CORTEX 205 (2026) 91–112

Available online at www.sciencedirect.com

ScienceDirect

Journal homepage: www.elsevier.com/locate/cortex

Single Case Report

Highly superior autobiographical memory (HSAM) in a 16-year-old male: Investigating involuntary autobiographical memory with questionnaire and laboratory methods

Krystian Barzykowski [a,b,*], *Valerio Santangelo* [c], *Lia Kvavilashvili* [d,1] *and Chris J.A. Moulin* [a,**,1]

[a] *Laboratoire de Psychologie et NeuroCognition, CNRS UMR 5105, Université Grenoble Alpes, France*
[b] *Applied Memory Research Laboratory, Institute of Psychology, Faculty of Philosophy, Jagiellonian University, Poland*
[c] *Department of Philosophy, Social Sciences & Education, University of Perugia, Perugia, Italy*
[d] *University of Hertfordshire, Hatfield, United Kingdom*

ARTICLE INFO

Article history:
Received 27 April 2026
Revised 20 August 2026
Accepted 22 August 2026
Action editor Daniel C. Mograbi
Published online 6 September 2026

Keywords:
Highly superior autobiographical memory
HSAM
Involuntary autobiographical memories
Autobiographical memory
IAMI
Threshold model

ABSTRACT

Highly Superior Autobiographical Memory (HSAM) is characterized by an exceptional ability to recall personal past events with remarkable accuracy and detail. While the mechanisms underlying this ability have begun to be elucidated, research so far has largely focused mainly on voluntary retrieval processes. The present study aimed to investigate autobiographical memory functioning in a single HSAM case (KCL), with a particular focus on involuntary autobiographical memories (IAMs). We combined standardized HSAM screening procedures with a multi-method assessment of autobiographical memory, implemented remotely under continuous researcher supervision. General autobiographical functioning was assessed using the Autobiographical Recollection Test and the Survey of Autobiographical Memory. Additional measures captured general memory functioning, mind-wandering, metacognitive and phenomenological characteristics, cognitive control, and affective and personality variables. IAMs were assessed using both self-report (Involuntary Autobiographical Memory Inventory) and a laboratory vigilance task with incidental cue-words and probe-caught thought sampling. KCL met established HSAM criteria and exhibited a markedly elevated frequency of IAMs relative to a comparison group, both in self-report and laboratory measures. Crucially, this increase did not reflect a general rise in spontaneous cognition, as overall task-unrelated thought frequency remained comparable, but rather a selective bias toward autobiographical content. At the same time, KCL did not differ from the general population in overall phenomenological experience of remembering, although he reported elevated autobiographical memory ability alongside increased confidence in memory accuracy. The results highlight the central role of involuntary

* *Corresponding author*. Applied Memory Research Laboratory, Institute of Psychology, ul. Ingardena 6, 30-363 Krakow, Poland.
** *Corresponding author*. Laboratoire de Psychologie & NeuroCognition (LPNC CNRS 5105), Université Grenoble Alpes, Domaine Universitaire de St Martin d'Hères, 1251 avenue Centrale, 38040, Grenoble, France.
E-mail addresses: krystian.barzykowski@uj.edu.pl (K. Barzykowski), christopher.moulin@univ-grenoble-alpes.fr (C.J.A. Moulin).
[1] These authors contributed equally as last authors.
https://doi.org/10.1016/j.cortex.2026.08.017
0010-9452/© 2026 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

remembering and point to altered cue sensitivity and lowered retrieval thresholds as key mechanisms underlying exceptional autobiographical memory.
© 2026 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

1. Introduction

What were you doing on March 19, 2024? Take a moment to try to recall a specific personal event from that exact date. Can you remember where you were, what you were doing, what day of the week it was, what the weather was like, how you felt, and what stood out as the most important event of that day? If this proves difficult, you might instead try to recall whether any notable public events occurred around that time—perhaps a major political development, a widely reported news story, or a sporting event. Such information is often easier to retrieve, as it can be reconstructed from general knowledge, external cues, or media exposure, even if the exact details remain uncertain. In contrast, recalling a specific personal episode tied to an arbitrary calendar date places far greater demands on autobiographical memory.

For most individuals, such retrieval is effortful, fragmentary, or simply unsuccessful. However, a small number of people can access this type of information with precision and ease. These individuals are described as having Highly Superior Autobiographical Memory (HSAM)—a rare ability characterized by the capacity to recall a high proportion of personal past events with accuracy and detail, often anchored to specific calendar dates (e.g., Parker, Cahill, & McGaugh, 2006; LePort et al., 2012; for a comprehensive review see Talbot et al., 2024).

1.1. *Highly superior autobiographical memory (HSAM): current knowledge and open questions*

Exceptional memory abilities have long attracted both scientific and public interest. Early accounts of extraordinary memory, such as the case of Solomon Shereshevsky described by Łuria (1987), highlighted remarkable mnemonic capacities, although these were often linked to the use of deliberate strategies. Similar cases have been reported in several other studies. For example, Hunt and Love (1972, 1983) described someone capable of playing multiple correspondence chess games simultaneously without notes and memorizing complex spatial layouts from early childhood, while Gordon, Valentine, and Wilding (1984) reported a case involving advanced mnemonic strategies for memorizing long digit sequences. More broadly, reviews of exceptional memory cases indicate that such abilities are typically supported by highly practiced mnemonic techniques (Wilding & Valentine, 1997). A more specific focus on autobiographical memory emerged with the description of the case of Jill Price (AJ) reported by Parker et al. (2006; Price & Davis, 2008). She demonstrated an exceptional ability to recall personal past events with detail and accuracy. Notably, her autobiographical retrieval was described as automatic, involuntary, and persistent, distinguishing them from strategy-based mnemonic performance.

Since this initial report on HSAM, there has been a growing number of studies examining additional cases worldwide (for a recent comprehensive overview of HSAM as a cognitive and research phenomenon, including newly identified cases across different populations, see Talbot et al., 2025a). This literature has converged on the notion of HSAM as an extraordinary capacity to recall personal past events in a highly detailed and temporally precise manner across extended periods of one's life. Memories can be readily accessed, often in response to internal or external cues, with calendar dates being particularly effective in eliciting specific recollections (e.g., Parker et al., 2006). People with HSAM are able to accurately identify when events occurred, including precise temporal information such as the day of the week, and their recollections are typically vivid, detailed, and confidently reported. Crucially, in contrast to other forms of exceptional memory performance, such as those observed in trained memory experts, HSAM does not rely on the use of explicit mnemonic strategies. Instead, retrieval processes are described as largely automatic, with memories often arising spontaneously and without intentional effort, regardless of their subjective relevance or emotional significance. The superior ability to retrieve personal memories in HSAM has been shown to rely on increased activation within a large brain network encompassing medial prefrontal, medial temporal, and temporo-parietal regions (Santangelo et al., 2018), particularly during memory retrieval rather than elaboration (Daviddi, Pedale, St Jacques, Schacter, & Santangelo, 2023). Within this network, a key role appears to be played by the ventromedial prefrontal cortex, especially in supporting the retrieval of memories that are either particularly old (Santangelo, Pedale, Macrì, & Campolongo, 2020) or difficult to retrieve (Santangelo et al., 2021). Beyond task-based activity, people with HSAM also exhibit altered patterns of resting-state connectivity (Daviddi, Pedale, et al., 2022; De Marco, Mazzoni, Manca, & Venneri, 2021; Orwig et al., 2024), suggesting differences in how information is encoded and consolidated (see also Santangelo et al., 2025).

Although people with HSAM clearly outperform others in the retrieval of autobiographical memories, particularly in terms of accessibility and speed of recall in response to cues, this advantage does not appear to extend broadly across other cognitive domains. Previous research has consistently shown that HSAM is not associated with superior performance in other forms of memory, such as semantic memory (e.g., Parker et al., 2006), prospective memory (e.g., Gibson, Ford, & Robinson, 2022), creative thinking (Daviddi, Orwig, et al.,

2022), or directed forgetting (Santangelo et al., 2025). Similarly, intelligence levels in HSAM typically fall within the normal range, rather than reflecting exceptionally elevated cognitive ability (e.g., Patihis, 2016). More generally, the available evidence suggests that HSAM represents a highly specific enhancement in autobiographical memory, rather than a global cognitive advantage. Consistent with this view, people with HSAM remain susceptible to memory distortions, including false memories, indicating that their memory system is not fundamentally immune to typical cognitive biases (e.g., Patihis et al., 2013). This highlights an important distinction between memory accuracy and memory accessibility. Although individuals with HSAM can often retrieve autobiographical information with remarkable detail, this does not necessarily imply perfect accuracy. Indeed, the presence of false memories suggests that autobiographical remembering in HSAM also remains subject to the reconstructive processes that characterize memory more generally. Consequently, examining involuntary autobiographical memories may provide a useful complementary perspective on HSAM, as such memories emerge without an explicit intention to retrieve the past and may therefore be less dependent on strategic search processes. Although involuntary autobiographical memories are not immune to memory distortions, it may be argued that they may be less susceptible to certain distortions than voluntarily retrieved memories (for a discussion of these issues see Dodier, Barzykowski, & Souchay, 2023). Rather than asking whether people with HSAM remember more accurately, the present study focuses on whether autobiographical information may be more readily accessible and, consequently, more likely to enter awareness spontaneously.

While individuals with HSAM have been studied using a variety of methods and across multiple cognitive domains, involuntary autobiographical memory retrieval has only recently begun to be examined systematically in HSAM, and experimental evidence concerning the frequency of involuntary autobiographical memory remains very limited (see Cleary et al., 2026, for a recent questionnaire-based investigation). This omission is particularly striking given that one of the defining characteristics of HSAM is the rapid and seemingly effortless access to past events. Moreover, cognitive psychology has increasingly shifted its focus from deliberate, goal-directed processes toward forms of cognition that arise spontaneously, without prior intention. This shift has led to the development of several research domains examining spontaneous mental phenomena including mind-wandering and daydreaming (e.g., Christoff, Irving, Fox, Spreng, & Andrews-Hanna, 2016), involuntary autobiographical memories (e.g., Berntsen, 1996; Mace, 2007), spontaneous future thinking (e.g., Cole & Kvavilashvili, 2019, 2021), and other forms of automatically retrieved voluntary autobiographical memories (e.g., Barzykowski & Staugaard, 2016; Uzer, Lee, & Brown, 2012), as well as metacognitive reflections and subjective states (Zareen et al., 2026). Within these domains, involuntary autobiographical memories have been shown to play a central role in everyday cognition, typically emerging rapidly in response to incidental cues and without deliberate effort (for reviews, see Barzykowski & Kvavilashvili, 2024; Berntsen, 2020). In turn, even contemporary theoretical accounts of *voluntary* autobiographical remembering, including the Self-Memory System framework (Conway, 2005; Conway, Justice, & D'Argembeau, 2019; Conway & Pleydell-Pearce, 2000), distinguish between two modes of retrieval: a direct mode, in which memories come to mind rapidly with minimal search, and a generative mode, in which retrieval unfolds more gradually through strategic, effortful processes (see also Barzykowski & Staugaard, 2016, 2018; Uzer et al., 2012). These modes are thought to be supported, at least in part, by partially separate neural systems (for a recent meta-analysis, see Daviddi, Yaya, Sperduti, & Santangelo, 2025). That is, voluntary memory itself is not a unitary process and this raises the possibility that HSAM may differentially engage these retrieval modes.

Taken together, these considerations point to a critical gap in the literature: it remains unclear whether the superior retrieval of autobiographical memories observed in HSAM extends to involuntary forms of remembering, and whether such memories occur more frequently when assessed under controlled laboratory conditions. To date, to the best of the authors' knowledge, only two studies have examined involuntary autobiographical memories in individuals with HSAM. The first, reported by Talbot, Gatti, and Mazzoni (2025a), investigated a single HSAM case (DT) using a naturalistic diary method over the course of one day. Participants (DT and twenty-two controls) recorded spontaneously occurring autobiographical memories as they arose in everyday life, allowing for the assessment of both their frequency and phenomenological characteristics. Despite possessing an exceptional ability to recall past events, DT did not record a higher frequency of involuntary memories compared to controls. However, the qualitative properties of these memories differed: involuntary autobiographical memories reported by DT were more vivid and more strongly related to the self. These findings, as argued by Talbot et al. (2025a), suggest that in HSAM the advantage may lie not in the increased occurrence of involuntary memories, but rather in their enhanced phenomenological richness. However, reliance on self-initiated diary recordings may not provide the most accurate estimates of involuntary autobiographical memory frequency, as they depend heavily on participants' metacognitive awareness and willingness to report spontaneous experiences. In the diary study by Talbot et al. (2025a), participants were instructed to record involuntary memories as they occurred using a smartphone-based reporting system. While such approaches offer ecological validity, they also require individuals to notice and act upon spontaneous experiences, which may lead to underreporting. Supporting this concern, research comparing paper and smartphone diary methods has shown that fewer memory events tend to be recorded using smartphones, despite high compliance rates, and that shorter recording periods may yield higher reported frequencies than longer ones (Laughland & Kvavilashvili, 2018). These findings suggest that diary-based estimates are sensitive to procedural factors and may not fully capture the occurrence of involuntary memories (for a discussion on discrepant findings between diary and laboratory methods see Kvavilashvili & Ellis, 2004; Barzykowski, Staugaard, & Mazzoni, 2026).

In contrast to Talbot et al. (2025a), the second study, recently reported by Cleary et al. (2026), provided initial

evidence that involuntary autobiographical remembering may indeed be enhanced in HSAM. In a 16-year-old individual with HSAM, the authors found elevated scores on the Involuntary Autobiographical Memory Inventory (IAMI), with the reported frequency of past-oriented involuntary memories approximately two standard deviations above previously reported norms. Importantly, this elevation appeared relatively specific to involuntary autobiographical remembering, as performance on standard neuropsychological assessments and other memory tasks was generally within the typical range, suggesting that heightened involuntary autobiographical memory frequency may characterize at least some individuals with HSAM. At the same time, involuntary memory frequency in Cleary et al. (2026) was assessed using a retrospective questionnaire. As the authors themselves note, questionnaire estimates depend on memory for one's previous experiences and may therefore be influenced by retrospective distortions or reporting biases. Cleary et al. consequently highlighted the value of assessing involuntary autobiographical memories in real time using probe-caught and other experimental methodologies.

Taken together, the existing studies provide initial but methodologically contrasting evidence concerning involuntary remembering in HSAM. Talbot et al. (2025a) found no increase in IAM frequency using a naturalistic diary method, whereas Cleary et al. (2026) observed elevated involuntary memory frequency using a retrospective questionnaire. Both approaches provide important information, but each retains a substantial reliance on participants' monitoring or retrospective evaluation of their spontaneous experiences. This highlights the need for more controlled, laboratory-based approaches that reduce reliance on self-initiated monitoring and minimize retrospective and metacognitive demands. However, to date, no study has systematically examined involuntary autobiographical memories in individuals with HSAM in laboratory conditions in which ongoing thoughts are sampled using a probe-caught method. As a result, it remains unclear whether the frequency of such memories is elevated when assessed using objective, standardized paradigms. The present study investigates, for the first time, involuntary autobiographical memory retrieval in an HSAM individual using a laboratory-based task with a probe-caught sampling of ongoing thoughts (see The Present Study section).

1.2. *Case description: KCL*

KCL first contacted the first author (K.B.) on February 17, 2025, expressing interest in his autobiographical memory abilities and seeking an expert evaluation. In his initial correspondence, KCL, a 16-year-old male (born 2009), reported a long-standing interest in autobiographical memory and indicated that he suspected his memory abilities to be unusually strong and potentially rare. He described having exceptionally early autobiographical memories, including recollections dating back to approximately three months of age (April 2009), as well as memories from early childhood (2010–2011) that were reportedly corroborated by his parents. He further indicated that a sense of continuous, conscious autobiographical experience emerged around the age of three. Since that time, he reported that most of his memories are highly detailed and readily accessible. Importantly, KCL noted that from approximately August 2022 onward, he has been able to recall events from at least half of the days in his life, often not solely based on calendar dates, but rather through minimal contextual cues, such as a brief remark, a family photograph, a song, or a seemingly trivial detail from an everyday situation. He also reported that many of his memories are retrieved spontaneously and involuntarily, triggered by cues such as emotions, smells, or words. He described his autobiographical recall as encompassing a large proportion of his lived experience, suggesting that he is able to retrieve events from many points in his past when prompted. Consistent with this description, KCL reported that he frequently experiences spontaneous recollections in everyday life, indicating that he "always" finds himself drifting into past memories. He further estimated that he spends approximately 5–7 h per day thinking about past events and reported that he can recall in detail between 100 and 200 days from the past year. When asked to compare his abilities to those of peers, he rated his autobiographical memory as "substantially better," while indicating that his semantic and prospective memory abilities were comparable to, or slightly below, those of others. He also reported no history of deliberate engagement with calendar learning or related mnemonic practices. Motivated by these experiences, KCL sought professional feedback on whether his autobiographical memory abilities warranted scientific investigation.

Following this initial contact, an introductory meeting was organised to conduct a preliminary screening interview, including an open discussion of KCL's experiences and background. During a subsequent meeting, KCL's legal guardians were invited, the aims and procedures of the study were explained in detail, and all consent forms were obtained. After agreement to participate, a series of testing sessions was scheduled between July and October 2025. With respect to background characteristics, KCL is an only child, and no comparable memory abilities were reported within the immediate family, although his grandmother indicated having a generally strong memory for past events. KCL reported average school performance (mean grade = 3.9 on a 6-point scale). He noted that his autobiographical memory ability does not provide a clear academic advantage and may, at times, be distracting, as it can lead to spontaneous recollections during classes, resembling mind-wandering or daydreaming. In describing the nature of his memory, KCL indicated that his recollections are frequently triggered by external or internal cues. Although various cues (e.g., emotions, smells, words) can elicit memories, he reported that calendar dates are particularly effective triggers, whereas verbal cues are less efficient. Importantly, he reported no use of mnemonic strategies and indicated that his recall occurs naturally and effortlessly. KCL reported that he first became aware that his memory abilities might be unusual shortly before contacting the first author, around January 21, 2025. Reflecting on his past, he realised that he could recall events from early childhood (around the age of three), which led him to question whether his abilities might be exceptional. When asked to describe how he retrieves such memories, he reported that he "simply does," suggesting a largely automatic and non-strategic retrieval process. However, these self-

reported abilities required systematic evaluation, which was undertaken in the present study.

1.3. The present study

The present study aimed to provide a comprehensive investigation of autobiographical memory functioning in a single case, KCL, who represents the first documented case of HSAM in Poland. The overarching goal was twofold. First, we sought to determine whether KCL met established criteria for HSAM using standardized screening procedures. Second, we aimed to investigate, for the first time, the frequency of involuntary autobiographical memories using a standardized laboratory paradigm with a probe-caught method, allowing for an objective assessment of their occurrence.

To achieve these aims, we combined established HSAM screening procedures with a broad assessment of both voluntary and involuntary autobiographical memory. Involuntary memory frequency was examined using a validated vigilance task, alongside self-reported tendencies captured by the Involuntary Autobiographical Memory Inventory (IAMI). In addition, we conducted a comprehensive questionnaire-based assessment of autobiographical memory functioning using the Autobiographical Recollection Test (ART; Berntsen, Hoyle, & Rubin, 2019), and the Survey of Autobiographical Memory (SAM; Palombo et al., 2013). These measures allowed us to capture multiple dimensions of autobiographical memory, including recollective experience, and subjective memory abilities.

Beyond autobiographical memory, we assessed a broad spectrum of cognitive, metacognitive, affective, and individual difference variables to contextualize KCL's performance relative to a comparison group and normative samples. This multi-method approach allowed us not only to evaluate whether KCL met HSAM criteria, but also to delineate the broader cognitive and phenomenological profile associated with such extraordinary memory abilities. For details of the additional cognitive and questionnaire-based measures, please refer to Section 2.2.1.7 (*Additional Neuropsychological and Questionnaire Measures*).

In addition, we examined the frequency of déjà vu experiences (see Section 2.2.1.6), a phenomenon that has been largely overlooked in individuals with HSAM. Because déjà vu is an infrequent experience which is proposed to be related to spontaneous experiences such as involuntary autobiographical memories (Barzykowski & Moulin, 2023), we were motivated to explore its frequency in HSAM. Because empirically a positive relationship between the frequency of déjà vu and involuntary memories has been found (e.g., Zareen et al., 2026), we expected someone with HSAM to have possibly more déjà vu than the general population, although this hypothesis rests on whether we should think of déjà vu as being the result of a particular sensitivity to memory cues in the environment, or as being a somewhat impoverished or failed retrieval episode.

To capture involuntary autobiographical memories, we employed a probe-caught method within a laboratory vigilance task (Barzykowski, Ilczuk, & Kvavilashvili, 2026). At predefined intervals, participants were interrupted and asked to report the content of their ongoing thoughts. Importantly, participants were not instructed to focus specifically on autobiographical memories, but rather to report any spontaneously occurring thought. The use of a laboratory-based probe-caught paradigm is particularly advantageous when comparing the frequency of involuntary autobiographical memories between participants or conditions. Estimating how often such memories occur in naturalistic settings is methodologically challenging, as it relies on participants' ability to notice, evaluate, and decide to report their spontaneous experiences. This introduces an "attentional filter," whereby more salient or emotionally intense memories are more likely to be reported, while more fleeting or mundane experiences may go unnoticed. Indeed, estimates derived from diary-based approaches have been shown to vary depending on procedural characteristics, underscoring their susceptibility to reporting biases (Clevinger & Mace, 2024). By contrast, probe-caught methods reduce reliance on self-initiated monitoring by prompting reports at standardized time points, thereby enabling the capture of spontaneous thoughts irrespective of their salience and allowing for more objective assessment under controlled conditions (e.g., Barzykowski, Hajdas et al., 2021; 2022; Plimpton, Patel, & Kvavilashvili, 2015; Vannucci et al., 2014).

This issue may be particularly relevant in the context of HSAM. Although individuals with HSAM exhibit exceptional autobiographical memory retrieval, their performance in other cognitive domains—including susceptibility to memory distortions—typically falls within the normative range (e.g., Daviddi, Pedale, et al., 2022; Gibson et al., 2022; Le Port et al., 2012; Parker et al., 2006; Patihis, 2016; Santangelo et al., 2025). This suggests that, like the general population, they may also be subject to limitations in monitoring and reporting their own spontaneous experiences. Consistent with this view, recent work by Zareen et al. (2026) indicates that individuals do not always accurately estimate the frequency of spontaneous cognitive phenomena in everyday life. In that study, participants tended to underestimate the occurrence of certain experiences despite their measurable presence in laboratory settings, suggesting that metacognitive awareness of such events may be imperfect.

Taken together, these considerations highlight the importance of using objective, laboratory-based methods—such as the probe-caught paradigm—to more accurately assess the frequency of involuntary autobiographical memories. If HSAM is indeed characterised by a greater reliance on involuntary and automatic retrieval processes, one would expect to observe an elevated frequency of involuntary autobiographical memories, both in self-report measures (e.g., questionnaires) and in controlled laboratory assessments.

Finally, given the geographical distance between KCL and the research team, all assessments were conducted remotely under continuous researcher supervision. Although this approach enabled a comprehensive investigation of a HSAM case that would otherwise have been difficult to access, it also raises considerations regarding the degree of control over certain environmental variables relative to traditional laboratory testing. These issues are discussed further in the Discussion section.

2. Method

The study was approved by the Research Ethics Committee of the Institute of Psychology, Faculty of Philosophy, Jagiellonian University (No 221.0042.62_2025). Informed consent was obtained online prior to data collection from both the participant (KCL) and their legal guardian.

2.1. Participants

The present study focuses on a single-case investigation of KCL, a 16-year-old (16 years, 7 months) secondary-school student. At the time of the study, neither KCL nor his legal guardian reported any history of atypical development in a neurological, psychiatric, developmental, or educational, context. Likewise, no developmental concerns were reported during childhood. KCL completed a comprehensive battery of questionnaire-based and laboratory-based measures, and his performance was systematically compared against the data from general population samples. To provide an appropriate contextualization of KCL's performance across domains, several comparison groups were used.

First, for the assessment of HSAM, KCL completed a screening procedure consisting of a Public Dates Quiz and a Random Dates Quiz (see Materials). To contextualize his performance, the same procedure was additionally administered to a small comparison sample of eight Polish adults (3 females; $M_{age} = 24.63$, $SD = 3.74$). In addition, we recruited a matched comparison participant—a 16-year-old Polish boy who had also contacted the research team reporting strong autobiographical memory abilities—to provide a more developmentally comparable benchmark for KCL's performance. Second, to investigate involuntary autobiographical memories under controlled laboratory conditions, KCL's performance was compared to a comparison group of 36 participants (8 males; $M_{age} = 23.14$, $SD = 4.10$) drawn from a recently published study that employed an identical experimental procedure (Barzykowski, Ilczuk et al., 2026a). Third, KCL's performance on inhibitory control and working memory tasks was compared against large reference datasets collected using the same procedures within the same cultural context. Although these datasets were not specifically matched to KCL in terms of age or educational level, they provide a useful reference point for contextualizing his performance relative to typical performance observed under identical testing conditions. Specifically, inhibitory control was compared to a sample of 466 participants (Barzykowski, Wereszyński et al., 2022), and working memory to a sample of 566 participants (Wereszyński, Smołka et al., 2025). Fourth, for questionnaire-based measures, KCL's scores were compared with data from large samples of healthy participants. These data were derived either from the EU COST Action CA18106 ("*The Neural Architecture of Consciousness*"), a large-scale project combining MRI, EEG, and behavioural data ($N = 311$; 111 males; $M_{age} = 24.17$, $SD = 4.38$), or from existing validation studies of Polish adaptations of the employed instruments (e.g., ART: Barzykowski, Ilczuk, & Kvavilashvili, 2026b; IAMI: Barzykowski, Ilczuk, Öner, Chwiłka, & Wereszczyński, 2026c). The comparison group for the déjà vu questionnaire was a sample of 136 undergraduates from Leeds University (see below). Although this sample differed from KCL in both age and linguistic background, it provided the only available comparison dataset collected using the same questionnaire.

2.2. Materials

The present study focuses on autobiographical memory functioning, with a particular emphasis on involuntary memories, in the individual case of KCL. Accordingly, the main body of the Materials section describes the measures and tasks directly related to autobiographical memory functioning (but see section 2.2.1.6).

2.2.1. Autobiographical memory functioning

To assess autobiographical memory abilities and tendencies, the participant completed a set of established self-report instruments and laboratory-based procedures targeting memory for public events and dates, as well as voluntary and involuntary retrieval processes. These measures are described below.

2.2.1.1. Assessment of highly superior autobiographical memory (HSAM). To assess the presence of HSAM, the participants completed a structured battery of date-based memory tasks adapted from established HSAM screening approaches (e.g., LePort et al., 2012, 2016; Santangelo et al., 2018; Talbot et al., 2022). These tasks were designed to evaluate the ability to retrieve (a) precise temporal information about public events, (b) public knowledge linked to specific dates, and (c) personally experienced events associated with randomly selected calendar dates. Given the relatively young age of KCL, the materials were adapted to focus on a recent and developmentally appropriate time window (see for example Pedale et al., 2026). Specifically, the quizzes targeted events from the preceding 12 months, ensuring that all assessed memories referred to a period during which KCL was at least 15 years old. The full screening procedure is freely accessible and described in detail in Barzykowski, Santangelo, Kvavilashvili, and Moulin (2026e, 2026f).

Public Dates Quiz. The Public Dates Quiz consisted of two types of questions: (1) event-to-date and (2) date-to-event. **In the event-to-date questions,** participants were presented with 15 well-known public events and asked to report, as precisely as possible, the day, month, year, and day of the week on which each event occurred. For example, participants were asked to provide the full date of events such as *Aleksandra Mirosław winning the Olympic gold medal in speed climbing*. Following each response, participants rated their confidence and indicated the subjective basis of retrieval (i.e., whether the response reflected remembering, knowing, or guessing). **In the date-to-event questions,** participants were presented with 15 specific calendar dates (e.g., *13 August 2024*) and asked to recall a verifiable public event that occurred on or around that date, as well as to report the corresponding day of the week. Participants were instructed that acceptable events could include domains such as politics, sports, public figures, holidays, or other notable occurrences, provided that they could be verified through external sources. After each response, participants rated their confidence in both the recalled event

and the day of the week and again indicated whether their response was based on remembering, knowing, or guessing.

The order of these questions within each category (event-to-date *vs* date-to-event) was randomized for each participant. Performance in the Public Dates Quiz was measured by a points-based scoring system, with a maximum of 87 points attainable across both components (for details, see Barzykowski et al., 2026e; 2026f).

Random Dates Quiz. To further assess autobiographical memory, participants completed a Random Dates Quiz. In this task, participants were presented with 10 randomly selected calendar dates drawn from their lifetime (from age 15 up to the day preceding testing). For each date, participants were asked to provide: (1) The day of the week, (2) A verifiable public event occurring within one month before or after the given date, (3) A personal autobiographical memory associated with that date. Participants were instructed to rely on their genuine memory, to respond as accurately as possible, and to refrain from guessing or consulting external sources. If they were unable to recall a given element, they were encouraged to indicate that they did not remember rather than provide an inferred response. No time limits were imposed. For each response, participants additionally provided confidence ratings and indicated the subjective basis of retrieval (remembering/knowing/guessing), allowing assessment of both objective accuracy and phenomenological characteristics of retrieval. Performance in this task was scored with a maximum of 30 points. Briefly, one point was assigned for each correct response: (1) correctly identifying the day of the week, (2) providing a verifiable public event occurring around the given date, and (3) indicating a personal autobiographical memory associated with that date, resulting in a maximum of 3 points per each random date ($10 \times 3 = 30$). Importantly, the veracity of the reported autobiographical memories was not independently verified; rather, scoring was based on whether participants were able to provide a plausible description of a personal event or indicated that they were unable to recall one.

Overall HSAM Screening Score. Scores from the Public Dates Quiz and the Random Dates Quiz were summed to yield an overall HSAM screening score, with a maximum of 117 points across both tasks.

2.2.1.2. Involuntary Autobiographical Memory Inventory (IAMI). The Involuntary Autobiographical Memory Inventory (IAMI; Berntsen, Rubin, & Salgado, 2015; Polish adaptation by Barzykowski, Ilczuk et al., 2026a) is a 20-item self-report measure assessing the frequency of involuntary past and future thoughts. Items capture the extent to which autobiographical memories (e.g., past events) and future-oriented thoughts (e.g., imagined events) come to mind spontaneously, without deliberate retrieval. Responses are provided on a 5-point scale ranging from 0 (never) to 4 (once an hour or more).

2.2.1.3. The vigilance task to study involuntary past and future thoughts. To investigate involuntary autobiographical memories and involuntary future thoughts (IFTs) under controlled laboratory conditions, we employed a vigilance task procedure used in recent work (Barzykowski et al., 2026b), which also served as the reference dataset for the general population comparison. This paradigm has been widely used to assess the frequency and characteristics of spontaneous thoughts in the laboratory.

Participants completed a computerized vigilance task consisting of 800 trials, in which they were required to detect rare target stimuli (patterns of vertical lines; $n = 15$) embedded within a stream of non-target stimuli (horizontal lines; $n = 785$). Each trial was presented for 2 sec with a short interstimulus interval (500 msec). During the task, short verbal cue-phrases were intermittently presented to trigger the occurrence of spontaneous thoughts. The cue set consisted of 270 phrases, with equal numbers of neutral ($n = 90$; e.g., *buying bread*), positive ($n = 90$; e.g., *a wonderful smile*), and negative ($n = 90$; e.g., *an unpleasant conversation*) items, drawn from established stimulus pools used in previous studies (e.g., Barzykowski & Mazzoni, 2022; Barzykowski & Niedźwieńska, 2016). Cue-phrases were presented in two fixed pseudo-random orders and occurred at variable intervals ranging from 1 (approximately 2.5 sec) to 7 trials (approximately 17.5 sec), with a mean interval of 3 trials (approximately 7.5 sec). Critically, the task incorporated a probe-caught procedure. At 23 fixed pseudo-random points, the task was interrupted and participants were prompted with the message: *"Please stop and record your concentration and thoughts now."* Participants provided a brief written description of their current thoughts, rated their level of task focus (1 = *not at all*, 7 = *fully concentrating*), and indicated whether the thought had occurred deliberately or involuntarily. Reported thoughts were subsequently classified by participants and independent coders according to task-relatedness, intentionality, and temporal orientation, following established coding protocols (Barzykowski, Ilczuk, & Kvavilashvili, 2024). This approach allows for an objective, in-task assessment of the frequency and phenomenology of involuntary past and future thoughts. Finally, to assess the extent to which participants processed the incidental cue-phrases, an unexpected cue recognition task was administered immediately following the vigilance task. Participants were presented with 84 phrases, including 42 "old" cues randomly selected from those presented during the vigilance task and 42 "new" cues drawn from a larger pool of stimuli used in previous research (e.g., Barzykowski, Hajdas, Radel, & Kvavilashvili, 2022; Barzykowski & Niedźwieńska, 2016). Both sets contained equal numbers of neutral, positive, and negative items ($n = 14$ each). Cues were presented in fixed pseudo-random order. Participants responded to each cue in a self-paced manner, indicating whether they recognized it from the preceding task.

Finally, following the cue-recognition task, participants completed several additional ratings on a 7-point scale assessing task-related strategies and experiences. Specifically, they indicated the extent to which verbal phrases were experienced as interfering with the task, the extent to which they actively ignored the phrases, and the degree to which they deliberately suppressed their thoughts.

2.2.1.4. Autobiographical Recollection Test (ART). The Autobiographical Recollection Test (ART; Berntsen et al., 2019; Polish adaptation by Barzykowski et al., 2026c) was used to assess general tendencies in the subjective experience of

remembering, rather than the characteristics of specific autobiographical events. The ART captures broad, trait-like qualities of autobiographical memory and comprises seven theoretically derived dimensions: vividness, coherence, reliving, rehearsal, scene construction, visual imagery, and life-story relevance. Previous research has demonstrated that ART scores reliably predict the phenomenological qualities of autobiographical memories and show good test–retest reliability across short intervals, supporting their stability as indicators of individual differences in remembering (e.g., Barzykowski et al., 2026c; Berntsen et al., 2019; Gehrt et al., 2022; Billet et al., 2023).

2.2.1.5. Survey of Autobiographical Memory (SAM). The Survey of Autobiographical Memory (SAM; Palombo et al., 2013; Polish adaptation by Barzykowski, Ilczuk et al., 2026g) was used to assess individual differences in autobiographical memory across four dimensions: episodic, semantic, spatial, and future-oriented memory or prospection. The SAM conceptualizes autobiographical memory as a multifaceted, trait-like ability and captures individuals' general self-appraisals of their memory functioning in everyday life. Unlike the ART, which focuses on the phenomenological qualities of remembering, the SAM assesses perceived memory ability across different autobiographical domains rather than the subjective experience accompanying retrieval of individual memories. Each subscale reflects a distinct component of memory: episodic memory (recollection of detailed personal events), semantic memory (general knowledge and facts), spatial memory (navigation and memory for environments), and future-oriented memory (ability to imagine specific future events). Items are rated on a 5-point Likert scale ranging from strongly disagree to strongly agree.

2.2.1.6. Déjà vu questionnaire. We used an unpublished questionnaire designed to assess the frequency of déjà vu and other memory experiences to examine the experience of déjà vu. This scale asks questions about the frequency of feelings of repetition and cognitive failures in daily life. Critically, it presents participants with a definition of déjà vu: *"Déjà vu is the name we give to a strange sensation, where we feel like we have encountered something before, but we know that we have not. It might be when we meet a person for the first time, going to a new place, or just having a conversation."* It asks about the recency of the experience, as a proxy for frequency and also asks about whether the person experiences déjà vu more or less now than other times of their life, and whether they experience it more or less than other people. We have data from 136 British undergraduate students to which we can compare KCL's scores.

2.2.1.7. Additional measures across cognitive, metacognitive, and affective domains. To contextualize KCL's performance, we additionally assessed a broad range of cognitive, affective, and individual difference variables. These supplementary measures were included to situate KCL's profile relative to normative population patterns. For clarity and conciseness, detailed descriptions of these additional instruments are provided in Appendix 1, while only a brief overview of the assessed domains is presented here. Specifically, these domains included: (a) mind-wandering, maladaptive daydreaming, and attentional absorption; (b) metacognitive and phenomenological characteristics; (c) cognitive control and executive functioning (including attention and working memory); and (d) affective, personality, and broader individual difference measures. All measures used in the study, together with their corresponding domains, are summarised in Table 1.

2.3. *Procedure*

KCL. All testing sessions were conducted online due to the geographical distance between the researchers and KCL. During each session, KCL shared his screen to ensure that no external websites or materials were accessed. He was instructed to complete all tasks independently, relying solely on his own memory and experience. Importantly, audio, video, and screen sharing were maintained throughout all sessions to ensure compliance with the study protocol. Each session was conducted separately and lasted up to approximately 2.5 h, depending on the procedures administered. In total, seven sessions were conducted between July 30 and October 3, 2025. The present paper focuses on the sessions involving questionnaire-based assessments and the vigilance task. Specifically, all questionnaires were completed during the first two sessions in a randomized order using a Qualtrics-based survey platform. The HSAM screening procedure (Public Dates Quiz and Random Dates Quiz), administered during the third session, was also implemented via Qualtrics. In the subsequent sessions, KCL completed a series of laboratory-based tasks, including working memory and inhibitory control tasks, which were administered using Millisecond Inquisit software. Finally, the vigilance task was administered in a separate session.

Screening procedure for the comparison group. The comparison group ($N = 8$) and the additional 16-year-old participant completed the HSAM screening procedure using the same materials and protocol as KCL, including the Public Dates Quiz and Random Dates Quiz. The procedure was administered online under the researcher's (KB) supervision. The additional participant reported that his memory—both in general and across autobiographical, semantic, and prospective domains—was better than that of his peers; however, this was based solely on subjective self-report, as will be developed below, his performance was within normal ranges. All sessions were again conducted with screen sharing and audio/video communication enabled (i.e., active microphone and camera) to ensure that participants completed the tasks independently without the use of external aids. Participants were instructed to rely solely on their own memory. No deviations from the screening protocol were introduced across participants.

3. Results

3.1. *Strategy for analysing data*

First, in line with previous research on HSAM (e.g., Santangelo et al., 2018), we adopted a threshold of 3.09 standard

Table 1 – Overview of assessed domains and Measures.

Domain	Subdomain	Type	Measure / Task	Subscale	Results: Mean (SD) KCL	General population *M (SD)*	z-scored value	Comment
Autobiographical Memory Functioning	HSAM assessment	Behavioral	HSAM Screening Quiz task	Public Dates Quiz	44 (51%)	17.75 (6.84)	3.84	Extreme
				Random Dates Quiz	25 (83%)	8.63 (4.27)	3.83	Extreme
	Involuntary memory	Questionnaire	Involuntary Autobiographical Memory Inventory (IAMI)	Total Score	60	40.30 (13.32)	1.48	Elevated
				Past	39	21.37 (7.34)	2.40	Extreme
				Future	21	18.94 (6.94)	0.30	
		Behavioral	Vigilance task (probe-caught procedure)	Task-unrelated thoughts	15	13.48 (4.60)	0.33	
				Involuntary memories	13	5.25 (2.69)	2.88	Extreme
				Involuntary future thoughts	0	4.06 (3.13)	-1.30	
				Cue-recognition	0.65	0.64 (0.08)	0.12	
	Subjective AM characteristics	Questionnaire	Autobiographical Recollection Test (ART)	Total Score	3.76	4.74 (0.98)	-1.00	
				Vividness	4.00	4.71 (1.27)	-0.56	
				Coherence	3.67	4.19 (1.19)	-0.44	
				Relieving	3.33	4.16 (1.43)	-0.58	
				Rehearsal	4.00	5.11 (1.19)	-0.93	
				Scene	3.67	4.77 (1.28)	-0.85	
				Visual	3.67	5.07 (1.43)	-0.98	
				Life-story	4.00	5.17 (1.20)	-0.98	
	Subjective AM characteristics	Questionnaire	Survey of Autobiographical Memory (SAM)	Total Score	107.74	93.71 (9.43)	1.49	Elevated
				Episodic	115.96	92.93 (13.46)	1.71	Elevated
				Semantic	108.28	95.77 (13.45)	0.93	
				Spatial	115.75	92.87 (16.18)	1.41	
				Future	91.00	93.26 (12.93)	-0.17	
General Memory Functioning	Subjective AM characteristics	Questionnaire	Multifactorial Memory Questionnaire (MMQ)	Satisfaction	62	43.12 (13.27)	1.42	
				Ability	70	52.62 (10.81)	1.61	Elevated
			Squire Subjective Memory Questionnaire (SSMQ)		142	66.72 (18.38)	4.10	Extreme
Mind-Wandering, Daydreaming, and Attentional Absorption		Questionnaire	Mind-Wandering Questionnaire (MWQ)		19	16.74 (3.65)	0.62	
	Mind-wandering	Questionnaire	Mind-Wandering	Deliberate (MW-D)	25	16.67 (3.65)	1.90	Elevated
				Spontaneous (MW-S)	22	18.53 (5.67)	0.61	
		Questionnaire	Off-Task Thoughts Questionnaire (OTTQ)		107	101.63 (24.63)	0.22	
	Absorption	Questionnaire	Individual Experiences Questionnaire		17	15.63 (6.41)	0.21	
	Daydreaming	Questionnaire	16-item Maladaptive Daydreaming Scale		54	25.93 (18.17)	1.54	Elevated
	Imagery	Questionnaire	Vividness of Visual Imagery Questionnaire (VVIQ-2)		200	119.46 (22.85)	3.52	Extreme
		Questionnaire	Varieties of Visual Imagery Questionnaire (VVQ)	Visual	2	7.14 (1.77)	-2.90	Extreme low
				Verbal	4	4.55 (1.69)	-0.33	
Metacognitive and Phenomenological Characteristics	Interoception	Questionnaire	Multidimensional Assessment of Interoceptive Awareness (MAIA-2)	Total Score	5.16	2.75 (0.52)	4.62	Extreme
				Noticing	5.00	3.21 (0.92)	1.95	Elevated
				Not-distracting	4.83	1.99 (0.81)	3.52	Extreme
				Not-worrying	2.63	2.63 (0.96)	0.00	
				Attention Regulation	5.43	3.01 (0.82)	2.96	Extreme
				Emotional Awareness	6.00	3.26 (1.04)	2.64	Extreme
				Self-regulation	6.00	2.45 (1.08)	3.27	Extreme
				Body listening	5.67	2.37 (1.22)	2.71	Extreme
				Trusting	6.00	3.17 (1.18)	2.41	Extreme

Domain	Subdomain	Type	Measure / Task	Subscale	Results Mean (SD) KCL	General population *M (SD)*	z-scored value	Comment
Cognitive Control and Memory Functioning	Inhibitory control	Behavioral	Stroop Task	Congruent % correct	0.94	0.97 (0.05)	-0.60	
				Incongruent % correct	0.94	0.94 (0.07)	0.00	
				RTs congruent	687.86	787.84 (219.74)	-0.45	
				RTs incongruent	868.40	909.15 (276.40)	-0.15	
				Interference ratio	0.26	0.15 (0.12)	0.92	
		Behavioral	Eriksen Flanker Task	Congruent % correct	0.96	0.99 (0.05)	-0.60	
				Incongruent % correct	0.91	0.97 (0.06)	-1.00	
				RTs congruent	363.26	424.50 (68.04)	-0.90	
				RTs incongruent	470.84	470.06 (77.14)	0.01	
				Interference ratio	0.18	0.11 (0.06)	1.17	
	Working memory	Behavioral	Operation Span Task (OSPAN)	Absolute score	38	44.09 (15.31)	-0.40	
				Total number of letters	56	61.17 (9.73)	-0.53	
		Behavioral	Symmetry Span Task (SymmSpan)	Symmetry accuracy	0.98	.94 (5.60)	0.01	
				Absolute score	28	24.29 (9.05)	0.41	
	Cognitive failures	Questionnaire	Cognitive Failures Questionnaire (CFQ)		67	65.86 (12.45)	0.09	
		Questionnaire	Memory Failures Scale (MFS)		31	30.39 (6.14)	0.10	
		Questionnaire	Attention-Related Cognitive Errors Scale (ARCES)		39	31.23 (7.51)	1.03	
	Attention and control	Questionnaire	Mindful Attention Awareness Scale – Lapses Only (MAAS-LO)		35	39.53 (8.46)	-0.54	
		Questionnaire	Attentional Control	Distraction	12	12.65 (3.80)	-0.17	
				Shifting	10	10.69 (3.17)	-0.22	
Affective, Personality, and Individual Differences	Affective	Questionnaire	Generalized Anxiety Disorder Scale (GAD-7)		9	15.25 (4.88)	-1.28	
		Questionnaire	CES-D		35	17.53 (9.67)	1.81	Elevated
	Personality	Questionnaire	Freiburg Mindfulness Inventory	Presence	3.67	2.61 (0.57)	1.87	Elevated
				Acceptance	3.63	2.48 (0.49)	2.35	Extreme
	Closure	Questionnaire	Need for Cognitive Closure Scale (NCCS)	Order	8	11.96 (3.25)	-1.22	
				Predictability	12	10.60 (3.29)	0.43	
				Decisiveness	13	8.96 (3.84)	1.05	
				Ambiguity tolerance	10	13.39 (2.73)	-1.24	
				Closed mindedness	7	7.58 (2.54)	-0.23	
		Questionnaire	Need for Emotional Closure Scale (NECS)	Disturbance	3.14	3.15 (1.04)	-0.01	
				Discussion	5.00	3.47 (0.78)	1.96	Elevated
				Bother	4.20	3.45 (0.93)	0.80	
				Regret	4.50	3.64 (1.05)	0.82	
				Resolve	4.33	3.32 (0.99)	1.02	
	Rumination	Questionnaire	Ruminative Response Scale (RRS)		29	14.83 (5.89)	2.41	Extreme
	Sensory traits	Questionnaire	Olfactory Sensitivity Scale (OSS)		56	55.31 (8.12)	0.09	
		Questionnaire	Noise Sensitivity Scale (NSS)		57	62.17 (14.92)	-0.35	
		Questionnaire	Glasgow Sensory Sensitivity Scale (GSS)		121	51.87 (13.74)	5.03	Extreme
		Questionnaire	Highly Sensitive Person Scale (HSPS-10)	Total Score	53	53.89 (9.60)	-0.09	
				Low Sensory Threshold	13	10.96 (3.09)	0.66	
				Aesthetic Sensitivity	20	17.12 (3.37)	0.86	
				Ease of Excitation	20	25.81 (6.49)	-0.90	
	Autism spectrum	Questionnaire	AQ-Short	Total Score	60	67.40 (6.44)	-1.15	
				Social Skills	15	13.21 (7.44)	0.24	
				Attention Switching	13	16.32 (8.44)	-0.39	
				Attention to Detail	8	13.45 (9.44)	-0.58	
				Communication	6	8.31 (10.44)	-0.22	
				Imagination	18	16.10 (11.44)	0.17	

Note.
Behavioral = laboratory-based performance tasks; Questionnaire = self-report measures. | z-scored value = Z-scores represent KCL's standardized values computed relative to the general population. Specifically, each score was calculated using the formula: $z = (X_{kcl} - M_population) / SD_population$, where X_{kcl} is KCL's observed score, and M_population and SD_population are the mean and standard deviation of the general population, respectively. Positive values indicate performance above the population mean, whereas negative values indicate performance below the population mean. | Values close or exceeding ±1.5 SD from the reference group mean are highlighted.

deviations above the mean to determine whether KCL met the criteria for HSAM. This cutoff corresponds to the extreme upper tail of the distribution, such that only approximately .1% of observations in a normally distributed population would be expected to exceed it.[2]

Second, for all remaining behavioural, questionnaire-based, and laboratory measures, KCL's performance was standardised relative to the corresponding comparison groups by converting raw scores into z-scores based on the comparison group means and standard deviations.

Third, for the primary variables relating to involuntary autobiographical memories assessed under laboratory conditions, we conducted single-case statistical analyses using the SINGLIMS.EXE program.[3] This approach implements methods developed by Crawford and colleagues (Crawford & Garthwaite, 2002; Crawford & Howell, 1998) to estimate the extreme range of an individual's test score relative to a control sample, including associated confidence limits. This method is particularly appropriate for single-case designs and allows for formal statistical inference regarding whether KCL's performance differs significantly from that of the comparison group.

Finally, to maintain focus and clarity, the Results section primarily centres on autobiographical memory functioning. Findings from other assessed domains are reported more briefly and discussed in a descriptive manner, while full results across all measures are provided in Table 1 and reported in detail in Appendix 2.

3.1.1. *Autobiographical memory functioning*

3.1.1.1. Assessment of highly superior autobiographical memory (HSAM). **Public Dates Quiz.** On the Public Dates Quiz, the maximum possible score was 87 points. As shown in Table 1 and Fig. 1, KCL obtained 44 points, corresponding to 51% correct responses. In comparison, the comparison group ($N = 8$) achieved a mean score of 17.75 ($SD = 6.84$; mean percentage correct = 20.38%, $SD = 7.85$; range: 8–25), indicating substantially lower performance. For comparison, the age-matched individual obtained 13 points (15% correct responses), a level of performance comparable to that of the comparison group (z-score − .69). KCL's score corresponded to a z-score of 3.84, placing his performance above the normal range and exceeding the HSAM threshold of 3.09 standard deviations. To formally assess this difference, we conducted a single-case comparison using the Crawford and Howell (1998) method. The analysis revealed that KCL's score was significantly higher than that of the comparison group, $t(7) = 3.62$, $p = .009$ (two-tailed). The estimated proportion of the normative population scoring below KCL was 99.57% [95% CI (95.98%, 100%)], indicating that his performance falls within the extreme upper range.

A similar pattern was observed for the **Random Dates Quiz,** where the maximum possible score was 30 points. As shown in Table 1 and Fig. 1, KCL obtained 25 points, corresponding to 83% correct responses. In comparison, the same comparison group ($N = 8$) achieved a mean score of 8.63 ($SD = 4.27$; mean percentage correct = 28.75%, $SD = 14.15$), again indicating substantially lower performance (see Table 1 and Fig. 1). For comparison, the age matched individual obtained 7 points (23% correct responses), a level of performance comparable to that of the comparison group (z-score − .38). KCL's score corresponded to a z-score of 3.83, again exceeding the HSAM threshold. A single-case comparison (Crawford & Howell, 1998) showed that KCL's score was significantly higher than that of the comparison group, $t(7) = 3.61$, $p = .009$ (two-tailed). The estimated proportion of the normative population scoring below KCL was 99.57% [95% CI (95.96%, 100%)], again placing his performance in the extreme upper range.

In addition to the primary screening scores, we analysed responses to additional questions related to the screening procedure (i.e., ratings of confidence and type of retrieval), the results of which are presented in Table 2. In the Event-to-Date questions, KCL's performance was largely comparable to that of the comparison group, with similar levels of confidence and distributions of remembering, knowing and guessing responses. In contrast, in the Date-to-Event questions, KCL showed markedly elevated confidence ratings for both events and days of the week (both in the extreme range), accompanied by a substantially reduced number of guessing responses and increased reliance on remembering and knowing responses (all in the extreme range). A similar pattern was observed in the Random Dates Quiz, where KCL demonstrated exceptionally high confidence across all components (day of the week, public events, and autobiographical memories). Notably, his response profile was characterised by fewer guessing responses and a greater number of remembering responses relative to the comparison group, while knowing responses remained within the normative range. Overall, these findings indicate that KCL's performance is characterised by exceptionally high confidence and a shift toward more direct forms of retrieval, particularly in tasks requiring event and memory retrieval from dates. The dataset for the Public Events Quiz and Random Dates Quiz can be accessed in Barzykowski, Santangelo, Kvavilashvili, and Moulin (2026f).

3.1.1.2. Involuntary Autobiographical Memory Inventory (IAMI). KCL's overall score on the IAMI corresponded to a z-score of 1.48, indicating moderately elevated levels of involuntary mental time travel relative to the comparison group ($N = 300$). However, a more fine-grained examination revealed a dissociation between past- and future-oriented

[2] Please note that alternative approaches to HSAM screening criteria have been proposed in the literature. For example, Talbot et al. (2025b, also Le Port et al., 2016) employed a multi-stage procedure beginning with the Hull Memory Screening Questionnaire (Mazzoni et al., 2019). Individuals whose responses were consistent with HSAM characteristics were subsequently invited to complete a Public Events Quiz, followed—conditional on achieving at least 50% accuracy—by a Random Dates Quiz. Performance exceeding 65% on the latter was taken as indicative of HSAM. KCL met all of these criteria, achieving 51% correct responses on the Public Events Quiz and 83% on the Random Dates Quiz. However, as the present screening procedure was implemented without a large comparison sample, we could not exclude the possibility that the materials were relatively easy, potentially inflating performance. For this reason, we additionally relied on standardized, distribution-based criteria (i.e., ≥3.09 SD above the mean) to provide a more conservative and robust classification.

[3] The program, among many other specialized programs, can be access here: https://homepages.abdn.ac.uk/j.crawford/pages/dept/psychom.htm.

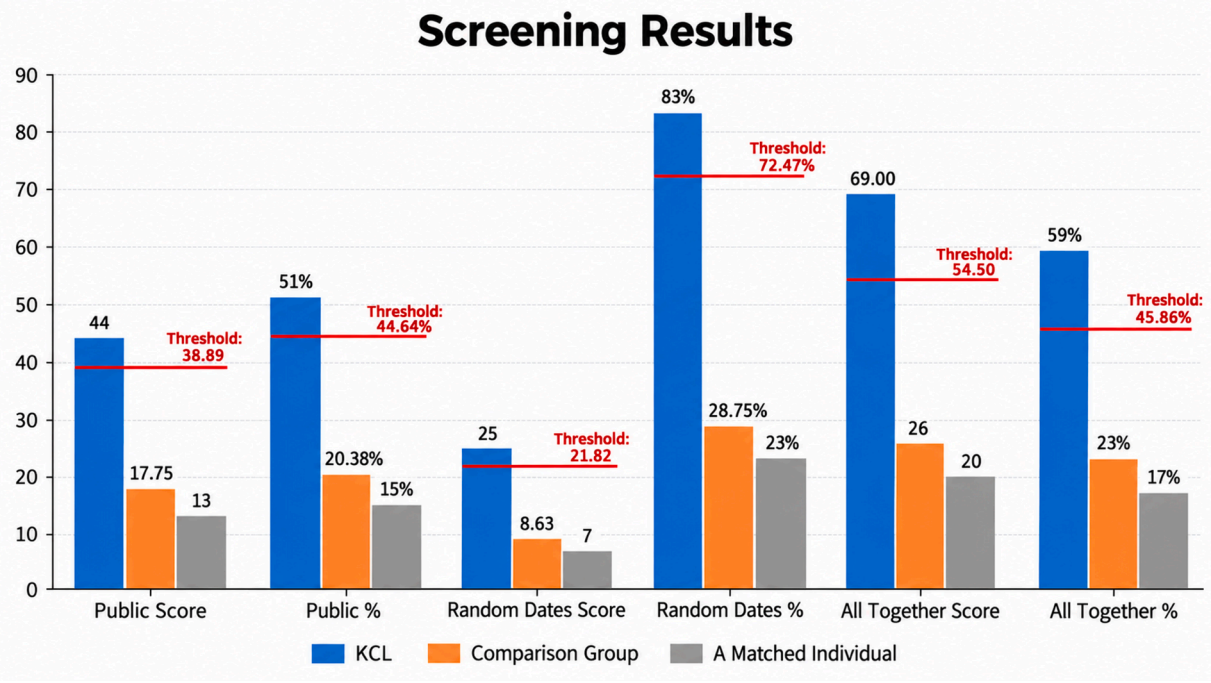


Fig. 1 – HSAM Screening Results: KCL Scores Compared to a Reference Group ($N = 8$) and the Matched Individual (16-Year-Old Male).

Note. The threshold lines indicate a cutoff of 3.09 standard deviations above the reference group mean, corresponding to the extreme upper tail of the distribution (approximately the top .1% in a normal distribution) and used in the present paper as a criterion for classifying Highly Superior Autobiographical Memory (HSAM).

Table 2 – Additional screening measures: Confidence ratings and retrieval Judgments.

			Results: Mean (SD)			
Measure / Task	Task	Subscale	KCL	General population *M (SD)*	z-scored value	Comment
Public Dates Quiz	Event-to-date questions	Confidence rating (date)	2.80	2.12 (0.80)	0.85	
		Guessing responses (number)	9.00	9.25 (3.11)	-0.08	
		Remembering responses (number)	5.00	4.88 (2.95)	0.04	
		Knowing responses (number)	1.00	0.88 (0.99)	0.13	
	Date-to-event questions	Confidence rating (event)	5.20	1.43 (0.35)	10.90	Extreme
		Confidence rating (day of the week)	6.73	1.70 (0.68)	7.45	Extreme
		Guessing responses (number)	4.00	12.63 (2.20)	-3.92	Extreme
		Remembering responses (number)	8.00	1.63 (2.33)	2.74	Extreme
		Knowing responses (number)	3.00	0.75 (0.89)	2.54	Extreme
Random Dates Quiz		Confidence rating (day of the week)	6.70	2.40 (0.69)	6.19	Extreme
		Confidence rating (public event)	7.00	2.24 (1.55)	3.07	Extreme
		Confidence rating (autobiographical memory)	5.80	3.20 (1.29)	2.01	Extreme
		Guessing responses (number)	2.00	5.13 (2.90)	-1.08	
		Remembering responses (number)	8.00	4.13 (2.59)	1.50	Elevated
		Knowing responses (number)	0.00	0.75 (1.39)	-0.54	

Note:
Confidence ratings were provided on a 7-point scale (1 = low confidence, 7 = high confidence). Values close or exceeding ±1.5 SD from the reference group mean are highlighted.

components. Specifically, KCL's frequency of involuntary autobiographical memories was markedly elevated ($z = 2.88$), indicating a substantially higher occurrence of spontaneously retrieved past events. In contrast, involuntary future-oriented thoughts were below the comparison group mean, but somewhat within the normal range ($z = -1.30$).

Single-case comparisons, using the Crawford and Howell (1998) method, confirmed these observations by showing that KCL showed a significantly higher frequency of involuntary autobiographical memories, $t(299) = 2.40$, $p = .017$ (two-tailed). The estimated proportion of the normative population scoring below KCL was 99.14% [95% CI (98.53%, 99.57%)], placing his performance within the extreme upper range. In contrast, KCL did not differ significantly from the comparison group in the frequency of involuntary future thoughts, $t(299) = .30$, $p = .767$ (two-tailed).

3.1.1.3. The vigilance task to study involuntary past and future thoughts. Data preparation and coding followed the procedure used in the original study, according to the protocol described by Barzykowski et al. (2024).

KCL's overall number of involuntary task-unrelated thoughts was comparable to that observed in the comparison group (see Table 1). However, a distinct pattern emerged in the composition of these thoughts. Specifically, a substantial proportion of KCL's task-unrelated thoughts consisted of involuntary autobiographical memories. KCL reported 13 such memories, accounting for 87% of all spontaneous task-unrelated thoughts. In comparison, the comparison group ($N = 36$) reported a mean of 5.25 (SD = 2.69), corresponding to an average of 39% ($SD = 15\%$; range = 0%–67%). This difference corresponded to a z-score of 2.88, indicating a markedly elevated frequency of involuntary autobiographical memories. The single-case comparison analysis revealed that KCL's score was significantly higher than that of the comparison group, $t(35) = 2.84$, $p = .007$ (two-tailed). The estimated proportion of the normative population scoring below KCL was 99.63% [95% CI (98.34%, 99.99%)], indicating that his performance fell within the extreme upper range.

In contrast, KCL reported no involuntary future-oriented thoughts, corresponding to 0% of spontaneous task-unrelated thoughts (see Table 1). The comparison group reported a mean of 4.06 ($SD = 3.13$), corresponding to an average of 27% ($SD = 18\%$; range = 0%–58%). This difference corresponded to a z-score of −1.30, indicating a lower-than-average frequency of future-oriented thoughts. The single-case comparison did not reveal a significant difference between KCL and the reference group, $t(35) = -1.28$, $p = .209$ (two-tailed), indicating comparable levels of future-oriented spontaneous cognition. Together, these findings suggest a relative asymmetry between past- and future-oriented spontaneous thought, driven primarily by an elevated frequency of involuntary autobiographical memories.

Finally, analyses of task engagement revealed a differentiated pattern. KCL reported markedly lower self-reported overall concentration on the vigilance task relative to the comparison group (2 *vs* $M = 4.94$, $SD = .75$; $z = -3.90$), a pattern that was also reflected in his average concentration rating across all probes (1.91 *vs* $M = 4.33$, $SD = 1.06$; $z = -2.29$). Despite this, his objective task performance remained comparable to the comparison group (see Table 1). Specifically, KCL showed perfect accuracy in detecting target stimuli (1.00), indicating ceiling-level performance. However, this level of performance was not unusual given the relative simplicity of the task. In the comparison group ($N = 38$), the mean accuracy was $M = .94$ ($SD = .09$), and 21 participants (55%) also achieved perfect performance. Among the remaining participants, 6 (16%) scored above .90, 8 scored between .80 and .89, one scored between .70 and .79, and one scored .60, indicating that KCL's performance fell within the typical range of the reference group. Response times (in seconds) to correct detections were also comparable (KCL: .75; comparison group: $M = .71$, $SD = .12$; $z = .32$). Importantly, cue-recognition performance was also within the normal range (.65 *vs* $M = .64$, $SD = .08$; $z = .12$). This is particularly noteworthy, as it indicates that KCL was no better than the comparison group in the extent he was able to recognise the incidental cue phrases which were presented during the vigilance task. Moreover, KCL did not differ substantially from the comparison group in task engagement. Specifically, his self-rated concentration on the primary task stimuli was comparable to that of the comparison group, both for vertical lines (7 *vs* $M = 5.53$, $SD = 1.30$; $z = 1.13$) and verbal phrases (3 *vs* $M = 4.54$, $SD = 1.46$; $z = -1.05$). Similarly, KCL did not differ from the comparison group in the extent to which verbal phrases were experienced as interfering with the task (1.00 *vs* $M = 2.17$, $SD = 1.28$; $z = -.92$), were actively ignored (3 *vs* $M = 3.08$, $SD = 1.44$; $z = -.06$), or in the degree to which thoughts were deliberately suppressed (2 *vs* $M = 3.17$, $SD = 1.72$; $z = -.68$).

Taken together, these findings indicate that although KCL subjectively experienced reduced task engagement, his objective performance and task-related processing remained comparable to the general population. Importantly, this pattern suggests that KCL was engaged with the task in a manner very similar to the comparison group, despite reporting lower subjective concentration. These results are not consistent with differences in task engagement which could account for the increased frequency of involuntary autobiographical memories—for example, KCL did not show reduced suppression of spontaneous thoughts, heightened attention to cue-phrases, or greater susceptibility to interference from noticing the irrelevant cues. Thus, the elevated frequency of involuntary autobiographical memories is unlikely to be explained by general differences in attentional engagement or task strategy.

3.1.1.4. Autobiographical Recollection Test (ART). KCL's scores across the ART subscales ranged from $z = -1.00$ to $z = -.44$ ($N = 240$), indicating performance within the normative range. None of the scores approached thresholds for atypical performance, and no clear deviations or extremes were observed across the assessed dimensions of autobiographical recollection.

3.1.1.5. Survey of Autobiographical Memory (SAM). KCL's overall SAM score was moderately elevated relative to the comparison group ($z = 1.49$, $N = 174$). Examination of subscales revealed a differentiated pattern across memory domains. Specifically, episodic memory showed the highest

deviation (z = 1.71), indicating a relatively stronger self-reported ability to recall detailed personal events. By contrast, semantic (z = .93), spatial (z = 1.41), and future-oriented (z = −.17) memory scores were within the normative range. Overall, these results suggest a selective elevation in episodic autobiographical memory, while other components of memory functioning remained typical.

3.1.2. *Déjà vu*

KCL reported having heard of the experience of déjà vu, and following our definition, reported experiencing it within the last week. Déjà vu is an infrequent experience which occurs approximately less than once a month, thus the probability of having had a déjà vu in the last week is relatively low: 31% of our sample (N = 136) reported having had it in the last week, with the median and modal recencies of the experience being in the last month. KCL endorsed the statement about having déjà vu more frequently than other people of his age, which corresponds with his response for the recency of the last experience. Taken together, these results suggest that KCL's experience of déjà vu might be more frequent than other people of approximately his age, but that it is within normal ranges.

Interestingly, the used déjà vu questionnaire asks about other cognitive errors and phenomena. KCL reported forgetting where he left important things on a weekly basis, common with 54% of our sample, and also having a word on the tip of the tongue approximately once a week (compared to 61% of our sample). He reported *never* finding it difficult to work out whether he imagined something or remembered it, which was somewhat less than the majority of our comparison group (18% of the sample). However, across all measures in this questionnaire, the overall pattern was within the normal range. The only notable deviations concerned KCL's hypothetical estimate of how many words he would be able to recall from a list of ten words, for which he gave the maximum response of ten words (z = 1.96; 4% of control participants), and the extent to which he worried about his memory, for which he responded "never" (z = 2.31; 7% of control participants).

3.1.3. *Additional measures across cognitive, metacognitive, and affective domains*

Full results are presented in Table 1 and Appendix 2; here we briefly summarise the most relevant findings. Overall, KCL showed a largely normative cognitive, affective, and personality profile, with several selective elevations across specific domains.

With respect to general memory functioning, KCL demonstrated elevated subjective evaluations of memory. Scores on the MMQ indicated moderately elevated Satisfaction (z = 1.42) and Ability (z = 1.61), while the SSMQ revealed exceptionally high confidence in memory (z = 4.10), placing his performance in the extreme upper range.

In the domain of mind-wandering and related constructs, a differentiated pattern emerged. Deliberate mind-wandering (z = 1.90) and maladaptive daydreaming (z = 1.54) were elevated, whereas spontaneous mind-wandering, off-task thoughts, and attentional absorption remained within the normative range. This suggests that KCL's internally oriented cognition is characterised more by intentional engagement than by uncontrolled attentional drift.

For metacognitive and phenomenological characteristics, KCL showed exceptionally vivid visual imagery (z = 3.52) alongside markedly elevated interoceptive awareness across most MAIA-2 subscales (typically zs > 2). At the same time, visual cognitive style, as measured by VVQ (see Appendix 1), was below the normative mean (z = −2.90), indicating a dissociation between imagery vividness and general processing preferences.

Across cognitive control and memory functioning, including inhibitory control, working memory, and attentional measures, KCL's performance was consistently within the normative range, with no systematic deviations observed. Finally, in affective, personality, and individual difference measures, KCL's profile was largely typical, with selective elevations in mindfulness (presence and acceptance), rumination, and interpersonal emotional processing. Notably, he exhibited markedly heightened sensory sensitivity (z = 5.03), representing an extreme deviation from the normative range.

4. Discussion

The present study provided a comprehensive examination of autobiographical memory functioning in a single case of a 16 year-old (KCL). Having determined that KCL did meet the criteria for HSAM, our aim was to examine, for the first time, the frequency of involuntary autobiographical memories using a controlled laboratory paradigm administered in a remote setting under continuous researcher supervision.

In sum, KCL's performance on standardized HSAM screening tasks clearly exceeded established criteria. Specifically, his scores on both the Public Dates Quiz and the Random Dates Quiz were more than 3 standard deviations above normative means, confirming that his autobiographical memory abilities fell within the extreme upper range and thus met accepted HSAM thresholds. This corresponded with his own view of his memory, the reason for contacting the authors (K.B.) in the first place, and his ability to spontaneously recall specific dates and events in everyday situations, such as identifying the exact day of the week on which a personal event occurred, often accompanied by vivid contextual detail.

Our results provide the first laboratory-based evidence that HSAM may be associated with an increased frequency of involuntary autobiographical memories. In the vigilance task, KCL reported a significantly higher number of involuntary autobiographical memories compared to the comparison group, despite showing a comparable overall level of task-unrelated thoughts. This indicates that his heightened experience of involuntary autobiographical memories was not due to a general increase in spontaneous cognition but rather reflected a specific increase in autobiographical memory retrieval. This pattern was further supported by self-report data, with elevated IAMI scores for past-oriented involuntary memories, while future-oriented thoughts remaining, below average and in the normal range.

Beyond involuntary memory, the broader assessment revealed a highly selective profile (see Section 3.1.2, Table 1

and Appendix 2). KCL showed typical performance across most cognitive domains, including attention, working memory, and executive functioning, consistent with previous HSAM research (e.g., Le Port et al., 2012; 2017; Parker et al., 2006). Questionnaire-based measures further indicated largely normative functioning across general memory, affective and personality dimensions, and the frequency of déjà vu. Within autobiographical memory measures, a differentiated pattern emerged: while performance on the ART remained within the normative range, self-reported episodic memory (SAM) was elevated. A similar pattern was observed for general subjective memory functioning (see Appendix 2, Table 1): KCL showed moderately elevated scores on the Multifactorial Memory Questionnaire, both in Satisfaction ($z = 1.42$) and Ability ($z = 1.61$), indicating a positive evaluation of his everyday memory performance. In contrast, his score on the Squire Subjective Memory Questionnaire was markedly elevated ($z = 4.10$), falling within the extreme upper range and indicating exceptionally high confidence in his memory abilities.

Taken together, these findings suggest that HSAM reflects a domain-specific enhancement in autobiographical memory, impacting not only voluntary retrieval but also to involuntary remembering measured under controlled laboratory conditions.

4.1. *Autobiographical memory retrieval in HSAM: involuntary retrieval and autobiographical memory functioning*

An overarching question that has driven research on HSAM concerns what is unique about these individuals. Accumulating evidence suggests that they are not cognitive "superheroes" in terms of general cognitive functioning. On the contrary, they appear largely comparable to the general population in domains such as learning everyday information or memorising numbers. What distinguishes them is the way in which they remember and access autobiographical events—information about what they have experienced, witnessed, and lived through.

To better understand autobiographical memory functioning in HSAM, it is useful to consider recent developments in autobiographical memory research. Most studies to date have examined autobiographical memory in HSAM using relatively standard approaches, focusing primarily on retrieval performance rather than on different types or modes of remembering. However, recent advances indicate that autobiographical memory is not a unitary phenomenon (for discussion, see e.g., Moulin, Carreras, & Barzykowski, 2023; Barzykowski & Moulin, 2023a, 2023b). More specifically, autobiographical memories can be retrieved in different ways: they may emerge rapidly and effortlessly (direct retrieval) or require a more gradual, effortful search process (generative retrieval; e.g., Barzykowski & Staugaard, 2016, 2018; Uzer et al., 2012; Conway & Pleydell-Pearce, 2000; Conway, 2005; Conway et al., 2019). In addition, involuntary autobiographical memories constitute a further mode of remembering, arising spontaneously in response to cues and potentially reflecting a fundamental, everyday mechanism of memory retrieval (e.g., Berntsen, 2010, 2026). Importantly, this distinction has rarely been considered in HSAM research, leaving open a question about retrieval modes underpin the exceptional memory abilities observed in these individuals. Below, we first discuss involuntary autobiographical memories in HSAM, followed by a broader characterization and discussion of general autobiographical memory functioning.

Involuntary memory retrieval. Building on the framework differentiating voluntary memory from involuntary memories, an important unresolved question concerns how people with HSAM retrieve autobiographical memories. It is well established that they can access highly detailed memories from the distant past and accurately locate them in time, often in response to date-based cues. However, it remains unclear whether their advantage reflects a greater reliance on direct retrieval processes when trying to recall something, a heightened tendency for involuntary and spontaneous remembering, or a combination of both. In the present study, we took a first step toward addressing this question by focusing specifically on involuntary autobiographical memories.

Previous research has consistently shown that HSAM is associated with enhanced neural activation during the initial phases of memory retrieval, particularly during memory access and the construction of recollected past events (Santangelo et al., 2018, 2020, 2021). Given that HSAM is characterised by facilitated access to autobiographical content, it is plausible to expect that such people may also experience an increased frequency of involuntary memories. Consistent with this assumption, KCL showed elevated scores on the Involuntary Autobiographical Memory Inventory, with particularly high levels of involuntary autobiographical memories, while remaining within the normative range for spontaneous future-oriented thoughts. This pattern suggests a selective enhancement of past-oriented spontaneous cognition and is consistent with the elevated frequency of involuntary autobiographical memories recently reported in another individual with HSAM by Cleary et al. (2026). At the same time, the present findings point to a potential asymmetry between past- and future-oriented forms of spontaneous thought. However, as the IAMI is a self-report measure, these findings require verification using more objective approaches. Critically, when we assessed involuntary cognition using a probe-caught method in a laboratory vigilance task—without directing attention specifically to autobiographical memories—the same pattern emerged. KCL exhibited a markedly elevated frequency of involuntary autobiographical memories, despite showing a comparable overall number of task-unrelated thoughts relative to the comparison group. This indicates that his heightened performance does not reflect a general increase in spontaneous cognition—as further evidenced by comparable levels of spontaneous mind-wandering (see Table 1 and Appendix 2)—but rather a specific bias toward autobiographical content.

Interestingly, this pattern was observed despite KCL exhibiting extremely high levels of rumination relative to the comparison group (see Table 1 and Appendix 2). Moreover, KCL also reported elevated levels of depressive symptoms on the CES-D, suggesting that his tendency to engage in repetitive self-focused thought may extend beyond autobiographical memory alone. This finding is noteworthy given that, even in

non-clinical samples, people reporting more frequent involuntary autobiographical memories tend to score higher on measures of anxiety, depressive symptoms, and rumination (e.g., Barzykowski et al., 2026a; Berntsen et al., 2015). At the same time, KCL's heightened involuntary remembering was accompanied by comparable levels of spontaneous mind-wandering and an absence of future-oriented thoughts, suggesting that his increased frequency of IAMs cannot be fully explained by a general tendency toward increased spontaneous thoughts, but may instead reflect enhanced accessibility of autobiographical representations. Taken together, these findings provide converging evidence for a selective dominance of past-oriented spontaneous cognition in HSAM and suggest that HSAM may be characterized by enhanced accessibility of autobiographical memories rather than simply by an increased tendency to engage in spontaneous cognition more generally. Future research may therefore benefit from systematically examining future-oriented thinking in people with HSAM, as well as investigating the extent to which elevated rumination and depressive symptoms in this population are specifically related to autobiographical content and memory-focused thought processes.

Although enhanced accessibility of autobiographical memories provides one plausible account of the present findings, alternative interpretations should also be considered. For example, heightened involuntary remembering in HSAM may reflect greater habitual engagement with autobiographical content, increased rehearsal of past experiences, stronger autobiographical identity processes, or other metacognitive factors that promote the availability of personal memories in everyday cognition. Importantly, these explanations are not necessarily mutually exclusive and may operate alongside enhanced accessibility mechanisms. Given the single-case nature of the present study, it is not possible to determine which of these accounts best explains the observed pattern of findings. Accordingly, the present results should be viewed as useful for generating hypotheses regarding the mechanisms underlying HSAM rather than providing definitive support for any particular theoretical interpretation.

One possible interpretation of the increased frequency of involuntary autobiographical memories in HSAM is that incidental cues are particularly effective in triggering autobiographical memories, whereas in the general population these cues give rise to a broader range of task-unrelated thoughts, including future-oriented thinking or semantic associations. In this sense, spontaneous cognition in HSAM may be disproportionately driven by personal past experiences. This interpretation is further supported by subjective reports: KCL indicated that he spends several hours per day thinking about past events and described this tendency as, at times, cognitively demanding and even disruptive. A similar experiential pattern has been noted in earlier case descriptions of HSAM (Parker et al., 2006), suggesting that heightened accessibility of autobiographical memory may have both functional and potentially burdensome consequences. Extending this account, it is possible that not only are cues more effective in triggering autobiographical memories in HSAM, but that such people may also be more sensitive to detecting these cues in the first place. This interpretation is consistent with KCL's exceptionally high score on sensory sensitivity (see Table 1, Appendix 2), as measured by the Glasgow Sensory Questionnaire (GSQ; Robertson & Simmons, 2013). Given that the GSQ assesses sensitivity across multiple sensory domains (e.g., vision, hearing, touch, taste, smell, proprioception, and vestibular perception), heightened sensory responsiveness may increase awareness of both external and internal cues, thereby elevating the likelihood of triggering autobiographical memories. A related, and not mutually exclusive, mechanism concerns interoceptive awareness. KCL showed extremely high scores on nearly all subscales, as well as the total score, of interoceptive awareness (MAIA-2; see Table 1, Appendix 2). Previous research (e.g., Barzykowski et al., 2026a; Messina & Berntsen, 2024) has linked interoceptive sensitivity to the occurrence of involuntary memories. Of course, to establish such relationships within people with HSAM is hard, since it would rely on an individual differences approach with a large sample of people with HSAM, and one must be cautious about over-interpreting this individual difference measures in one case.

The above patterns of results can be understood within the framework of the threshold model of memory awareness (e.g., Barzykowski & Staugaard, 2016, 2018; Barzykowski et al., 2026; Barzykowski et al., 2019; Moulin et al., 2023). According to this model, for a memory to enter conscious awareness, it must exceed a certain threshold. The likelihood of this occurring—referred to as accessibility—depends on features of the memory itself, such as its emotional intensity, personal relevance, and associated physiological responses. Memories that are more vivid, emotionally engaging, or bodily salient are more likely to capture attention and interrupt ongoing cognition, thereby becoming consciously experienced even in the absence of intentional retrieval. Importantly, this threshold is not fixed but can vary as a function of both situational and individual factors. From this perspective, heightened interoceptive sensitivity may lower the threshold for awareness, making individuals more likely to detect and attend to spontaneously arising mental content. At the same time, increased sensitivity to bodily and emotional signals may provide a richer pool of highly accessible cues that are particularly effective in triggering autobiographical memories. In this way, bodily and sensory signals may act as amplifiers of involuntary retrieval processes. The present findings are consistent with this account, suggesting that exceptionally high interoceptive awareness may contribute to the elevated frequency of involuntary autobiographical memories observed in HSAM. At the same time, the findings may also indicate that individuals with HSAM possess a relatively large proportion of highly activated—or highly accessible—memories, which are more likely to surpass the awareness threshold. In this sense, autobiographical memories in HSAM may be particularly "phenomenologically rich," increasing their likelihood of entering awareness. Importantly, these two mechanisms may operate in concert: on the one hand, a greater pool of highly accessible memories increases the probability of spontaneous retrieval; on the other hand, heightened sensitivity to internal sensations may amplify the detection of these emerging memory traces. A further possibility is that heightened accessibility in HSAM is supported by stronger or more persistent long-term priming of autobiographical information, such that incidental cues

partially activate multiple memory representations outside awareness, making them more likely to be retrieved later in response to additional triggers. If so, individuals with HSAM might show enhanced performance on conceptual priming tasks, an idea that could be tested in future studies. Together, these mechanisms may further facilitate the occurrence of involuntary remembering.

General autobiographical memory functioning. Moving beyond involuntary remembering, it is also important to consider the broader functioning and phenomenology of autobiographical memory in HSAM. Notably, previous studies have seldom examined the phenomenology of autobiographical memory retrieval in HSAM, despite the growing importance of this approach in contemporary research (e.g., Moulin et al., 2023; Chiorri & Vannucci, 2024; Perrin & Sant'Anna, 2022; Perrin, Michaelian, & Sant'Anna, 2020). Phenomenological accounts suggest that autobiographical remembering can be conceptualised along two complementary dimensions: (1) the experience of retrieval (e.g., whether remembering feels fluent, effortless, or involuntary), and (2) the subjective properties of the retrieved memory (e.g., vividness, emotional intensity, and level of detail). To date, these dimensions have not been systematically examined in individuals with HSAM. In particular, it remains unclear whether their recall is experienced as more fluent, effortless, or involuntary, and whether such experiential characteristics distinguish HSAM from typical autobiographical remembering.

In the present study, we addressed this issue using the ART (Berntsen et al., 2019; Barzykowski et al., 2026c). To our knowledge, this is the first time that an HSAM individual has been assessed using this measure. Importantly, the ART captures general, trait-like tendencies in the subjective experience of autobiographical remembering rather than the frequency of involuntary remembering or the properties of specific memory episodes. The scale captures broad phenomenological qualities of remembering, including vividness, coherence, reliving, rehearsal, scene construction, visual imagery, and life-story relevance. KCL's performance on the ART did not differ from that of the general population, neither in the overall score nor across individual subscales. This suggests that, at the level of general subjective tendencies, the phenomenological experience of remembering in HSAM may be largely typical. At the same time, this finding contrasts with the elevated frequency of involuntary autobiographical memories observed in both the IAMI and the vigilance task, raising the possibility that HSAM is characterized primarily by enhanced accessibility of autobiographical memories rather than by globally altered phenomenological experiences of remembering. Whether autobiographical memories in HSAM are phenomenologically richer at the level of individual memory episodes remains an important question for future research. However, because the ART is a self-report measure, these conclusions should be interpreted with caution. Future research employing laboratory-based paradigms and memory-level assessments is needed to more precisely assess both retrieval dynamics and the properties of retrieved memories (e.g., Barzykowski & Mazzoni, 2022).

A complementary perspective is provided by the Survey of Autobiographical Memory (SAM; Palombo et al., 2013), which assesses trait-like self-perceptions of autobiographical memory abilities. KCL showed elevated scores, particularly on the total and episodic subscales, indicating a heightened self-reported ability to recall detailed personal experiences. This pattern is consistent with the assumption that HSAM involves enhanced access to richly detailed autobiographical content. At the same time, such findings should be interpreted cautiously. As a self-report measure, the SAM may capture metacognitive beliefs about memory rather than objective retrieval ability. Indeed, the present study did not include performance-based assessments of various autobiographical memory recall (e.g., Levine, Svoboda, Hay, Winocur, & Moscovitch, 2002; see also Barzykowski & Staugaard, 2016, 2018; Barzykowski, Staugaard, & Mazzoni, 2021), nor did it directly assess personal and general semantic autobiographical knowledge using performance-based methods (e.g., Melega et al., 2024). Future research should therefore integrate subjective and objective measures of autobiographical memory to determine the extent to which elevated SAM scores reflect actual episodic retrieval capacity as well as autobiographical semantic knowledge.

Many of the measures of interest in HSAM rely on subjective report. The present study combined multiple methodological approaches, but several key aspects of memory retrieval relied on self-report instruments (e.g., ART, SAM). While these tools provide valuable insight into subjective experience and trait-like tendencies, they are inherently influenced by metacognitive beliefs and introspective accuracy, and thus may not fully capture objective properties of autobiographical memory retrieval. It is likely that, even in someone as young as 16, the interpretation of one's experiences and comparisons with one's peers has led to biased descriptions of autobiographical memory retrieval. We might therefore imagine that KCL has needed to 'understand' his own experience of memory, and how he is able to retrieve so many autobiographical memories in so much detail. Future studies should therefore integrate performance-based and laboratory measures, such as experimentally controlled paradigms (e.g., Barzykowski & Staugaard, 2016, 2018), to more directly assess episodic retrieval processes. Importantly, such approaches would allow the examination of both retrieval-related processes (e.g., perceived fluency, retrieval effort, retrieval intentionality) and memory-content characteristics (e.g., vividness, emotional intensity, level of detail). Ideally, future research could also benefit from applying distinct procedures to investigate involuntary autobiographical memories (e.g., Schlagman & Kvavilashvili, 2008; see also Barzykowski & Kvavilashvili, 2024) alongside voluntary retrieval paradigms (e.g., Barzykowski & Staugaard, 2016; Uzer et al., 2012).

Finally, although the use of a probe-caught vigilance paradigm represents a methodological strength in assessing the frequency of involuntary cognition, it captures only one aspect of spontaneous remembering. Probe-caught methods reduce reliance on self-initiated monitoring and provide more objective estimates of occurrence, but they do not fully account for the processes involved in noticing and reporting spontaneous experiences. In contrast, self-caught approaches rely on participants' ability to detect and report their own thoughts, thereby providing complementary insight into metacognitive awareness and the subjective salience of

memories. Future research would therefore benefit from combining probe-caught and self-caught methods, allowing for a more comprehensive examination of involuntary autobiographical memory (Takarangi, Strange, & Lindsay, 2014). Such an approach would enable the simultaneous assessment of frequency (via probe-caught sampling) and experiential and metacognitive aspects of retrieval (via self-caught reports), including retrieval dynamics (e.g., response times) and phenomenological characteristics of spontaneously occurring memories.

4.2. *Possible limitations and future avenues for research*

Some limitations of the present study warrant discussion in order to identify important directions for future research.

First, although remote assessment allowed us to study a rare HSAM case that would otherwise have been difficult to access, it necessarily provided less control over environmental variables than in-person laboratory testing. Several safeguards were therefore implemented: KCL was asked to complete each session in a quiet, distraction-free environment; all sessions were conducted under direct supervision of the first author with continuous audio, video, and screen sharing; and KCL was instructed to work independently, relying only on his own memory and experience. No evidence of protocol violations was observed. Remote assessment also cannot fully exclude the possibility of unobserved access to external sources of information, including online resources or AI-based tools. Several aspects of KCL's performance make systematic use of such aids unlikely: his screening performance, although exceptional, was far from ceiling; he frequently reported not knowing or remembering specific answers; many responses reflected idiosyncratic interests or local knowledge rather than highly salient public events that would typically be prioritized by search engines or AI systems. Nevertheless, future investigations of HSAM would benefit from conducting key screening assessments in person whenever feasible.

Moreover, the pattern of findings was internally consistent across multiple measures and showed convergence between subjective reports and objective task performance. Importantly, available evidence suggests that the remote nature of the assessment is unlikely to fully account for the observed pattern of results. In an unpublished study conducted in our laboratory (Barzykowski & Kvavilashvili, in preparation), 78 young adults completed the same vigilance task in both remote (at home, without direct researcher supervision) and laboratory (under direct supervision) settings, with the order of the two testing conditions counterbalanced across participants. No significant differences were observed in the frequency of involuntary autobiographical memories between the laboratory ($M = 3.92$, $SD = 2.47$) and remote conditions ($M = 3.77$, $SD = 3.09$), $t(78) = .41$, $p = .685$, $BF_{10} = .135$, providing moderate evidence in favour of the null hypothesis. Similarly, no differences were found for involuntary future thoughts (laboratory: $M = 2.31$, $SD = 1.80$; remote: $M = 2.33$, $SD = 2.07$), $t(78) = .10$, $p = .920$, $BF_{10} = .125$, again indicating moderate evidence for the absence of a difference between testing environments. These findings suggest that the vigilance task does not produce different levels of spontaneous autobiographical cognition across laboratory and remote testing environments. Taken together with the continuous audio, video, and screen-sharing supervision employed throughout the study, this evidence suggests that the remote mode of testing is unlikely to have substantially influenced the pattern of findings observed in KCL.

Another limitation concerns the fact that several of the reference datasets consisted primarily of young adult samples rather than age-matched adolescents. Consequently, these comparisons should be interpreted as providing a broad contextualization of KCL's performance rather than definitive age-normed evaluations. Future studies would benefit from establishing larger age- and education-matched normative datasets, particularly for adolescents, which would facilitate more precise characterization of HSAM and related cognitive abilities across development.

A final limitation concerns the assessment of involuntary autobiographical memories. Although the vigilance task provides a controlled experimental context in which spontaneous thoughts are sampled while they occur during ongoing task performance, the identification of involuntary autobiographical memories is reliant upon self-reports. Specifically, participants are required to describe the contents of consciousness present immediately prior to a probe and, following task completion, to verify whether the reported experiences meet the criteria for autobiographical memories. The latter procedure follows current methodological recommendations in the field (Barzykowski, Ilczuk, & Kvavilashvili, 2024) and, in the present study, all entries classified as autobiographical memories were additionally screened by the first author to ensure that they clearly referred to personally experienced past events. Nevertheless, some degree of subjective judgment remains inherent in the assessment process. Thus, while the vigilance task provides a more controlled and less retrospective assessment of involuntary remembering than questionnaire-based measures, it should not be regarded as fully objective in the same sense as behavioural indices such as response times or accuracy measures. Future research may therefore benefit from combining vigilance-task procedures with additional behavioural, physiological, or neurocognitive markers of spontaneous retrieval (e.g., see Pelagatti, Binda, & Vannucci, 2018, 2020).

5. Final conclusions and future directions

The present study provides a comprehensive and detailed account of autobiographical memory retrieval in HSAM by examining the frequency of involuntary autobiographical memories under well-controlled laboratory conditions. While KCL, an individual with HSAM, did not differ from the general population in the general phenomenological experience of remembering or in broader cognitive functioning, he exhibited a marked increase in the accessibility of autobiographical content, particularly within the involuntary domain. Crucially, this enhancement does not reflect a global increase in spontaneous cognition, but rather a selective bias toward past-oriented, autobiographical material. These findings suggest that HSAM may be best understood not as a form of generalized memory superiority, but as a shift in the

dynamics of retrieval, characterised by heightened cue sensitivity and a lowered threshold for accessing autobiographical information. In this framework, involuntary remembering—and, more broadly, direct forms of retrieval—may play a central role in the HSAM phenotype. Overall, the present study advances current understanding of HSAM by demonstrating that its uniqueness may lie not only in what is remembered, but in how autobiographical memories are accessed, highlighting accessibility and retrieval dynamics as key mechanisms underlying exceptional autobiographical memory.

CRediT authorship contribution statement

Krystian Barzykowski: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Valerio Santangelo:** Writing – review & editing, Methodology, Conceptualization. **Lia Kvavilashvili:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Chris J.A. Moulin:** Writing – review & editing, Supervision, Methodology, Conceptualization.

Disclaimer

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Commission. Neither the European Union nor the granting authority can be held responsible for them.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the ChatGPT-5 was used to proofread the text and enhance its readability. After using this tool, the sentences were reviewed and the content was edited as needed by Author(s), who take full responsibility for the content of the published article.



Acknowledgements

Krystian Barzykowski and his work were supported by the funding from the European Union's Horizon research and innovation programme (Call: HORIZON-MSCA-2022-PF-01) under the Marie Skłodowska-Curie Postdoctoral Fellowship (grant agreement No: 101103345—SpontaneousPAST). More about the project can be found here: https://memorylab.phils.uj.edu.pl/msca | The adaptation of the questionnaires (IAMI, ART, SAM, MWQ, MW-D, MW-S, NECS), as well as the implementation of the cognitive tasks (vigilance task, Stroop task, Eriksen Flanker Task, OSPAN, Symmetry Span, Vigilance Task), were supported by the National Science Centre, Poland (OPUS grant No. 2019/35/B/HS6/00528 and SONATA grant No. 2015/19/D/HS6/00641 awarded to K.B.). We would like to thank Weronika Hryniszak for sharing data used as some of the comparison groups in the present study. We also thank Michał Wierzchoń for providing access to reference datasets collected as part of research conducted within COST Action CA18106, *The Neural Architecture of Consciousness*, supported by COST (European Cooperation in Science and Technology). The data were collected with funding from the National Science Centre, Poland (OPUS grant 2017/27/B/HS6/00937 awarded to M.W.). The Centre for Brain Research is supported as a flagship project by the Future Society Priority Research Area and the Quality of Life Priority Research Area under the Strategic Programme of Excellence Initiative at the Jagiellonian University.

Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cortex.2026.08.017.

REFERENCES

Barzykowski, K., Hajdas, S., Radel, R., & Kvavilashvili, L. (2022). Effects of inhibitory control capacity and cognitive load on involuntary past and future thoughts: A laboratory study. *Consciousness and Cognition, 102*, 1–19. https://doi.org/10.1016/j.concog.2022.103353

Barzykowski, K., Ilczuk, E., & Kvavilashvili, L. (2024). A comprehensive guide to research protocols for collecting and coding involuntary past and future thoughts. *MethodsX, 12*, Article 102732. https://doi.org/10.1016/j.mex.2024.10.

Barzykowski, K., Ilczuk, E., & Kvavilashvili, L. (2026b). The role of working memory in the occurrence of involuntary thoughts about the past and future: An experimental investigation. *Journal of Experimental Psychology: Learning, Memory and Cognition*. https://doi.org/10.1037/xlm0001624

Barzykowski, K., Ilczuk, E., Öner, S., Chwiłka, P., & Wereszczyński, M. (2026c). A Polish adaptation of the autobiographical recollection test (ART): Toward a reliable and valid measure of individual differences in autobiographical memory. *Memory, 34*(1), 70–81. https://doi.org/10.1080/09658211.2025.2594560

Barzykowski, K., Ilczuk, E., Öner, S., Chwiłka, P., Wereszczyński, M., Jakubowska, W., et al. (2026a). Convergent validation of the involuntary autobiographical memory inventory across levels of analysis in a Polish sample. *Scientific Reports, 16*(22862), 1–16. https://doi.org/10.1038/s41598-026-40606-3

Barzykowski, K., & Kvavilashvili, L. (2024). Involuntary (autobiographical) memory. In L. M. Bietti, & M. Pogacar (Eds.), *The palgrave encyclopedia of memory studies* (pp. 1–6). Cham: Palgrave Macmillan. https://doi.org/10.1007/978-3-030-93789-8_73-1.

Barzykowski, K., & Mazzoni, G. (2022). Do intuitive ideas of the qualities that should characterize involuntary and voluntary

memories affect their classification? *Psychological Research, 86*, 170–195. https://doi.org/10.1007/s00426-020-01465-3
Barzykowski, K., & Moulin, C. (2023a). Are involuntary autobiographical memory and déjà vu natural products of memory retrieval? *Behavioral and Brain Sciences, 46*, Article E356. https://doi.org/10.1017/S0140525X22002035
Barzykowski, K., & Moulin, C. (2023b). Further advancing theories of retrieval of the personal past. *Behavioral and Brain Sciences, 46*, Article E384. https://doi.org/10.1017/S0140525X23002765
Barzykowski, K., & Niedźwieńska, A. (2016). The effects of instruction on the frequency and characteristics of involuntary autobiographical memories. *PLoS One, 11*(6). https://doi.org/10.1371/journal.pone.0157121
Barzykowski, K., Niedźwieńska, A., & Mazzoni, G. (2019). How intention to retrieve a memory and expectation that it will happen influence retrieval of autobiographical memories. *Consciousness and Cognition, 72*, 31–48. https://doi.org/10.1016/j.concog.2019.03.011
Barzykowski, K., Santangelo, V., Kvavilashvili, L., & Moulin, C. *Implementation of a screening method for highly superior autobiographical memory (HSAM) using the public events quiz and random dates quiz - Research data (version V1)*. (2026f). Jagiellonian University in Krakow. https://doi.org/10.57903/UJ/T78TXN.
Barzykowski, K., Santangelo, V., Kvavilashvili, L., & Moulin, C. J. A. (2026e). Implementation of a screening method for highly superior autobiographical memory (HSAM) using the public events quiz and random dates quiz. *Open Research Europe, 6*(243), 1–10. https://doi.org/10.12688/openreseurope.24267.1
Barzykowski, K., Staugaard, R., & Mazzoni, G. (2026). Advancing the threshold model: Methodological divergence and the involuntary–voluntary memory differences paradox. *Journal of Applied Research in Memory and Cognition*.
Barzykowski, K., & Staugaard, S. R. (2016). Does retrieval intentionality really matter? Similarities and differences between involuntary memories and directly and generatively retrieved voluntary memories. *British Journal of Psychology, 107*(3), 519–536. https://doi.org/10.1111/bjop.12160
Barzykowski, K., & Staugaard, S. R. (2018). How intention and monitoring your thoughts influence characteristics of autobiographical memories. *British Journal of Psychology, 109*(2), 321–340. https://doi.org/10.1111/bjop.12259
Barzykowski, K., Wereszczyński, M., Hajdas, S., & Radel, R. (2021). An Inquisit-web protocol for calculating composite inhibitory control capacity score: An individual differences approach. *MethodsX, 8*, 1–10. https://doi.org/10.1016/j.mex.2021.101530
Barzykowski, K., Wereszczyński, M., Hajdas, S., & Radel, R. (2022). Cognitive inhibition behavioral tasks in online and laboratory settings: Data from stroop, SART and Eriksen Flanker tasks. *Data in Brief, 43*, 1–6. IF: 2.6. https://doi.org/10.1016/j.dib.2022.108398
Barzykowski, K., Zięba, S., Öner, S., Ilczuk, E., Chwiłka, P., Jakubowska, W., et al. (2026g). *Measuring the wandering mind: Polish psychometric adaptation of mind-wandering scales and their links to cognitive control* (Manuscript under revision).
Berntsen, D. (1996). Involuntary autobiographical memories. *Applied Cognitive Psychology, 10*, 435–454. https://doi.org/10.1002/(SICI)1099-0720(199610)10:5<435::AIDACP408>3.0.CO;2-L
Berntsen, D. (2010). The unbidden past: Involuntary autobiographical memories as a basic mode of remembering. *Current Directions in Psychological Science, 19*(3), 138–142. https://doi.org/10.1177/0963721410370301
Berntsen, D. (2020). Involuntary autobiographical memories and their relation to other forms of spontaneous thoughts. *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences, 376*(1817), 20190693. https://doi.org/10.1098/rstb.2019.0693
Berntsen, D. (2026). Involuntary and voluntary memories of the personal past: Their characteristics and evolutionary origins. *Journal of Applied Research in Memory and Cognition*.
Berntsen, D., Hoyle, R. H., & Rubin, D. C. (2019). The autobiographical recollection test (ART): A measure of individual differences in autobiographical memory. *Journal of Applied Research in Memory and Cognition, 8*(3), 305–318. https://doi.org/10.1016/j.jarmac.2019.06.005
Berntsen, D., Rubin, D. C., & Salgado, S. (2015). The frequency of involuntary autobiographical memories and future thoughts in relation to daydreaming, emotional distress, and age. *Consciousness and Cognition, 36*, 352–372. https://doi.org/10.1016/j.concog.2015.07.007
Billet, M., Geurten, M., & Willems, S. (2023). How well do you think you remember your personal past? French validation of the Autobiographical Recollection Test (ART) and exploration of age effect. *Memory (Hove, England), 31*(6), 864–870. https://doi.org/10.1080/09658211.2023.2207805
Chiorri, C., & Vannucci, M. (2024). The subjective experience of autobiographical remembering: Conceptual and methodological advances and challenges. *Journal of Intelligence, 12*(2), 21. https://doi.org/10.3390/jintelligence12020021
Christoff, K., Irving, Z. C., Fox, K. C. R., Spreng, N. R., & Andrews-Hanna, J. R. (2016). Mind-wandering as spontaneous thought: A dynamic framework. *Nature Review Neuroscience, 17*, 718–731. https://doi.org/10.1038/nrn.2016.113
Cleary, A. M., Okada, N., Bearden, D. J., Alfonso, D., Mills, C., Neisser, J., et al. (2026). A case of highly superior autobiographical memory (HSAM) accompanied by highly frequent involuntary autobiographical memory. *Neurocase, 32*(4), 152–166. https://doi.org/10.1080/13554794.2026.2701703
Clevinger, A. M., & Mace, J. H. (2024). Studying naturally occurring involuntary autobiographical memories with the diary approach: A comparison of diary methods. *Applied Cognitive Psychology, 38*(4), Article e4225. https://doi.org/10.1002/acp.4225
Cole, S., & Kvavilashvili, L. (2019). Spontaneous future cognition: The past, present and future of an emerging topic. *Psychological Research, 83*(4), 631–650. https://doi.org/10.1007/s00426-019-01193-3
Cole, S., & Kvavilashvili, L. (2021). Spontaneous and deliberate future thinking: A dual process account. *Psychological Research, 85*(2), 464–479. https://doi.org/10.1007/s00426-019-01262-7
Conway, M. A. (2005). Memory and the self. *Journal of Memory and Language, 53*(4), 594–628. https://doi.org/10.1016/j.jml.2005.08.005
Conway, M. A., Justice, L. V., & D'Argembeau, A. (2019). The self-memory system revisited : Past, present, and future. In J. Mace (Ed.), *The organization and structure of autobiographical memory* (pp. 28–51). Oxford University Press. https://doi.org/10.1093/oso/9780198784845.003.0003.
Conway, M. A., & Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review, 107*(2), 261–288. https://doi.org/10.1037/0033-295X.107.2.261
Crawford, J. R., & Garthwaite, P. H. (2002). Investigation of the single case in neuropsychology: Confidence limits on the abnormality of test scores and test score differences. *Neuropsychologia, 40*, 1196–1208.
Crawford, J. R., & Howell, D. C. (1998). Comparing an individual's test score against norms derived from small samples. *The Clinical Neuropsychologist, 12*, 482–486.
Daviddi, S., Orwig, W., Palmiero, M., Campolongo, P., Schacter, D. L., & Santangelo, V. (2022). Individuals with highly superior autobiographical memory do not show enhanced creative thinking. *Memory, 30*(9), 1148–1157. https://doi.org/10.1080/09658211.2022.2094416

Daviddi, S., Pedale, T., Serra, L., Macrì, S., Campolongo, P., & Santangelo, V. (2022). Altered hippocampal resting-state functional connectivity in highly superior autobiographical memory. *Neuroscience, 480*, 1–8. https://doi.org/10.1016/j.neuroscience.2021.11.004

Daviddi, S., Pedale, T., St Jacques, P. L., Schacter, D. L., & Santangelo, V. (2023). Common and distinct correlates of construction and elaboration of episodic-autobiographical memory: An ALE meta-analysis. *Cortex; a Journal Devoted to the Study of the Nervous System and Behavior, 163*, 123–138. https://doi.org/10.1016/j.cortex.2023.03.005

Daviddi, S., Yaya, G., Sperduti, M., & Santangelo, V. (2025). A systematic review and meta-analysis of the neural correlates of direct *vs* generative retrieval of episodic autobiographical memory. *Neuropsychology Review, 35*(4), 710–730. https://doi.org/10.1007/s11065-024-09653-3

De Marco, M., Mazzoni, G., Manca, R., & Venneri, A. (2021). Functional neural architecture supporting highly superior autobiographical memory. *Brain Connectivity, 11*(4), 297–307. https://doi.org/10.1089/brain.2020.0858

Dodier, O., Barzykowski, K., & Souchay, C. (2023). Recovered memories as a special (or not so special) form of involuntary autobiographical memories. *Frontiers in Psychology (Special Issue: The Impact of Internal and External Influences on Memory and their Relevance to Legal Decisions), 14*, Article 1268757. https://doi.org/10.3389/fpsyg.2023.1268757

Gehrt, T. B., Nielsen, N. P., Hoyle, R. H., Rubin, D. C., & Berntsen, D. (2022). Individual differences in autobiographical memory: The autobiographical recollection test predicts ratings of specific memories across cueing conditions. *Journal of Applied Research in Memory and Cognition, 11*(1), 85–96. https://doi.org/10.1037/h0101869.

Gibson, E. C., Ford, L., & Robinson, G. A. (2022). Investigating the role of future thinking in a case of highly superior autobiographi- cal memory. *Cortex; a Journal Devoted To the Study of the Nervous System and Behavior, 149*, 188–201. https://doi.org/10.1016/j.cortex.2022.01.016

Gordon, P., Valentine, E., & Wilding, J. (1984). One man's memory: A study of a mnemonist. *British Journal of Psychology, 75*, 1–14.

Hunt, E., & Love, T. (1972). How good can memory be? In A. W. Meltin, & E. Martin (Eds.), *Coding processes in human memory* (pp. 237–260). Washington, D.C.: Winston-Wiley.

Hunt, E., & Love, T. (1983). The second mnemonist. In U. Neisser (Ed.), *Memory observed: Remembering in natural context* (pp. 390–398). San Francisco: W.H. Freeman & Co.

Kvavilashvili, L., & Ellis, J. (2004). Ecological validity and twenty years of real-life/laboratory controversy in memory research: A critical (and historical) review. *History and Philosophy of Psychology, 6*, 59–80.

Laughland, A., & Kvavilashvili, L. (2018). Should participants be left to their own devices? Comparing paper and smartphone diaries in psychological research. *Journal of Applied Research in Memory and Cognition, 7*(4), 552–563. https://doi.org/10.1037/h0101828

LePort, A. K., Mattfeld, A. T., Dickinson-Anson, H., Fallon, J. H., Stark, C. E., Kruggel, F., et al. (2012). Behavioral and neuroanatomical investigation of highly superior autobiographical memory (HSAM). *Neurobiology of Learning and Memory, 98*(1), 78–92. https://doi.org/10.1016/j.nlm.2012.05.002

LePort, A. K. R., Stark, S. M., McGaugh, J. L., & Stark, C. E. L. (2016). Highly superior autobiographical memory: Quality and quantity of retention over time. *Frontiers in Psychology, 6*(JAN), 1–10. https://doi.org/10.3389/fpsyg.2015.02017

LePort, A. K. R., Stark, S. M., McGaugh, J. L., & Stark, C. E. L. (2017). A cognitive assessment of highly superior autobiographical memory. *Memory, 25*(2), 276–288. https://doi.org/10.1080/09658211.2016.1160126

Levine, B., Svoboda, E., Hay, J. F., Winocur, G., & Moscovitch, M. (2002). Aging and autobiographical memory: Dissociating episodic from semantic retrieval. *Psychology and Aging, 17*(4), 677–689.

Łuria, A. R. (1987). *The mind of a mnemonist: A little book about a vast memory*. Cambridge: Harvard University Press.

Mace, J. H. (2007). Does involuntary remembering occur during voluntary remembering? In J. H. Mace (Ed.), *Involuntary memory* (pp. 50–67). Blackwell.

Mazzoni, G., Clark, A., De Bartolo, A., Guerrini, C., Nahouli, Z., Duzzi, D., et al. (2019). Brain activation in highly superior autobiographical memory: The role of the precuneus in the autobiographical memory retrieval network. *Cortex; a Journal Devoted to the Study of the Nervous System and Behavior, 120*, 588–602. https://doi.org/10.1016/j.cortex.2019.02.020

Melega, G., Lancelotte, F., Johnen, A. K., Hornberger, M., Levine, B., & Renoult, L. (2024). Evoking episodic and semantic details with instructional manipulation during autobiographical recall. *Psychology and Aging, 39*(4), 378–390. https://doi.org/10.1037/pag0000821

Messina, A., & Berntsen, D. (2024). Self-reported sensibility to bodily signals predicts individual differences in autobiographical memory: An exploratory study. *Memory, 32*(8), 996–1011.

Moulin, C. J. A., Carreras, F., & Barzykowski, K. (2023). The phenomenology of autobiographical retrieval. Wiley interdisciplinary reviews. *Cognitive Science, 14*(3), Article e1638. https://doi.org/10.1002/wcs.1638

Orwig, W., Diez, I., Bueichekú, E., Pedale, T., Parente, F., Campolongo, P., et al. (2024). Cortical hubs of highly superior autobiographical memory. *Cortex; a Journal Devoted to the Study of the Nervous System and Behavior, 179*, 14–24. https://doi.org/10.1016/j.cortex.2024.06.018

Palombo, Daniela J., Williams, Lynne J., Abdi, Hervé, & Levine, Brian (2013). The survey of autobiographical memory (SAM): A novel measure of trait mnemonics in everyday life. *Cortex, 49*(6), 1526–1540. https://doi.org/10.1016/j.cortex.2012.08.023

Parker, E. S., Cahill, L., & McGaugh, J. L. (2006). A case of unusual autobiographical remembering. *Neurocase, 12*(1), 35–49. https://doi.org/10.1080/13554790500473680

Patihis, L. (2016). Individual differences and correlates of highly superior autobiographical memory. *Memory, 24*(7), 961–978. https://doi.org/10.1080/09658211.2015.1061011

Patihis, L., Frenda, S. J., LePort, A. K., Petersen, N., Nichols, R. M., Stark, C. E., et al. (2013). False memories in highly superior autobiographical memory individuals. *Proceedings of the National Academy of Sciences, 110*(52), 20947–20952. https://doi.org/10.1073/pnas.1314373110

Pedale, T., Puccio, G., Pisaneschi, A., Laricchiuta, D., Campolongo, P., & Santangelo, V. (2026). Highly superior autobiographical memory in early adolescence: A single case study. *Cortex; a Journal Devoted to the Study of the Nervous System and Behavior, 202*, 20–31. https://doi.org/10.1016/j.cortex.2026.05.010. Epub 2026 May 28. PMID: 42269457.

Pelagatti, C., Binda, P., & Vannucci, M. (2018). Tracking the dynamics of mind wandering: Insights from pupillometry. *Journal of Cognition, 1*(1), 38. https://doi.org/10.5334/joc.41

Pelagatti, C., Binda, P., & Vannucci, M. (2020). A closer look at the timecourse of mind wandering: Pupillary responses and behaviour. *PLoS One, 15*(4), Article e0226792. https://doi.org/10.1371/journal.pone.0226792

Perrin, D., Michaelian, K., & Sant'Anna, A. (2020). The phenomenology of remembering is an epistemic feeling. *Frontiers in Psychology, 11*, 1531.

Perrin, D., & Sant'Anna, A. (2022). Episodic memory and the feeling of pastness: From intentionalism to metacognition. *Synthese, 200*, 109.

Plimpton, B., Patel, P., & Kvavilashvili, L. (2015). Role of triggers and dysphoria in mind-wandering about past, present and future: A laboratory study. *Consciousness and Cognition, 33*, 261–276. https://doi.org/10.1016/j.concog.2015.01.014

Price, J., & Davis, B. (2008). *The woman who can't forget: The extraordinary story of living with the Most remarkable memory known to Science–A memoir*. The Free Press.

Robertson, A. E., & Simmons, D. R. (2013). The relationship between sensory sensitivity and autistic traits in the general population. *Journal of Autism and Developmental Disorders, 43*(4), 775–784. https://doi.org/10.1007/s10803-012-1608-7

Santangelo, V., Cavallina, C., Colucci, P., Santori, A., Macrı, S., McGaugh, J. L., et al. (2018). Enhanced brain activity associated with memory access in highly superior autobiographical memory. *Proceedings of the National Academy of Sciences of the United States of America, 115*, 7795, 7780.

Santangelo, V., Pedale, T., Colucci, P., Giulietti, G., Macrì, S., & Campolongo, P. (2021). Highly superior autobiographical memory in aging: A single case study. *Cortex; a Journal Devoted to the Study of the Nervous System and Behavior, 143*, 267–280. https://doi.org/10.1016/j.cortex.2021.05.011

Santangelo, V., Pedale, T., Daviddi, S., Salsano, I., Macrì, S., & Campolongo, P. (2025). Altered brain activity during active forgetting in highly superior autobiographical memory: Evidence from an item-method directed forgetting. *iScience, 28*(6), Article 112607. https://doi.org/10.1016/j.isci.2025.112607

Santangelo, V., Pedale, T., Macrì, S., & Campolongo, P. (2020). Enhanced cortical specialization to distinguish older and newer memories in highly superior autobiographical memory. *Cortex; a Journal Devoted To the Study of the Nervous System and Behavior, 129*, 476–483. https://doi.org/10.1016/j.cortex.2020.04.029

Schlagman, S., & Kvavilashvili, L. (2008). Involuntary autobiographical memories in and outside the laboratory : How different are they from voluntary autobiographical memories? *Memory & Cognition, 36*(5), 920–932. https://doi.org/10.3758/MC.36.5.920

Takarangi, M. K. T., Strange, D., & Lindsay, D. S. (2014). Self-report underestimates trauma intrusions. *Consciousness and Cognition, 27*, 297e305. https://doi.org/10.1016/j.concog.2014.06.002

Talbot, J., Convertino, G., De Marco, M., Venneri, A., & Mazzoni, G. (2024). Highly superior autobiographical memory (HSAM): A systematic review. *Neuropsychology Review*. , Article 0123456789. https://doi.org/10.1007/s11065-024-09632-8

Talbot, J., Gatti, D., Boccalari, M., Marchetti, M., Mitaritonna, D., Convertino, G., et al. (2025b). Exploring inhibitory control processes in highly superior autobiographical memory (HSAM): A single case study. *Journal of Cognition, 8*(1), 1–14. https://doi.org/10.5334/joc.421

Talbot, J., Gatti, D., & Mazzoni, G. (2025a). *Frequency and characteristics of spontaneous memories in highly superior autobiographical memory (HSAM): A naturalistic single case diary study*. https://doi.org/10.31234/osf.io/y3nf6_v1

Talbot, J., Gatti, D., Mitaritonna, D., Marchetti, M., Convertino, G., & Mazzoni, G. (2022). Stimulating a hyper memory: A single case TMS study on an individual with highly superior autobiographical memory. *Brain Stimulation, 15*(5), 1122–1124. https://doi.org/10.1016/j.brs.2022.08.006

Uzer, T., Lee, P. J., & Brown, N. R. (2012). On the prevalence of directly retrieved autobiographical memories. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 38*(5), 1296–1308. https://doi.org/10.1037/a0028142

Vannucci, M., Batool, I., Pelagatti, C., Mazzoni, G., & Dekel, S. (2014). Modifying the frequency and characteristics of involuntary autobiographical memories. *PLoS One, 9*(4), Article e89582. https://doi.org/10.1371/journal.pone.0089582, 10.1371/journal.pone.0089582.t00110.1371/journal.pone.0089582.s00110.1371/journal.pone.0089582.s002.

Wereszczyński, M., Smołka, E., Ilczuk, E., Chwiłka, P., Öner, S., & Barzykowski, K. (2025). Data from SymSPAN and OSPAN working memory capacity tasks in online and laboratory setting. *Data in Brief, 62*(111923), 1–11. https://doi.org/10.1016/j.dib.2025.111923

Wilding, J., & Valentine, E. (1997). *Superior memory*. Psychology Press.

Zareen, G., Souchay, C., Barzykowski, K., & Moulin, C. J. A. (2026). Spontaneous metacognitive experiences and involuntary memories in the laboratory. *Consciousness and Cognition, 137*(1), 1–19. https://doi.org/10.1016/j.concog.2025.103976