

Involuntary autobiographical memories

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Involuntary autobiographical memories (IAMs) seem to pop up into consciousness more easily and more frequently than voluntary memories. Occurring without any deliberate attempt at retrieval and often during undemanding everyday activities, IAMs also appear to be more resistant to ageing and dementia.

Newly developed laboratory paradigms, such as the free word association method or a vigilance task, could be used along with neuroimaging to help describe the functional anatomy and pathways of IAMs in the brain. It may even be possible to use IAMs with older adults to maintain psychological well-being and positive outlook in life.

questions

Can apparently random memories that enter our mind unbidden tell us anything meaningful about cognition? Can they tell us anything about our personal relationship with the past?

resources

Berntsen, D. (2009). *Involuntary autobiographical memories: An introduction to the unbidden past*. Cambridge: Cambridge University Press.
<http://involuntarymemory.blogspot.fr>
<http://www.psychologytoday.com/blog/mental-mishaps/201202/intrusive-memories-happy-experiences>

references

Ball, C.T. (2007). Can we elicit involuntary autobiographical memories in the laboratory? In J.H. Mace (Ed.) *Involuntary memory* (pp.127–153). Oxford: Blackwell.
 Berntsen, D. (1996). Involuntary autobiographical memories. *Applied Cognitive Psychology*, 10, 435–454.
 Berntsen, D. (2009). *Involuntary autobiographical memories: An introduction to the unbidden past*.

Cambridge: Cambridge University Press.
 Berntsen, D. (2010). The unbidden past: Involuntary autobiographical memories as a basic mode of remembering. *Current Directions in Psychological Science*, 19(3), 138–142.
 Berntsen, D. & Hall, N.M. (2004). The episodic nature of involuntary autobiographical memories. *Memory and Cognition*, 32(5), 789–803.

Bradley, R.J. & Moulin, C.J.A. (2009). *Laboratory induced memories in groups of young and old*. Unpublished report.
 Clegg, D. (2010). *Tell Mrs Mill her husband is still dead*. London: Trebus Projects.
 Conway, M.A. & Pleydell-Pearce, C.W. (2000). A construction of autobiographical memories in the self-memory system. *Psychological Review*, 107(2), 261–288.

Ebbinghaus, H. (1964) *Memory: A contribution to experimental psychology* [H.A. Ruger & C.E. Bussensiv, Trans.]. New York: Dover. [Original work published 1885]
 Galton, F. (1879). Psychometric experiments. *Brain*, 2(2), 149–162.
 Hall, N.M., Gjedde, A. & Kupers, R. (2008). Neural mechanisms of voluntary and involuntary recall: A PET study. *Behavioural Brain Research*, 186, 261–272.

Illman, N.A., Butler, C.R., Souchay, C. & Moulin, C.J.A. (2012). Déjà vu experiences in temporal lobe epilepsy. *Epilepsy Research and Treatment*. doi:10.1155/2012/539567
 Jones, G.V. & Martin, M. (2006). Primacy of memory linkage in choice among valued objects. *Memory and Cognition*, 34(8), 1587–1597.
 Mace, J.H. (2004). Involuntary autobiographical memories are highly dependent on abstract cueing: The Proustian view is incorrect. *Applied Cognitive Psychology*, 18, 893–899.

Mace, J.H. (2006). Episodic remembering creates access to involuntary conscious memory: Demonstrating involuntary recall on a voluntary recall task. *Memory*, 14(8), 917–924.
 Mace, J.H. (Ed.) (2007). *Involuntary memory*. Oxford: Blackwell.

Mace, J.H. (Ed.) (2010). *The act of remembering the past: Toward an understanding of how we recall the past*. Oxford: Wiley-Blackwell.
 Mace, J.H., Atkinson, E., Moeckel, C.H. & Torres, V. (2011). Accuracy and perspective in involuntary autobiographical memory. *Applied Cognitive Psychology*, 25(1), 20–28.
 Milton, F., Butler, C.R. & Zeman, A.Z.J.

(2011). Transient epileptic amnesia: Déjà vu heralding recovery of lost memories. *Journal of Neurology, Neurosurgery & Psychiatry*, 82, 1178–1179.
 Penfield, W. & Perot, P. (1963). The brain's record of auditory and visual experience. *Brain*, 86(4), 595–696.
 Rasmussen, A.S. & Berntsen, D. (2009). The possible functions of involuntary autobiographical memories. *Applied*

reoccurrences of the psychedelic drug effect' (Wesson & Smith, 1976, p.425). Generally, they decrease in intensity and frequency once drug taking ceases, but are often distressing and debilitating when they occur. Some of the defining features of memories in post-traumatic stress disorder (PTSD) are that they repeatedly intrude upon consciousness, are extremely distressing and are difficult to control. Spontaneous recurrence of past memories has also been noted in patients with temporal lobe epilepsy shortly before or during simple partial seizures.

However, more contemporary strands of research suggest that IAMs are actually a relatively normal part of our mental lives, and that they form a useful and important directive function, guiding present and future thinking and behaviour. Cues in the environment can provide rapid access to past experiences, which may have survival value in situations that could be life threatening, or require problems to be solved quickly (Rasmussen & Berntsen, 2009).

IAMs occur spontaneously without any deliberate intention to recall anything. In fact they are most likely to occur when individuals are engaged in regular, automatic activities that are not attentionally demanding, such as walking, driving or eating. It is estimated that they occur on average three to five times a day (Berntsen, 1996), and up to three times as frequently as voluntary memories (Rasmussen & Berntsen, 2011). So for most people they are common, unexceptional occurrences, but occasionally they can be extremely meaningful, as described by Proust, or surprising. 'Colin', who has dementia, clearly describes this kind of unexpected memory:

I think if you get a little stimulus you can then remember quite clearly an incident and what connects with it branch by branch... going backwards I think I can work my way down to the roots... for example I saw a picture of a man digging a hole in a piece of ice

somewhere and instantly what that did was make me think of the time I was in Kazakhstan somewhere in winter. (Clegg, 2010, p.133)

How can they be measured?

Over the decades since Ebbinghaus first described these types of memories, different methods have been used to study them. Some writers followed the self-testing approach advocated by Ebbinghaus, such as Esther Salaman (1970), who analysed systematically her own involuntary memories, but there were few empirical studies. It was only in the final decade of the 20th century that involuntary memories became an area of interest to cognitive psychologists, and it is now becoming a steadily growing field of research (e.g. Berntsen, 1996, 2009, 2010; Mace, 2007, 2010).

Involuntary memories can be difficult



Cues in the environment can provide rapid access to past experiences

to trigger experimentally because they require personal, or idiosyncratic, cues, and once a person becomes aware of trying to bring back a memory it becomes a voluntary memory. Most studies performed in the last 10 to 15 years have consisted of diaries and questionnaires, requiring participants to keep records of any involuntary memories that occurred over a specific time period, with details of how they were cued, and their content, vividness, etc. These studies have produced interesting and replicable findings concerning the frequency and nature of IAMs.

However, more recently, several laboratory paradigms have been developed to study IAMs under controlled conditions. For example Mace (2006) showed that participants reported experiencing IAMs when recalling specific memories in response to cue phrases such as 'being at a picnic' – so called 'memory chaining'. Ball (2007) elicited IAMs in college students using the free word association method, with participants instructed to generate continuous associations cued by words such as 'coffee' or 'thunder', until the experimenter stopped them after 20 to 30 seconds. The responses were recorded and after three word-association trials participants listened to their replies and stated whether or not a past personal experience had come to mind during the trials. IAMs were reported during 86 per cent of the trials. In our replication study with 31 adults, aged 21 to 86 years, we showed that a word association task led to the generation of vivid IAMs in 90 per cent of our participants (Bradley & Moulin, 2009). For example, a 73-year-old male

recalled a violent hailstorm in North Wales that he experienced 55 years before, triggered by the word 'storm'. He remembered the sight of the storm coming, and feeling concerned, wet and annoyed. Furthermore, Schlagman and Kvavilashvili (2008) developed a laboratory paradigm that enables researchers to measure retrieval times of IAMs while participants are engaged in an easy vigilance task requiring the detection of target vertical lines amongst a stream of horizontal lines. The IAMs are mostly reported as being triggered by random words, that participants were told to ignore, displayed in the centre of the array of lines.

Results from these and other studies have consistently shown that IAMs are more likely to be of a specific event, and come to mind significantly faster than voluntary autobiographical memories. They are also more likely to result in bodily reactions and impact on current mood than voluntary memories (Berntsen & Hall, 2004). However, no differences were observed in terms of perspective experienced in memory (field vs. observer) and the accuracy (measured by participants' own confidence ratings) of recorded memories (Mace et al., 2011).

Triggers of IAMs

One consistent finding that has emerged from the literature is that the majority of IAMs are triggered by easily detectable cues in one's environment or thoughts. Mace (2004) investigated the types of cues most likely to elicit IAMs in healthy adults aged 21 to 58 years. Participants recorded their involuntary memories and triggers in diaries covering a two-week period. The results showed that more memories were triggered by abstract verbal/linguistic cues (68 per cent) than by sensory/perceptual cues (30 per cent). Similarly, in a one-week long diary study of young and old participants, Schlagman et al. (2007) found that the reported IAMs were equally likely to be linguistically based or sensory/perceptual. Mace (2004)

therefore concluded that these results do not support the 'Proustian' view that IAMs are predominantly triggered by taste and aroma cues.

Jones and Martin (2006) investigated the importance of objects in eliciting memories in everyday life. They discovered that participants valued objects with the capacity of bringing back memories more highly than other characteristics, such as their monetary value or usability. This was found to be consistent between two age groups, 'young' (mostly students under 25 years) and 'old' (working people aged 30 and above). Jones and Martin suggest that people may deliberately keep objects around them, knowing they can evoke involuntary memories, rather than rely solely on being able to voluntarily recall these memories. This was further supported by Wildschut et al. (2006) who found that objects, places and other people can trigger spontaneous memories that are accompanied by feelings of nostalgia, which in turn may lead to positive affect and increased self-esteem in the rememberer.

In sum, the research has shown strong links between IAMs and cues in one's environment and thoughts which are often of verbal/linguistic nature and relate to key aspects of the recalled memory. Hence, IAMs are spontaneous not because they are cue-independent but because there is no intention to recall at the time (Berntsen, 1996).

Ageing and IAMs

Memory research has a rich tradition of drawing upon the experiences and performances of older adults in order to better understand memory function. There is a large body of research showing that older adults perform worse than young adults in laboratory episodic memory tasks such as free recall, recognition and cued recall. That is, their auto-noetic (self-reflecting) memories of experiencing events diminish, but they retain a sense of noetic familiarity (just knowing) that the event occurred.

Significant age effects have also been obtained in the (voluntary) autobiographical memory test, where older adults recall fewer memories in response to word cues than younger adults. In addition, it takes them longer to recall these memories, and they are less likely to recall memories of specific events that happened at a particular time and date. These findings are explained by older adults' reduced ability to engage in controlled retrieval processes. However, will similar age effects be obtained for IAMs?

According to Conway and Pleydell-Pearce's (2000) influential model of autobiographical memory, during involuntary recall 'ecphoric' cues can bypass the usual top-down strategic retrieval pathway, involving activation of the left frontal lobe, resulting in a rapid formation of memory. This automatic route to remembering may be preserved in older adults, producing involuntary memories, while more wilful, strategic search processes are diminished or impaired. Therefore older adults' IAMs should be as specific as in young adults, and the frequency of these memories should be comparable across the age groups.

However, initial research has produced somewhat inconsistent findings. Thus, older adults tend to report fewer IAMs in their everyday life than younger adults, which is similar to findings from voluntary autobiographical memories. Young and old participants in the study of Schlagman et al. (2009) had to recall voluntary autobiographical memories in response to word cues and record their IAMs in a diary for seven days. Results showed that older adults recalled fewer voluntary memories as well as fewer IAMs than younger adults. However, while there was a significant effect in the specificity of voluntary memories, older adults' IAMs were as specific as young adults' IAMs, providing support to Conway's theory that older adults may have automatic access to some memories in response to strong external or internal cues (Conway & Pleydell-Pearce, 2000). One way to explain why older

adults report fewer IAMs is to suggest that due to limited attentional resources, older adults are less aware of memories automatically produced in response to cues owing to their attention being focused on ongoing activities. Indeed, several studies have indicated that older adults perceive their ongoing tasks as more attentionally demanding than young adults.

What meaning and emotional valence do these memories hold? Schlagman and colleagues compared the effects of age on involuntary and voluntary memories, and found that older adults rated their involuntary memories more positively than young adults, and this positivity effect was not found with voluntary memories (Schlagman et al., 2009). Schlagman and colleagues had previously analysed the content of involuntary memories, looking specifically at the positivity effect in old age (Schlagman et al., 2006). They found that young and old recalled similar numbers of positive memories, but their older group recalled fewer with negative content. If negative involuntary memories were recalled, older people rated them as neutral or even positive.

To sum up, it seems likely that older people can retain an automatic fast route to their involuntary memories, which more often than not provide pleasurable links to their past, even if the original events might be negative.

Intracortical stimulation, déjà vu and IAMs

There is a clear overlap between the experiences of déjà vu and involuntary memories: both are vivid, uncontrolled and relatively rare experiences. The idea has recently been put forward that déjà vu and involuntary memory may lie on a continuum, with uncued feelings of familiarity being déjà vu, but recollection of prior events being involuntary memory (Illman et al., 2012).

The main evidence for this idea comes from studies of temporal lobe epilepsy, an area of research that is overlooked in the involuntary memory literature, and in



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particular, intracortical stimulation studies. Famously, Penfield (e.g. Penfield & Perot, 1963) was able to induce déjà vu by electrically stimulating the temporal lobe. The resulting phenomena included sights, sounds and emotions of past events, which the patients recognised spontaneously as personal experiences, and noted that their 'vividness or wealth of detail and the sense of immediacy that goes with them serves to set them apart from the ordinary process of recollection' (p.679). Penfield's work, and that of later researchers using similar methods shows that this artificial process generates 'illusions' such as déjà vu, and also fully formed memories – which we suggest are experienced in a similar way to involuntary memories.

Such experiences do also occur spontaneously in epilepsy without stimulation. In *The Man Who Mistook His Wife for a Hat* Oliver Sacks (1985) describes the case of an elderly lady, Mrs O'C, who experienced epileptic seizures after suffering a small thrombosis in her temporal lobe. For a few months following the stroke she experienced vivid memories that transported her back to her childhood, to 'her long-forgotten home, in the arms and presence of her mother'. Sacks describes this as 'a trembling, profound and poignant joy...like the opening of a door...which had been stubbornly closed all her life' (p.156). He contends that these kinds of 'Proustian' memories should be investigated further, to stimulate 'a new and beautiful "existential" science and therapy' (p.142) which may help to understand and support brain-damaged patients.

Milton et al. (2011) describe an epileptic patient who presented with an

extensive loss of autobiographical memories from his past that remained following treatment. He had never previously experienced déjà vu, but following his treatment period reported six or seven episodes of déjà vu. After these episodes he then reported the spontaneous retrieval of a number of remote memories that were previously inaccessible. These memories were verified by his wife. Formal testing revealed that one of the recovered memories was retrieved with the same level of contextual richness, or episodicity, as matched controls.

This overlap offers us a chance to examine the underlying neural mechanisms responsible for both, which converge on erroneous activation of the temporal lobe, decoupled from other structures. In short, we suggest that déjà vu experiences and involuntary memories probably arise in overlapping neural regions and both capture some subjective form of uncontrolled memory experience. Whilst there is much neurological research on déjà vu, there is less on IAMs. Hall et al. (2008) carried out a PET study in healthy controls, using emotionally charged pictorial cues, and found that involuntary memory retrieval by-passed the initial search process, mediated by the prefrontal cortex, which occurs in conscious voluntary retrieval. This concurs with Conway and colleagues' (2000) view that involuntary retrieval can bypass the pathway involving activation of the left prefrontal lobe.

Future research

Since Proust's first characterisation of involuntary memories, there have been

several research programmes investigating this topic. But research into IAMs, compared to strategic, wilful retrieval, is still modest. Given the nature of IAMs and their prevalence in daily life and the links they have with conditions such as PTSD and epilepsy, it seems more research would be worthwhile.

A combination of neuroimaging and laboratory methods of studying IAMs, described earlier, may help to illuminate the retrieval processes in healthy people, and it may also help to explain why dementia sufferers such as 'Colin' are able to experience involuntary memories. It is believed that people with dementia find it difficult to actively retrieve memories because their working memory is impaired, possibly due to frontal lobe damage resulting from the disease. Because of the automatic nature of retrieval, involuntary memories may not require any working memory input. It is possible that dementia patients retain precious autobiographical memories that are locked out of reach until suitable triggers release them (resembling Oliver Sacks's patient, Mrs O'C.), and it may be possible to train caregivers, in relatively simple ways, to reactivate these memories, and thus help maintain sufferers' sense of self and life stories. This might bring positive emotional effects: participants in Schlagman et al. (2009) experienced mostly positive emotions with their involuntary memories, and some described feelings of nostalgia, itself associated with pleasure, joy, goodness and love (Wildschut et al., 2006).



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Cognitive Psychology, 23, 1137-1152.
Rasmussen, A.S. & Berntsen, D. (2011). The unpredictable past: Spontaneous autobiographical memories outnumber autobiographical memories retrieved strategically. *Consciousness and Cognition*, 20(4), 1843-1846.
Sachs, O. (1985). *The man who mistook his wife for a hat*. London: Picador.

Salaman, E. (1970). *A collection of moments: A study of involuntary memories*. London: Longman.
Schlagman, S., Kliegal, M., Schulz, J. & Kvavilashvili, L. (2009). Differential effects of age on involuntary and voluntary autobiographical memory. *Psychology and Aging*, 24(2), 397-411.
Schlagman, S. & Kvavilashvili, L. (2008). Involuntary autobiographical

memories in and outside the laboratory. *Memory and Cognition*, 36(5), 920-932.
Schlagman, S., Kvavilashvili, L. & Schulz, J. (2007). Effect of age on involuntary memories. In J.H. Mace (Ed.) *Involuntary memory* (pp.87-126). Oxford: Blackwell.
Schlagman, S., Schulz, J. & Kvavilashvili, L. (2006). A content analysis of involuntary memories.

Memory, 14(2), 161-175.
Wesson, D.R. & Smith, D.E. (1976). An analysis of psychedelic drug flashbacks. *American Journal of Drug and Alcohol Abuse*, 3(3), 425-438.
Wildschut, T., Sedikides, C., Arndt, J. & Routledge, C. (2006). Nostalgia. *Journal of Personality and Social Psychology*, 91(5), 975-993.