

Baseline Paper Series 1

Memory for Time

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Authorship

Parts I and II of this article are co-authored by **Hilary Evans Cameron** and **Jane Herlihy**.¹

Part III is co-authored by **Hilary Evans Cameron**, **Jane Herlihy** and **the 58 experts in autobiographical memory** who are named at the end of this paper.

Part I: Introduction

The decision to deny refugee protection often rests on a conclusion that the claimant is lying.² Such conclusions, in turn, often rest on the decision-maker's assumptions about human psychology: on what they think they know about how people think and act.

Many common assumptions in refugee status rejections depart markedly from the findings in psychology research. Ways of thinking and acting that decision-makers regularly feel are too improbable to be believed are, according to the best available evidence, entirely unremarkable.³

For decades, researchers, judges, system administrators, and other policy actors have warned decision-makers that relying on such flawed assumptions may lead them to deny well-founded claims.⁴ That the problem persists suggests that decision-makers require more concrete assistance.

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² Hilary Evans Cameron, "Risk and the Reasonable Refugee: Exploring a Key Credibility Inference in Canadian Refugee Status Rejections" (2023) 35:1 *International Journal of Refugee Law* 10–36, <https://doi.org/10.1093/ijrl/eead022>; Jane Herlihy, Hilary Evans Cameron & Stuart Turner, "Psychological research evidence in refugee status determination" (2024) 37:4 *Journal of Refugee Studies* 938–953, <https://doi.org/10.1093/jrs/fead043>; Tanja S van Veldhuizen, Robert Horselenberg, Sara Landström, Pär Anders Granhag & Peter J van Koppen, "Interviewing asylum seekers: A vignette study on the questions asked to assess credibility of claims about origin and persecution" (2017) 14:1 *Journal of Investigative Psychology and Offender Profiling* 3–22, <https://doi.org/10.1002/jip.1472>.

³ Hilary Evans Cameron, Jane Herlihy & Michaela Hynie, "Investigating deception findings in Canadian refugee status rejections: legal inferences and psychological assumptions" (2025) 32:6 *Psychiatry, Psychology, and Law* 949–975, <https://doi.org/10.1080/13218719.2024.2404862>; Herlihy, above note 2; Jenny Skrifvars, Veronica Sui, Jan Antfolk, Tanja van Veldhuizen & Julia Korkman, "Psychological Assumptions Underlying Credibility Assessments in Finnish Asylum Determinations" (2022) 76:1 *Nordic Psychology* 55–77, <https://doi.org/10.1080/19012276.2022.2145986>.

⁴ For a recent review, see Asta S Stage Jarlner, Maya Ellen Hertz, Marieke Anne Heyl, Thomas Gammeltoft-Hansen & William Hamilton Byrne, "Credibility as a fuzzy concept in refugee law: a

The Baseline Paper Series

The multi-authored statements in this series affirm that certain psychological responses have been established by the relevant research to be *well within the range of normal experience* in studied populations. Each of these statements sets a baseline: “a known measure”; “a set of critical observations or data used for comparison” “a starting point.”⁵ They describe a set of responses that represent neither the lower nor the upper limit of the normal range – neither the floor nor the ceiling – but instead a point somewhere *well within* that range.

As such, these statements will not help decision-makers to identify responses that are *outside of the normal range*. And as discussed below, they will not help decision-makers to predict the psychological responses of individual claimants. Instead, they may help decision-makers to identify flawed assumptions: to recognize when there is *no reason to assume* that a claimant would (or would not) have responded in a certain way. These statements may make clear, in other words, that a decision-maker needs to rethink or else better support the conclusion that a psychological response is too improbable to be believed.

Baseline Paper Series 1: Memory for Time

In assessing a refugee claimant’s credibility, decision-makers often identify as a reason to doubt the claimant’s truthfulness their failure to recall accurately or consistently the temporal information associated with events that they are describing: the time of day when an event occurred, or the day, month, or year; whether one event occurred before or after another; how much time passed between events; how long an event lasted; or how often repeated events occurred.⁶ As the United Nations High Commissioner for Refugees (UNHCR) has noted, psychology evidence can help set the relevant baselines for these kinds of credibility assessments: decision-makers “need to be familiar with the findings of scientific research in order to have realistic expectations of [claimants’] memory.”⁷

In the large body of literature on credibility assessment in refugee status decision-making, concerns about unrealistic expectations run in one direction: this literature makes clear that decision-makers often expect too much accuracy and consistency in claimants’ autobiographical memory.⁸ This paper’s consequent focus on unremarkable memory

systematic literature review” (2026) advance online publication *Journal of Ethnic and Migration Studies* 1–31, <https://doi.org/10.1080/1369183X.2026.2619660>.

⁵ Merriam-Webster Dictionary: ‘baseline (noun)’: <https://www.merriam-webster.com/dictionary/baseline>. (accessed 6 September 2026).

⁶ See sources in above note 3.

⁷ United Nations High Commissioner for Refugees (UNHCR), *Beyond Proof: Credibility Assessment in EU Asylum Systems: Full Report* (Brussels: UNHCR, 2013) at 117, <https://www.refworld.org/docid/519b1fb54.html> (accessed 29 June 2026).

⁸ E.g. Hilary Evans Cameron, “Refugee Status Determinations and the Limits of Memory” (2010) 22:4 *International Journal of Refugee Law* 469–511, <https://doi.org/10.1093/ijrl/eeq041>; Jane Herlihy, Kate Gleeson & Stuart Turner, “What Assumptions about Human Behaviour Underlie Asylum Judgments?” (2010) 22:3 *International Journal of Refugee Law* 351–366, <https://doi.org/10.1093/ijrl/eeq027>; Jane

failures – on ‘normal’ inaccuracy and inconsistency in honest accounts of autobiographical recollections – does not imply that memory is uniformly unreliable, that all memory failures are equally expected, or that no claimed failure could reasonably require further explanation. It rather reflects the fact that the scholarship in this field has not identified any comparable systemic tendency among decision-makers to expect too little accuracy or consistency.

When they occur in a refugee claim, memory failures like those in the scenarios below may well call into question the accuracy of the claimant’s testimony on the temporal aspects. Yet in the many hundreds of decisions that the research team has read and analysed, decisions that hinge on the *accuracy* of a claimant’s temporal claims are vanishingly rare. The kinds of inconsistencies and inaccuracies profiled below take centre stage in refugee status decisions because of what they suggest to decision-makers about the claimant’s *truthfulness*. They are otherwise almost never relevant to the claimant’s risk profile. In other words, to decide whether a *truthful* claimant is objectively at risk of persecution, a decision-maker very rarely needs to establish accurately whether they were assaulted five years ago or six, three times or four, in May or in August, in the morning or in the afternoon.

Part II: Methodology

Developing the scenarios

The authors of this paper’s statement address a set of hypothetical scenarios. Hypothetical scenarios are often used to present expert evidence to courts in common law legal systems.⁹ While these scenarios were inspired by the many hundreds of real-life decisions that the research team has read and analysed, they serve to inform future decision-making rather than to condemn past decision-making.

Each scenario describes a subject’s failure to recall consistently or accurately the timing of an event. Little is known about the event, the subject, or their context, beyond the fact that, in each case, the report occurs following a significant delay and the subject is able to recall the central gist of their experience. As described below, the statement’s co-authors conclude that such failures in such cases are within the range of normal human autobiographical memory ‘all else being equal’ – absent any other information. As described below, this wording does not imply that these failures typically or commonly

Herlihy, Laura Jobson & Stuart Turner, “Just Tell Us What Happened to You: Autobiographical Memory and Seeking Asylum” (2012) 26:5 *Applied Cognitive Psychology* 661–676, <https://doi.org/10.1002/acp.2852>; Jane Herlihy, Peter Scragg & Stuart Turner, “Discrepancies in autobiographical memories-implications for the assessment of asylum seekers: repeated interviews study” (2002) 324:7333 *British Medical Journal* 324–327, <https://doi.org/10.1136/bmj.324.7333.324>; Skrifvars et al., above note 3; Thomas Wimarck, “The limits of refugee status determination through credibility assessment: Empirical evidence from sexual orientation asylum cases” (2025) *International Migration Review*, Advance online publication, 1–28, <https://doi.org/10.1177/01979183251360677>.

⁹ Stanley L Brodsky, Caroline Titcomb, David M Sams, Kara Dickson & Yves Benda, “Hypothetical constructs, hypothetical questions, and the expert witness” (2012) 35:5-6 *International Journal of Law and Psychiatry* 354–361, <https://doi.org/10.1016/j.ijlp.2012.09.011>.

occur, but that they may occur “to otherwise unexceptional people, under otherwise unexceptional circumstances.” In other words, they are compatible with normal autobiographical memory. Why these failures happen, and how frequently, is beyond the scope of this paper.

As noted at the outset, these scenarios set a baseline for the kinds of memory failures that the authors conclude are unremarkable in the populations that have long been the primary focus of studies in the field of psychology. Findings from psychology research are well suited to setting these kinds of general baselines *within these studied populations*. In contrast, these findings are an unreliable basis on which to predict how *a given refugee claimant* would think or act, for the reasons that follow.

For a start, this kind of evidence paints a group-level picture. This can help scientists to make reliable generalizations about studied populations, but when it comes to making predictions about individuals – even individuals who belong to the studied populations – “reasoning from the group to an individual case presents considerable challenges.”¹⁰ And refugee claimants may be unlike the participants in psychology studies in many relevant ways.

Refugee claimants may belong to populations and subpopulations that have long been overlooked in a field that has “uncovered truths about a thin slice of our species – people who live in Western, educated, industrialized, rich, and democratic (WEIRD) nations.”¹¹ Claimants and their experiences “may not be well reflected in the findings of a discipline that has disproportionately studied undergraduate students majoring in psychology at Western universities.”¹² Understandings of time, in particular, have long been recognized as culturally mediated.¹³

¹⁰ David L Faigman, John Monahan & Christopher Slobogin, “Group to individual (G2i) inference in scientific expert testimony” (2014) 81 The University of Chicago Law Review 417-480 at 420, https://repository.uclawsf.edu/faculty_scholarship/1036.

¹¹ Joseph Henrich, Steven J Heine & Ara Norenzayan, “The weirdest people in the world?” (2010) 33 *Behavioural and Brain Sciences* 61-83; discussion 83-135; Michael Muthukrishna, Adrian V Bell, Joseph Henrich, Cameron M Curtin, Alexander Gedranovich, Jason McInerney & Braden Thue, “Beyond Western, Educated, Industrial, Rich, and Democratic (WEIRD) Psychology: Measuring and Mapping Scales of Cultural and Psychological Distance” (2020) 31:6 *Psychological Science* 678–701, <https://doi.org/10.1177/0956797620916782>; Thomas V Pollet & Tamsin K Saxton, “How Diverse Are the Samples Used in the Journals ‘*Evolution & Human Behavior*’ and ‘*Evolutionary Psychology*’?” (2019) 5:3 *Evolutionary Psychological Science* 357–368, <https://doi.org/10.1007/s40806-019-00192-2>; Mostafa Salari Rad, Alison Jane Martingano & Jeremy Ginges, “Toward a Psychology of Homo Sapiens: Making Psychological Science More Representative of the Human Population” (2018) 115:45 *Proceedings of the National Academy of Sciences of the United States of America* 11401–11405, <https://doi.org/10.1073/pnas.1721165115>.

¹² Hilary Evans Cameron, “Principled Asymmetry: Putting Psychology Research Evidence Before Refugee Status Decision-makers” (under review in *Journal of Refugee Studies*).

¹³ E.g. Robert V. Levine, “Time and culture,” in R. Biswas-Diener & E. Diener (Eds), *Noba textbook series: Psychology* (Champaign, IL: DEF publishers, 2026), <http://noba.to/g6hu2axd>; Nancy A Combs, *Fact-finding without facts: The uncertain evidentiary foundations of international criminal convictions*. (Cambridge University Press, 2010). Indeed, it has been suggested that, in the history of our species, “mapping psychological time onto clock and calendar time” is a “very recent” phenomenon; D. B. Wright &

Beyond this, many variables – contextual elements typically not present either in the studies or in this paper’s scenarios – may work to increase or decrease the consistency and accuracy of claimants’ memories for temporal information.

Unlike the participants in the studies and the subject in the scenarios, refugee claimants may have rehearsed their testimony before giving their accounts. Depending on a number of factors, rehearsal may lead to more or less accuracy and more or less consistency of autobiographical memories.¹⁴ Claimants are often recounting traumatic experiences, and the effect of trauma on memory is likewise complex; depending on a number of factors, traumatic events may be remembered more consistently or less consistently than non-traumatic events.¹⁵ Many claimants will give statements separated by longer time intervals than the subject does in this paper’s scenarios, and about events that occurred longer ago. Increasing the elapsed time between events and recollections may increase both inaccuracy and inconsistency.¹⁶ Unlike most study participants, refugee claimants may be giving multiple statements under different test conditions (e.g. giving one statement in writing in response to questions on a form and another orally in response to a question in an interview), and varying test conditions may increase inconsistency of autobiographical memory.¹⁷ Unlike many study participants, claimants will often be

E. F. Loftus, “Eyewitness memory” in G. Cohen & M. A. Conway (Eds.), *Memory in the real world* (Psychology Press, 2008), 91–105 at 98; see discussion in Evans Cameron, above note 8 at 474–5.

¹⁴ E.g. Jason C K Chan & Jessica A LaPaglia, “The dark side of testing memory: Repeated retrieval can enhance eyewitness suggestibility” (2011) 17:4 *Journal of Experimental Psychology: Applied* 418–432, <https://doi.org/10.1037/a0025147>; Geraldine Odinet, Amina Memon, David La Rooy & Ailsa Millen, “Are Two Interviews Better than One? Eyewitness Memory across Repeated Cognitive Interviews” (2013) 8:10 *PLoS ONE* e76305, <https://doi.org/10.1371/journal.pone.0076305>; David C Rubin, Adriel Boals & Dorthe Berntsen, “Memory in posttraumatic stress disorder: properties of voluntary and involuntary, traumatic, and nontraumatic autobiographical memories in people with and without posttraumatic stress disorder symptoms” (2008) 137:4 *Journal of Experimental Psychology: General* 591–614, <https://doi.org/10.1037/a0013165>; Chris R Brewin, “The nature and significance of memory disturbance in posttraumatic stress disorder” (2011) 7 *Annual Review of Clinical Psychology* 203–227, <https://doi.org/10.1146/annurev-clinpsy-032210-104544>.

¹⁵ David C Rubin, Adriel Boals & Dorthe Berntsen, “Memory in posttraumatic stress disorder: properties of voluntary and involuntary, traumatic, and nontraumatic autobiographical memories in people with and without posttraumatic stress disorder symptoms” (2008) 137:4 *Journal of Experimental Psychology: General* 591–614, <https://doi.org/10.1037/a0013165>; Brewin, above note 14; Annelies Vredeveldt, Zoe Given-Wilson & Amina Memon, “Culture, trauma, and memory in investigative interviews” (2026) 32:1 *Psychology, Crime & Law* 300–320, <https://doi.org/10.1080/1068316X.2023.2209262>; William B. Ridgway, Kevin D. Mohawk, Rhiannon N. Soriano Smith, Renato N. Liboro, Charles A Morgan III, Steven D. Benning, Colleen M. Parks, “What Survivors Remembered: Cognitive and Experiential Themes in Trauma Narratives From the Deadliest Mass Shooting in Modern American History” (2026) 0:0 *Psychological Science*, <https://doi.org/10.1177/09567976261471424>.

¹⁶ Robert F Belli, Wendy L Shay & Frank P. Stafford, “Event history calendars and question list surveys: A direct comparison of interviewing methods” (2001) 65:1 *Public Opinion Quarterly* 45–74 at 46, <https://doi.org/10.1086/320037>; Evans Cameron, above note 8 at 507–508; Helen Williams, Martin Conway & Gillian Cohen, “Autobiographical memory” in Gillian Cohen & Martin Conway, ed, *Memory in the real world* (Hove England: Psychology Press, 2008) 21–90 at 81.

¹⁷ E.g. Julian AE Gilbert & Ronald P. Fisher, ‘The effects of varied retrieval cues on reminiscence in eyewitness memory’ (2006) 20 *Applied Cognitive Psychology* 723–39; Neil Brewer, Rob Potter, Ronald P. Fisher, Nigel Bond & Mary A Luszcz, ‘Beliefs and data on the relationship between consistency and accuracy of eyewitness testimony’ (1999) 13 *Applied Cognitive Psychology* 297–313; D. Dunning & L. B.

recounting experiences of repeated, overlapping or similar events, which may increase inconsistency.¹⁸ Unlike many study participants, claimants may be giving their evidence through interpreters, which may cause inconsistencies.¹⁹ Moreover, a greater proportion of refugee claimants will suffer from serious mental health issues, like depression and PTSD,²⁰ and will be acutely stressed and fatigued while giving their accounts, all of which may increase inconsistency and inaccuracy.²¹

In short, this paper's scenarios do not speak directly to refugee claimants and their experiences. Instead, they speak to the experiences of a hypothetical member of a *typical studied population*. With this evidence before them, a refugee status decision-maker would not be obliged to accept that a response that is 'normal' in the studied populations would also be 'normal' for the claimant. But the decision-maker would need a solid reason to explain why, in the claimant's case, this response is improbable enough to suggest that the claimant is lying.

Stern, 'Examining the generality of eyewitness hypermnesia: a close look at time delay and question type' (1992) 6 *Applied Cognitive Psychology* 643-57; Evans Cameron, above note 8 at 506-507.

¹⁸ E.g. Eva Rubinova, Hartmut Blank, Jonathan Koppel & Eliška Dufková, "Repeated recall of repeated events: Accuracy and consistency" (2022) 11:2 *Journal of Applied Research in Memory and Cognition* 229-244, <https://doi.org/10.1016/j.jarmac.2021.09.003>.

¹⁹ Louisa Morrison, Zoe Given-Wilson & Amina Memon, "The impact of emotionally evocative information on interpreting accuracy in a mock asylum interview" (2024) 38:2 *Applied Cognitive Psychology* e4185, <https://doi.org/10.1002/acp.4185>; Anthony Good, "Interpretation, Translation, and Confusion in Refugee Status Determination Procedures" (2025) 38 *International Journal for the Semiotics of Law* 2695-2719, <https://doi.org/10.1007/s11196-025-10297-6>.

²⁰ Md Yeaser Yunus, Lorraine Hope, Tanja van Veldhuizen & Jonathan Koppel, "Understanding culture, memory and trauma in asylum interviews: A mixed-methods systematic review and meta-analysis" (2026) 0:0 *Legal and Criminological Psychology* 1-34, <https://doi.org/10.1111/lcrp.70051>; Martina Patané, Samrad Ghane, Eirini Karyotaki, Pim Cuijpers, Linda Schoonmade, Lorenzo Tarsitani & Marit Sijbrandij, "Prevalence of mental disorders in refugees and asylum seekers: a systematic review and meta-analysis" (2022) 14:9 *Cambridge Prisms: Global Mental Health* 250-263, <https://doi.org/10.1017/gmh.2022.29>; Rebecca Blackmore, Jacqueline A Boyle, Mina Fazel, Sanjeeva Ranasinha, Kylie M Gray, Grace Fitzgerald, Marie Misso & Melanie Gibson-Helm, "The prevalence of mental illness in refugees and asylum seekers: A systematic review and meta-analysis" (2020) 17:9 *PLOS Medicine* e1003337, <https://doi.org/10.1371/journal.pmed.1003337>; Marija Bogic, Anthony Njoku & Stefan Priebe, "Long-term mental health of war-refugees: a systematic literature review" (2015) 15 *BMC International Health and Human Rights* 29, <https://doi.org/10.1186/s12914-015-0064-9>.

²¹ Jane Herlihy, Peter Scragg & Stuart Turner, "Discrepancies in autobiographical memories – implications for the assessment of asylum seekers: repeated interviews study" (2002) 324:7333 *British Medical Journal* 324-327, <https://doi.org/10.1136/bmj.324.7333.324>; Jane Herlihy, Laura Jobson & Stuart Turner, "Just Tell Us What Happened to You: Autobiographical Memory and Seeking Asylum" (2012) 26:5 *Applied Cognitive Psychology* 661-676, <https://doi.org/10.1002/acp.2852>; Samuel Weiss-Cowie, Paul Verhaeghen & Audrey Duarte, "An updated account of overgeneral autobiographical memory in depression" (2023) 149 *Neuroscience & Biobehavioral Reviews* 105157, <https://doi.org/10.1016/j.neubiorev.2023.105157>; Sanjida Khan, Sara K Kuhn & Shamsul Haque, "Systematic review of autobiographical memory and mental health in refugees" (2021) 12 *Frontiers in Psychiatry* 658700, <https://doi.org/10.3389/fpsy.2021.658700>; Cadu Klier & Luciano Grüttner Buratto, "Stress and long-term memory retrieval: a systematic review" (2020) 42:3 *Trends in Psychiatry and Psychotherapy* 284-291, <https://doi.org/10.1590/2237-6089-2019-0077>.

Selecting and contacting expert co-authors

The research team used Artificial Intelligence (ChatGPT) as a preliminary tool to attempt to identify all researchers in psychology who publish in English with expertise in autobiographical memory for the dates, times, frequency, duration, and sequence of events. Humans with expertise in psychology reviewed the AI-generated output and identified gaps, which the team then fed back to the AI in an iterative process (the team did not use AI in any other capacity in writing this paper). The human experts conducted the final review of the resulting list.

The research team contacted by email each of the experts on the list, outlined this project's aims, and asked whether they wanted to review this paper's statement with a view to co-authoring it as written. Several co-authors provided feedback, which the team incorporated. The final text was affirmed by all co-authors: 58 researchers representing 49 universities in 14 countries.

A detailed description of this search protocol and the outreach results is available for review.²²

Experts who reviewed the paper and chose not to participate gave various reasons for declining (e.g. they felt that they lacked sufficiently recent expertise; they were too busy or unwell to engage; they were not comfortable making claims 'all else being equal,' without canvassing all potentially relevant contextual information). One expert did not participate because they felt that one of the statement's claims was incorrect: that, all else being equal, the 'time of day' memory failure (the first example, below) is not within the normal range.²³

Others did not respond after reviewing the paper. While they may also have concluded that one or more of the statement's claims were incorrect, we think that it is more likely that they declined for other reasons, along the same lines as the other declining respondents. Not only have 58 experts affirmed that each of its conclusions is accurate, and only one has said otherwise (and about only one of the statement's 40 examples) – but this statement aimed to present a broad consensus position and so, by design, its claims were uncontroversial by a wide margin. Indeed, 3 of our co-authors noted that the statement, while correct as far as it went, did not go far enough in illustrating the potential for poor memory outcomes: e.g. "your conclusion about what is the 'normal' range of performance in research is not pessimistic enough."²⁴

²² "Baseline Paper Series #1: Memory for Time: Co-author Search Protocol and Results of Outreach" Toronto Metropolitan University: Borealis Dataverse, <https://doi.org/10.5683/SP4/N5ZMQN>.

²³ Ibid.

²⁴ Ibid.

Part III: Statement

In the hypothetical scenarios below, each of which represents an independent occurrence, the subject is recalling the following events: they were the victim of a robbery; some time later, they were in a car accident where they sustained a minor injury that aggravated a preexisting injury; following this accident, they attended physiotherapy appointments.

Inconsistency

The subject makes two statements. Unless otherwise indicated, they make the first statement one year after the event in question, and they make the second statement one year after the first statement. They make both statements orally, in response to a question in an interview.

Time of day; day of the week; day of the month; month; year

- In the first statement, the subject says that the robbery occurred “in the morning.” In the second statement, they say that it occurred “in the afternoon.”
- In the first statement, the subject says that the robbery occurred “on a Monday.” In the second statement, they say that it occurred “at the end of the week, I think it was a Thursday or a Friday.”
- In the first statement, the subject says that the robbery occurred “on the 22nd of September.” In the second statement, they say that it occurred “in the first week of September.”
- In the first statement, the subject says that the car accident aggravated an injury that they had sustained “maybe 8 or 9 years ago.” In the second statement, they say that the previous injury occurred “about a dozen years ago.”
- In the first statement, the subject says that they had surgery to treat this previous injury “in 2018.” In the second statement, they say that they had this surgery “in 2016.”

Time between events

- In the first statement, the subject says that they moved out of their neighbourhood “a few weeks after the robbery.” In the second statement, they say that they moved out “several months after the robbery.”
- In the first statement, the subject says that they had bought their car “about six months before the accident.” In the second statement, they say that they had bought their car “about a year or so before the accident.”

- In the first statement, the subject says that they began having physiotherapy appointments “about a month after the accident.” In the second statement, they say that they began having physiotherapy appointments “shortly after the accident, like a few days after.”

Duration

- In the first statement, the subject says that the ambulance ride to the hospital took “not long, maybe fifteen or twenty minutes.” In the second statement, they say that the ambulance ride to the hospital took “a long time, at least an hour.”
- In the first statement, the subject says that they waited for an X-ray in the hospital “for ages, more than an hour.” In the second statement, they say that they waited for the X-ray “for maybe fifteen minutes.”
- In the first statement, the subject says that, after the accident, they had nightmares about it almost nightly “for a couple of months.” In the second statement, they say that, after the accident, they had nightmares about it almost nightly “for over a year.”
- In the first statement, the subject says that they saw a physiotherapist “for a couple of months” following the accident. In the second statement, they say that they saw a physiotherapist “for six months” following the accident.

Frequency

- In the first statement, the subject says that they had made calls to the police to report a suspicious person loitering in the neighbourhood “a couple of times” in the weeks leading up to the robbery. In the second statement, the subject says that they had made these calls “on at least five or six occasions” in the weeks leading up to the robbery.
- In the first statement, the subject says that after the robbery, the police came by their apartment “at least a half-dozen times” to ask them follow-up questions. In the second statement, the subject says that after the robbery, the police came by “once or twice” to ask them follow-up questions.
- In the first statement, the subject says that before the car accident, they took medication to manage flare-ups of their pre-existing injury “a couple of times a year.” In the second statement, the subject says that before the car accident, they took this medication to manage flare-ups “every year or so.”
- In the first statement, the subject says that during the course of their physiotherapy treatment, they had appointments “every week or so.” In the second statement, they say that they went to these appointments “monthly.”

Sequence

- In the first statement, the subject says that the robber stepped out from behind a parked car, flashed a gun, and said, “Give me your money.” In the second statement, the subject says that the robber said, “Give me your money,” and then flashed a gun, before stepping out from behind a parked car.
- In the first statement, the subject says that after the car accident, the police arrived on the scene first, then the ambulance, and then a fire truck. In the second statement, the subject says that the fire truck arrived on the scene first, then the police, then the ambulance.
- In the first statement, the subject says that after the accident, the paramedic assessed them; then the police officer questioned them; then they called their spouse. In the second statement, they say that they called their spouse; then the paramedic assessed them; then the police officer questioned them.
- In the first statement, the subject says that their back began hurting right after the accident; a few days later, their head started hurting; and a few days after that, they began to feel tingling in their hands. In the second statement, the subject says that their head began hurting right after the accident; a few days later, they began to feel tingling in their hands; and a few days after that, their back started hurting.

Inaccuracy

The subject makes one single statement, a year and a half after the event in question. They make this statement orally, in response to a question in an interview. This statement is now being compared with an independent written record.

Time of day; day of the week; day of the month; month; year

- The subject says that the robbery occurred “in the morning.” Police records establish that it occurred just after 3 p.m.
- The subject says that the robbery occurred “on a Friday.” Police records establish that it occurred on a Monday.
- The subject says that the robbery occurred “on the 22nd of September.” Police records establish that it occurred on the 3rd of September.
- The subject says that the car accident occurred “in May.” Police records establish that it occurred in August.
- The subject says that the car accident aggravated an injury that they had sustained “maybe 8 or 9 years ago.” Medical records establish that the previous injury occurred thirteen years ago.

- The subject says that they had surgery to treat their previous injury “in 2018.” Medical records establish that they received this treatment in 2015.

Time between events

- The subject says that they moved out of their neighbourhood “a few weeks after the robbery.” Records establish that they moved out three months after the robbery.
- The subject says that they had bought their car “a year or so before the accident.” Records establish that they bought their car six months before the accident.
- The subject says that they began having physiotherapy appointments “about a month after the accident.” Records show that they began these appointments a week after the accident.

Duration

- The subject says that the ambulance ride to the hospital took “a long time, at least an hour.” Records establish that it took just over twenty minutes.
- The subject says that they waited for an X-ray in the hospital “for maybe fifteen minutes.” Records establish that they waited for just over an hour.
- The subject says that, after the accident, they had nightmares about it almost nightly “for weeks.” Counselling records establish that the subject reported having nightmares about the accident almost nightly for six months.
- The subject says that they saw a physiotherapist “for a couple of months” following the accident. Records establish that they saw a physiotherapist for six months following the accident.

Frequency

- The subject says that they had made calls to the police to report a suspicious person loitering in the neighbourhood “on at least five or six occasions” in the weeks leading up to the robbery. Police records establish that they made two such calls during this period.
- The subject says that after the robbery, the police came by their apartment “once or twice” to ask them follow-up questions. Police records establish that the police came by the subject’s apartment five times after the robbery to ask them follow-up questions.
- The subject says that before the car accident, they took medication to manage flare-ups of their pre-existing injury “every year or so.” Medical records establish that before the accident they took this medication to manage flare-ups on average twice per year.

- The subject says that during the course of their physiotherapy treatment, they had appointments “every week or so.” Records establish that they went to these appointments monthly.

Sequence

- The subject says that the robber stepped out from behind a parked car, flashed a gun, and said, “Give me your money.” Video footage establishes that the robber said, “Give me your money,” and then flashed a gun, before stepping out from behind a parked car.
- The subject says that the fire truck arrived on the scene first, then the police, then the ambulance. Records establish that the police arrived on the scene first, then the ambulance, and then a fire truck.
- The subject says that after the accident, the paramedic assessed them; then the police officer questioned them; then they called their spouse. Records establish that they called their spouse; then the paramedic assessed them; then the police officer questioned them.
- The subject says that their head began hurting right after the accident; a few days later, they began to feel tingling in their hands; and a few days after that, their back started hurting. Medical records establish that the subject’s back began hurting right after the accident; a few days later, their head started hurting; and a few days after that, they began to feel tingling in their hands.

Outcomes well within the range of normal human autobiographical memory

All else being equal, each of the above outcomes is well within the range of normal human autobiographical memory.

‘All else being equal’

Each scenario above describes a memory failure that is unremarkable on its face. Knowing more about the event, the person, or their context could suggest reasons why this outcome would be more (or even less) remarkable. ‘All else being equal’ means here that no other relevant information is available. On these facts alone, this outcome would be ‘well within the normal range.’

‘Well within the normal range’

In the studied populations, autobiographical memory for temporal information varies widely. Some people will remember exceptionally accurately and consistently the timing of an event that they have experienced. Others will remember this kind of information exceptionally inaccurately and inconsistently. The normal range stretches in between.

Within this normal range, some people will remember the timing of the event more accurately and consistently; others will remember it less accurately and consistently; and a person's level of accuracy and consistency may vary from event to event. All, by definition, are remembering in a way that is unexceptional and unremarkable – in a way that is, quite simply, memory functioning normally.

In each of the scenarios above, the subject has misremembered the timing of an event in a way that is well within the range of normal human autobiographical memory. While it is beyond the scope of this paper to address the reasons why a person's memory might fail in the ways that it did in these scenarios, in a typical studied population, we would expect to see some people misremember this way. We would not be surprised or puzzled by this kind of memory failure. It will simply happen – to otherwise unexceptional people, under otherwise unexceptional circumstances. All else being equal, for a person to misremember in one or more of these ways would be entirely unremarkable.

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