakage' in dissociative disorders is the activation of a more or less fully dissociated personality, accompanied by the deactivation of the intruded upon personality. This personality-switching occurred in cases 3 and 4, in which GA appeared to represent a rudimentary form of DID/DDNOS.

Aetiology

According to the DSM-IV [1], the (important personal) information which the person is unable to recall is usually of a traumatic or stressful nature. Indeed, in several of the reported cases of GA, stressful life events or trauma were mentioned (see Table 2, for an overview). In a few cases, there was evidence that the GA was related to an acute traumatic or stressful event which, at the same time, reactivated prior traumatic memories [55-57]. Some of these trauma-related GA's involved signs of neurological damage, while others did not show any evidence. However, in various other case reports of GA the aetiology remained unclear. One example is the famous case of Mary Reynolds (case 3), with regard to which, Goodwin [58] discovered evidence for an extremely stressful, if not traumatic life prior to the development of her GA. Still, from the data presented in various case reports, no firm conclusion can be drawn regarding the role of trauma in the development of GA.

Cases in which GA has apparently not been precipitated by traumatic stress could not always be explained by organic factors. For example, Dalla Barba *et al.* [59] described a patient, whose amnesia was formally documented, who lost episodic memory over a time frame of 10 minutes. Semantic memory remained largely intact, or could be readily regained. Neurological tests were negative. Interestingly, after 2.5 years the patient was still fearful when walking along the poorly lit road where she was found amnesic, or when she found herself in a dark place. Perhaps a stressful event had occurred, with being in the dark acting as the conditioned stimulus. In this case, GA in the absence of either reported traumatic stress or organic pathology remains an aetiological mystery.

A rather sudden recovery of episodic memory and a speedy re-education, mentioned above [5,7,32], suggests that organic defects are unlikely explanations of the GA. It should nevertheless be noted that organic factors may contribute to, or potentiate, the development of dissociative amnesia, including GA [42,57].

Although simulation of GA can occasionally occur, the cases of GA presented do not seem to support simulation, malingering or factitious disorder. However, given the fact that some of the cases were not carefully evaluated, there is no clear evidence that some of the presented cases may not have been factitious or simulated. And even in genuine cases of dissociative GA, we do not know how much of the complaint is conscious and how much is unconscious. We should not necessarily assume that patients with dissociative amnesia cannot cross into the borderlands of a fictitious disorder or even frank malingering [60]. However, in particular in those cases that were formally tested, simulation, malingering or fictitious disorder do not seem to be the most likely interpretations.

Phobia of the lost personal past

Traumatized individuals are generally phobic for traumatic and related stressful memories [61,62]. Preliminary data from an ongoing study suggest that so-called apparently normal personalities [55] (amnesic personalities) in DID, which are at least partially amnesic for trauma memories, avoid subliminally presented external threat cues [63]. It seems quite possible that this preconscious avoidance would also apply to internal threat cues such as the so-called emotional personalities [55] (personality parts that contain traumatic memories) and their trauma memories. If true, the apparently normal or more generally amnesic personality may remain unaware of the motives and mental actions sustaining its amnesia.

Inadvertent re-exposure to dissociated traumatic material increased the level of fear in cases 1 and 5. In case 5, confrontation with reminders of trauma induced a manic episode, and subsequent deep depression with a dangerous suicide attempt. This patient's amnesia for childhood, which included several years spent in hiding

Table 2. An overview of 32 cases of generalized amnesia

Case	Author(s)	M/F	Age	Trauma/ Precipitating Stressful event	Brain damage	Loss Of SM*	Loss Of PM*	Leakage of lost memories	Memory recovery (EM/SM/PM)*	Memory recovery with hypnosis	PA	Other dissociative and other symptoms	Discussed in this paper
1	Myers [20]	M	25	Combat trauma					EM	+	-	SDS: hypoalgesia	+
2	Pratt [21]	M	45			+			SM, EM, partial, later EM full				+
3	Eisen [37]	F	34	Family problems, abuse		+	+	+	Partial	+	-	Frozen stae	
4	Pratt [21]	M	23	Car accident	Very brief Loss of consciousness	+	+		PM	+ Narcosis			+
5	Dunn [38]	F	17	Almost drowned		+	+	+ Love of flowers, fear of water	+ But loss of EM for amnestic period		+	SDS: fits	
6	Sharpey [39]	F	24			+	+	+	+ Slow regain of SM		+		
7	Mitchell [23]	F	18			+	+		PM (fast), SM, EM (partial)		+	Hysterical attacks SDS: blindness, deafness	+
8	Sidis and Goodhart [34]	M		Heavy fall	Probable	+	+		PM (fast), SM, EM	+	+	SDS	+
9	Schacter et al. [40]	M	21		-	-	-					Fugue	+
10	Domb and Beaman [41]	M	Late 50's	Death of wife, intended suicide		+			+			Depressed and suicidal upon memory recovery	+
11	Markowitz et al. [42]	M	30	? Financial and legal problems	-	+	Impaired						+
12	Markowitz et al. [45]	M	37	Alcoholic parents Cross-dressed By mother 'problematic childhood', insulted by physician, financial problems.	-	+	-		-			Fugue, prior fugues	+
13	Feiling [66]	M	24	Combat trauma		+	-	+	- (But partly + upon Personality alternation)	+	+		

Table 2. continued

Case	Author(s)	M/F	Age	Trauma/ Precipitating Stressful event	Brain damage	Loss Of SM*	Loss Of PM*	Leakage of lost memories	Memory recovery (EM/SM/PM)*	Memory recovery with hypnosis	PA	Other dissociative and other symptoms	Discussed in this paper
14	Modai [35]	F	58	Wartime trauma (amnesia for complete childhood)				+ (Distressed When exposed to trauma Related cues)	-			Severely distressed and suicidal upon exposure to trauma related cues	+
15	Takahasi [65]	M	21	Trouble in love affair, intended suicide	-				-			Suicide after memory recovery	
16	Takahasi [65]	F	28	Sexual abuse, several suicide attempts, intended suicide	-				+			Borderline PD, more suicidal upon memory recovery	
17	Takahasi [65]	M	46	Sudden death of daughter	-								
18	Kazniak et al. [70]	M	27	Rape	-	-	-	+	+	+			
19	Dalla Barbara et al. [59]	F	17	No trauma or stress reported	-	-	-	+	-		DEP		
20	Fukuzako et al. [48]	F	13	Reproach by father	-				+			-	
21	Fukuzako et al. [48]	F	19	Trouble in love affair	-				+			Suicide attempt	
22	Fukuzako et al. [48]	M	24	Trouble in love affair	-				+			Suicide attempt	
23	Fukuzako et al. [48]	M	21	Cruelty	-				+			SDS: aphonia, suicide ideation	
24	Fukuzako et al. [48]	M	22	Traffic accident	-				+			-	
25	Fukuzako et al. [48]	F	48	Refusal of assistance with debt	-				+			Suicidal ideation	
26	Winslow [53]	M	30	Serious illness		+	+	+					
27	Lyon [54]	F	Early 30s	Removal of family				+	EM	Resisted Hypnosis; relaxation	-		
28	Sengupta et al. [71]	M	20 – 30	Robbed of large sum of money, intoxicated	Probably -				EM, minimal during narcosis	Narcosis			
29	Myers [55]	M	?	Combat trauma		+	-		+	Hypnosis	-	SDS: hypoalgesia	

Table 2. continued

Case	Author(s)	M/F	Age	Trauma/ Precipitating Stressful event	Brain damage	Loss Of SM*	Loss Of PM*	Leakage of lost memories	Memory recovery (EM/SM/PM)*	Memory recovery with hypnosis	PA	Other dissociative and other symptoms	Discussed in this paper
30	Witztum et al. [57]	M	24	Combat trauma	-	+	+	+	Full recovery	+	+	Depression, nightmares, insomnia, SDS: speech disorder, headaches	-
31	Wong [72]	M	17	Life in cadet school unbearable					+	Family therapy		Multiple SDS, belle indifference	
32	Van der Hart and Freidman [56]	F	26	Accident during sport, prior gang rape	-	+	+		-	Hypnosis	+	SDS	

* Presence (+) or absence (-) is indicated if specific inquires have been made. For example, brain image – indicates that neuropsychological tests have not found supportive evidence for the interpretation that GA results from cerebral damage. Borderline PD, borderline personality disorder; DEP, declined exploratory psychotherapy; EM, episodic memory; PA, personality alteration; PM, procedural memory; SM, somatic memory; SDS, somatoform dissociative symptoms.

during the Holocaust, was not relieved, and she remained unaware of the source of her despair.

We hypothesize that exposure to potent reminders of traumatic stress may tend to de-stabilize the amnesic personality, since such conditioned stimuli tend to reactivate the lost dissociated personality. It seems that homeostatic avoidance reactions of the amnesic personality can be triggered by such confrontations with the lost dissociated personality. This avoidance may consist of. (i) deactivation of the amnesic personality and full activation of the lost dissociated personality (cases 3 and 4); (ii) redissociation of feared memories disturbing the amnesic personality (case 5); and (iii) partial dissociation with noetic rather than autonoetic awareness of prior personal life and sense of self.

Fear of the past could partly explain sustained emotional flatness and negative dissociative somatoform symptomatology as well. To an extent, mental avoidance of internal trauma-related emotional and somatoforrn cues seems capable of preventing reactivation of traumatic memories which might destabilize the amnesic personality. The need for specific avoidance of these reminders would also explain why dissociated procedural and semantic memories are reintegrated much more easily than episodic memory. When memories of trauma are successfully integrated by the amnesic personality, the need to exclude the lost dissociated personality disappears. This is observed following the treatment of traumatic memories, when there is sudden recovery of previously lost general episodic memory.

Recovering lost memories

In those GA cases which included loss of procedural and semantic memory, recovery of episodic memory followed the recovery of procedural and semantic memory (cases 2-4,8,9). Clinical studies indicated that the rate of automatic recovery of procedural and semantic memory can be enhanced by cognitive-behavioral exercises such as skills training and relearning of facts. Recovery of these memories may be subjectively pleasing (case 4). Mental inhibition of procedural and semantic memory sustaining the division between the lost dissociated personalities and amnesic personalities is generally moderate. This is suggested in most cases by the steady rate of recovery.

Recovery of episodic memory often occurs suddenly, does not demand therapeutic exercises, and is painful when the memories represent experiences of a traumatic or highly stressful nature. In some cases, reactivation of the lost dissociated personality and its subsequent integration with the amnesic personality, is elicited by specific salient reminders of traumatic events, remembering dreams, and by hypnosis (case 1) and narcotherapy [21]. Integration of the painful past can either occur spontaneously following failure of dissociative avoidance or re-dissociation, or can be therapeutically elicited. However, episodic memory loss was permanent in some of the cases, probably because integration of the painful memories remained beyond the subject's coping capacities [64]. Memory recovery in case 5 and in the case reported Takahashi [65] evoked severe depression and suicidality. In cases 3 and 4 (see also [38,39]), recovery of preamnesic episodic material was accompanied by a similar memory loss for the amnesic period, implying a switch from the amnesic to the emotional personality.

In yet other cases, memory avoidance accompanied repetitive switching between two personalities. The available evidence suggests that the integration of the lost dissociated personality and the amnesic personality depends on integration of the traumatic memories. For example, in Feiling's [66] case of combat-related GA the lost dissociated personality could be reactivated under hypnosis and recount its history, but the amnesic personality's phobia of the traumatic memories was so strong that the dissociative barrier between the two personalities could not be removed. Hence, reactivation and integration of episodic memory are quite separate processes. Even though integration occurred rather rapidly in successful cases, the general therapeutic rule is to first raise the amnesic personality's level of mental functioning to allow for integration of the lost dissociative personality [67-69].

In case l, lost memories were regained using potentially suggestive techniques such as hypnosis, and in a case concerning a 23-year-old soldier [21], narcotherapy. It has not been reported that such interventions induce memory distortion among GA patients. However, systematic evaluation of the validity of both therapeutically and non-therapeutically recovered memories among GA patients would be valuable.

Failure of personification of recovered memories

It is a remarkable fact that, for varying periods, recovered episodic memories may not be recognized as personal memories, but rather as semantic, noetic information. Recovery of noetic awareness of episodic memories may represent an intermediate stage between complete memory loss and autonoetic awareness of the personal past. In Janet's terms [32], at this intermediate stage, patients manifest failure of personification of their past experiences. Another case of such failure was described by Kaszniak et al. [70]. Following being raped, a 27-year-old man developed dissociative fugue with GA (for other cases of fugue-related GA see [54,65]). When, in the course of several hypnotic sessions, the patient started to recall the incident, he initially did not recognize it as a personal event. His noetic awareness of the dissociated memory preceded autonoetic awareness - (for a comparable case see [40]). In several of the cases reported above, when GA was either induced by or strongly associated with trauma, recall and integration of this trauma was central to the recovery of general episodic memory. This observation suggests that resolution of trauma-related dissociative disorders other than GA may also critically depend on the recovery of traumatic memories. Generally, regaining noetic awareness of previously lost memories prior to recovery of autonoetic consciousness is consistent with Ribot's law.

Conclusion

The cases reviewed demonstrate that GA often not only involves dissociation of episodic memories. In many instances it also encompasses

varying degrees of dissociation of semantic and procedural memory, and of affect, behaviour, somatoform reactions and functions, and sense of self. Such complex dissociation reflects a split between a lost dissociated personality, which has encoded and stored the lost memories, and an amnesic personality. Both of these can be conceptualized as, and shown to be, more-or-less distinct psychophysiological systems. This dissociation notwithstanding, the lost dissociated personality may impose itself on the amnesic personality. In some instances, and for varying degrees of time, it may even take control of consciousness and behaviour from the amnesic personality, yielding an intermediate condition located between GA and DID. Complete reactivation of the lost dissociated personality does not necessarily imply its integration into the amnesic personality, since such integration necessitates concurrent activation of both personalities and concomitant integration and personification of memories, including traumatic memories, as they become available.

In some cases, the precise aetiological background remains unknown, while in other cases the GA appears to be induced by traumatic events. Such events evoke physiological states involving narrowing of the field of consciousness. The`negative', amnesic, symptomatic state is sustained by a `phobia' for the traumatic memory. Recovery of procedural and semantic information is generally experienced as rewarding, but integration of episodic experiences, in particular with regard to traumatic events, is often a painful process. However, recovery of trauma-induced GA relies on it. The reviewed cases suggest that Ribot's law of regression often applies, but systematic study is required to evaluate this law more critically.

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