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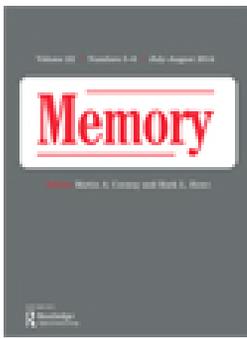
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Contribution of past and future self-defining event networks to personal identity

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ABSTRACT
Personal identity is nourished by memories of significant past experiences and by the imagination of meaningful events that one anticipates to happen in the future. The organisation of such self-defining memories and prospective thoughts in the cognitive system has received little empirical attention, however. In the present study, our aims were to investigate to what extent self-defining memories and future projections are organised in networks of related events, and to determine the nature of the connections linking these events. Our results reveal the existence of self-defining event networks, composed of both memories and future events of similar centrality for identity and characterised by similar identity motives. These self-defining networks expressed a strong internal coherence and frequently organised events in meaningful themes and sequences (i.e., event clusters). Finally, we found that the satisfaction of identity motives in represented events and the presence of clustering across events both contributed to increase in the perceived centrality of events for the sense of identity. Overall, these findings suggest that personal identity is not only nourished by representations of significant past and future events, but also depends on the formation of coherent networks of related events that provide an overarching meaning to specific life experiences.

The capacity to imagine possible futures is a central aspect of the human mind that serves multiple adaptive functions, such as planning, decision-making, self-control, and emotion regulation (Boyer, 2008; D'Argembeau, Renaud, & Van der Linden, 2011; Miloyan & Suddendorf, 2015; Schacter, 2012; Taylor, Pham, Rivkin, & Armor, 1998). An important function that has received relatively little attention to date is the contribution of prospective thinking to the formation and maintenance of self-representations or personal identity. Personal identity may be broadly defined as referring to all aspects of self-definition at the level of the individual person (Vignoles, Schwartz, & Luyckx, 2011), which not only include representations of one's present and past personal characteristics, but also expectations, aspirations, and fears regarding possible future selves (Markus & Nurius, 1986). Recent studies suggest that images of future selves may be shaped or supported by representations of particular events that are anticipated to happen in one's personal future (D'Argembeau, Lardi, & Van der Linden, 2012; Rasmussen & Berntsen, 2013; Rathbone, Conway, & Moulin, 2011). However, the structure and organisation of these envisioned events and how they nourish personal identity remain poorly understood. The aim of the present study is to explore this issue.

People in modern societies create meaning out of their lives by constructing narratives of the self that integrate past, present, and possible future experiences (McAdams, 2001). Such internalised stories provide unity and purpose to one's life, thereby contributing to personal identity (Prebble, Addis, & Tippett, 2013). A life story is a selective account of one's life experiences in which a subset of autobiographical memories – referred to as self-defining memories – are particularly important ingredients (Conway, Singer, & Tagini, 2004; Singer, Blagov, Berry, & Oost, 2013). These vivid, affectively intense, and frequently accessed memories represent the dominant themes and/or concerns in a person's life, and anchor identity in remembered reality (e.g., Blagov & Singer, 2004; Bouizegarene & Philippe, 2016; Lardi, D'Argembeau, Chanal, Ghisletta, & Van der Linden, 2010; Thorne, McLean, & Lawrence, 2004). Singer and colleagues (see e.g., Singer et al., 2013; Singer & Salovey, 1993) have proposed that self-defining memories are rarely represented in isolation but instead are connected to other significant memories that share their themes and together form scripts and narrative sequences, which are the building blocks of narrative identity (see also, Thomsen, 2015). The organisation of self-defining memories in the cognitive system has received little empirical attention, however.

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A recent study has shown that self-defining memories are indeed frequently linked to other memories that together constitute memory networks (Philippe, Koestner, Beaulieu-Pelletier, Lecours, & Lekes, 2012), but whether the nature and extent of these networks differ from more mundane memories remains unknown.

In addition to being supported by significant memories, personal identity may also be fostered by the imagination of meaningful events that one anticipates to happen in the future. D'Argembeau et al. (2012) introduced the notion of self-defining future projections to refer to the future counterparts of self-defining memories, that is, mental representations of plausible and highly significant future events that provide core information for one's understanding of self. In the same way as self-defining memories support representations of present and past selves (Conway, 2005; Conway et al., 2004), self-defining projections may ground and exemplify people's conceptions of themselves in the future. For example, an envisioned future self as a father may be nourished by the construction of future scenarios that incarnate this possible state of the self, such as picturing oneself playing with one's child in the backyard. The contribution of some future event representations to personal identity has been evidenced in several recent studies (Chessell, Rathbone, Souchay, Charlesworth, & Moulin, 2014; D'Argembeau et al., 2012; Rasmussen & Berntsen, 2013; Rathbone et al., 2011). However, as for self-defining memories, how self-defining future projections are structured in the cognitive system remains unknown.

If self-defining memories and future projections are indeed important ingredients of life stories, they should be frequently linked to each other and form coherent themes and sequences. Such organisation has been referred to as *event clusters* – a memory structure that organises a set of causally and thematically related events (Brown & Schopflocher, 1998). Previous research has indeed shown that when people are asked to produce a set of related past or future events, the generated events do not simply share surface features (such as the location or people involved), but are frequently part of higher order themes and event sequences (i.e., ministories) that are imbued with personal meaning (Brown & Schopflocher, 1998; D'Argembeau & Demblon, 2012; Demblon & D'Argembeau, 2014; see also Thomsen, Olesen, Schnieber, & Tønnesvang, 2014). Our first goal in the present study was to test the hypothesis that self-defining memories and future projections would be more frequently part of such event clusters than more mundane event representations. Furthermore, we expected that remembered and imagined events that are part of clusters would be perceived as more central to identity than non-clustered events.

Our second goal was to investigate to what extent event networks are organised according to identity motives and whether such motives contribute to the perceived centrality of events to personal identity. Identity motives are

motivational pressures toward particular ways of seeing oneself (for review, see Vignoles, 2011). Vignoles, Regalia, Manzi, Golledge, and Scabini (2006) identified six identity motives, suggesting that people are generally motivated to see themselves in a positive light (the self-esteem motive), to believe that they are distinguished from other people (the distinctiveness motive), to see their identities as continuous over time despite significant life changes (the continuity motive), to find significance or purpose in their lives (the meaning motive), to feel included and accepted within their social circles (the belonging motive), and to believe that they are competent and capable of influencing their environments (the efficacy motive). Previous studies have shown that these motives are involved in identity construction (Vignoles et al., 2006) and are reflected, in particular, in people's desired and feared possible future selves (Vignoles, Manzi, Regalia, Jemmolo, & Scabini, 2008). To the extent that past and future event networks play some role in supporting self-representations, identity motives should be an important dimension organising events within networks (i.e., networks should be coherent in terms of underlying motives) and should significantly contribute to the perceived centrality of events for identity.

To summarise, the present research aims (1) to investigate whether, compared to more mundane event representations, self-defining memories and prospective thoughts are more likely to be linked to other representations of past and future events that are central for personal identity (forming *self-defining event networks*) and that frequently form event clusters, and (2) to examine whether events within networks are organised according to identity motives and whether this organisation influences the perceived centrality of events for identity. To examine these issues, participants were asked to generate a self-defining memory and a self-defining future projection, and then to report all other events (past or future) that spontaneously came to their minds when thinking about these self-defining events. These sets of events, or event networks, were compared to other sets of events that were produced in response to non-self-defining events (i.e., past and future events produced in response to a cue-word and that were marginal for personal identity). Participants then rated several characteristics of each event (e.g., their centrality for identity; the extent to which they served identity motives) and determined the nature of the relations linking events within networks (e.g., causal relations).

Methods

Participants

Forty participants (20 females), mainly students from the University of Liège, voluntarily took part in the study. They ranged in age from 18 to 26 years ($M = 21.5$, SD = 2.12). An a priori power analysis using G*Power 3 (Faul,

Erdfelder, Lang, & Buchner, 2007) indicated that this sample size yielded a power of above 80% to detect a medium within-subjects effect size (with an alpha of .05, two tailed).

Materials and procedure

Participants were asked to produce four autobiographical event networks. These networks were initiated by a first event that varied according to (1) its temporal orientation (past vs. future) and (2) its relevance for personal identity (self-defining vs. word-cued). Participants were asked to bring to mind and to briefly describe a specific personal event (i.e., a particular event occurring in a specific place at a specific time, lasting some minutes or hours) that occurred or will occur between 1 month and 5 years from the present (hereafter referred to as the initiating event). This initiating event was either a self-defining memory, a self-defining future event, a word-cued memory, or a word-cued future event.

Instructions (translated from French) for self-defining events (past/future) were as follows:

> You will now have to remember/imagine a specific event that occurred/is likely to occur between 1 month and 5 years ago/ from now, and that you consider important for your sense of identity (an event involving important aspects or concerns in your life). This event must help you to better understand who you are as an individual, and it is the kind of event that you would tell someone you just met if you wanted that person to know you better.

Instructions for word-cued events (past/future) were as follows:

> You will now have to remember/imagine a specific event that occurred/is likely to occur between 1 month and 5 years ago/ from now, and that spontaneously comes to your mind in response to the word presented below. This event should be of little importance for your sense of identity. Select the first event, or one of the first events, that comes to your mind.

The two cue words were "bag" and "tool", and their assignment to the past and future conditions was counterbalanced across participants. We selected cue words that could potentially be associated with various mundane events and that have high imagery values (Desrochers & Bergeron, 2000), in order to facilitate the production of specific events (e.g., Anderson, Dewhurst, & Nash, 2012).

Immediately after having described each initiating event, participants were asked to think about the event and to mention whether other past or future events that were directly or indirectly linked to this event spontaneously came to mind. It was emphasised that they were not required to produce as many events as possible, but simply to report any specific event that would spontaneously come to mind, without restrictions regarding the number of events that could be reported. There was no constraint regarding the type of events that could be produced, except that they should be specific. For each initiating event, participants were thus allowed to report both past and future events that would come to mind when thinking about this event. The instructions (translated from French) were as follows:

> Does the event you described above evoke other memories of past events or other events likely to happen in your future, which are directly or indirectly related to it? These could have happened or could take place at any time, but they should be specific events. The aim is not to produce as many events as possible, but to report events that would spontaneously come to your mind when you think about your first event.

Participants then wrote a brief description of all events that came to mind.

This procedure was repeated until the four event networks were produced, and the order of presentation of the four kinds of networks was counterbalanced across participants. This paradigm for eliciting autobiographical event networks was adapted from previous studies on networked memories and future thoughts (Demblon & D'Argembeau, 2016; Philippe et al., 2012; Philippe, Koestner, Lecours, Beaulieu-Pelletier, & Bois, 2011; Philippe, Lecours, & Beaulieu-Pelletier, 2009).

Once participants had produced the four networks, they answered questionnaires assessing characteristics of each reported past and future event. Specifically, they indicated whether the event corresponded to a past or a future event, the moment when the event occurred or would occur (in years and months), whether they felt an emotion when thinking about this event (from −3 = very negative, to 3 = very positive, with 0 = no emotion), whether their representation of the event was clear (i.e., rich in sensorial details, such as mental images of the location, persons or objects) (from 1 = not clear at all, to 7 = very clear), whether the event is central or marginal to their identity (from 1 = very marginal, to 7 = very central), and whether they had already thought about this event before (from 1 = never, to 7 = very often).

Identity motives associated with each event were also assessed based on the work of Vignoles et al. (2006, 2008, 2011). Six identity motives were investigated by asking participants to rate the extent to which thinking about the event gave them a sense of *self-esteem* (the feeling of being a likeable and worthwhile person), the sense of being a competent or capable person (*efficacy*), the sense that their life has *meaning*, a sense of *continuity* in their life (between past, present, and future), the sense of being close to or accepted by other people (*belongingness*), and the sense of being distinct from other people (*distinctiveness*). Each motive was assessed on a 7-point Likert scale (from −3 = completely disagree, to 3 = completely agree, with 0 = neither agree nor disagree).

Finally, the relational dimensions that linked events within networks were assessed. For each network, participants indicated whether some events constituting the network (1) contained common elements (i.e., the same people, objects, activity or location), (2) were causally related to each other, (3) were part of a same general

event, (4) were part of the same project or corresponded to steps allowing the achievement of a personal goal, and (5) shared a common theme related to an important aspect or concern in their life. These relational dimensions were adapted from previous studies investigating the presence of event clusters in autobiographical memory or prospective thought (Brown, 2005; Brown & Schopflocher, 1998; D'Argembeau & Demblon, 2012; Demblon & D'Argembeau, 2014, 2016). For the question assessing the presence of a general event, a brief definition and some examples were presented, as follows:

> A general event is an event lasting more than one day, limited in time (lasting some days or weeks), which includes more specific events referring to the same theme. "My holidays in France", "the exam session of January", "the Christmas holidays", or "my learning to drive period", are examples of general events.

Participants evaluated these relational dimensions as follows: each event within a network received a number corresponding to its position in the network (i.e., the initiating event was numbered 1, the first associated event was numbered 2, and so on) and, for each relational dimension, participants had to indicate whether some events were related to each other (based on that dimension) by writing the corresponding event numbers. For example, if events 1, 2, and 5 were causally related to each other, participants indicated "1, 2, and 5" for the question addressing causality. For subsequent analyses, each event received a score of 1 or 0 for each relational dimension, depending on whether or not it was reported as involving that dimension (in the above mentioned example, events 1, 2, and 5 would each receive a score of 1 for causal relations, whereas events 3 and 4 would each receive a score of 0 if they were not causally related to any other event within the network).

Results

Characteristics of initiating events

First, we investigated whether the initiating events generated by participants and used to cue further memories and prospective thoughts showed the expected characteristics (i.e., self-defining or mundane). We performed a series of 2 (type of cue: self-defining vs. word cue) × 2 (temporal orientation: past vs. future) repeated-measures ANOVAs on each event characteristic (Table 1).

These analyses confirmed that the instructions were effective for obtaining past and future initiating events that differed in terms of their self-relevance: self-defining memories and prospective thoughts were judged as more central for the sense of self, as involving a greater satisfaction of identity motives (for all motives), and as more frequently thought about than word-cued memories and prospective thoughts. Additionally, self-defining events were more distant in time and were judged more positive than word-cued events.

Regarding the effect of temporal orientation, the analyses showed that future events were more positive and closer in time than past events, in line with previous findings (e.g., D'Argembeau & Van der Linden, 2006; Spreng & Levine, 2006). Future events were also judged to convey a higher sense of efficacy and self-esteem than past events. On the other hand, memories for past events were rated as clearer than future thoughts, which is again consistent with previous studies (e.g., D'Argembeau & Van der Linden, 2006).

Characteristics of networked events

Having established that our manipulation of the self-relevance of initiating events was effective for both the past and the future, we then sought to examine the properties of associated event networks. To investigate whether the nature of the initiating events influenced the characteristics of associated events within networks, the averaged characteristics of events produced in response to each initiating event were computed and submitted to a series of 2 (type of cue: self-defining vs. word-cued) × 2 (temporal orientation: past vs. future) repeated-measures ANOVAs (Table 2).

Overall, participants reported from 1 to 3 events when thinking about an initiating event, and the number of reported events was significantly higher when the initiating events were self-relevant rather than mundane. Furthermore, the nature of networked events also differed as a function of the type of initiating events: events produced in response to self-defining memories or future thoughts were judged, on average, as more central to identity and more frequently thought about, and as fulfilling identity motives (self-esteem, efficacy, meaning, continuity, belonging, and distinctiveness) to a greater extent than events produced in response to more mundane memories or future thoughts. The dimension of belonging showed a significant interaction between the self-relevance and temporal orientation of initiating events: self-defining memories induced the representation of events that conveyed a greater sense of belonging relative to mundane memories, $F(1, 39) = 12.73$, $p < .001$, whereas self-defining and mundane future thoughts did not differ in this respect, $F(1, 39) = 0.16$, $p = .69$.

The proportion of past/future events composing the networks, and the temporal distance, emotional valence, and clarity of these events were not significantly affected by the self-relevance or the temporal orientation of the initiating event. The dimension of clarity showed a significant interaction, which was due to the fact that ratings of clarity were numerically higher for events initiated by a self-defining versus a word-cued memory, while the numerical difference was in the opposite direction for self-defining versus word-cued prospections; however, these differences did not reach statistical significance ($F(1, 39) = 2.23$, $p = .14$; and $F(1, 39) = 2.22$, $p = .14$, respectively).

Table 1. Characteristics of initiating events as a function of their self-relevance and temporal orientation.

	SDP	SDF	WCP	WCF	Temporal orientation of the cue			Self-relevance of the cue			Interaction		
	M (SD)	M (SD)	M (SD)	M (SD)	$F(1, 39)$	p	η_p^2	$F(1, 39)$	p	η_p^2	$F(1, 39)$	p	η_p^2
Temporal distance (days)	757 (572)	693 (558)	644 (582)	249 (326)	**6.72**	**.013**	**0.15**	**16.49**	**<.001**	**0.30**	3.99	.053	0.09
Emotional valence	1.15 (2.12)	2.00 (1.62)	0.63 (1.71)	1.25 (1.30)	**13.69**	**<.001**	**0.26**	**5.79**	**.021**	**0.13**	0.15	.700	<0.01
Clarity	6.03 (1.07)	4.18 (1.55)	5.48 (1.40)	4.15 (1.73)	**39.34**	**<.001**	**0.50**	3.35	.075	0.08	2.34	.134	0.06
Thought before	4.73 (1.38)	4.95 (1.54)	2.85 (1.25)	2.90 (1.57)	0.38	.541	0.01	**83.22**	**<.001**	**0.68**	0.21	.652	<0.01
Centrality	5.98 (0.86)	5.98 (0.89)	2.50 (1.47)	2.45 (1.40)	0.02	.878	<0.01	**398.13**	**<.001**	**0.91**	0.03	.870	<0.01
Identity motives													
Self-esteem	1.38 (1.27)	1.83 (1.28)	0.15 (0.74)	0.38 (1.13)	**4.53**	**.040**	**0.10**	**44.87**	**<.001**	**0.54**	0.50	.482	0.01
Efficacy	1.28 (1.38)	1.75 (1.35)	0.28 (1.34)	0.60 (1.43)	**4.45**	**.041**	**0.10**	**22.46**	**<.001**	**0.37**	0.13	.716	<0.01
Meaning	1.53 (1.41)	1.85 (1.14)	−0.03 (1.21)	0.05 (1.08)	1.65	.207	0.04	**80.64**	**<.001**	**0.67**	0.64	.427	0.02
Continuity	1.80 (1.29)	2.23 (0.86)	0.25 (1.30)	0.30 (1.22)	1.40	.244	0.03	**89.72**	**<.001**	**0.70**	1.45	.236	0.04
Belonging	1.10 (1.36)	1.03 (1.05)	0.60 (1.46)	0.45 (1.28)	0.47	.496	0.01	**6.97**	**.012**	**0.15**	0.04	.837	<0.01
Distinctiveness	1.03 (1.21)	0.98 (1.30)	0.20 (1.09)	0.08 (1.38)	0.25	.619	<0.01	**21.49**	**<.001**	**0.36**	0.04	.841	<0.01

Notes: Column headings define the nature of the initiating event. SDP, self-defining past event; WCP, word-cued past event; SDF, self-defining future event; WCF, word-cued future event. Significant main effects and interactions are indicated in bold.

Table 2. Characteristics of networked events as a function of the self-relevance and temporal orientation of the initiating event.

	SDP	SDF	WCP	WCF	Temporal orientation of the cue			Self-relevance of the cue			Interaction		
	M (SD)	M (SD)	M (SD)	M (SD)	$F(1, 39)$	p	η_p^2	$F(1, 39)$	p	η_p^2	$F(1, 39)$	p	η_p^2
Number of cued events	2.35 (0.66)	2.28 (0.60)	2.00 (0.75)	2.15 (0.66)	0.22	.645	<0.01	**9.78**	**.003**	**0.20**	1.18	.284	0.03
Prop. of past events	0.75 (0.34)	0.65 (0.36)	0.74 (0.34)	0.69 (0.37)	1.38	.247	0.03	0.15	.697	<0.01	0.47	.499	0.01
Temporal distance (days)	981 (1089)	1181 (1273)	1009 (1123)	1057 (1424)	0.98	.329	0.02	0.20	.658	<0.01	0.29	.595	<0.01
Emotional valence	1.34 (1.39)	1.11 (1.50)	0.93 (1.40)	1.33 (1.25)	0.13	.721	<0.01	0.16	.688	<0.01	2.30	.138	0.06
Clarity	5.43 (1.24)	4.88 (1.19)	5.08 (1.29)	5.19 (1.31)	1.27	.267	0.03	0.01	.916	<0.01	**4.97**	**.032**	**0.11**
Thought before	4.05 (1.27)	3.95 (1.50)	3.12 (1.26)	3.15 (1.52)	0.03	.855	<0.01	**16.38**	**<.001**	**0.30**	0.16	.695	<0.01
Centrality	4.66 (1.42)	4.84 (1.38)	3.08 (1.58)	3.44 (1.50)	1.83	.184	0.04	**47.12**	**<.001**	**0.55**	0.27	.609	<0.01
Identity motives													
Self-esteem	1.06 (1.09)	0.93 (1.00)	0.27 (0.95)	0.63 (1.13)	0.45	.504	0.01	**17.70**	**<.001**	**0.31**	1.65	.206	0.04
Efficacy	1.08 (1.08)	1.03 (1.07)	0.23 (1.07)	0.57 (1.17)	0.87	.356	0.02	**20.63**	**<.001**	**0.35**	0.91	.346	0.02
Meaning	0.96 (1.16)	0.97 (1.08)	0.11 (1.12)	0.56 (1.16)	2.04	.161	0.05	**10.71**	**.002**	**0.22**	1.99	.166	0.05
Continuity	1.54 (1.11)	1.48 (1.02)	0.79 (1.12)	0.69 (1.26)	0.21	.650	<0.01	**20.23**	**<.001**	**0.34**	0.02	.886	<0.01
Belonging	1.24 (0.98)	0.98 (0.98)	0.49 (0.90)	0.90 (1.07)	0.41	.525	0.01	**6.75**	**.013**	**0.15**	**6.06**	**.018**	**0.13**
Distinctiveness	0.60 (1.08)	0.60 (0.93)	0.07 (0.90)	0.30 (1.07)	0.66	.421	0.02	**10.14**	**.003**	**0.21**	0.69	.410	0.02

Notes: Column headings define the nature of the initiating event. SDP, self-defining past event; WCP, word-cued past event; SDF, self-defining future event; WCF, word-cued future event. Significant main effects and interactions are indicated in bold.

Relational dimensions characterising event networks

We also investigated what relational dimensions linked events within networks and whether they were affected by the nature of the initiating event. Based on participants' evaluations, each event received a value of 1 or 0 for each relational dimension, depending on whether or not it was related to (an)other event(s) based on that dimension. Then, for each network, the proportion of events that involved a particular relational dimension (i.e., events that received a value of 1 for that dimension) was calculated. The mean proportion for each relational dimension is shown in Table 3, as a function of the nature of the initiating event.

We first examined the frequency of event clusters. Following previous studies (Brown, 2005; Brown & Schoplocher, 1998), events were considered to be part of the same cluster if they were causally related to each other and/or part of the same general event. In other words, when an event was related to at least one other event of the same network according to at least one of these two dimensions, it was counted as being part of an event cluster. Overall, the proportion of events per network that were part of a cluster varied between 0 and 1 (for all types of networks). A 2 (self-relevance) × 2 (temporal orientation) ANOVA conducted on these proportions showed that networks more frequently included event clusters when they were initiated by a self-defining event than by a word-cued event (Table 3). This effect was observed for each of the two dimensions defining event clusters (i.e., general events and causal relations). There was no effect of the time period of the initiating event (i.e., past or future) and no interaction.

Similarly, the proportion of events that were related to a same project, and the proportion of events that shared a common life theme were greater when the initiating event was self-defining (Table 3). There was no effect of time period and no interaction.

Finally, events that were initiated by a word-cued event were more likely to share the same surface features (i.e., the people, location, activity, and/or objects involved) than events initiated by a self-defining representation. There was no effect of time period and no interaction.

Coherence of identity motives within networks

If event networks play some role in supporting personal identity, identity motives should be an important dimension organising events within networks (i.e., networks should be coherent in terms of underlying motives). To test this hypothesis, we used multilevel modelling (with events as level 1 unit, networks as level 2 unit, and participants as level 3 unit) in order to examine whether a significant part of the total variance in each identity motive was due to differences between networks. More specifically, we compared a three-level model (that included networks as level 2 unit, as described above) with a two-level model (that only included events as level 1 unit, and participants as level 2 unit) to investigate whether networks explained a significant part of the variance in identity motives.

Regarding centrality for identity, 50% of the total variance was due to differences between networks; a likelihood ratio (LR) test indicated that this part of variance due to differences between networks was significantly different from 0 (Table 4). This result indicates that events within networks were significantly more similar to each other in terms of identity centrality than they were to events of other networks. In the same vein, the results showed that events within networks were more similar to each other in terms of identity motives (i.e., self-esteem, competence, meaning, continuity, belonging, and distinctiveness) than they were to events of other networks, showing a high internal consistency within networks on these dimensions (Table 4).

Altogether, these results indicate that events within networks show a high coherence in terms of identity centrality and motives, which supports the view that the importance of events for the sense of identity and the elements of identity they convey are key dimensions organising events within networks.

Impact of clustering and identity motives on event centrality

Finally, we examined to what extent clustering and identity motives influenced the perceived centrality of events to identity. First, we examined the bi-variate relationships between centrality and each variable. To do so, we conducted a series of three-level regression models (with

Table 3. Relational dimensions linking events within networks, as a function of the self-relevance and temporal orientation of the initiating event.

	SDP M (SD)	SDF M (SD)	WCP M (SD)	WCF M (SD)	Temporal orientation of the cue			Self-relevance of the cue			Interaction		
					$F(1, 39)$	p	η_p^2	$F(1, 39)$	p	η_p^2	$F(1, 39)$	p	η_p^2
Cluster	0.69 (0.39)	0.76 (0.37)	0.45 (0.42)	0.43 (0.42)	0.13	.723	<0.01	**33.32**	**<.001**	**0.46**	0.62	.436	0.02
General event	0.32 (0.42)	0.34 (0.42)	0.18 (0.35)	0.26 (0.36)	0.58	.450	0.01	**4.80**	**.034**	**0.11**	0.33	.572	<0.01
Causal relation	0.68 (0.39)	0.75 (0.36)	0.34 (0.39)	0.36 (0.43)	0.58	.450	0.01	**47.65**	**<.001**	**0.55**	0.13	.725	<0.01
Common elements	0.77 (0.31)	0.73 (0.36)	0.90 (0.24)	0.87 (0.25)	0.45	.506	0.01	**9.38**	**.004**	**0.19**	<0.01	.980	<0.01
Project	0.54 (0.43)	0.65 (0.39)	0.18 (0.33)	0.33 (0.41)	3.23	.080	0.08	**46.92**	**<.001**	**0.55**	0.18	.673	<0.01
Life theme	0.78 (0.34)	0.78 (0.28)	0.28 (0.41)	0.35 (0.37)	0.36	.550	0.01	**69.29**	**<.001**	**0.64**	0.63	.434	0.02

Notes: Column headings define the nature of the initiating event. SDP, self-defining past event; WCP, word-cued past event; SDF, self-defining future event; WCF, word-cued future event. Significant main effects and interactions are indicated in bold.

Table 4. Percentage of the total variance in identity motives that was due to differences between networks.

	Networks	LR	p
Centrality for identity	50	119.01	<.001
Identity motives			
Self-esteem	24	28.58	<.001
Efficacy	29	38.15	<.001
Meaning	42	85.15	<.001
Continuity	39	72.45	<.001
Belonging	16	13.53	<.001
Distinctiveness	21	23.79	<.001

Note: Likelihood ratio (LR) tested for the significance of variance at level 2 (between networks).

participants as level 3 unit, *networks* as level 2 unit, and *events* as level 1 unit), with centrality as dependent variable, and clustering and ratings of identity motives as predictors. All the metric variables entered in these analyses (i.e., the six identity motives and the dimension of centrality) were standardised so that the coefficients (β) reflect effect sizes. These analyses showed that clustering and each identity motive were positively related to the perceived centrality of the event to identity (Table 5).

To investigate the independent contribution of these variables, they were entered simultaneously in a three-level regression model. This model revealed that clustering and the identity motives of meaning, self-esteem, continuity, and distinctiveness all made a unique and positive contribution to the perceived centrality of events to identity. The motive of belonging was negatively related to centrality when it was entered simultaneously with all the other dimensions. However, this latter finding is difficult to interpret because the bi-variate relationship between belonging and centrality was actually positive (see Table 5). The dimension of efficacy did not significantly predict centrality when the other dimensions were taken into account.[1]

Discussion

Previous research suggests that abstract knowledge about the self (e.g., conceptual self-representations and personal goals) and specific representations of life events are closely interconnected (see e.g., Conway, 2005, 2009; Conway et al., 2004; D'Argembeau et al., 2012; D'Argembeau & Mathy, 2011; Rathbone et al., 2011). Self-images and goals shape and constrain the formation of specific memories and future thoughts (providing coherence between

represented events and self-conceptions), and reciprocally, mental representations of important life events may ground, nourish, and exemplify self-conceptions (Conway, 2005; D'Argembeau et al., 2012). The present research provides novel evidence that such personally significant events are often organised in coherent networks that include both memories and prospective thoughts. More specifically, we found that, compared to networks of mundane events, networks of self-defining events were more extended (i.e., included more events), were more frequently organised in meaningful themes and sequences (i.e., event clusters), and satisfied identity motives to a greater extent. Furthermore, our results suggest that identity motives are pivotal dimensions that link events into networks and contribute to their perceived centrality to identity.

Self-defining memories capture important aspects of self-understanding and are thought to anchor identity in remembered reality (see e.g., Singer et al., 2013). Singer and colleagues (Singer & Blagov, 2004; Singer et al., 2013; Singer & Salovey, 1993) have proposed that self-defining memories are often connected to other related memories that share similar themes, goals, and/or affective responses. The present results provide experimental support for this assumption, by showing that when people evoke self-defining memories, other self-defining events often spontaneously come to their minds (see also Philippe et al., 2012). More specifically, we found that, compared to more mundane events, thinking about self-defining events induced the production of a greater number of related experiences, and these associated events were estimated as more central to identity, conveyed more satisfaction of identity motives, were more recurrent in thought, and more likely to be centred on a common project or goal. Importantly, our results further showed that not only self-defining memories, but also self-defining future projections were associated with such networks of events, suggesting that both past and future event networks may contribute to ground and nourish personal identity.

When looking more specifically at the relational dimensions that linked events within networks, we found that past and future events composing self-defining networks were more frequently part of coherent themes and narrative-like sequences, referred to as event clusters (Brown & Schopflocher, 1998; D'Argembeau & Demblon, 2012).

Table 5. Dimensions that contribute to the perceived centrality of events for identity.

	Bi-variate relationship				Multiple regression			
	β	SE	Z	p	β	SE	Z	p
Self-esteem	**0.32**	**0.04**	**9.26**	**<.001**	**0.11**	**0.05**	**2.24**	**.025**
Efficacy	**0.28**	**0.04**	**7.59**	**<.001**	−0.004	0.05	−0.08	.935
Meaning	**0.44**	**0.04**	**11.61**	**<.001**	**0.24**	**0.05**	**4.96**	**<.001**
Continuity	**0.42**	**0.04**	**10.95**	**<.001**	**0.23**	**0.04**	**5.04**	**<.001**
Belonging	**0.14**	**0.04**	**3.49**	**<.001**	−0.09	0.04	−2.24	.025
Distinctiveness	**0.25**	**0.04**	**6.49**	**<.001**	**0.11**	**0.04**	**2.82**	**.005**
Cluster	**0.19**	**0.09**	**2.07**	**.039**	**0.16**	**0.08**	**2.04**	**.041**

Note: Statistically significant positive coefficients are indicated in bold.

Furthermore, clustering across remembered and imagined events contributed to increasing their perceived centrality for identity. Event clusters may indeed be important building blocks of personal identity: by highlighting thematic and causal links between events, they may provide an overarching meaning to life experiences that goes beyond the meaning attributed to any single event taken in isolation, and contributes to the construction of a coherent self-image (Bluck & Habermas, 2000; McAdams, 2001; Pasupathi, Mansour, & Brubaker, 2007). In particular, specific memories and future thoughts are closely tied to personal goals (Conway, 2005; D'Argembeau & Mathy, 2011) and the organisation of such goal-related representations in event clusters might foster their integration within the self-concept (a process referred to as "goal fusion"), resulting in greater effort and persistence in goal pursuit (Burkley, Curtis, Burkley, & Hatvany, 2015).

Considering recent research that has revealed a close relationship between autobiographical memory and motivational elements of identity (see e.g., Philippe et al., 2012; Ritchie, Sedikides, & Skowronski, 2015; Woike, Mcleod, & Goggin, 2003), we also hypothesised that members of a same network would express a strong coherence in terms of identity motives. Consistent with this assumption, our results revealed that networks were characterised by a high internal consistency not only in terms of the centrality of represented events to identity, but also regarding the (dis)satisfaction of identity motives; in other words, members of a same network were more similar to each other on all of these dimensions than they were to members of other networks. This finding provides evidence that events composing a same network have a particular signature in terms of identity centrality and motives. In addition to the mere importance of events for identity, the particular identity motive(s) involved in the represented events thus seem to be a key dimension linking memories and prospective thoughts into networks.

Our results also revealed that the satisfaction of identity motives increased the perceived centrality of events to identity. Previous studies have shown that four of the six motives assessed in the present research contribute to identity definition (i.e., *self-esteem*, *meaning*, *distinctiveness*, and *continuity*), while the two remaining motives are related to identity enactment (i.e., *efficacy* and *belonging*; note that *self-esteem* is involved in both identity definition and enactment) (Vignoles, 2011; Vignoles et al., 2006). In the present study, the two dimensions that characterise identity enactment did not show a significant effect on centrality once the other dimensions were taken in account. On the other hand, the four pivotal motives that define identity were independently related to centrality in autobiographical memories and prospective thoughts. These results suggest that the dimensions of self-esteem, meaning, distinctiveness, and continuity in remembered and imagined events all uniquely contribute to the perceived relevance of memories and future thoughts for identity.

An intriguing result was that, among mundane event networks, the amount of surface relations (i.e., the presence of common elements, such as people, objects or actions) shared by events was substantially higher than in self-defining event networks. A possible explanation of this finding is that participants might have focused on different event features when thinking about the two types of initiating events, which then might have oriented the nature of the connections with networked events. When processing self-defining initiating events, participants might have focused on event properties that make them central for their sense of identity (such as their implications, meaning, or underlying goals), resulting in the initiation of causal and thematic associations. On the other hand, when processing word-cued initiating events (which were less charged with personal meaning), participants might have focused on other salient aspects of events, such as their surface features. These differences in focus might have been exacerbated by the instructions given to participants in the present study. As our main aim was to investigate whether and how the organisation of memories and prospective thoughts differs depending on their relevance for identity, we designed conditions that were maximally contrasted in terms of personal relevance by explicitly asking participants to produce initiating events with high versus low importance for their identity. Therefore, it would be interesting in future studies to investigate whether the present findings can be replicated when participants' attention is not explicitly drawn to the personal (in)significance of the initiating events. In a related vein, it should also be noted that participants might have focused on the surface features of mundane events in part because we used cue words that referred to objects (i.e., bag and tool) to elicit the initiating events. Such cues could have made the surface features of the initiating events (e.g., an object represented within the event) particularly salient, leading participants to associate related events on the basis of these surface characteristics. It could therefore be useful in future studies to manipulate the nature of the cues used to elicit the initiating events and to examine whether this affects the characteristics of associated event networks.

Another avenue for future research is to investigate individual differences in the organisation of self-defining thoughts. Previous studies have shown that inter-individual variations in the characteristics of self-defining memories and future projections are significantly correlated, suggesting that an individual's particular "style" in representing self-defining events is similarly manifested for the past and the future (D'Argembeau et al., 2012). The present study was not designed to examine individual differences and we lack statistical power to do so, but it would be interesting in future studies to investigate whether individual differences in the organisation of self-defining events are also similarly manifested for the past and the future.

Finally, the present study has potentially important implications for psychopathological conditions that are associated with identity disturbances. Considering the potential importance of self-defining event networks for the construction of personal identity, it would be interesting to investigate the organisational structure of self-defining memories and prospective thoughts, as well as their underlying identity motives, in individuals suffering clinical conditions that are associated with disturbed self-representations, either in terms of content (e.g., depression; Sowislo & Orth, 2013) or structure (e.g., schizophrenia; Bennouna-Greene et al., 2012; Raffard et al., 2010). Based on the evaluation of biases and deficits in self-defining networks, one could design cognitive interventions to help individuals coherently organise their thoughts in the form of event clusters, and then investigate whether such training improves the definition and perceived achievability of personal goals and enhances the sense of personal identity.

In summary, the present study has revealed the existence of self-defining event networks composed of both memories and prospective thoughts that are intimately related in terms of identity centrality and underlying motives. Another important and novel contribution of this research is that it clarifies the nature of the connections linking events within networks, showing in particular the narrative-like structure of self-defining event networks. Finally, our results demonstrate the pivotal role played by clustering and the satisfaction of identity motives on the perceived centrality of events for identity. Together, these findings suggest that personal identity is not only nourished by representations of significant past and future events, but also depends on the formation of coherent networks of related events that provide an overarching meaning to specific life experiences.

Note

1. There is a lack of discussion and research on the issue of multicollinearity in multilevel modelling (Clark, 2013). High degrees of correlation between level 1 predictors may introduce bias into the standard errors of the parameter estimates, reducing the likelihood to reach statistical significance (Shieh & Fouladi, 2003). The absence of significant contribution for the dimension of efficacy should thus be considered with caution, given the relatively high correlations existing between this dimension and the dimensions of self-esteem ($r = .73$) and meaning ($r = .53$), as well as between meaning and the dimensions of continuity ($r = .63$) and self-esteem ($r = .58$). All other correlations between the predictors were lower than .46.

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