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To cite this article: Scott N. Cole & Dorthe Berntsen (2016) Do future thoughts reflect personal goals? Current concerns and mental time travel into the past and future, *The Quarterly Journal of Experimental Psychology*, 69:2, 273-284, DOI: [10.1080/17470218.2015.1044542](https://doi.org/10.1080/17470218.2015.1044542)

To link to this article: <http://dx.doi.org/10.1080/17470218.2015.1044542>



Published online: 02 Jun 2015.



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Do future thoughts reflect personal goals? Current concerns and mental time travel into the past and future

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(Received 29 December 2014; accepted 16 April 2015; first published online 2 June 2015)

Our overriding hypothesis was that future thinking would be linked with goals to a greater extent than memories; conceptualizing goals as current concerns (i.e., uncompleted personal goals). We also hypothesized that current-concern-related events would differ from non-current-concern-related events on a set of phenomenological characteristics. We report novel data from a study examining involuntary and voluntary mental time travel using an adapted laboratory paradigm. Specifically, after autobiographical memories or future thoughts were elicited (between participants) in an involuntary and voluntary retrieval mode (within participants), participants self-generated five current concerns and decided whether each event was relevant or not to their current concerns. Consistent with our hypothesis, compared with memories, a larger percentage of involuntary and voluntary future thoughts reflected current concerns. Furthermore, events related to current concerns differed from non-concern-related events on a range of cognitive, representational, and affective phenomenological measures. These effects were consistent across temporal direction. In general, our results agree with the proposition that involuntary and voluntary future thinking is important for goal-directed cognition and behaviour.

Keywords: Goals; Current concerns; Episodic future thinking; Mental time travel; Involuntary memory.

Recent theoretical and empirical work indicates that autobiographical memories often have relevance to our current goals (e.g., Conway, 2005, for a review; Johannessen & Berntsen, 2009, 2010). In addition to recollecting their past, humans can vividly imagine possible self-referential future scenarios (i.e., episodic future thinking;

Atance & O'Neill, 2001). Reexperiencing the past and preexperiencing the future are inherently linked, cognitively and neurologically, and can be subsumed under one capacity: *mental time travel* (MTT; Wheeler, Stuss, & Tulving, 1997). Importantly, there is a growing focus on how *future* MTT might underlie or influence important

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The authors would like to thank Søren Staugaard, Daniella Villadsen, Thorbjørn Larsen, and Marie Kirk for assisting in conducting the study. We also extend our gratitude to Lia Kvavilashvili who kindly provided the materials for the adapted paradigm. The authors declare no conflict of interest. These results were presented at the inaugural International Convention of Psychological Science in Amsterdam (March, 2015) as part of a symposium on the “Functions of Future Thoughts”.

This work was supported by the Danish National Research Foundation [grant number DNRF93].

goal-oriented human functions, such as intention, planning, decision making, and goal attainment (e.g., Klein, 2013; Schacter, 2012; Seligman, Railton, Baumeister, & Sripada, 2013; Suddendorf & Corballis, 2007; Szpunar & Jing, 2013), which may garner beneficial outcomes for one's future. Other authors argue that *spontaneous* thoughts also garner benefits toward future goals (Antrobus, Singer, & Greenberg, 1966; Baird, Smallwood, & Schooler, 2011). This study examines the relation between personal goals and past and future MTT with the expectation that future thought will reflect current goals to a greater extent than memories and that goal-related past and future MTT will differ from their non-goal-related counterparts in similar ways. We here use the term past and future MTT as a reference to remembering past events and imagining possible future events, whilst acknowledging that these vary with regard to their spatiotemporal specificity (Anderson & Dewhurst, 2009; Berntsen & Jacobsen, 2008; Klein, 2013).

Johannessen and Berntsen (2010) examined the relation between goals and involuntary (spontaneously arising) versus voluntary (strategically retrieved) autobiographical memories by utilizing the concept of current concerns (Klinger, 1975). Current concerns refer to personal goals that have a specific onset (goal commitment) and offset (goal achievement or disengagement) and which have observable effects upon thoughts, perception, and behaviour until they are completed or discarded (Klinger, 1975). These generally refer to higher order goals (e.g., obtaining one's preferred job, having children)—which remain sensitive to current-concern-related cues (Klinger, 1975)—rather than drives (e.g., hunger) or specific action plans (e.g., implementation intentions; see Gollwitzer, 1993). In their diary study, Johannessen and Berntsen (2010) found that approximately half of the recorded autobiographical memories (both involuntary and voluntary) were judged by participants to be related to one or more of their current concerns. They also found that memories related to current concerns were more rehearsed, important for self-identity and life story, and closer to the present, supporting

the idea that goal-related memories may have a cognitive and representational status akin to “self-defining memories” (Singer & Salovey, 1993). Interestingly, Johannessen and Berntsen (2010) also found that participants judged that current-concern-related *memories* would have a greater effect upon their *future* life. However, in their study, Johannessen and Berntsen (2010) did not pursue the role of current concerns for future thinking.

In the present paper, we similarly operationalize goals with the construct of current concerns (Klinger, 1975). Our main aim was to examine whether current concerns would be represented more frequently in future MTT than past MTT, thus filling a critical gap in the existing literature on MTT and its relation to current concerns. Another important aim was to examine whether current-concern-related events would be distinguishable from non-current-concern-related events on key phenomenological variables, and whether this pattern of differences would be similar for both future and past events.

Consistent with Johannessen and Berntsen (2010), we examine both involuntary and voluntary MTT, and, consistent with their findings, we expect concern-related events to be equally frequent for the involuntary and voluntary conditions. However, our study differs from previous work by including a future condition and by using an adapted laboratory paradigm (Cole, Staugaard, & Berntsen, 2014; Schlagman & Kvavilashvili, 2008) to elicit the events. In this paradigm, the participants are asked to conduct a vigilance task, while reporting memories and future thoughts that potentially may arise spontaneously in response to subtly presented word phrase cues. The external validity of this paradigm was verified by finding consistent results with diary studies (e.g., Berntsen & Jacobsen, 2008; Cole et al., 2014). Involuntary future projections are a particularly important phenomenon to investigate in the laboratory as, although we know that they are experienced in daily life (Berntsen & Jacobsen), very little is known about how and why they occur. Following Johannessen and Berntsen's (2010) findings for past events, we predicted that concern-related

future thoughts would be more important to self-identity and life story, more rehearsed, and be dated more closely to the present than events judged to be unrelated to current concerns.

Summary and hypotheses of the present study

We examined both involuntary and voluntary MTT, including future MTT. We used a recently validated laboratory paradigm to elicit involuntary and voluntary MTT. This method was originally developed to measure involuntary autobiographical memories in a laboratory setting (Schlagman & Kvavilashvili, 2008), but has recently been adapted to also measure involuntary future thinking (Cole et al., 2014; see Method). Considering the unique contribution of future MTT to goal-related cognition and behaviour, we predicted that, compared with memories, a larger proportion of future thoughts would be current-concern related. Based on aforementioned theoretical and empirical work assigning voluntary and involuntary future thoughts a role in representing personal goals, as with memories, we did not predict that one retrieval mode would be especially important for goal representation (Johannessen & Berntsen, 2010). Also, we did not expect our findings regarding involuntary MTT to necessarily replicate findings in the mind-wandering literature. This is because involuntary past and future MTT is conceptually distinct from the notion of mind wandering, by the former being clearly autobiographical, typically cue dependent, short-lived, and not necessarily off-task thinking (see Berntsen, 2009, for an extended discussion).

In addition, we predicted that, like memories, current-concern-related future thoughts have a privileged cognitive, emotional, and representational status. Specifically, we expected concern-related representations to be rated higher on a number of phenomenological measures related to rehearsal frequency, temporal distance, and self-relevance. More speculatively, if self-defining memories (Singer & Salovey, 1993) and self-defining future projections (D'Argembeau, Lardi, & Van der Linden, 2012) conceptually overlap with current-concern-related representations, then current-

concern-related MTT should be rated higher on vividness and affective characteristics, in agreement with findings from past events (Johannessen & Berntsen, 2010). We expected this advantage of goal-related events to be similar for future and past MTT, consistent with evidence of both temporal directions being supported by many of the same neurocognitive substrates, and responding similarly to a number of experimental manipulations (see D'Argembeau, 2012; Szpunar, 2010a, for reviews).

EXPERIMENTAL STUDY

Method

The data presented here derive from a more extensive study examining differences between involuntary and voluntary mental time travel using an adapted laboratory paradigm (Cole et al., 2014; Schlagman & Kvavilashvili, 2008) in which the participants were asked to report autobiographical memories or future thoughts (depending on group assignment) that occur during and after a vigilance task. The vigilance task was presented to participants as their "primary task" and was implemented to simulate the moderately demanding tasks in which involuntary future mental time travel occurs in daily life (e.g., washing the dishes, see Berntsen & Jacobsen, 2008). If participants believed their main role was to generate past/future thoughts, they may have contaminated the involuntary condition by using voluntary self-generation processes. In a different part of this study, we obtained data on their current concerns and whether their future thoughts (or memories) were related (or unrelated) to their reported current concerns. Here we report these previously unpublished data on the role of current concerns in the frequencies and qualities of the reported future thoughts and autobiographical memories.

Participants

From the initial 64 participants who were recruited for the study, data from 55 Danish-speaking participants were included here (reasons for exclusion

were: psychological illness, $n = 2$; an absence of involuntary representations, $n = 1$; and noncompliance with task instructions, $n = 6$). The included participants, who also participated in Cole et al. (2014), were randomly assigned to report memories from their past ($n = 28$) or imagined events in their future ($n = 27$).¹ The two groups were alike regarding age (*past*: $M = 24.29$ years, $SD = 6.19$; *future*: $M = 24.33$ years, $SD = 6.93$) and male:female ratio (*past* = 5:23; *future* = 7:20) and were psychologically and neurologically healthy. All tested participants received two cinema tickets as recompense.

Design

For analyses addressing the frequencies of current-concern-related memories and future thoughts, we employed a 2 (future, past; between-participants) by 2 (involuntary, voluntary; within-participants) mixed design. For analyses comparing phenomenological characteristics of current-concern- and non-current-concern-related past and future event representations, only voluntarily retrieved representations were included in the analyses. The involuntary conditions were not analysed here because participants varied greatly in the frequencies of involuntary representations, and several lacked sufficient numbers of representations related and not related to current concerns to generate participant averages and render the analyses meaningful. (This variability is a natural consequence of having the number of current-concern-related events as a dependent variable for the first part of our analyses.) Also, previous work examining involuntary versus voluntary memories that were related versus unrelated to current concerns found no interactions between these two factors (Johannessen & Berntsen, 2010). This part therefore utilized a 2 (future, past; between-participants) \times 2 (concern-related,

concern-unrelated; within-participants) mixed design.

Materials

All instructions and measures were presented in Danish (see Cole et al., 2014, for details on translations). The Current Concerns Questionnaire was presented after all involuntary and voluntary past/future thoughts were elicited. Whereas some questions of the Autobiographical Characteristics Questionnaire were presented immediately after elicitation because they required immediate recording (Part 1), most were administered retrospectively (Part 2).

Current Concerns Questionnaire. A questionnaire was administered in which participants were asked to provide five current concerns.² It included a written part, which described current concerns as something you would like to have, achieve, or complete (i.e., *positive*) or something that you might want to get rid of, prevent, or avoid (i.e., *negative*). Participants were also provided with two examples (“devote more time to my hobbies—especially singing” or “avoid getting into debt with the bank”) for clarity. Participants were free to choose their own current concerns and were not prompted or cued. This represented a shortened version of the instrument used by Sellen, Murran, Cox, Theodosi, and Klinger (2006) and Johannessen and Berntsen (2010).

Autobiographical Characteristics Questionnaire. For each recorded future or past representation, participants completed the structured Autobiographical Characteristics Questionnaire, consisting of two parts (represented on the same page). In Part 1, participants provided a short description of the representation, followed by a vividness rating (1 to 7; 1 = vague, almost no image; 7 = very vivid,

¹Participants were taken from an original pool of 64 participants (32 for each temporal direction condition). Four participants were excluded from the past condition analyses due to noncompliance with concentration task instructions ($n = 1$; e.g., confusion over button press to identify targets), an absence of any involuntary memories ($n = 1$), and self-reported mental illness ($n = 2$), and five were excluded from the future condition analyses due to noncompliance with concentration task instructions ($n = 4$) and reporting only involuntary memories or images not concerning the future ($n = 1$).

²As part of the standardized questionnaire, participants also rated the importance of each on an 11-point scale (0 = *not important*, 10 = *very important*).

almost like normal vision).³ In Part 2, participants completed a more extensive description followed by indicating whether the representation was a specific event (binary; specific, not specific), their age within the past/future representation, how often the representation had been thought of before (1 to 5; 1 = never, 5 = very often), and the emotional valence (-2 to +2; -2 = negative, 0 = neutral, +2 = positive) and emotional intensity (1 to 5; 1 = no intensity, 5 = very intense) of the representation. They also rated the impact of the representation on current mood (-1 = negative, 0 = neutral, +1 = positive) and the extent to which the representation was/will be a central part of one's life story and was/will be a part of one's personal identity (1 to 5; 1 = totally disagree, 5 = totally agree; both items). Finally, participants were asked to refer back to current concerns and document which, if any, were related to the particular memory or future thought being reported (consistent with Johannessen & Berntsen, 2010). Items were presented in the above order.

Involuntary and voluntary MTT session equipment. Both involuntary and voluntary conditions were presented on E-Prime Professional Version 2.0 on desktop computers. Cue phrases (e.g., "coffee jar", "lucky find") served as the stimuli presented in both conditions, presented in the centre of the screen (18-point Arial font). Each slide consisted of a cue phrase embedded in line arrays distributed on a white background. For the involuntary condition, 600 slides were presented in the context of a vigilance task in which participants were required to identify targets (1.5 s/slide). Targets were line arrays presented vertically ($N = 11$, presented every 40–60 slides). All others were horizontal. For the voluntary condition, slides were formatted similarly except that all line arrays were presented horizontally, and 12 cue phrases were presented (maximum = 60 s/slide). Different cue phrases were assigned to each retrieval mode condition and were consistent across past/future conditions. The implementation of these experimental

materials was based upon a paradigm that successfully elicited involuntary autobiographical memories (Schlagman & Kvavilashvili, 2008). Here, they were utilized to elicit both involuntary memories and future thoughts.

Procedure

Upon entering the laboratory, each participant completed informed consent procedures. Each participant completed all tasks individually in workstations, consisting of a desktop computer and questionnaire booklet.

For the involuntary condition, on-screen instructions introduced a vigilance task in which participants had to press a button (spacebar) each time a target (vertical lines) was identified. No response was required for nontargets (horizontal lines). Participants were also informed that they would see phrases, but they were to ignore these as these would be detected by participants in another condition (actually, no such condition existed) to maintain the impression that successful performance on the vigilance task was paramount. Thereafter, participants completed a one-minute practice session consisting of 40 trials (three targets).

Following the practice vigilance task, screen instructions varied depending on past/future group assignment. In the future condition, participants were initially informed that since the vigilance task was monotonous, they may have other thoughts, including goals, daydreams, and memories (the last example was "imagined future events" in the past condition), which was normal. Instructions highlighted that participants might experience imagined future events that "pop" into their mind spontaneously. Participants were told that future MTT could be temporally near or far, refer to a specific event that referred to a particular day in the future, or be a more general scene with no reference to a specific day (we allowed variable temporal distances to be consistent with Schlagman & Kvavilashvili, 2008, and we allowed different levels of specificity because both

³Two additional items were included for involuntary representations; participants were asked to describe the event's trigger or cue, if known, and their level of concentration when the representation came to mind.

autobiographical memories and future thoughts can be specific or general; see, for example, Anderson & Dewhurst, 2009; Berntsen & Jacobsen, 2008; Klein, 2013). In addition to the “primary” vigilance task, participants were asked to press the left mouse button when involuntary future MTT occurred. Once pressed, the vigilance task was paused, and text instructed participants to complete Part 1 of the Autobiographical Characteristics Questionnaire, then press enter to return to the task. Overall, involuntary session duration depended upon amount and length of pauses. Participants then completed the voluntary condition, which differed from the involuntary condition in the following ways: (a) There was no parallel vigilance task, (b) participants were asked to consciously imagine future events associated with 12 different cue phrases (although see below), and (c) if a representation was not recorded in 60 s (by pressing left mouse button), the next cue phrase was presented. Cue phrases used in involuntary and voluntary conditions were selected from the same pool of standardized cue phrases as those used in the respective conditions in Schlagman and Kvavilashvili (2008), matched for imagery and concreteness. The order of the involuntary and voluntary conditions was fixed as one important aim of this study was to compare our findings with those of the original involuntary memory paradigm (Schlagman & Kvavilashvili, 2008). Also having the involuntary condition before the voluntary condition was important in order not to disclose the actual purpose of the experiment and thus potentially contaminate the involuntary condition with strategic search for future and past events.

After a short break, participants were given three tasks in the following order: the Current Concerns Questionnaire, Part 2 of the Autobiographical

Characteristics Questionnaire for each representation, and the Consideration of Future Consequences Scale (Strathman, Gleicher, Boninger, & Edwards, 1994).⁴ Part 2 contained an extensive series of phenomenological rating scales (see Materials) and was completed for each Part 1 entry. Part 2 items were only revealed when participants removed an adhesive piece of paper that had covered them up to this point. No time limit was imposed for these measures. The rationale for not administering the Current Concerns Questionnaire before the past/future elicitation phase was that it was likely that it would have affected the main phenomena of interest (i.e., past and future thoughts) by priming personal goals. Priming has been shown to affect both past and future thoughts (Mace, 2005; Szpunar, 2010b; Wang, 2008). Overall testing time per participant was approximately 100 minutes. In the memory group, instructions were identical except references to temporal direction.

Results

Descriptive data

Due to the nature of the tasks, the total number of recorded events depended on retrieval mode and temporal direction conditions (past involuntary = 239, past voluntary = 307, future involuntary = 154, and future voluntary = 267). When the mean participant frequencies were entered in a 2×2 mixed analysis of variance (ANOVA; within-participant factor was retrieval mode; between-participant factor was temporal direction), voluntary representations significantly outnumbered involuntary ones (in line with Schlagman & Kvavilashvili, 2008), and there were significantly fewer future versus past

⁴The Consideration of Future Consequences (CFC) scale was administered to assess whether this general disposition was related to frequency of goal-related future thoughts. Two subscales were used due to recent research showing a two-factor structure (see Joireman, Balliet, Sprott, Spangenberg, & Schultz, 2008). No relationship was evident between the mean CFC scores and proportion of involuntary ($r = -.08, p = .69$) or voluntary ($r = -.05, p = .79$) current-concern-related future thoughts. When immediate (involuntary $r = .11, p = .57$, voluntary $r = .16, p = .43$) and future (involuntary $r = .004, p = .99$, voluntary $r = .15, p = .45$) subscales of the CFC were correlated against proportion of current-concern-related future thoughts, this lack of a correlation remained. It remains an open question whether other individual differences (e.g., self-consciousness) moderate the CFC future-thinking relationship and/or whether the CFC correlates with other aspects of future thought (e.g., objectively coded detail).

Table 1. *Frequencies of involuntary and voluntary past and future MTT*

Variable	Past				Future				Main effects and interaction					
	Involuntary		Voluntary		Involuntary		Voluntary		Past vs. future		Involuntary vs. voluntary		Interaction	
	M	SD	M	SD	M	SD	M	SD	F	η_p^2	F	η_p^2	F	η_p^2
Total frequency	8.54	3.85	10.96	1.60	5.70	4.23	9.89	1.74	11.62*	.18	29.76*	.36	2.10	.04
CC-related (frequencies)	3.43	2.30	3.14	2.56	3.48	2.78	4.67	2.47	1.77	.03	1.11	.02	2.96	.05
CC-related (proportions)	.41	.30	.29	.24	.65	.32	.47	.24	11.55*	.18	12.01*	.19	0.46	.01

Note: Main effects and interactions indicated by analysis of variance (ANOVA) statistics. All effect sizes are partial eta-squared (η_p^2).

MTT = mental time travel; CC = current concerns.

* $p < .005$.

representations.⁵ See Table 1 for relevant means, statistics, and effect sizes.

The frequency of current-concern-related MTT elicited involuntarily and voluntarily

The frequencies and percentages of future and past events that were perceived as related to one or more of participant's five stated current concerns are presented in Table 1. As can be observed from proportional data, on average, future representations were more frequently related to current concerns than those directed toward the past. A mixed ANOVA (retrieval mode, within-participants; temporal direction, between-participants; see Table 1 for F -values, p -values, and effect sizes) using current-concern-related-to-total proportions demonstrated a main effect of temporal direction, with individuals having a higher proportion of current-concern-related future than past representations ($M = .56$, 95% CI [.47, .65], where CI = confidence interval, versus $M = .35$, 95% CI [.27, .44]). In contrast to predictions, there was a main effect of retrieval mode whereby involuntary conditions contained a higher proportion of current-concern-related representations than voluntary conditions ($M = .53$, 95% CI [.45, .61], versus $M = .38$, 95% CI [.32, .45], respectively). There was no interaction.

Given the fact that more past than future events were recorded, as well as the fact that more

voluntary than involuntary representations were recorded, we conducted the same analysis on the basis of the means of the raw frequencies (cf. Table 1). For this analysis, there was no main effect of temporal direction or retrieval mode. Nor was there a significant interaction, but a trend was seen ($p = .09$). Given this trend, and given the fact that an inspection of the numbers in Table 1 suggested a difference between the frequencies of past- and future-concern-related events in the voluntary condition (but less so in the involuntary condition), we conducted a t -test following up on the numerically greater frequency of voluntary future than of voluntary past representations that were concern related. This test confirmed a reliable difference between these conditions, $t(53) = 2.25$, $p < .05$. Thus, whereas proportional data showed increased goal relatedness of future representations in general, when analysing frequencies, only the voluntary future representations were more frequently goal related (when compared with its contrasting voluntary past condition).

Phenomenological characteristics as a function of temporal direction and current-concern relatedness

The means, standard deviations, and ANOVA statistics of all phenomenological characteristics are reported in Table 2. Note that no significant

⁵These frequencies differed slightly from those of Cole et al. (2014), as two representations were excluded here due to not having current-concerns relatedness data.

Table 2. Descriptive and ANOVA statistics for phenomenological characteristics of MTT as a function of temporal direction and current-concern relatedness

Measure	Past				Future				Main Effects and Interaction					
	NCC		CC		NCC		CC		Past vs. future		NCC vs. CC		Interaction	
	M	SD	M	SD	M	SD	M	SD	F	η_p^2	F	η_p^2	F	η_p^2
Specificity	.51	.26	.67	.33	.44	.31	.52	.37	2.34	.05	5.68*	.10	0.68	.01
Vividness	4.51	1.02	5.02	1.46	3.87	1.20	4.13	1.14	6.72*	.12	5.20*	.10	0.59	.01
Rehearsal	2.28	0.58	2.56	1.02	2.04	0.81	2.86	1.01	0.03	.00	13.37**	.21	3.14	.06
Life story	1.85	0.65	2.41	1.21	1.88	0.66	2.44	0.99	0.02	.00	14.39**	.23	0.00	.00
Identity	1.82	0.65	2.33	1.26	1.91	0.68	2.37	0.99	0.08	.00	9.80**	.17	0.03	.00
Valence	0.38	0.38	0.70	0.92	0.46	0.57	0.80	0.65	0.49	.01	6.57*	.12	0.01	.00
Intensity	1.94	0.70	2.50	0.99	2.30	0.77	2.91	0.91	3.99	.08	17.15**	.26	0.03	.00
Pos. mood impact	.37	.24	.58	.38	.35	.24	.57	.29	0.04	.00	18.29**	.24	0.00	.00
Neg. mood impact	.07	.11	.16	.25	.15	.18	.17	.17	1.01	.02	3.02	.06	1.14	.02
No mood impact	.56	.26	.26	.33	.51	.33	.26	.29	0.33	.00	29.45**	.38	0.33	.01
Temporal distance	4.90	3.42	3.49	3.85	2.87	3.85	2.80	3.76	2.66	.05	1.34	.03	1.08	.02

Note: CC = current-concern-related; NCC = non-current-concern-related; ANOVA = analysis of variance; MTT = mental time travel; pos. = positive; neg. = negative. Most dependent measures are scale averages, except specificity and mood impact measures, which are denoted by mean proportions. See Materials for scale anchor points. Temporal distance = difference between current age and age-in-event (in years).

* $p < .05$. ** $p < .005$.

interactions were found for any autobiographical characteristic (see Table 2).

Main effects of current-concern relatedness. Overall our findings are consistent with our prediction that there would be increases on several autobiographical characteristics for past/future representations related (versus not related) to current concerns. First, in line with predictions, on average, representations associated with current concerns were rehearsed more frequently ($M = 2.71$ versus $M = 2.16$), and were more important to one’s life story ($M = 2.43$ versus $M = 1.86$) and self-identity ($M = 2.35$ versus $M = 1.85$) than non-current-concern-related representations (see Table 2 for statistical analyses). Current-concern-related representations were, on average, more vivid ($M = 4.58$ versus $M = 4.19$) and more frequently referred to specific spatiotemporal events ($M = .59$ versus $M = .47$). They also differed with regard to affective characteristics; current-concern-related representations were more emotionally intense ($M = 2.71$ versus $M = 2.12$), were more emotionally

positive ($M = .75$ versus $M = .42$), and more frequently had impact on current mood ($M = .26$ versus $M = .53$, see “no mood impact”, Table 2), with the most pronounced differences in positive ($M = .58$ versus $M = .37$) rather than negative ($M = .17$ versus $M = .11$) mood impact (see Table 2).

Main effects of temporal direction. Comparing past and future representations showed that, in line with previous studies (see D’Argembeau, 2012, for a review), past representations were more vivid than projections into the future ($M = 4.77$ versus $M = 4.00$). Except for a marginally significant difference indicating that future representations had greater emotional intensity than past representations ($M = 2.61$ versus $M = 2.22$), no other main effects emerged.

Discussion

In this study, we utilized a recently validated laboratory-based paradigm (Cole et al., 2014) to

elicit involuntary and voluntary memories and future thoughts and asked participants to indicate which were related to their personal goals—operationalized here as current concerns (Klinger, 1975). Several novel results were found. First, in line with our principal hypothesis that future MTT is more important for goal-oriented cognition than past MTT, analysis of proportions and frequencies indicated that current-concern-related representations are more prevalent for future than for past MTT, at least when generated voluntarily through a top-down strategic manner. Additionally, when comparing the two retrieval modes, a higher proportion of current-concern-related representation was found in the involuntary (i.e., nonstrategic) condition. However, this difference was not present in analysis based on the frequencies, perhaps indicating a selective bias toward the goal relatedness of involuntary MTT experiences due to their relatively scarce nature in the present experiment (see below for further details). Because the participants retrieved more voluntary representations overall, they may have reported more events that were of less goal relevance and personal significance. Secondly, across almost all phenomenological characteristics, representations related to at least one current concern could be reliably distinguished from those unrelated to any. Consequently, this study was the first to demonstrate that MTT future and past representations related to our current goals have a privileged status across cognitive, representational, and affective dimensions, building upon prior memory research (Johannessen & Berntsen, 2010). The implications and limitations of these findings are discussed below.

Here, we found supporting evidence for the hypothesis that future-directed MTT would be more goal related than past MTT, at least when sampled through a voluntary retrieval task. This finding builds on findings from cognitive studies showing, for example, that individuals perceive a role for their own future thoughts in planning and goal attainment (D'Argembeau, Renaud, & Van der Linden, 2011; Rasmussen & Berntsen, 2013) and that episodic future thoughts are elicited more fluently when cued by personal goals

(D'Argembeau & Mathy, 2011, Study 3). The current study extends the latter result by showing that goals increase the phenomenological prominence of future thoughts.

This study also found that MTT related to current concerns differed from non-current-concern-related MTT in a similar way on various phenomenological characteristics, regardless of the temporal direction. First, current-concern-related representations were significantly more rehearsed. This result agrees with how self-defining *memories* are characterized (Johannessen & Berntsen, 2010; Singer & Salovey, 1993) and extends these to future projections suggesting that goal-related representations have a history of being brought to mind. Second, current-concern-related representations were rated higher on sensory-perceptual vividness and were more frequently classed as being spatiotemporally specific. The latter result was in line with previous findings from future thinking (D'Argembeau & Mathy, 2011; but not memory research, see Johannessen & Berntsen, 2010). Several authors have argued that representing specific, rather than general, future events may be especially important for goal planning (Atance & O'Neill, 2001; Szpunar, 2010a, see also Gollwitzer, 1993). Third, current-concern-related representations had greater relevance to life story and identity. This can be seen as consistent with D'Argembeau et al. (2010) who found that goal-related future thoughts had greater perceived personal import (see also Johannessen & Berntsen, 2010, for similar results concerning memories). Fourth, the present results established several differences concerning emotion: Current-concern-related MTT was more emotionally positive and intense and garnered a greater positive impact upon present mood. In contrast to previous findings in memory (Johannessen & Berntsen, 2010), concern-related MTT was not closer to the present. Finally, the overall lack of interaction in phenomenological characteristics analyses supports the prevailing theoretical view that episodic past and future thinking relies on shared cognitive and neuropsychological processes (Schacter et al., 2012, for a review).

In this study, goal-related MTT was more prevalent in an involuntary mode than in a voluntary mode when analysed proportionally. This contrasted with our expectation based on previous work that retrieval mode should not affect the proportion of goal-related representations, for past (see Johannessen & Berntsen, 2010) and future MTT. As shown by the frequencies in Table 1, the number of voluntary event representations greatly exceeded the number of involuntary ones in the present study, whereas the numbers of involuntary and voluntary memories were kept similar in Johannessen and Berntsen's (2010) diary study. Given that relatively fewer involuntary representations were recorded in the present study, these may have been more selective and thus perceived as more frequently referring to current concerns than their (more frequent) voluntary counterparts. Analyses of the raw frequencies of current-concern-related representations indeed showed no differences between involuntary and voluntary MTT in terms of current-concern relatedness. To clarify this issue, future studies investigating involuntary and voluntary MTT may benefit from equating frequencies of representations across conditions.

Directions for future research

Although this study supports the view that many future thoughts serve goal functions (see Schacter, 2012), some important questions remain unexplored. Research has demonstrated that brief goal-related future thought interventions induce behaviour change (e.g., Pham & Taylor, 1999). However, do people who spontaneously experience more goal-related future thoughts complete plans more often and more effectively? Furthermore, how might *involuntary* future projections be involved in goal-directed cognition and behaviour? Also, there is evidence that future thinking sometimes may become dysfunctional (Schacter, 2012), such as in terms of worry (e.g., Borkovec, Robinson, Pruzinsky, & DePree, 1983), but little is known as to the underlying mechanisms of adaptive versus maladaptive forms of future thinking. Future investigations using the present and related paradigms could help uncover how goal-

related involuntary and voluntary future thoughts contribute to goal-directed behaviour and related functions.

Summary

The current study assessed the relation between goals and MTT, conceptualizing goals as current concerns—a self-selected set of uncompleted personal goals. The past MTT data complement recent data and theory about autobiographical memory (Johannessen & Berntsen, 2010; see also Conway, 2005) indicating that goals are related to a sizeable proportion of memories. Analysis of phenomenological characteristics uncovered that being goal related affected representational, cognitive, and affective aspects of past and future MTT. Crucially, the frequency data indicate that, in comparison to the past, future thought has a tighter relation with one's goals. Overall, this finding corresponds with recent reviews (e.g., Seligman et al., 2013) indicating that controlled and spontaneous thoughts about the future have an important role in optimizing goal-directed cognition and behaviour.

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