Commentary on

Barzykowski & Moulin

Word counts

ABSTRACT: 56

MAIN TEXT: 908

REFERENCES: 280

ENTIRE TEXT: 1312

Neuropsychological predictions on involuntary autobiographical memory and déjà vu

Christine Bastin

GIGA-Cyclotron Research Center-In Vivo Imaging, University of Liège, Belgium

Quartier Agora, Allée du 6 Août, 8, B30, 4000 Liège, Belgique

Telephone : +32 4 366 23 69

Email: [Christine.Bastin@uliege.be](mailto:Christine.Bastin@uliege.be)

[https://www.gigaaml.uliege.be](https://www.gigaaml.uliege.be/)

Abstract

I strongly support Barzykowski and Moulin in their proposal that common retrieval mechanisms can lead to distinct phenomenological memory experiences. I emphasize the importance of one of these mechanisms, namely the attribution system. Neuropsychological studies should help clarifying the role of these retrieval mechanisms, notably in cases of medial temporal lobe lesions and cases of dementia.

Main text

A fundamental tenet in Barzykowski and Moulin’s proposal is the idea of common retrieval mechanisms leading to distinct phenomenological memory experiences depending on the success/failure and degree of involvement of these mechanisms. In both involuntary autobiographical memory and déjà vu, there are a rapid cue-generated automatic search in memory, a feeling of familiarity and attribution processes that come into play. I agree with Barzykowski and Moulin that a key difference lies in the content reactivation, with content that comes successfully to mind in the case of involuntary autobiographical memories and failure to find any content in the case of déjà vu. However, more emphasis could be made on the fact that the two types of memory experiences critically differ in the extent of contribution of the attribution system. Of note, the notion of attribution system refers here to the cognitive appraisal of the result of the memory search to generate an output (Bastin et al., 2019). In other words, this corresponds to the set of inferential and monitoring processes that evaluate retrieved contents before deciding about the old/new status of the information or expressing a subjective feeling of memory. In involuntary autobiographical memories, the retrieval cue leads to the rapid reactivation of some content that is compatible with expectations that there is indeed a memory trace. Here, the match between content reactivation and feelings of familiarity is satisfactory and not surprising, so that attribution processes take the form of relatively automatic and unconscious inferential processes. In contrast, in déjà vu, some cues generate expectation of processing fluency and feeling of familiarity, but the search fails to find any content. Attribution processes become hyperactive because they detect a mismatch between content and feeling. Moreover, there is knowledge that it is not possible to have content. This conflict reaches consciousness and is likely responsible for the unique phenomenology of déjà vu. Another common mechanism that is evoked in Barzykowski and Moulin is that elements of internal and external context are automatically weighted against prior knowledge, and this generates expectations. There are similarities with the ideas proposed in the Predictive Interactive Multiple Memory Systems model (Henson & Gagnepain, 2010). Notably, Henson and Gagnepain (2010) suggest that the content retrieved in a memory system is compared to context-based predictions. In this view, déjà vu arises from a prediction error as the absence of memory content mismatches the expectations.

If involuntary autobiographical memory and déjà vu rely on the same neurocognitive architecture, one expects that selective dysfunction of some retrieval mechanisms following brain damage impacts the expression of these phenomenological experiences. Predictions for brain-damaged patients is only briefly mentioned in Barzykowski and Moulin’s article, but this is an important avenue for future research as it provides a way to test predictions emerging from the proposal. Barzykowski and Moulin predict that patients with medial temporal lobe damage should show similar changes in déjà vu and involuntary autobiographical memories. For instance, temporal lobe epilepsy would be associated with more déjà vu experiences and more involuntary autobiographical memories. However, if the two memory phenomena differ critically on the access to content, one may predict a different pattern. Considering that the medial temporal lobe is critical to store contents of past episodes (Davachi, 2006; Eichenbaum et al., 2007; Ranganath & Ritchey, 2012), medial temporal lobe damage should decrease involuntary autobiographical memories. And as metacognitive appraisal would partly depend on frontal areas (Chua et al., 2014; Kurilla & Gonsalves, 2012) and is not expected to be impaired in medial temporal lobe pathology, such patients may show preserved or more déjà vu experiences. The opposite pattern would be expected in patients with frontal lobe damage, with the disappearance of déjà vu experiences and intact or increased involuntary autobiographical memories.

An interesting case is the one of patients with dementia as the extent of the neuropathology disrupts several retrieval mechanisms evoked as the building blocks for involuntary autobiographical memory and déjà vu. Patients with dementia sometimes present with persistent déjà vu whereby they have the feeling that everyday life events constantly repeat (Moulin, 2013). These patients typically come up with some explanations about their pervasive feeling of memory (i.e., confabulations) and do not report knowing that this feeling of memory is false. This is likely because both memory content and attribution processes are altered because of medial temporal and frontal pathology (Moulin, 2013). Another line of research suggests that demented patients have preserved involuntary autobiographical memories evoked by nostalgia films or music (El Haj et al., 2012; Rasmussen et al., 2021), which may seem surprising if these memories rely on the same retrieval mechanisms that are impaired and cause persistent déjà vu. Nevertheless, it is likely that those memories are recollection of remote memories, mostly belonging to young adulthood, whose content is consolidated (Berntsen et al., 2022). So, the question remains as to the integrity of involuntary autobiographical recall of recent memories in demented patients. This also raises the possibility that involuntary autobiographical memory and déjà vu differ on another dimension, which is temporality. Whereas involuntary autobiographical memory brings back to mind events from any time in the past, déjà vu seems anchored in the present (i.e., “the situation I experience *now* feels familiar even if I know it is new”) with some glimpse into the future with the feeling of prescience. I agree with Barzykowski and Moulin that considering both involuntary autobiographical memory and déjà vu experiences within the same sample would provide insights as to their common mechanisms.

COMPETING INTEREST STATEMENT

Competing interests: none

FUNDING STATEMENT

This work was supported by the F.R.S.-FNRS (CB is a senior research associate at F.R.S.-FNRS).

References

Bastin, C., Besson, G., Simon, J., Delhaye, E., Geurten, M., Willems, S., & Salmon, E. (2019). An Integrative Memory model of recollection and familiarity to understand memory deficits. *Behavioral and Brain Sciences*, *42*(e281), 1-60. https://doi.org/10.1017/S0140525X19000621

Berntsen, D., Kirk, M., & Kopelman, M. D. (2022). Autobiographical memory loss in Alzheimer's disease: The role of the reminiscence bump. *Cortex*, *150*, 137-148. https://doi.org/https://doi.org/10.1016/j.cortex.2022.02.008

Chua, E., Pergolizzi, D., & Weintraub, R. R. (2014). The Cognitive Neuroscience of Metamemory Monitoring: Understanding Metamemory Processes, Subjective Levels Expressed, and Metacognitive Accuracy. In S. M. Fleming & C. D. Frith (Eds.), *The Cognitive Neuroscience of Metacognition* (pp. 267-291). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-45190-4\_12

Davachi, L. (2006). Item, context and relational episodic encoding in humans. *Current Opinion in Neurobiology*, *16*(6), 693-700. https://doi.org/10.1016/j.conb.2006.10.012

Eichenbaum, H., Yonelinas, A. P., & Ranganath, C. (2007). The medial temporal lobe and recognition memory. *Annual Review of Neuroscience*, *30*, 123-152. https://doi.org/10.1146/annurev.neuro.30.051606.094328

El Haj, M., Fasotti, L., & Allain, P. (2012). The involuntary nature of music-evoked autobiographical memories in Alzheimer’s disease. *Consciousness and Cognition*, *21*(1), 238-246. https://doi.org/https://doi.org/10.1016/j.concog.2011.12.005

Henson, R. N., & Gagnepain, P. (2010). Predictive, interactive multiple memory systems. *Hippocampus*, *20*(11), 1315-1326. https://doi.org/10.1002/hipo.20857

Kurilla, B. P., & Gonsalves, B. D. (2012). An ERP investigation into the strategic regulation of the fluency heuristic during recognition memory [Research Support, N.I.H., Extramural]. *Brain Research*, *1442*, 36-46. https://doi.org/10.1016/j.brainres.2011.12.060

Moulin, C. J. (2013). Disordered recognition memory: recollective confabulation. *Cortex*, *49*(6), 1541-1552. https://doi.org/10.1016/j.cortex.2013.01.010

Ranganath, C., & Ritchey, M. (2012). Two cortical systems for memory-guided behaviour. *Nature Reviews: Neuroscience*, *13*, 1-15.

Rasmussen, K. W., Salgado, S., Daustrand, M., & Berntsen, D. (2021). Using nostalgia films to stimulate spontaneous autobiographical remembering in Alzheimer’s disease. *Journal of Applied Research in Memory and Cognition*, *10*(3), 400-411. https://doi.org/10.1016/j.jarmac.2020.11.001