

HOW TO MEASURE RETROGRADE AMNESIA

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Abstract

Retrograde amnesia principally is divided into autobiographical and semantic retrograde amnesia. Autobiographical retrograde amnesia refers to personal events and episodes of the past which are usually emotionally connotated, can be remembered with respect to the time, when they occurred, and to the place, where they happened. Semantic retrograde amnesia refers to knowing of facts that had been learned in the past. Semantic facts usually cannot be traced back in time and place: One just knows that the Eiffel tower is in Paris. Retrograde amnesia is found in patients with neurological and psychiatric diseases. Neurological patients with retrograde amnesia frequently have traumatic brain injury, are intoxicated, have epileptic attacks, or suffer from a process of dementia. Psychiatric patients with retrograde amnesia may have endured psychic shock condition, or may suffer from conditions of depression. Other psychiatric disease conditions with major retrograde amnesia in the autobiographical domain are found in patients with dissociative conditions, in particular dissociative amnesia and dissociative identity disorder. The great majority of all patients shows deficits only in the episodic-autobiographical domain of retrograde memory. Reliable and valid measurements of retrograde memory are – compared to measuring anterograde memory – particularly difficult, as all individuals have a unique repertoire of retrograde memories, especially, of course, in the episodic-autobiographical domain. Therefore, instruments, using a score system that allows a gradation between individuals, were developed only lately. At present, however, a number of test instruments exists (Markowitsch et al., 2023). These will be analyzed and compared with respect to their qualities, cultural aptness, and psychometric properties.

Keywords: *Episodic-autobiographical memory, semantic memory, neurology, psychiatry.*

1. Introduction

Memory is divided into anterograde and retrograde memory. Anterograde memory refers to newly encoded information which then is further processed in the brain and stored for later retrieval (Markowitsch, 2008; Markowitsch & Staniloiu, 2022). Retrograde memory means the remembering of already stored information.

While there is a huge variety of tests, measuring anterograde memory (e.g., the 4th edition of the Wechsler Memory Scale, or the Rey-Osterrieth Figure; Ryan et al., 2025; Kent, 2026; Lezak et al., 2012), there was, until recently, only little material available for testing retrograde memory. This was due to the fact that in patients with memory impairment, the deficits are mainly seen in the episodic-autobiographical domain, but not in semantic memory (Markowitsch, 2003, 2008, 2013; Markowitsch & Staniloiu, 2012; Fujiwara & Markowitsch, 2005; Tulving & Markowitsch, 1998). Semantic memory, or memory for facts, usually is preserved in both neurological and psychiatric patients, that is, these patients know what is a table or a tree. On the other hand, memory for episodes or events of the past (e.g., the party after finishing high school, or my first sexual engagement) are impaired in patients with retrograde amnesia. As such events are highly individual, they are difficult to measure and to quantify.

2. Disease conditions associated with retrograde amnesia in particular

It is everyday knowledge that after a severe blow to the head individuals may become unconscious for a short time and may lose access to their immediate past. Similarly, in an accident situation (e.g., with a car), people may thereafter have difficulties in remembering the crash situation. These, however, are very short-lasting amnesic situations. Even the possible memory loss after intoxication is usually of short duration and will not be considered for formal test assessment (but see, e.g., Dominici et al., 2015).

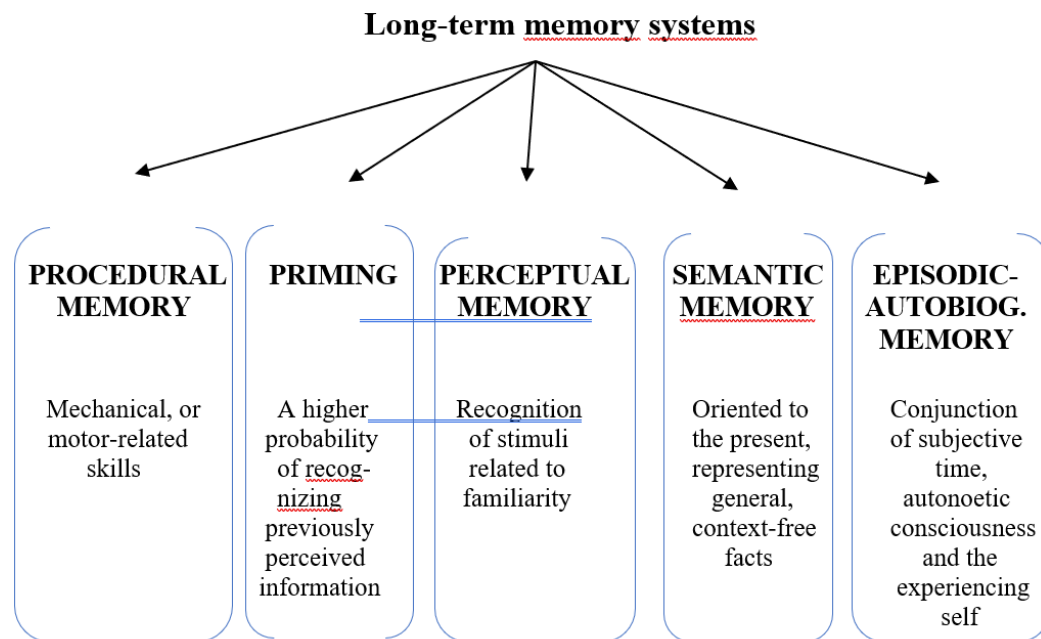
Neurological disease conditions which are particularly relevant with respect to retrograde amnesia are traumatic brain injury (TBI), closed head injuries, epilepsy, and dementia (Lah et al., 2006; Jus & Jus, 1962; Mayes et al., 2003; Meeter et al., 2006; Beatty et al., 1988). However, patients with sometimes even more complete retrograde amnesia (covering the whole life time) are found in the psychiatric domain, namely in patients with dissociative amnesia (Markowitsch & Staniloiu, 2013, 2016; Staniloiu & Markowitsch, 2014). In these patients, even self-awareness (consciousness of the own person) may be altered, as their retrograde amnesia covers all their past life (Markowitsch & Staniloiu, 2011; Staniloiu et al., 2020; Staniloiu & Markowitsch, 2012).

For these patient groups, assessment of retrograde amnesia, especially in the episodic-autobiographical domain, is essential. Furthermore, especially as some of the patients with dissociative conditions have a forensic background and may malingering (Jenkins et al., 2009; Staniloiu et al., 2018; Rubenzer, 2023), the application of tests of malingering is necessary for a differential diagnosis of true retrograde amnesia (Jelicic, 2018; Jelicic et al., 2004).

3. Assessment of retrograde amnesia

Neuropsychological assessment of a patient always should be integrative and holistic, that means that basically tests should cover intelligence, attention and concentration, executive functions, affect and mood, and explicit and implicit memory functions, including anterograde and retrograde memory. This is necessary in order to relate features to each other. For example, it is unlikely that a healthy, non-brain damaged and non-depressed individual has high intelligence, but low memory capacities.

Figure 1. Summary of the five long-term memory systems (*episodic-autobiog.* = *episodic-autobiographical*).



As mentioned above, if there are memory problems, these should be primarily in the episodic-autobiographical domain (see Figure 2 in Markowitsch & Staniloiu, 2025, or the Figure in Markowitsch & Pritzel, 2014, or Figure 1 in Markowitsch & Staniloiu, 2022, or Figure 11.1 in Markowitsch et al., 2023). The other memory systems – semantic, perceptual, procedural, and priming memory – should be tested, if there is suspicion for impairment. Figure 1 summarizes definitions of the five long-term memory systems.

We found, for example, in a patient with dissociative (functional) amnesia that he could not understand any Latin, though he had studied it in university prior to his amnesia (Markowitsch & Staniloiu, 2025; Staniloiu et al., 2020). Our explanation of this failure was that he disliked studying Latin (his father had forced him to choose it) and that there was a link between his car accident (while driving to his university) and his subsequent dissociative amnesia. So, these semantic facts had a strong emotional connotation for him.

3.1. Tests of retrograde (episodic-autobiographical) amnesia

3.1.1. Autobiographical memory interview. The most widely used test of retrograde episodic-autobiographical memory is the ‘Autobiographical Memory Interview’ (AMI; Kopelman et al., 1990). Individuals are requested to produce as detailed and as emotionally laden episodes as possible. For each decade two episodes are requested; for the childhood and youth periods two episodes per half decade. The episodes – and this holds for other tests of retrograde episodic-autobiographical memory as well – should fulfill the following criteria: emotional colorization, specific location and time, and a feeling of belonging to oneself (“autonoetic consciousness”; see Figure 1).

3.1.2. Galton-crovitz technique. Older than the AMI is the ‘Galton-Crovitz Technique’, forwarded by Crovitz and Schiffman in 1974. This procedure is based on presenting a word (e.g., “ship”). Individuals are asked to recall an episode, in which the presented word plays a role. This is repeated for a number of words, in the paper of Crovitz and Schiffman for 20 words altogether which were presented in a list. Subjects were also asked to date the episode as accurately as possible.

3.1.3. Standardized enquiry. From the same time as the AMI stems the ‘Standardized Enquiry’, published by Borroni et al. (1989). It consists of three sets of questions, centering on the life periods (a) childhood and adolescence (until age 15), and (b) early (16-40 years) and (c) late (41 years to 2 years prior to present age) adulthood. Questions to (a) were ‘primary school’, ‘childhood home’, ‘family members’, ‘family illness’ and ‘play’. Questions to (b) were ‘ceremonies’, ‘getting about’ (e.g., by bike), ‘children, military service’, ‘wedding, trips’ and ‘work’. And for (c) ‘moving house’, ‘work changes’, ‘medical events, doctors’, ‘retirement’ and ‘leisure’. Norms were based on 157 healthy individuals of age 55 and over.

3.1.4. Autobiographical Interview. A much simpler test was created by Levine and co-workers (2002) – the ‘Autobiographical Interview’. It asks for autobiographical memories from two time periods: ‘recent’ (last 6 months) and ‘remote’ (5 to 15 years ago), with five memories per time period.

3.1.5. I am memory task. The ‘I Am Memory Task’ (IAM Task) was proposed by Rathbone et al. (2009) as a test for retrograde autobiographical memory. The authors write: “In this task the participant is asked to generate four selves (e.g., ‘I am a singer’) . . . , and then generate eight memories associated with each self. After autobiographical retrieval, participants go back and date all the memories and provide an age at which each self became a defining part of their identity – an age of self emergence.” (p. 411).

3.1.6. Test épisodique de mémoire du passé autobiographique. In the same year as Rathbone et al., Piolino et al. (2009) published a retrograde autobiographical memory test in French, the ‘Test Episodique de Mémoire du Passé Autobiographique’ (TEMPau). This test is closely related to Tulving’s (2002) definition of episodic memory. Participants are first instructed to recall personal events from five different time periods which occurred only once, at a particular place and date, and lasted several minutes or hours, but never more than a day. Then the Remember/Know procedure (Tulving, 1985), which allows a differentiation between episodic and semantic memory retrieval, that is between items of autonoetic consciousness and item of noetic consciousness, is applied. At the end, a procedure is used to check whether the Remember responses contain idiosyncratic perspectives, emotions and thoughts of the person doing the remembering.

3.1.7. Survey of autobiographical memory. Finally, Palombo et al. (2013) constructed a rather long test for testing retrograde autobiographical memory, which they named ‘Survey of Autobiographical Memory’ (SAM). It is a self-report inventory on naturalistic episodic-autobiographical (42 questions), semantic (24 questions) and spatial (20 questions) and prospective memory (16 questions). (‘Prospective memory’ refers to the remembering of events happening in the future.) Participants had to rate the extent to which each question applied to their memory.

3.1.8. Tests of malingering. To rule out malingering, tests of assessing malingering should be applied. There are both verbal and nonverbal tests available. The most common are the ‘Test of Memory Malingering’ (Tombaugh, 1996), the ‘Word Memory Test’ (Green, 2003), and the ‘Amsterdam Short-Term Memory Test’ (Schagen et al., 1997).

References

- Beatty, W. W., Salmon, D. P., Butters, N., Heindel, W. C., & Granholm, E. L. (1988). Retrograde amnesia in patients with Alzheimer's disease or Huntington's disease. *Neurobiology of Aging*, *9*, 181-186.
- Borrini, G., Dall'Orta, P., Della Sala, S., Marinelli, L., & Spinnler, H. (1989). Autobiographical memory. Sensitivity to age and education of a standardized enquiry. *Psychological Medicine*, *19*, 215-224.
- Crovitz, H. F., & Schiffman, H. (1974). Frequency of episodic memories as a function of their age. *Bulletin of the Psychonomic Society*, *4*, 519-521.
- Dominici, P., Kopec, K., Manur, R., Khalid, A., Damiron, K., & Rowden, A. (2015). Phencyclidine intoxication case series study. *Journal of Medical Toxicology*, *11*, 321-325.
- Fujiwara, E. & Markowitsch, H.J. (2005). Autobiographical memory disorders. In T. E. Feinberg & J. P. Keenan (Eds.), *The lost self: Pathologies of the brain and identity* (pp. 65-80). New York: Oxford University Press.
- Green, P. (2003). *Green's Word Memory Test: User's manual*. Edmonton, Canada: Green's Publishing Inc.
- Jelicic, M. (2018). Testing claims of crime-related amnesia. *Frontiers in Psychiatry*, *9*, 617. doi: 10.3389/fpsy.2018.00617
- Jelicic, M., Merckelbach, H., & Van Bergen, S. (2004). Symptom validity testing of feigned amnesia for a mock crime. *Archives of Clinical Neuropsychology*, *19*, 525-531. doi: 10.1016/j.acn.2003.07.00
- Jenkins, K. G., Kapur, N., & Kopelman, M. D. (2009). Retrograde amnesia and malingering. *Current Opinion in Neurology*, *22*, 601-605.
- Jus, A., & Jus, K. (1962). Retrograde amnesia in petit mal. *Archives of General Psychiatry*, *6*, 163-167.
- Kent, P. L. (2026). 80 years of the Wechsler Memory Scale: A selective review. *Applied Neuropsychology: Adult*, in press. doi: 10.1080/23279095.2026.2612724
- Lah, S., Lee, T., Grayson, S., & Miller, M. (2006). Effects of temporal lobe epilepsy on retrograde memory. *Epilepsia*, *47*, 615-625.
- Levine, L., Svoboda, E., Hay, J. F., Winocur, G., & Moscovitch, M. (2002). Aging and autobiographical memory: dissociating episodic from semantic retrieval. *Psychology of Aging*, *17*, 677-689.
- Lezak, M. D., Howieson, D. B., Bigler, E. D., & Tranel, D. (2012). *Neuropsychological assessment* (5th ed). New York: Oxford University Press.
- Markowitsch, H. J. (2003). Memory: Disturbances and therapy. In T. Brandt, L. Caplan, J. Dichgans, H. C. Diener & C. Kennard (Eds.), *Neurological disorders; Course and treatment* (2nd ed.) (pp. 287-302). San Diego: Academic 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. (2013). Memory and self – Neuroscientific landscapes. *ISRN Neuroscience*, Art ID 176027. <http://dx.doi.org/10.1155/2013/176027>.
- Markowitsch, H. J., Schröder, J., Kordon, A., & Staniloiu, A., (2023). Measures of episodic memory. In G. J. Boyle, Y. Stern, D. J. Stein, B. J. Sahakian, C. J. Golden, T. M.-C. Lee & S.-H. A. Chen (Eds.), *The SAGE Handbook of clinical neuropsychology* (Volume 2) (pp. 162-178). London: Sage Publ.
- Markowitsch, H. J., & Staniloiu, A. (2011). Memory, auto-noetic consciousness, and the self. *Consciousness and Cognition*, *20*, 16-39.
- 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., & Staniloiu, A. (2025). Episodic-autobiographical memory and functional amnesia. *Translational Neuroscience*, *16*, 20250387. <https://doi.org/10.1515/tnsci-2025-0387>
- Mayes, A. R., Isaac, C. L., Holdstock, S., Cariga, P., Gummer, A., & Roberts, N. (2003). Long-term amnesia: a review and detailed illustrative case study. *Cortex*, *39*, 567-603.
- Meeter, M., Eijsackers, E. V., & Mulder, J. L (2006). Retrograde amnesia for autobiographical memories and public events in mild and moderate Alzheimer's disease. *Journal of Clinical and Experimental Neuropsychology*, *28*, 914-927.

- Rathbone, C. J., Moulin, C. J. A., & Conway, M. A. (2009). Autobiographical memory and amnesia: using conceptual knowledge to ground the self. *Neurocase, 15*, 405-418.
- Rubenzler, S. J. (2023). Ruling out feigned crime-related amnesia? A response to Acklin (2022). *Behavioral Science and the Law, 41*, 207-223.
- Ryan, J. J., Kreiner, D. S., Gontkovsky, S. T., & Teichner, G. (2025). Wechsler Memory Scale-fourth edition (WMS-IV) in the neuropsychological evaluation of patients diagnosed with probable Alzheimer's disease. *Applied Neuropsychology: Adult, 32*, 245-252.
- Schagen, S., Schmand, B., de Sterke, S., & Lindeboom, J. (1997). Amsterdam Short-Term Memory test: a new procedure for the detection of feigned memory deficits. *Journal of Clinical and Experimental Neuropsychology, 19*, 43-51.
- Staniloiu, A., Kordon, A., & Markowitsch, H. J. (2020). 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.
- Tombaugh, T. N. (1996). *Test of Memory Malingering (TOMM)*. New York: Multi Health Systems.
- Tulving, E. (1985). Memory and consciousness. *Canadian Psychologist, 25*, 1-12.
- Tulving, E. (2002). Episodic memory: from mind to brain. *Annual Review of Psychology, 53*, 1-25.
- Tulving, E., & Markowitsch, H. J. (1998). Episodic and declarative memory: Role of the hippocampus. *Hippocampus, 8*, 198-204.