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RETROGRADE AMNESIAS WITHOUT SIGNIFICANT BRAIN DAMAGE IN YOUNG VERSUS OLD AGE

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Abstract

Retrograde amnesia is a severe, but rarely diagnosed disorder. Most retrograde amnesias primarily affect the episodic-autobiographical domain. This means that events or episodes that are emotionally connotated and that can be traced back with respect to the time, when they occurred, and with respect to the place, where the event happened. Retrograde amnesia usually occurs in the context of traumatic brain damage, in patients with epilepsy, or in patients with a condition of dementia. However, there are also disease conditions that lead to retrograde amnesia of a more transient nature. This holds true for two prominent disease conditions: *transient global amnesia* and *dissociative amnesia*. Transient global amnesia is considered to be a neurological condition, while dissociative amnesia is a psychiatric condition. Transient global amnesia usually occurs after stressful somatic or psychic incidents (e.g., sudden change in temperature, strenuous physical effort, emotional stress) and lasts only a few hours (up to a day). With more sophisticated imaging methods, brain damage may be found especially in the hippocampal region, but seems to be more transient in nature. Aside from memory problems, no other major behavioral symptoms are present. So, there is full consciousness and personal data are present. Dissociative amnesia, on the other hand, is characterized by a loss of personal data – the patient no longer remembers who he or she is. Furthermore, there may be an altered state of consciousness ("self-awareness"). The disease appears suddenly, usually because of overwhelming stress. The disease may last short-term or long-term. Long-term disease conditions seem to be accompanied by brain hypometabolism, especially in the right fronto-temporal cortex, as measured by fluoro-deoxy-d-glucose metabolism with positron-emission-tomography.
The two disease conditions consequently demonstrate that psychic or physical stress or trauma events may have a major impact on the brain, resulting in amnesia in the episodic-autobiographical domain. Both kinds of diseases are potentially reversible – transient global amnesia per definition always within a day, dissociative amnesia depending on circumstances, sometimes quickly, sometimes not at all.

Keywords: *Transient global amnesia, dissociative amnesia, neurological disorders, psychiatric disorders.*

1. Introduction

Long-term memory may be disturbed in two time directions – anterogradely and retrogradely. Figure 1 illustrates this. In this Figure the flash symbol represents the time point of brain damage or of a major psychic traumatic event, leading to either anterograde or retrograde amnesia or to both. Retrograde amnesia frequently follows Ribot's Law. The psychologist Ribot (1882) had found that events dating back to childhood or youth have a higher likelihood of being preserved than those from the recent past. Several factors may contribute to this: Remote memories were encoded and stored in a young, barely loaded brain and were unique at the time of encoding, which means that there was little interference with concurring information (e.g., similar events). Furthermore, they were frequently more emotionally loaden than similar events, occurring later. Due to repeated recall over time (until the present) such early encoded events had a high chance of becoming deeply re-encoded and broadly embedded in respective neural networks.

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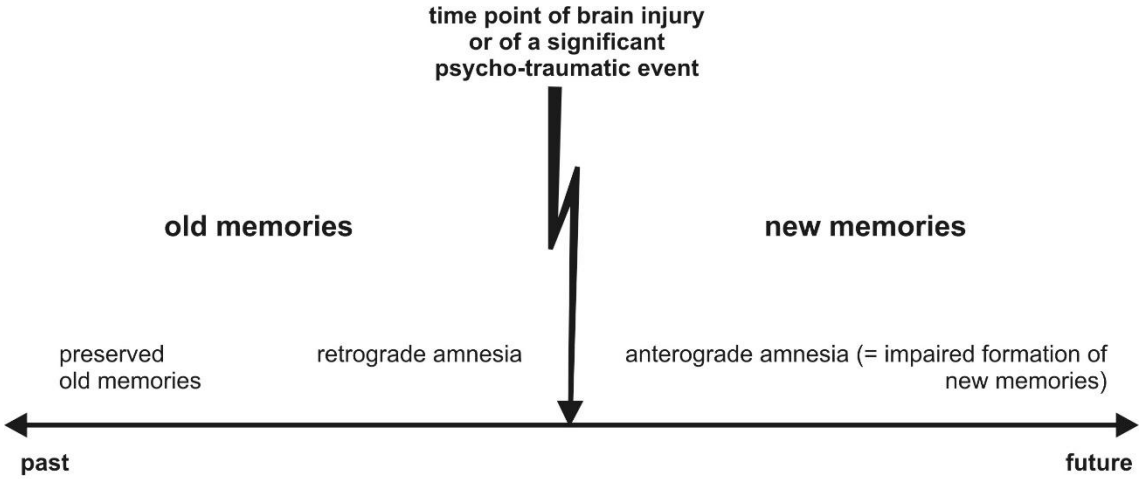
Figure 1. Relationships between anterograde and retrograde amnesia.



Anterograde memory disturbances are quite frequent after brain damage and can be long-lasting or even persistent (Markowitsch, 2008; Markowitsch & Staniloiu, 2012, 2022). They occur especially after bilateral brain damage which affects one or more structures of the limbic system (Markowitsch, 1999). Three long-term memory processing divisions of the limbic system have been established – the medial temporal lobe (with the hippocampus as core structure), the medial diencephalon, and the basal forebrain (Markowitsch & Staniloiu, 2012, 2022). Aside from direct, focal brain damage, diffuse brain damage, as in dementia, can lead to anterograde amnesia (Abbate et al., 2023; Caine et al., 2001). And psychiatric diseases may impair anterograde memory as well (Markowitsch & Staniloiu, 2012, 2022; Staniloiu & Markowitsch, 2014).

Retrograde memory disturbances have been much less described, both in neurology and psychiatry (Kopelman, 2008; Markowitsch & Staniloiu, 2022; Staniloiu & Markowitsch, 2014). Conditions of traumatic brain damage, epilepsy and dementia are most commonly associated with retrograde memory loss. There are, however, disease conditions that lead to retrograde amnesia of a more transient or variable nature. This holds true for the disease conditions: *transient global amnesia* (TGA) and *dissociative amnesia* (DA).

For nearly all disease conditions the memory impairments hold in principal for one memory system: episodic-autobiographical memory (Staniloiu et al., 2020a). That means, it refers to personal, usually emotionally loaden events and episodes. Fact retrieval may be affected in a few instances when the facts are emotionally connotated.

2. Transient global amnesia

TGA is a disease that was first described in the middle of the last century (Courjon & Guyotat, 1956; Fisher & Adams, 1964). Its characteristics, especially its epidemiology, remained an enigma over the next half century. Only in the present century, detailed data about its conditions became available (Bartsch & Deutschl, 2010; Bartsch & Butler, 2013; Sealy et al., 2022). Basically, TGA is characterized by severe anterograde and less severe retrograde amnesia, which occurs with a sudden onset and disappears after about a day – frequently after sleep. It affects mainly old(er) individuals. The anterograde amnesia leads to confusion, but basic knowledge about oneself is preserved (name, birthday, and the like). Patients repeatedly ask questions about the day's events (Sealy et al., 2022). Precipitating events or triggering factors can be found both in the somatic and the psychic domain. Bartsch and Deuschl (2010) tried a quantification (their Figure 1) which indicated that nearly one third of the affected cases were due to emotional stress, another about 30% to strenuous physical activity, about 10% each to temperature change and sexual intercourse, and the rest to acute pain or other factors. Related to the emotional stress conditions is the "broken heart syndrome" (or Takotsubo cardiomyopathy) and migraine headaches that have been associated with the onset of TGA (Sealy et al., 2022).

TGA was considered being a benign disease, as it lasts only a day or less and no overt brain damage was detected. More recent data, however, changed the picture. Bartsch and Deuschl (2010), and Bartsch et al. (2007) detected lesions in the CA1 sector of the hippocampal formation by using magnetic resonance imaging. A 6-month follow-up revealed, however, that these lesions were of transient character. Other studies showed apparently permanent lesions in hippocampal and further brain areas related to memory in

general (Wang et al., 2018) and to spatial memory and navigation in particular (Schöberl et al., 2019). Functionally, Hsieh et al. (2019) proposed a relation between TGA and the later development of dementia.

Finally, it should be mentioned that there is a tendency of recurrence of TGA which, of course, has implications for chronicity. Recurrence was first analyzed by Markowitsch (1983) (see his Figure 3). Recently, Sealy et al. (2022) reported a life time recurrence rate of up to 23.8%. The considerable recurrence rate is in line with a vascular origin of TGA, as suggested by Bartsch et al. (2007).

3. Dissociative amnesia

DA is an illness which, on first glance, differs considerably from TGA. The hallmark of DA is a temporary or long-lasting inability to recollect personal (autobiographical) memories, which is referred to as retrograde amnesia (see Figure 1). In very rare instances the reverse, namely severe anterograde amnesia may occur (Staniloiu & Markowitsch, 2014; Markowitsch & Staniloiu, 2016). Contrary to the situation in TGA, patients with DA usually are unable to name personal data (own name, birthday, etc.) and they seem to be unconcerned by this inability. This lack of concern was noted already in the early literature and was named *belle indifference* by Janet in 1907 (see also Reinhold & Markowitsch, 2009). DA can vary in duration from days to decades. Sometimes it may be limited to a certain time epoch (e.g., Markowitsch et al., 1997).

DA preponderantly is found in younger individuals; this may be attributable to the frequently found labile und uncertain personality of the affected individuals. The major trigger symptom of DA is stress (Staniloiu et al., 2020b). Staniloiu and Markowitsch (2014) proposed the "Two-hit hypothesis" which postulates an additive or synergistic interaction between psychological (and physical) incidents that then will lead to DA. This hypothesis furthermore should explain, why for the outsider even minor incidents might trigger an amnestic condition. Interactions between stress occurrence and molecular reactions in the brain were proposed as inducing such major and frequently long-lasting changes in personality (see e.g., the sequence depicted in Table 36.2 in Markowitsch & Staniloiu, 2016).

In our experience, DA is frequently long-lasting and changes the personality (Markowitsch & Staniloiu, 2013; Staniloiu & Markowitsch, 2012; Staniloiu et al., 2018, 2020b). The personality change appears obvious, as an individual with DA, covering the whole life, has no reference to his or her own past behavior. This means, that self-awareness is altered. One of our patients stated "My memory are the others" (Staniloiu et al., 2020b), meaning that the others tell him what he is and what he did in the past. Another patient with DA changed his job, lost his interest in cars (while prior to DA he was an avid car driver) and in his family, and changed his diet (Markowitsch et al., 1997).

As in TGA, there is evidence for brain changes in DA: Since the end of the 1990s we performed especially fluoro-deoxy-d-glucose imaging with positron emission tomography (in combination with magnetic resonance imaging). The most reliable result was a right-hemispheric hypometabolism in the fronto-temporal cortex (including the amygdala and at least portions of the hippocampal formation) (Brand et al., 2009; Staniloiu et al., 2011) (which is in conformity with related results of others, e.g., Tramoni et al., 2009). We therefore suggested that a synchronous activity of lateral prefrontal and anterior temporal regions of the right hemisphere brings the cognitive and emotional components of episodic-autobiographical memory together.

4. Similarities and differences between TGA and DA

There are several similarities between the two diseases: Above all, the sudden onset and the dominance of episodic-autobiographical memory loss. Furthermore, the vague neuronal correlates that until recently were considered to non-exist. Triger factors overlap in part – especially a stress-related onset is found for about a third of the TGA cases and for nearly all of the DA cases.

However, the differences predominate. These are seen in the age distribution which is on the younger side for DA and on the old side for TGA. Then with respect to the distribution of the memory problems which are principally on the anterograde side for TGA and on the retrograde side for DA. Furthermore, the duration of the memory problems is by definition limited to one day for TGA, while it is usually much longer for DA. With respect to retrograde amnesia, cases with DA are unable to retrieve data about the own person, while these data are preserved in patients with TGA. Self-awareness may be altered for individuals with DA, but not for those with TGA. The neuronal correlates may overlap with respect to the medial temporal lobe, but the mechanisms for their occurrence and maintenance may differ. There seems to be a difference in the development of possible brain and molecular factors, inducing the two disease conditions. Concomitant factors such as migraine and *belle indifference* differ between TGA and DA.

5. Conclusions

TGA and DA are two diseases in which memory problems stay in the center and are mandatory for a differential diagnosis. Though a few other factors overlap for the description of the two disease conditions, there exists a multitude of features which differs between TGA and DA.

References

Abbate, C., Trimarchi, P. D., Fumagalli, G. G., Gallucci, A., Tomasini, E., Fracchia, S., … & Rossi, P. D. (2023). Diencephalic versus hippocampal amnesia in Alzheimer's disease: The possible confabulation-misidentification phenotype. *Journal of Alzheimer's Disease, 91*, 363-388.

Bartsch, T., Alfke, K., Deuschl, G., & Jansen, O. (2007). Evolution of hippocampal CA-1 diffusion lesions in Transient Global Amnesia. *Annals of Neurology, 62*, 475-480.

Bartsch, T., & Deuschl, G. (2010). Transient global amnesia: functional anatomy and clinical implications. *Lancet Neurology, 9*, 205-214.

Bartsch, T., & Butler, C. (2013). Transient amnesic syndromes. *Nature Reviews Neurology, 9*, 89-97.

Brand, M., Eggers, C., Reinhold, N., Fujiwara, E., Kessler, J., Heiss, W.-D., & Markowitsch, H. J. (2009). Functional brain imaging in fourteen patients with dissociative amnesia reveals right inferolateral prefrontal hypometabolism. *Psychiatry Research: Neuroimaging Section, 174*, 32-39.

Caine, D., Patterson, K., Hodges, J. R., Heard, R., & Halliday, G. (2001). Severe anterograde amnesia with extensive hippocampal degeneration in a case of rapidly progressive frontotemporal dementia. *Neurocase, 7*, 57-64.

Courjon, J., & Guyotat, J. (1956). Les ictus amnesiques. *Journal de Medecine, 37*, 697-701.

Fisher, C. M., & Adams, R. D. (1964). Transient global amnesia. *Acta Neurolologica Scandinavica, 40* (Suppl. 9), 1-83.

Hsieh, S.-W., Chen, C.-H., Huang, P., Li, C.-H., Yang, C.-H., & Yang, S.-T. (2019). The long-term risk of dementia after transient global amnesia: A population-based cohort study in Taiwan. *Neuroepidemiology, 53*, 201-208.

Janet, P. (1907). *The major symptoms of hysteria: Fifteen lectures given in the Medical School of Harvard University*. New York: Macmillan.

Kopelman, M. D. (2008). Retrograde memory loss. In G. Goldenberg & B. L. Miller (Eds.), *Handbook of Clinical Neurology, Vol. 88 (3rd series; Neuropsychology and behavioral neurology)* (pp. 185-201). Amsterdam: Elsevier.

Markowitsch, H. J. (1983). Transient global amnesia. *Neuroscience and Biobehavioral Reviews, 7*, 35-43.

Markowitsch, H. J. (1999). Limbic system. In R. Wilson & F. Keil (Eds.), *The MIT encyclopedia of the cognitive sciences* (pp. 472-475). Cambridge, MA: MIT Press.

Markowitsch, H. J. (2008). Anterograde amnesia. In G. Goldenberg & B. L. Miller (Eds.), *Handbook of clinical neurology (3rd Series, Vol. 88: Neuropsychology and behavioral neurology)* (pp. 155-183). New York: Elsevier.

Markowitsch, H. J., Fink, G. R., Thöne, A. I. M., Kessler, J., & Heiss, W.-D. (1997). Persistent psychogenic amnesia with a PET-proven organic basis. *Cognitive Neuropsychiatry, 2*, 135-158.

Markowitsch, H. J., & Staniloiu, A. (2012). Amnesic disorders. *Lancet, 380*(9851), 1429-1440.

Markowitsch, H. J., & Staniloiu, A. (2013). The impairment of recollection in functional amnesic states. *Cortex*, 49(6), 1494-1510.

Markowitsch, H. J., & Staniloiu, A. (2016). Functional (dissociative) retrograde amnesia. In M. Hallett, J. Stone & A. Carson (Eds.) *Handbook of clinical neurology (3rd series): Functional neurological disorders* (pp. 419-445). Amsterdam: Elsevier.

Markowitsch, H. J., & Staniloiu, A. (2022). Behavioral, neurological, and psychiatric frailty of autobiographical memory. *WIREs Cognitive Science*, e1617. DOI: 10.1002/wcs.1617

Markowitsch, H. J., Thiel, A., Kessler, J., von Stockhausen, H.-M., & Heiss, W.-D. (1997). Ecphorizing semi-conscious episodic information via the right temporopolar cortex - a PET study. *Neurocase, 3*, 445-449.

Reinhold, N., & Markowitsch, H. J. (2009). Retrograde episodic memory and emotion: a perspective from patients with dissociative amnesia. *Neuropsychologia, 47*, 2197-2206.

Ribot, T. (1882). *Diseases of memory*. New York: D. Appleton and Co.

Sealy, D., Tiller, R. J., & Johnson, K. (2022). Transient global amnesia. *American Family Medicine, 105*. 50-54.

Schöberl, F., Irving, S., Pradhan, C., Bardins, S., Trapp, C., Schneider, E., … & Zwergal, A. (2019). Prolonged allocentric navigation deficits indicate hippocampal damage in TGA. *Neurology, 92*, e234-e243.

Staniloiu, A., Kordon, A., & Markowitsch, H. J. (2020a). Quo vadis episodic memory – past, present, perspective. *Neuropsychologia, 141*, Art. 107362. doi: 10.1016/j.neuropsychologia.2020.107362.

Staniloiu, A., Kordon, A., & Markowitsch, H. J. (2020b). Stress- and trauma-related blockade of episodic-autobiographical memory processing. *Neuropsychologia, 139*, Art. 107364. doi: 10.1016/j.neuropsychologia.2020.107364.

Staniloiu, A., & Markowitsch, H. J. (2012). The remains of the day in dissociative amnesia. *Brain Sciences, 2*, 101-129.

Staniloiu, A., & Markowitsch, H. J. (2014). Dissociative amnesia. *Lancet Psychiatry*, *1*, 226-241.

Staniloiu, A., Markowitsch, H. J., & Kordon, A. (2018). Psychological causes of amnesia: A study of 28 cases. *Neuropsychologia*, *110*, 134-147.

Staniloiu, A., Vitcu, I., & Markowitsch, H. J. (2011). Neuroimaging and dissociative disorders. In V. Chaudhary (Ed.), *Advances in brain imaging* (pp. 11-34). INTECH – Open Access Publ.

Tramoni, E., Aubert-Khalfa, S., Guye, M., Ranjeva, J. P., Felician, O., & Ceccaldi, M. (2009). Hypo-retrieval and hyper-suppression mechanisms in functional amnesia. *Neuropsychologia, 47*, 611-624.

Wang, X., Zhang, R., Wei, W., Jiang, H., Gao, Z., Lin, J., & Zhang, J. (2018). Long-term sequelae of hippocampal lesions in patients with transient global amnesia: A multiparametric MRI study. *Journal of Magnetic Resonance Imaging, 47*, 1350-1358.