



## Predicting the phenomenology of episodic future thoughts

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### ABSTRACT

Recent findings suggest that multiple event properties contribute to shape the phenomenology of episodic future thoughts, but the specific role of each property is not yet fully understood. This study shows that different phenomenological features are predicted by distinct event properties. The vividness of an episodic future thought largely depends on the familiarity of its constitutive elements (i.e., the envisioned location, persons and objects), while the visual perspective adopted is instead related to the temporal distance of the imagined event. Cognitive feelings such as the sense of pre-experiencing the future depend on sensory-perceptual qualities, and are further modulated by the personal importance attributed to the event. These findings suggest that the essence of episodic future thought—the sensation of mentally visiting one's personal future—lies, in part, in the relevance of imagined events with respect to personal goals.

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### 1. Introduction

One of the remarkable features of the human mind is that it allows us to transcend our immediate circumstances to envision possible futures. This ability—often termed *episodic future thinking*—is central to many aspects of human cognition and behavior, from planning and decision making, to self-control and the sense of identity (Atance & O'Neill, 2001; Boyer, 2008; Damasio, 1999; Schacter, Addis, & Buckner, 2008; Suddendorf & Corballis, 2007; Szpunar, 2010; Tulving, 2005). A hallmark characteristic of episodic future thinking is the subjective feeling of “pre-experiencing” the future; we can imagine what it would be like to be in a particular future situation, for example, by picturing the setting, characters and action in our mind's eye (D'Argembeau & Van der Linden, 2004). These phenomenological qualities are important because they likely determine one's beliefs about what might lie ahead, and in turn influence one's decisions and behavior (Libby, Shaeffer, Eibach, & Slemmer, 2007).

What shapes the sense of pre-experiencing and other phenomenological features of episodic future thoughts is not yet fully understood. Recent studies suggest that multiple properties of envisioned events (e.g., temporal distance, affective valence, location familiarity) play some role (Berntsen & Bohn, 2010; D'Argembeau & Van der Linden, 2004; de Vito, Gambuzo, & Brandimonte, 2012; Szpunar & McDermott, 2008). However, different event properties often co-vary with each other and it is therefore essential to determine the specific contribution of each property to better understand what modulates the phenomenology of episodic future thoughts. For example, recent findings suggest that temporal distance is associated with a decrease in vividness not because of time *per se*, but because people tend to place near future episodes in more familiar locations, which are represented more clearly than less familiar locations (Arnold, McDermott, & Szpunar, 2011). Although these findings point to the importance of location familiarity in mediating the vividness of episodic future

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thoughts, a comprehensive investigation of the possible contribution of other event properties remains to be performed. Furthermore, it is unknown whether phenomenological features other than vividness are also mediated by the familiarity of envisioned settings.

Two types of phenomenological features should be distinguished in episodic future thoughts: sensory–perceptual qualities and cognitive feelings. We here refer to sensory–perceptual qualities as the phenomenological properties of mental images. As with memories for past events, episodic future thoughts are constructed by assembling a set of details stored in episodic memory, such as details about particular locations, persons, and objects (Schacter & Addis, 2007; Suddendorf & Corballis, 2007). These details may be represented as simulations in modality-specific systems (Barsalou, 2008; Rubin, 2006) and give rise to mental images, mainly (though not exclusively) visual images (for a discussion of the central role of visual imagery in autobiographical memory, see Brewer, 1996). These images are subjectively perceived as more or less vivid (D'Argembeau & Van der Linden, 2006) and can be viewed from different perspectives—one can see an event through one's own field of view or as an external observer (Nigro & Neisser, 1983; Rice & Rubin, 2009).

Besides sensory–perceptual qualities (e.g., vividness and visual perspective), episodic future thoughts are accompanied by particular states of consciousness (Tulving, 1985) or “cognitive feelings” (Conway, 2009). Of central importance is the subjective sense of being brought forward in time to pre-experience an event—a specific state of consciousness that Tulving termed “autonoetic consciousness” (Tulving, 1985, 2005). Another cognitive feeling relates to the belief that the imagined event will actually happen in the future, which of course can have quite powerful effects on behavior (Conway, 2009). Finally, there is evidence that imagined future events can subjectively feel more or less distant, sometimes independently of objective (clock and calendar) time (Ross & Wilson, 2002).

The purpose of this study was to investigate the specific contribution of various event properties to these different aspects of the phenomenology of episodic future thoughts. To do so, we assessed the degree to which naturally occurring variations in sensory–perceptual qualities and cognitive feelings are predicted by different event properties that have been linked to the phenomenology of future thoughts in previous studies (Arnold et al., 2011; Berntsen & Bohn, 2010; D'Argembeau & Van der Linden, 2004; de Vito et al., 2012; Szpunar & McDermott, 2008). In line with recent findings (Arnold et al., 2011), we expected that the vividness of an episodic future thought would be mainly related to the familiarity of its constitutive elements (i.e., the imagined setting, persons, and objects), and we were particularly interested in assessing the degree to which other event properties (e.g., temporal distance, personal significance) contributed to vividness once this factor had been taken into account.

An important goal of this study was then to examine what variables predicted the cognitive feelings associated with episodic future thoughts (i.e., autonoetic consciousness, belief, and subjective distance). Cognitive feelings can be broadly conceived as meta-cognitive judgments that are based on sensory–perceptual qualities (Rubin, Schrauf, & Greenberg, 2003), and we thus expected that cognitive feelings would vary with the vividness of episodic future thoughts. Yet, it is unlikely that states such as autonoetic consciousness depend solely on sensory–perceptual qualities. Indeed, people can vividly imagine fictitious experiences without necessarily having the sensation that they are pre-experiencing the future (de Vito et al., 2012; Hassabis, Kumaran, Vann, & Maguire, 2007). Perhaps what distinguishes episodic future thoughts from mental representations of such fictitious experiences is the relevance of the imagined events with regard to personal goals—episodic future thoughts may be primarily driven by personal goals, their main function being to incarnate goals into specific future scenarios (D'Argembeau & Mathy, 2011; D'Argembeau, Stawarczyk, et al., 2010). Cognitive feelings such as the subjective sense of pre-experiencing the future might thus be shaped, in part, by the relevance of the envisioned events with respect to personal goals. In this study, we tested this hypothesis by examining whether cognitive feelings are modulated by the personal importance attributed to imagined events, after the effect of sensory–perceptual qualities had been taken into account.

## 2. Methods

### 2.1. Participants

Seventy-two students (36 women and 36 men) from the University of Liège and the University of Geneva volunteered to take part in the study (mean age = 21.8 years,  $SD = 2.4$ ).

### 2.2. Materials and procedure

Participants received a booklet instructing them to imagine a series of specific events that they might experience in the future. The cover page explained in detail that each future thought should refer to a specific event (i.e., an event that happens in a specific place, at a specific time, and that last a few minutes or hours but not more than a day) and some examples were provided to illustrate what would or would not be considered as a specific event. The instructions also mentioned that participants were free to imagine events from any life domain and from any time period, provided that these events might reasonably happen in the future.

The following pages asked participants to imagine five specific future events in response to cue words. The cues referred to familiar persons and broad categories of experiences (i.e., *family*, *work*, *friend*, *party*, and *trip*) that could potentially be

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