

Belief in occurrence as a key ingredient of episodic future thinking

Arnaud D'Argembeau

University of Liège, Belgium

©American Psychological Association, 2025. This paper is not the copy of record and may not exactly replicate the authoritative document published in the APA journal. The final article is available, upon publication, at: <https://doi.org/10.1037/mac0000219>

Corresponding author: Arnaud D'Argembeau, Department of Psychology, Psychology and Neuroscience of Cognition, University of Liège, Place des Orateurs 1 (B33), 4000 Liège. Email: a.dargembeau@uliege.be

Acknowledgements: Arnaud D'Argembeau is a Research Director at the Fonds de la Recherche Scientifique (F.R.S.-FNRS), Belgium.

Abstract

This commentary extends MacLeod's (2025) case that belief is pivotal to future-directed thinking. I suggest that *belief in future occurrence*—the subjective impression that an imagined event will (or will not) transpire in the future—is an epistemic feeling that informs us about the reliability of our future simulations, so as to effectively guide decisions and actions. Although belief in occurrence can be influenced by a range of factors, for autobiographical events it depends primarily on the consistency of the imagined content with background knowledge about oneself and one's life. Because they are rooted in knowledge of the circumstances of our lives, degrees of belief are not arbitrary but predict, to some extent, the actual occurrence of future events. Although there is clear evidence of differences in beliefs about the future in emotional disorders, their basis and predictive validity remain to be studied in detail.

Keywords: episodic future thinking; autobiographical memory; belief; truth; epistemic feeling

The ability to envision future possibilities has enabled humans to progressively detach their behavior from immediate circumstances, increasing chances of survival in an ever-changing world (Suddendorf & Corballis, 2007). Anticipating potential rewards and threats, and devising effective ways of dealing with them, are undoubtedly major elements that have made the human species thrive on this planet. However, future-directed thinking can go awry and significantly hamper well-being. In his thoughtful review of the literature on alterations of future thinking in emotional disorders, MacLeod (2025) convincingly demonstrates that belief plays a central role in problematic anticipations. Indeed, when people's beliefs about what will happen do not reflect their life circumstances, prospective thinking can no longer fulfill its adaptive function. The proper attribution of degrees of belief to imagined events is therefore a key ingredient of future-directed thinking. Here, I discuss in greater detail the nature of this belief, its determinants and its role in guiding decisions and actions.

What is belief in future occurrence?

Beliefs about the future and their influence on behavior have been widely studied, notably in social psychology (Roese & Sherman, 2007). The concept of *belief in future occurrence* has emerged more specifically in relation to episodic future thinking, i.e. the ability to mentally project oneself into specific future events (Atance & O'Neill, 2001; Szpunar, 2010). Initial research on episodic future thinking largely focused on understanding the cognitive and neural processes involved in the construction of episodic simulations—how we can imagine novel specific events on the basis of information stored in episodic and semantic memory (for review, see Schacter et al., 2017). Interest in the notion of belief then arose from the observation that the construction of a detailed simulation does not necessarily imply that its content is subjectively perceived as a future event (Lehner &

D'Argembeau, 2016). Simulation processes are in fact involved in imagining many types of content, whether related to the future or not (Hassabis & Maguire, 2009). Furthermore, in future-directed thinking, imagination is not given free rein. To be adaptive, imagined content should not only follow our goals and aspirations, but should also be constrained by our physical and social circumstances (Oettingen et al., 2001).

The term 'belief in occurrence' originates from autobiographical memory research, which has shown that recollective experience (i.e., the feeling of mentally reliving of an event) and belief in its correspondence to a real event are distinct dimensions of memories (Scoboria et al., 2014). Building on this work, Ernst and D'Argembeau (2017) proposed that, akin to its role in memory, belief in occurrence is a key ingredient of episodic future thinking, emphasizing that imagined events are associated, to varying degrees, with a subjective sense of 'realness'. More formally, belief in future occurrence can be conceived as an epistemic feeling—a class of feelings that indicate the status of one's knowledge, understanding, or expectations (Arango-Muñoz, 2014; Clore & Parrott, 1994). It is a phenomenological experience that consists in the subjective impression that an imagined event will (or will not) happen in the future (Ernst & D'Argembeau, 2017). The informational function of this feeling is to indicate the status of imagined events: it is an experienced indicator of the reliability of future simulations. As an epistemic feeling, belief in occurrence plays motivational and regulatory roles (Clore & Parrott, 1994; Proust, 2015). It serves to monitor future-directed thinking and to guide judgments, decisions, and behavior accordingly. Degrees of belief tell the person whether to act with the corresponding future event in mind; imagined events that subjectively appear as real carry more weight in guiding decisions and actions.

As noted by MacLeod (2025), the notion of belief in relation to future thinking has mostly been operationalized in terms of probability or likelihood judgments.¹ However, the feeling that an imagined event will actually occur is not necessarily based on explicit probability judgments, although of course it can be.² Quite often the belief in a future event is an immediate, non-reflective feeling associated with imagined content (see Proust, 2015, for further discussion of the view that feelings carry non-conceptual information). To more directly capture this non-reflective dimension, Scoboria et al. (2020) developed a scale to assess degrees of belief in future occurrence, in which most items do not refer to likelihood (e.g., “I feel that this event will really happen”). Structural equation modeling showed evidence for a belief latent variable that is distinct from other phenomenological aspects of episodic future thinking, such as the vividness of simulations and the sense of experiencing the imagined events. So far, this scale has only been used in the context of episodic future thinking, and it would be interesting to assess the extent to which it can be adapted to other forms of prospection (e.g., imagining more general events or life periods).

What underlies belief in future occurrence?

Ernst and D’Argembeau (2017) proposed that belief in future occurrence is the product of metacognitive appraisals (generally made heuristically) based on a range of information available at the time an event is imagined, in a similar way as the experience of remembering results from attributional processes (Johnson et al., 1993; Scoboria et al., 2014). The sense of realness associated with imagined future events can potentially rely on multiple factors, including the characteristics of mental representations (e.g., detail and vividness), the properties of the

¹ Although in statistical usage there is a clear distinction between likelihood and probability, here I use the two terms interchangeably in accord with their lay meaning.

² In this regard, it is also interesting to note that expressions of frequentist probabilities (e.g., “There is an X% probability”) and degrees of belief (e.g., “I am X% certain”) are empirically dissociable (Løhre & Teigen, 2016).

imaginative process (e.g., fluency or ease), and the consistency of imagined content with background knowledge (e.g., about one's life circumstances).

The ease and quality of imagination have long been recognized as factors influencing judgments of likelihood (for review, see Koehler, 1991). However, most studies involved non-personal events (e.g., imagining the outcome of an upcoming election) or situations provided by the experimenter that may not be perceived as truly autobiographical (e.g., imagining contracting a disease). As noted by MacLeod (2025), for autobiographical events, there is no simple detail-belief link. Indeed, some studies found that the degree of belief in future events correlated with the amount of detail imaged (D'Argembeau & Garcia Jimenez, 2020; Ernst & D'Argembeau, 2017), while others observed no such relationship (Scoboria et al., 2020). A possible explanation for these discrepant results is that the effect of the quality of mental imagery on belief may only appear for events that feel uncertain; when one is already certain that an event will (or will not) occur, imagining it in detail may make no difference. In line with this view, it has been found that the repeated simulation of an event makes its representation more detailed and more believable, but only when the event is associated with moderate levels of belief; repetition does not influence belief for events already believed or for events considered implausible (Garcia Jimenez, Mazzoni, et al., 2023).

For autobiographical events, belief in future occurrence mainly depends on the consistency of imagined content with background knowledge about oneself and one's life. As MacLeod notes, belief is rooted in people's conception of their life trajectory. Two sources of data support this view. First, the main predictors of the degree of belief in a future event (as assessed by rating scales) are the personal plausibility of imagined content and the extent to which it is integrated in an autobiographical context—its consistency with other planned events and with the person's goals and general expectations (Ernst et al., 2019; Ernst & D'Argembeau, 2017; Scoboria et al., 2020).

Second, qualitative analyses of the reasons provided to justify belief in future occurrence indicate that people most frequently refer to personal goals, personal characteristics, and other planned events to explain their sense that an imagined event will (or will not) happen in the future (Ernst et al., 2019; Ernst & D'Argembeau, 2017).

The available evidence therefore suggests that it is not mental imagery per se that determines belief in a future event, but the extent to which the imagined content is consistent with autobiographical knowledge. In this respect, belief in future occurrence may be based on the same kind of mechanisms as those generally involved in judging truth. Consistency with existing knowledge and information stored in memory is indeed an important (though not the only) ingredient of truth judgments (Brashier & Marsh, 2020). In general, statements that activate more coherent references in memory tend to be accepted as true, while those that activate incoherent references tend to be rejected (Unkelbach & Rom, 2017). In the case of episodic future thinking, coherence may be primarily determined by reference to autobiographical knowledge.³

From a broader theoretical perspective, this conception of belief in occurrence as rooted in autobiographical knowledge dovetails with the view that episodic future thinking rests on two main components: a system supporting episodic simulations and a structure of autobiographical knowledge that contextualizes the simulated events in the person's life (D'Argembeau, 2020). The first system enables the mental simulation of non-occurrent experiential contents (i.e., experiential contents that are decoupled from current sensory-perceptual input) based on details from previous experiences (drawn from episodic memory) and semantic knowledge (Addis, 2020; Irish & Piguet,

³ It should be noted that this coherence is not necessarily evaluated explicitly (consciously), although it can be. But even when it is not, autobiographical knowledge is available in the background. It may be that any given simulation automatically evokes associative links with this knowledge, and that the strength of these associations then translates into a stronger or weaker belief in future occurrence.

2013; Schacter et al., 2017). Its function is to provide a representation of the experiential content of events from an egocentric perspective, depicting what it would be like to experience these events. However, as such, event simulations are atemporal in nature, in the sense that they lack a broader temporal context that would locate events in the past, present or future (Mahr et al., 2021). The temporal context of simulations is provided (in part) by autobiographical knowledge, which contains information about the content and structure of a person's life (including goals, general expectations, and knowledge of life regularities) and forms a sort of personal timeline on which simulated events can be localized (Ben Malek et al., 2017).

An important distinguishing feature of these two components of future-directed thinking is their underlying representational format (Andrews-Hanna & Grilli, 2021; D'Argembeau, 2020; Mahr, 2020). Event simulations rely on mental imagery (i.e., depictive representations), while autobiographical knowledge involves propositional representations, a format that is well suited to link, sequence, and organize information (Paivio, 1991). In our view, it is these propositional representations that place simulations in context and determine belief or lack of it (see also Mahr, 2020). This is consistent with MacLeod's proposal that belief in future outcomes mainly depends on verbally based causal reasoning.

What is the function of belief in future occurrence?

As an epistemic feeling, the main role of belief in occurrence may be to inform us about the reliability of our simulations of the future. Variations in the sense of truth attributed to future thoughts may enable us to sort out imagined possibilities and give them different weight, so that we can base our decisions and actions on what is most likely to happen. An important question, then, is the extent to which belief in future occurrence is well-founded. Although most people tend to be

overly optimistic about their personal future (Weinstein, 1980), to be useful, belief in future occurrence must reflect, to some extent, what is actually going to happen. Insofar as belief is based not only on our goals, but also on knowledge of our life circumstances, the degree of belief in a future event should be indicative of its actual occurrence.

To examine whether belief in future occurrence indeed predicts the actual occurrence of events, D'Argembeau and Garcia Jimenez (2020) asked people to imagine a series of specific events that might happen to them in the coming month (Experiment 1) or in the coming week (Experiment 2). For each event, participants were asked to rate their degree of belief in the occurrence of the event using the Scoboria et al. (2020) scale. Participants were then re-contacted to determine which imagined events had occurred and which had not. The results showed that around 65% of imagined events had occurred, and that belief was a significant predictor of event occurrence—the odds of event occurrence were about two times higher with a one-unit increase on the belief scale. Similar results have been observed when people are asked to imagine specific events related to their personal goals. In particular, it was found that the level of engagement and expectancy associated with a goal (e.g., spending more time with my family) was associated with belief in the occurrence of specific events related to that goal (e.g., going to see my son at his triathlon competition next Saturday), which in turn predicted their actual occurrence (Garcia Jimenez & D'Argembeau, 2024). A limitation of these studies is that the temporal distance of events was relatively short (up to one month), so it remains to be determined whether belief also has predictive validity when considering more distant future events.

Recent evidence further suggests that belief in future occurrence influences decision-making. In general, people tend to discount the value of a potential reward as a function of the temporal distance to its delivery in the future, a phenomenon known as delay discounting (Odum et al., 2020). However, research has shown that episodic future thinking reduces this tendency:

imagining future events before making intertemporal choices decreases the extent to which people discount delayed rewards (for a meta-analysis, see Rösch et al., 2022). Garcia Jimenez, Rifon et al. (2023) examined to what extent this effect of episodic future thinking depends on the degree of belief in the future occurrence of imagined events. Delay discounting rates in a monetary choice task were compared between three groups of participants: one group imagined future events that felt certain (i.e., events associated with high levels of belief) before making the monetary choices, a second group imagined future events that felt uncertain (i.e., events associated with lower levels of belief), and a third group recalled recent past events (control group). Episodic future thinking was found to reduce delay discounting, but only when the imagined events felt certain; there was no statistically significant difference in delay discounting rates between the uncertain and control groups (numerically, the difference was even in the direction of an increase in delay discounting when imagining uncertain future events). These results suggest that belief in occurrence may help us make more flexible intertemporal decisions. When a future event seems uncertain, it may be more advantageous to opt for an immediate reward because one does not know whether the delayed reward will actually be obtained (see (Bulley & Schacter, 2020) for further discussion of the view that delay discounting does not necessarily reflect impulsivity but can be deliberate and adaptive).

Overall, these studies show that belief in future occurrence is not randomly generated but conveys useful information about imagined events. Belief is shaped by background knowledge about our life circumstances and is sensitive to the actual occurrence of events. As a result, belief in occurrence likely plays an important role in guiding our decisions and actions. The extent to which the impact and predictive value of belief are altered in clinical populations remains to be examined in detail. As reviewed by MacLeod, people with mood disorders rate the achievement of their personal goals as less likely and give a higher subjective probability to negative hypothetical

events. These differences in judgment may reflect biases in beliefs about the future and/or differences in actual life circumstances. In this regard, MacLeod mentions a study by Strunk et al. (2006) showing that, although people with higher depressive symptoms do experience more negative future events, they still exhibit a pessimistic bias when this is taken into account. Furthermore, depression was found to be associated with less accurate predictions of the occurrence of negative events. Although interesting, a limitation of this study is that the list of future events to be evaluated was provided by the experimenter, so it remains unclear to what extent (some of) these events correspond to the kind of events that people envision when imagining the future in their daily lives (e.g., the list included events such as being arrested or being the victim of a crime, which may be rarely envisioned by most people). One element suggesting that the results of this study may not be generalizable to self-generated future events is that only 32% of the events provided actually occurred, which is about half the rate of occurrence observed in studies of autobiographical events (D'Argembeau & Garcia Jimenez, 2020; Spreng & Levine, 2013). It would therefore be worth investigating further the extent to which the basis and predictive validity of belief are impaired in emotional disorders for the type of future events that people typically envision in their daily lives.

Conclusion

Belief in future occurrence is an epistemic feeling that likely plays a pivotal role in guiding decisions and actions by indicating the reliability of imagined events. Rooted in autobiographical knowledge, belief allows people to distinguish between plausible and implausible future scenarios given their life circumstances. Research has demonstrated its sensitivity to actual event occurrences and its influence on decision-making behaviors like intertemporal choices. While belief generally aligns

with the individual's life circumstances, in emotional disorders such as depression, belief mechanisms may become distorted, reflecting pessimistic biases or reduced predictive accuracy. However, the basis and impact of belief for self-generated future thoughts relevant to everyday life needs to be further investigated in clinical populations. Ultimately, a better understanding of the mechanisms underlying alterations of belief in occurrence could help individuals suffering emotional disorders to navigate their future lives more effectively.

References

- Addis, D. R. (2020). Mental Time Travel? A Neurocognitive Model of Event Simulation. *Review of Philosophy and Psychology*, 11(2), 233–259. <https://doi.org/10.1007/s13164-020-00470-0>
- Andrews-Hanna, J. R., & Grilli, M. D. (2021). Mapping the imaginative mind: Charting new paths forward. *Current Directions in Psychological Science*, 30(1), 82–89. <https://doi.org/10.1177/0963721420980753>
- Arango-Muñoz, S. (2014). The nature of epistemic feelings. *Philosophical Psychology*, 27(2), 193–211. <https://doi.org/10.1080/09515089.2012.732002>
- Atance, C. M., & O'Neill, D. K. (2001). Episodic future thinking. *Trends Cogn Sci.*, 5(12), 533–539.
- Ben Malek, H., Berna, F., & D'Argembeau, A. (2017). Reconstructing the times of past and future personal events. *Memory*, 25(10), 1402–1411. <https://doi.org/10.1080/09658211.2017.1310251>
- Brashier, N. M., & Marsh, E. J. (2020). Judging Truth. *Annual Review of Psychology*, 71, 499–515. <https://doi.org/10.1146/annurev-psych-010419-050807>
- Bulley, A., & Schacter, D. L. (2020). Deliberating trade-offs with the future. *Nature Human Behaviour*, 4(3), Article 3. <https://doi.org/10.1038/s41562-020-0834-9>
- Clore, G. L., & Parrott, W. G. (1994). Cognitive feelings and metacognitive judgments. *European Journal of Social Psychology*, 24(1), 101–115. <https://doi.org/10.1002/ejsp.2420240108>
- D'Argembeau, A. (2020). Zooming in and out on one's Life: Autobiographical representations at multiple time scales. *Journal of Cognitive Neuroscience*, 32, 2037–2055. https://doi.org/10.1162/jocn_a_01556
- D'Argembeau, A., & Garcia Jimenez, C. (2020). The predictive validity of belief in future occurrence. *Applied Cognitive Psychology*, 34(6), 1265–1276. <https://doi.org/10.1002/acp.3708>

- Ernst, A., & D'Argembeau, A. (2017). Make it real: Belief in occurrence within episodic future thought. *Memory & Cognition*, 45(6), 1045–1061. <https://doi.org/10.3758/s13421-017-0714-3>
- Ernst, A., Scoboria, A., & D'Argembeau, A. (2019). On the role of autobiographical knowledge in shaping belief in the future occurrence of imagined events. *Quarterly Journal of Experimental Psychology*, 72(11), 2658–2671. <https://doi.org/10.1177/1747021819855621>
- Garcia Jimenez, C., & D'Argembeau, A. (2024). Goal characteristics predict the occurrence of goal-related events through belief in future occurrence. *Consciousness and Cognition*, 119, 103649. <https://doi.org/10.1016/j.concog.2024.103649>
- Garcia Jimenez, C., Mazzoni, G., & D'Argembeau, A. (2023). Repeated simulation increases belief in the future occurrence of uncertain events. *Memory & Cognition*, 51(7), 1593–1606. <https://doi.org/10.3758/s13421-023-01414-6>
- Garcia Jimenez, C., Rifon, L., Mazzoni, G., & D'Argembeau, A. (2023). *Belief in future occurrence modulates the effect of episodic future thinking on delay discounting*. <https://osf.io/qey8b/>
- Hassabis, D., & Maguire, E. A. (2009). The construction system of the brain. *Philos Trans R Soc Lond B Biol Sci*, 364(1521), 1263–1271.
- Irish, M., & Piguet, O. (2013). The pivotal role of semantic memory in remembering the past and imagining the future. *Front Behav Neurosci*, 7, 27.
- Johnson, M. K., Hashtroudi, S., & Lindsay, D. S. (1993). Source monitoring. *Psychol. Bull*, 114(1), 3–28.
- Koehler, D. J. (1991). Explanation, imagination, and confidence in judgment. *Psychological Bulletin*, 110(3), 499–519. <https://doi.org/10.1037/0033-2909.110.3.499>

- Lehner, E., & D'Argembeau, A. (2016). The role of personal goals in autonoetic experience when imagining future events. *Consciousness and Cognition*, 42, 267–276.
<https://doi.org/10.1016/j.concog.2016.04.002>
- Løhre, E., & Teigen, K. H. (2016). There is a 60% probability, but I am 70% certain: Communicative consequences of external and internal expressions of uncertainty. *Thinking & Reasoning*, 22(4), 369–396. <https://doi.org/10.1080/13546783.2015.1069758>
- MacLeod, A. K. (2025). Future-directed thinking and emotional disorder. *Journal of Applied Research in Memory and Cognition*.
- Mahr, J. B. (2020). The dimensions of episodic simulation. *Cognition*, 196, 104085.
<https://doi.org/10.1016/j.cognition.2019.104085>
- Mahr, J. B., Greene, J. D., & Schacter, D. L. (2021). A long time ago in a galaxy far, far away: How temporal are episodic contents? *Consciousness and Cognition: An International Journal*, 96, 1–14. <https://doi.org/10.1016/j.concog.2021.103224>
- Odum, A. L., Becker, R. J., Haynes, J. M., Galizio, A., Frye, C. C. J., Downey, H., Friedel, J. E., & Perez, D. M. (2020). Delay discounting of different outcomes: Review and theory. *Journal of the Experimental Analysis of Behavior*, 113(3), 657–679. <https://doi.org/10.1002/jeab.589>
- Oettingen, G., Pak, H., & Schnetter, K. (2001). Self-regulation of goal setting: Turning free fantasies about the future into binding goals. *J. Pers. Soc. Psychol.*, 80(5), 736–753.
- Paivio, A. (1991). Dual coding theory: Retrospect and current status. *Canadian Journal of Psychology/Revue Canadienne de Psychologie*, 45(3), 255–287.
<https://doi.org/10.1037/h0084295>
- Proust, J. (2015). The Representational Structure of Feelings. In T. K. Metzinger & J. M. Windt (Eds.), *Open MIND*. MIND Group. <https://doi.org/10.15502/9783958570047>

- Roese, N. J., & Sherman, J. W. (2007). Expectancy. In *Social psychology: Handbook of basic principles, 2nd ed* (pp. 91–115). The Guilford Press.
- Rösch, S. A., Stramaccia, D. F., & Benoit, R. G. (2022). Promoting farsighted decisions via episodic future thinking: A meta-analysis. *Journal of Experimental Psychology. General*, 151(7), 1606–1635. <https://doi.org/10.1037/xge0001148>
- Schacter, D. L., Benoit, R. G., & Szpunar, K. K. (2017). Episodic Future Thinking: Mechanisms and Functions. *Current Opinion in Behavioral Sciences*, 17, 41–50. <https://doi.org/10.1016/j.cobeha.2017.06.002>
- Scoboria, A., Jackson, D. L., Talarico, J., Hanczakowski, M., Wysman, L., & Mazzoni, G. (2014). The role of belief in occurrence within autobiographical memory. *Journal of Experimental Psychology. General*, 143(3), 1242–1258. <https://doi.org/10.1037/a0034110>
- Scoboria, A., Mazzoni, G., Ernst, A., & D’Argembeau, A. (2020). Validating “Belief in Occurrence” for Future Autobiographical Events. *Psychology of Consciousness: Theory, Research, and Practice*, 7, 4–29. <https://doi.org/10.1037/cns0000193>
- Spreng, R. N., & Levine, B. (2013). Doing what we imagine: Completion rates and frequency attributes of imagined future events one year after prospection. *Memory*, 21(4), 458–466. <https://doi.org/10.1080/09658211.2012.736524>
- Strunk, D. R., Lopez, H., & DeRubeis, R. J. (2006). Depressive symptoms are associated with unrealistic negative predictions of future life events. *Behaviour Research and Therapy*, 44(6), 861–882. <https://doi.org/10.1016/j.brat.2005.07.001>
- Suddendorf, T., & Corballis, M. C. (2007). The evolution of foresight: What is mental time travel and is it unique to humans? *Behavioral and Brain Sciences*, 30, 299–351.
- Szpunar, K. K. (2010). Episodic future thought: An emerging concept. *Perspectives on Psychological Science*, 5, 142–162.

Unkelbach, C., & Rom, S. C. (2017). A referential theory of the repetition-induced truth effect.

Cognition, 160, 110–126. <https://doi.org/10.1016/j.cognition.2016.12.016>

Weinstein, N. D. (1980). Unrealistic optimism about future life events. *J.Pers.Soc.Psychol.*, 39, 806–820.