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Specific autobiographical memories are a resource for identity strength among mature but not emerging adults

Denise R. Beike ^a, Holly E. Cole^b and Carmen R. Merrick^c

^aDepartment of Psychological Science, University of Arkansas, Fayetteville, AR, USA; ^b Wesleyan College, Macon, GA, USA; ^cDepartment of Psychology, Hendrix College, Conway, AR, USA

ABSTRACT

Four studies, three pre-planned on Open Science Framework, with 2296 participants explored the potential role of recollecting autobiographical memories in enhancing the sense of identity. Among emerging adults (college students under age 25), recollecting important autobiographical memories did not strengthen sense of identity. Autobiographical memories failed to strengthen identity among emerging adults despite inducing low self-clarity first; despite attempts to prime self-consistent memories by having emerging adults report their stable self-aspects first; and despite attempts to inspire self-event connections by asking emerging adults to explain how the memories exemplified something enduring about the self. Among mature adults (age 25 and older), recollecting important autobiographical memories strengthened sense of identity. Identity was strengthened regardless of whether mature adults were asked to explain how the memories exemplified something enduring about the self. Differences in types of memories or motivation did not account for the differential effects of recollecting autobiographical memories in identity. In short, mature adults appear to readily use autobiographical memories as a resource for identity in a way that emerging adults have not yet mastered.

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The functional approach to autobiographical memory posits three main functions served by having autobiographical memory: identity, social, and directive (Bluck et al., 2005). Of the three, the most research attention has been dedicated to the identity function (Beike et al., 2020). A good deal of research shows autobiographical memory and identity are linked in terms of content. Specifically, recollecting memories of a certain content affects the content of the current self-view and vice versa (Bluck & Alea, 2008; Schwartz et al., 2017; Sanitioso et al., 1990). But the role of specific autobiographical memories in enhancing the *strength* (rather than shaping the momentary *content*) of identity has been tested in only one set of studies of which we are aware (Jiang et al., 2020). Moreover, the identity function of autobiographical memory is known to change over the lifespan (Vranić et al., 2018), which may explain why some studies find a link between autobiographical memory and certain aspects of identity (Haslam et al., 2011) while others do not (van Doeselaar et al., 2020). The present research was designed to test rigorously whether recollection of specific autobiographical memories contributes to the strength, not merely the content, of identity, and whether that contribution varies by age.

Functions of autobiographical memory across the lifespan

Remembering specific life events is a cognitively complex, demanding, and late-developing skill (Nelson, 1993; Rubin, 2005), and it is likely unique to humans (Fivush, 2011). Why might humans expend the required cognitive energy to remember the fine details of their own lives? In answer to this question, three primary functions or benefits of autobiographical memory have been suggested: Social, directive, and identity. The social function refers to autobiographical memories' enhancing effect on relationships through private recollection (Bluck & Alea, 2009) or sharing memories with others (Beike et al., 2017). The directive function refers to autobiographical memories informing and motivating future behaviours (Beike et al., 2010). The identity function, the focus of the present research, refers to the tendency of autobiographical memories to solidify and exemplify one's sense of one's own unique qualities and values. Indeed, a variety of processes ensure that autobiographical memories and the self-concept correspond (Bluck & Alea, 2008; Conway & Pleydell-Pearce, 2000).

The three functions of autobiographical memory are known to vary over the course of the lifespan, though

CONTACT Denise R. Beike  dbeike@uark.edu  Department of Psychological Science, 216 Memorial Hall, University of Arkansas, Fayetteville, AR 72701, USA

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the evidence is mixed. For example, in one study younger adults (18–45 years) reported being more likely to utilise the social and directive functions of autobiographical memory than older adults (46–90 years), without differences in the identity function (Vranić et al., 2018). However, in another study younger adults (17–39 years) reported being more likely to use the identity function of autobiographical memory than older adults (60–91 years) to increase self-continuity (Bluck & Alea, 2009).

In both studies, it is noteworthy to highlight the cutoff point between the two age cohorts. In both cases, young adults were categorised as those in their teenage years into their thirties and forties. Although these general cutoff points have precedents in the autobiographical memory literature (Comblain et al., 2005; Levine et al., 2002), there is reason to expect differences between emerging adults (age 18 to early 20s) and mature adults (age 25 and older) in the relationship between their autobiographical memories and strength of identity. Emerging adulthood has been described as a unique stage of development, particularly in terms of identity (Arnett, 2000). The primary differences between emerging adults and mature adults involve the acquisition of adult roles (such as parent or professional) and psychosocial maturity, both of which contribute to identity development (Piotrowski et al., 2013). Therefore, emerging adults (18–24) may well differ from mature adults (25 or older) in the identity function of autobiographical memory. The primary purpose of the present research is to investigate how autobiographical memory contributes to identity in these two age groups.

Autobiographical memory is not the only type of knowledge known to serve the identity function. A stable sense of identity is also maintained by general self-knowledge, or knowing one's general tendencies (Klein et al., 1996). The claim often made in the autobiographical memory literature (e.g., Pillemer, 2010) is that memory for specific autobiographical episodes is *more* powerful than such general self-knowledge. For example, a person might have general knowledge that they are generous, and that information may influence their thoughts, feelings, and behaviours. They might also have specific autobiographical memories of times in which they acted generously, which when recalled might *more* strongly influence thoughts, feelings, and behaviours than that general knowledge about the self. Autobiographical memories therefore package a message in the form of a specific, meaningful narrative about an experience.

On the other hand, the power of the specific episode is not always greater than that of general self-knowledge. For example, sharing with another person a specific memory of helping a stranger, and sharing general self-knowledge that one is generous, have the same closeness-enhancing effects (Beike et al., 2016). The effect of general self-knowledge may even be greater than that of specific autobiographical memory. People recruit more general, not more specific, memories when trying to

shore up a self-concept they are momentarily motivated to have (Brunot & Sanitioso, 2004). A second purpose of the present research is to test whether general self-knowledge serves a greater or lesser role in identity than autobiographical memories do.

Strength of identity across the lifespan

Most of the research on the identity function of autobiographical memory focuses on the content of identity; that is, the characteristics or traits one might use to describe the self. The content of recently recalled memories and the content of the self are causally connected. For example, a person whose identity is that of an extravert asked to recollect an important life event memory would likely report an incident of extraversion (Singer & Salovey, 1993). Even a momentary change in the desired view of the self leads to selective recollection of autobiographical memories that support that momentary view (Sanitioso et al., 1990). Recollecting autobiographical memories can increase accessibility of related general self-knowledge in memory (Charlesworth et al., 2016).

It is not at all clear that this content-relatedness is what participants are thinking about when they report using autobiographical memory to serve an identity function. Some items from the self-report measure of the identity function of autobiographical memory refer to “understand[ing] who I am now”, “see[ing] if my life has an overall theme”, and “understand[ing] how I have changed from who I was before” (Bluck et al., 2005). This effect of autobiographical remembering on a deep understanding of the self is what we hoped to capture in the present research. We wished to determine whether, in the words of Demblon and D'Argembeau (2017), “identity is nourished by memories of significant past experiences” (p. 656). That is, does autobiographical remembering strengthen one's sense of identity, one's confidence that they truly understand the self?

A strong sense of identity entails the certainty that one is the same through time, different from others, and able to choose one's destiny (Bamberg, 2011). Identity strength is therefore analogous to the developmental notion of commitment (Marcia, 1966); being certain about who one is. Components of identity strength include self-concept clarity and self-continuity (Jiang et al., 2020), both of which, along with a more straightforward measure of sense of identity, were measured in the present research.

Although they are interconnected, identity and self-esteem are distinct constructs (Campbell et al., 1996). Self-esteem is typically considered to be one's overall evaluation of their identity, or their sense of self-worth (Luyckx et al., 2013; Rosenberg, 1965). Interestingly, there is evidence that self-esteem changes precede self-concept clarity in adolescent samples, suggesting that in order to successfully develop a strong sense of identity, adolescents may first develop self-esteem (Weber et al.,

2023). This developmental pattern suggests that self-esteem may play a causal role in identity development. However, self-esteem declines after age 60, whereas identity strength shows stability across later adulthood (Orth et al., 2010; Troll & Skaff, 1997). Thus, these concepts can be distinguished theoretically and empirically, as they were in the present research.

Identity development is a lifelong process. A rudimentary sense of self develops around 2 years of age (Kristen-Antonow et al., 2015), and a permanent ability to recollect specific autobiographical memories emerges around age 4, varying somewhat by culture and gender (Mullen, 1994). The tendency to describe the self consistently using trait terms develops by age 10 (Measelle et al., 2005). At adolescence, searching for and achieving a sense of identity is undertaken (Erikson, 1968). Identity is in greatest flux between the ages of 18 and 25, with the greatest likelihood of identity exploration without commitment occurring during those ages (Kroger, 2002; Waterman, 1982). It has been argued that the links between aspects of the self and identity do not strengthen until after age 25 (Jiang et al., 2020).

However, not everyone achieves a strong sense of identity, and there may be lengthy periods of exploration (Meeus, 2011; Topolewska & Ciecuch, 2017). Moreover, mature adults' identity is not ossified; adults move throughout identity development statuses over time (Fadjukoff et al., 2016). Unfortunately, identity in adults is rarely studied as a dynamic process (Topolewska & Ciecuch, 2017), making it difficult to ascertain whether the contribution of autobiographical memories to strength of identity may vary across development. The present research tests whether momentary access of autobiographical memories affects strength of identity; that is, whether the proposed linkages between autobiographical memory and identity that would be required for an identity function to be served are indeed present.

Hints that autobiographical memory strengthens identity

Several lines of reasoning suggest that recollecting specific autobiographical memories would indeed have a particularly powerful effect on strength of identity. First, autobiographical memory may serve as a resource for identity. After a threat to self-clarity, recollecting important autobiographical memories restores a sense of self-continuity, one of the components of identity (Jiang et al., 2020). Elderly adults (approximately 80 years of age) who retain the ability to recollect detailed and specific autobiographical memories from various time periods in their lives also retain a strong sense of personal identity, due to enhanced access to knowledge about the self (Haslam et al., 2011).

A second line of reasoning linking autobiographical memory to enhanced strength of identity is that two vital identity-related tasks occur at the same developmental point in time. Specifically, in late adolescence, identity

commitment solidifies (Erikson, 1968), and a life story is constructed out of autobiographical memories (Habermas & Bluck, 2000). Both tasks might reflect the same underlying process of identity formation, one in a more proposition-based form ("I am a liberal") and the other in a more narrative form ("My life is broken down into these chapters, in which these events took place, resulting in who I am today"). Working to figure out who one is and working to figure out one's life story might involve many of the same types of reflection on life events, so that one interweaves with the other. Consistent with this view, both the coherence of the life narrative and the level of identity commitment predict well-being in late adolescents (van Doeselaar et al., 2020).

Hints that autobiographical memory does not strengthen identity

On the other hand, recollecting autobiographical memories might be expected not to affect or even to weaken identity. First, autobiographical memories do not necessarily express individuality, one of the components of identity. Life events considered important are those contained in a cultural life script (Berntsen & Bohn, 2009); for example, schooling, marriage, childbirth, employment. This life script is generic rather than idiosyncratic. Therefore, recollecting important autobiographical memories may not give a sense of distinctiveness from others so much as conformity to the norm for one's culture. In a cultural setting like the United States, in which individuality is seen as important to identity, this reminder of being like everyone else may weaken identity.

Second, there is a neural dissociation between autobiographical memories and the sense of self (Klein & Gangi, 2010). People can maintain a strong sense of identity despite having lost access to autobiographical memories that confirm that identity (Medved & Brockmeier, 2008). Relatedly, general information about the self (semantic or general autobiographical memory) is related to the content of the self to a greater extent than specific (episodic) autobiographical memory (Brunot & Sanitioso, 2004; Grilli, 2017). Third, despite both being predictors of well-being and co-occurring in development, the coherence of an autobiographical memory narrative and the level of identity commitment are unrelated to one another (van Doeselaar et al., 2020).

Identity strength, age, and self-event connections

We have suggested that age might moderate whether autobiographical memories enhance identity strength. One possible reason why autobiographical memories might affect older more than younger adults is the presence or absence of self-event connections. These are explicit causal connections between autobiographical memories and broader, more enduring aspects of the

self (Holm & Thomsen, 2018; Pasupathi et al., 2007). For example, a person may tell a story about a specific experience of flubbing their lines during a school play, then spontaneously mention that this is when they first learned that they were not destined for a career on Broadway. As in this example, a common type of self-event connection is when a particular experience illustrates or exemplifies something about the self. Not all autobiographical memories are connected to the self in this explicit way, at least not during a particular narration episode. Important memories are more likely to be stored with self-event connections, as are the memories of older rather than younger adults (Pasupathi, 2001; Pasupathi et al., 2007). Thus, recollection of an autobiographical memory may result in a stronger sense of identity only if that memory comes with a self-event connection. Self-event connections were measured in each study and manipulated in Studies 3 and 4. Because there is a linear relationship between age and the tendency to make connections between the self and autobiographical memory, from age 14 through 79 (Krettenauer & Mosleh, 2013), we predicted that autobiographical memory would strengthen identity more for mature than for emerging adults.

Overview of research

The aim of the present research was to test whether recollecting specific important autobiographical memories increases the momentary strength of identity among emerging and mature adults; i.e., whether memories nourish identity. As mentioned earlier, some research suggests that autobiographical memory is more strongly tied to identity for older adults, for whom self-event connections are already stored with most autobiographical memories (McLean, 2008). Other research suggests the opposite, in that younger adults report greater use than older adults of autobiographical memories for identity purposes, due to the lower clarity of the self-concept among younger adults (Bluck & Alea, 2008). Still other research has found no age cohort differences in self-reported use of autobiographical memories for identity purposes (Vranić et al., 2018). Not only has prior research on age differences found inconsistent patterns, but also it has failed to measure participants' identity strength after recollection of autobiographical memories.

Five studies were conducted, a pilot study and four pre-planned studies. Participants in all studies gave informed consent for their participation and the publication of their data in academic outlets. For three studies (1, 2, and 4), materials, hypotheses, and analytic plans were recorded and uploaded to OSF before data collection. All materials and data from each study are available publicly on OSF.

When we designed the first two studies (the pilot study and Study 1), the impact of autobiographical memory recollection versus general self-knowledge on identity

strength had not been directly tested. These studies used a convenience sample of college students who were emerging adults (under 25 years of age). Based on our prior research demonstrating no difference between recollecting specific autobiographical memories and general self-knowledge (Beike et al., 2016), we originally hypothesised that recollecting autobiographical memories would strengthen identity more than a neutral control, but not more than thinking of general self-knowledge. To our surprise, this hypothesis was not supported. The remaining three studies were designed to explore potential reasons for this unexpected pattern. Specifically, Study 2 explored whether the effect of autobiographical memories on identity strength might be greater for mature adults, and Studies 3 and 4 manipulated the potential mediating process of self-event connection in emerging and mature adults. Our hypotheses for Studies 2, 3, and 4 were therefore based on the findings of the prior studies and will be provided prior to the presentation of each study.

Pilot study: emerging adults

We conducted an exploratory pilot study in early 2019 with 485 emerging adults. We attempted to manipulate the need for identity by having participants read a paragraph stating that a strong sense of identity was linked with higher grades (versus two control conditions). After this first independent variable was manipulated, participants rated their need for a strong sense of identity and their desire to recollect autobiographical memories. Next, participants were assigned to recollect important autobiographical memories, to write about general self-knowledge (in particular, their most cherished values; Steele, 1988), or to read an article about the geology of Earth's moon as a control condition. Ratings of need for identity and desire to recollect autobiographical memories were made once again. Finally, outcome measures Sense of Identity (Lounsbury et al., 2005) and Self-Clarity (Campbell et al., 1996) were given. (See Supplemental Materials for details.)

We predicted that participants who read about identity being linked to higher grades would express a stronger need for identity and a greater desire to recollect autobiographical memories than those in the other two conditions. Furthermore, this induction of need for identity, followed by *either* listing autobiographical memories *or* cherished values, would lead to increased Sense of Identity and Self-Clarity scores relative to the control condition.

However, none of the predictions were supported. Instead, we found a simple main effect, such that writing about general self-knowledge (one's values) led to enhanced Sense of Identity scores ($M = 5.63$ on a 1–7 scale) relative to the non-self-relevant moon control condition ($M = 5.30$), whereas listing important autobiographical memories did not ($M = 5.37$). A similar (but non-significant) pattern occurred for Self-Clarity (general self-knowledge $M = 3.16$, autobiographical memory condition $M = 3.13$, non-self-relevant control condition

$M = 3.05$); the two identity strength measures were strongly correlated ($r = .52$, $p < .001$). In short, thinking about general self-knowledge about values but not autobiographical memories enhanced strength of identity in emerging adults. This pattern was inconsistent with the notion of autobiographical memory being deeply interwoven with identity as the theorised identity function would require.

After conducting this pilot study, we encountered a preprint of Jiang et al.'s (2020) article on the *restorative* function of autobiographical memory. They measured the impact of recollecting autobiographical memories on strength of identity operationalised as Self-Continuity (rather than Sense of Identity or Self-Clarity as we had). Unlike our pilot study, their studies demonstrated several necessary aspects of the identity (restorative) function of specific autobiographical memories. First, reducing self-clarity activated a desire to recollect autobiographical memories. Second, self-continuity was low after the low self-clarity manipulation followed by recollecting news events. But self-continuity was restored to the same level as participants in the high self-clarity condition if low self-clarity was followed by recollecting autobiographical memories. This pattern demonstrates what Jiang et al. termed a *restorative* effect of autobiographical remembering on identity strength, at least as measured with the Self-Continuity scale.

To address the inconsistency between our pilot study and Jiang et al.'s findings, we chose to adopt Jiang et al.'s methodology. In our Study 1, we made four alterations to their Study 5. First, we used a convenience sample of undergraduate students (emerging adults). Second, Jiang et al. had compared the recollection of autobiographical memories to a non-self-related control condition, but not to a condition in which general self-knowledge was recollecting. Therefore in Study 1 as in the pilot study we included a general self-knowledge condition as a comparison with a control and an autobiographical memory condition. Third, we included a variety of measures of identity strength. Fourth, we modified Jiang et al.'s control condition of writing about five news events (compared to five autobiographical memories). News stories are almost always unpleasant in content (Rozado et al., 2022) and watching or reading news evokes a negative mood (Achor & Gielan, 2015), which might have depressed participants' ratings of self-continuity. Therefore, we created a control condition that involved memory for emotionally neutral non-self-related information; specifically, recalling facts about animals.

Study 1: emerging adults

Study 1 was a replication and extension of Jiang et al.'s (2020) Study 5, which was a 2 (high vs. low self-clarity manipulation) X 2 (autobiographical memory vs. news events) between-participants design. Ours was a 2 (high vs. low self-clarity manipulation) X 3 (general self-knowledge vs. autobiographical memory vs. control)

between-participants design. Identity strength was measured with three different scales, each assessing some portion of identity strength as we define it (Self-Clarity, Sense of Identity, and Self-Continuity). In addition, properties of autobiographical memories that are known to mediate their role in identity were measured. In this article, we focus primarily on three aspects of autobiographical memory: Pleasantness, importance, and essentialness to the self (other measured properties are reported in the Supplemental Materials). The pleasantness of memory has been associated with long-term recollection; the more pleasant a memory, the more likely it is to be remembered for extended periods of time, particularly by older adults who are more likely to display a positive effect (Ikier & Duman, 2022; Walker et al., 1997). Furthermore, the perceived importance and how essential a memory is to oneself could be extremely important in understanding identity, particularly from a self-narrative perspective (Pasupathi & Hoyt, 2009). Memories seen as high in importance and high in essentialness to the self are more likely to be given meaning, woven into the self-narrative, and have been closely associated with identity in previous literature (McAdams et al., 2006; McLean & Pratt, 2006; Pasupathi & Hoyt, 2009; Yamamoto, 2015). Therefore, to more fully explore how autobiographical memory might fulfil an identity function, we measured the pleasantness, importance, and essentialness to the self of autobiographical memories, general self-knowledge, or facts about animals. To ascertain that participants were not listing everyday autobiographical memories, such as what they ate for breakfast that morning, we instructed them to recollect important memories only.

We expected that autobiographical memories and general self-knowledge would be rated higher on all three dimensions than facts about animals, and expected that any differences between autobiographical memories and self-knowledge would parallel effects on identity strength measures. Furthermore, we measured self-esteem to test whether it was indeed distinct from identity strength.

Our pre-experiment recorded predictions were as follows. Prediction 1: Consistent with the results of Jiang et al. (2020), the self-concept clarity manipulation would be effective as measured with the three self-concept clarity scale items. Prediction 2: Consistent with Jiang et al. (2020), threatened self-concept clarity would lead to reduced self-continuity, but only in the control condition and not the autobiographical memory condition. Prediction 3: Threatened self-concept clarity would not lead to reduced self-continuity in the general self-knowledge (listing self-descriptors) condition. That is, both specific autobiographical memory and general self-knowledge would re-establish self-continuity, with no benefit of autobiographical memory over general self-knowledge. Prediction 4: Listing general self-knowledge would strengthen sense of identity, self-continuity, and sense of self, relative to the control condition and the

autobiographical memory condition. Prediction 5: There would be stronger effects of recollecting either type of self-knowledge on sense of identity, self-continuity, and sense of self following the low self-clarity manipulation.

Method

Transparency and openness

Materials, measures, predictions, and a data-analytic plan for Study 1 were uploaded to OSF (https://osf.io/paqjh/?view_only=3c2fe4f2ba044cf0af542b7b72508254) prior to data collection.¹ The data file with computed scores is also available at OSF. In this and all studies, participants' listed responses to general self-knowledge, autobiographical memories, and animal facts are not posted to protect confidentiality. Many participants provided details in these responses that could identify them, including their full names. Data were analysed with SPSS version 27; syntax is also available on OSF.

Participants

In this study, as well as the pilot study and Studies 2 through 4, ethical approval was obtained from the Institutional Review Boards of the authors' institutions. Participants in all studies gave their informed consent for use and publication of their responses. Sample size was predetermined at 100 participants per cell for a total of 600 participants, as a result of an *a priori* power analysis based on our pilot study. The power analysis was based on power of .80 and alpha of .05, with the critical means (and standard deviations) in the pilot study being 5.37 (1.10) and 5.63 (0.99). The resulting sample size required for 6 conditions is 420, or 70 per condition. We increased our sample size to 100 per condition to exceed this minimum number. Participants were recruited from the University of Arkansas General Psychology pool in exchange for partial fulfilment of a course requirement. Six hundred forty-eight University of Arkansas students started the survey. Forty-five exited the survey before completing it. Of the remaining 603 participants, 66.9% identified as female (32.7% identified as male and .3% identified as other), 83.4% identified as White (7.2% Latinx, 5.9% Black, 4.7% Asian, 2.1% Native American, 1.5% Other), and the mean age was 19.17 (range 18-47; eight participants (1.3%) were over 25).

Procedure

Participants were randomly assigned to a low or high self-concept clarity task (a replication of Jiang et al., 2020). Participants read:

Sometimes people feel that different aspects of their personality conflict (are coherent) with each other, which would make them confused about (clarify for them) who they are. Please describe two aspects of your personality or two self-beliefs that conflict (are coherent) with each other. You have to

describe what they are, how you feel the two conflicts (are coherent) with each other, and the confusion that the conflict (the clarity that the coherence) brings to you.

After completing the self-concept task, participants were randomly assigned to list 20 autobiographical memories (Jiang et al., 2020) for the autobiographical memory condition, to list 20 self-descriptors by answering the question "Who am I?" (Kuhn & McPartland, 1954) for the general self-knowledge condition, or to complete an animal memory test in which participants estimated the length and diet of 20 animals for the control condition. All participants were required to list at least five items in their assigned condition and spend a minimum of three minutes and a maximum of five minutes working on the task.

Materials

Immediately after completing the self-concept manipulation, all participants completed a brief manipulation check, taken from Jiang et al. (2020). This included three items rated from 1 (*strongly disagree*) to 7 (*strongly agree*), including: "My beliefs about myself conflict with one another", "I did not experience conflict between the different aspects of my personality", and "I feel that I am not the person that I appear to be" (the first and third question were reversed scored so that higher scores indicate greater self-concept clarity). Responses were averaged together to form a self-concept clarity manipulation check score ($\alpha = .58$). Note that this measure was placed immediately after the self-clarity manipulation, to replicate the procedure used by Jiang et al. (2020). We did not think it would be informative to repeat the measure at the end of the survey as an outcome measure, so this study does not include self-clarity as an identity outcome variable.

After completing the listing activity, participants completed (in random order) the 8-item APSI Sense of Identity subscale ("I have a firm sense of who I am"; 1 = *strongly disagree*, 7 = *strongly agree*; Lounsbury et al., 2003; $\alpha = .88$), the 12-item Sense of Self scale ("I often think how fragile my existence is" (reverse scored); 1 = *very uncharacteristic of me*, 4 = *very characteristic of me*; Flury & Ickes, 2007; $\alpha = .83$), the 8-item Self-Continuity Index ("There is continuity in my life"; 1 = *strongly disagree*, 7 = *strongly agree*; Sedikides et al., 2015; $\alpha = .85$), and the 1 item Self-esteem scale ("I have a high self-esteem"; 1 = *strongly disagree*, 7 = *strongly agree*; Robins et al., 2001).

Next, participants completed 16 task-related items. These included 10 items that asked participants about the manipulation task that they completed generally (e.g., "The information I wrote about during the task was positive in content") and six items about the content of the specific answers that participants provided (e.g., "General facts about the self"). We included these items to explore possible mediators of the relationship between our manipulation and the identity measures.

Table 1. Ratings of information qualities, identity strength, and self-esteem measures in Studies 1 (emerging adults) and 2 (mature adults).

Measure	Age Group (Study)	Autobiographical Memories	General Self-Knowledge	Animal Facts
Pleasant	Emerging adults (1)	4.70_a (1.51)	5.43 _b (1.41)	4.77_a (1.15)
	Mature adults (2)	5.42 (1.28)	5.41 (1.40)	5.26 (1.00)
Important	Emerging adults (1)	5.15_a (1.59)	4.99_a (1.50)	2.77 _b (1.39)
	Mature adults (2)	5.92_a (1.26)	5.32_b (1.38)	2.87 _c (1.48)
Essential to self	Emerging adults (1)	4.42_a (1.71)	5.51 _b (1.41)	2.63_c (1.51)
	Mature adults (2)	5.35_a (1.40)	5.66 _b (1.12)	2.13_c (1.38)
Sense of Self	Emerging adults (1)	2.80 (0.61)	2.87 (0.58)	2.86 (0.56)
	Mature adults (2)	3.08 (0.63)	3.01 (0.66)	2.91 (0.72)
Self-Esteem	Emerging adults (1)	4.61 _a (1.69)	5.00_b (1.54)	4.90_{ab} (1.57)
	Mature adults (2)	4.27 _a (1.83)	4.42_a (1.79)	3.82_b (1.80)

Notes: Values range from 1 (*strongly disagree*) to 7 (*strongly agree*). Sense of Self ranges from 1 (*very uncharacteristic of me*) to 4 (*very characteristic of me*). Values in parentheses are standard deviations. Subscripts indicate significant pairwise differences among the three task conditions. Within each age group, means not sharing subscripts differ at $p < .05$ by Tukey post-hoc tests for that variable. Bold values indicate significant differences between emerging and mature adults for that variable and condition, $p < .05$.

As explained earlier, we focused on three of these task-related constructs: pleasantness, importance, and essentialness of the information to the self.² Lastly, participants provided demographic information.

Results

Pre-experiment analytic plan on OSF

A series of 3 (autobiographical memory, general self-knowledge, control) X 2 (low self-concept clarity, high self-concept clarity) ANOVAs were planned on each of the DVs of interest (self-continuity, sense of identity, and sense of self). Additionally, 3 X 2 ANOVAs were planned on the task-relevant items (pleasantness, importance, and essentialness to the self of the task information) and self-esteem. Mediation analyses were planned for any of these subsidiary measures that paralleled the pattern for any of the identity measures; these are reported in the Supplemental Materials as they did not clarify the findings. Degrees of freedom vary slightly in analyses due to missing scores for a small number of participants.

Self-clarity manipulation check

The manipulation of self-clarity was successful. Participants expressed greater self-clarity after writing about self-consistent ($M = 4.61$, $SD = 1.17$) than self-discordant ($M = 3.75$, $SD = 1.17$) self-descriptors ($t(601) = 9.01$, Cohen's $d = 0.73$).

Differences among tasks

The manipulation of recall task was successful in bringing to mind the type of information we had intended. Table 1 displays the descriptive statistics regarding task differences. As intended, the information listed in the control task of listing facts about animals were rated as less important ($F(2, 591) = 155.86$, $p < .001$, $\eta_p^2 = .35$), and less essential to the sense of self ($F(2, 591) = 180.11$, $p < .001$, $\eta_p^2 = .38$), compared to the information listed in the autobiographical memory and the

general self-knowledge tasks. Tukey pairwise tests revealed that the information listed in the general self-knowledge task was rated as more essential to the sense of self than that listed in the autobiographical memory test. In addition, the information listed in both the control task and the autobiographical memory task were rated as less pleasant than the information listed in the general self-knowledge task ($F(2, 591) = 17.63$, $p < .001$, $\eta_p^2 = .056$).

Effects of task type on identity strength outcome variables

See Figure 1. Contrary to the notion that autobiographical memory nourishes identity, participants who listed important autobiographical memories did not experience a boost in Sense of Identity, Self-Continuity, or Sense of Self relative to the control condition after undergoing the low self-clarity manipulation. There were no effects of the self-clarity manipulation or the task, or their interaction on these three variables ($ps > .10$). It is important to note that the lack of effects on Self-Continuity represents a failure to replicate Jiang et al.'s (2020) Study 5, which used the same manipulation of self-clarity and the same autobiographical memory listing task. However, the task manipulation did affect Self-Esteem ($F(2, 587) = 2.11$, $p = .045$, $\eta_p^2 = .010$), such that participants who completed the self-descriptor task expressed higher Self-Esteem ($M = 5.00$, $SD = 1.54$) than those who completed the autobiographical memory task ($M = 4.61$, $SD = 1.69$), with participants who listed facts about animals falling in between ($M = 4.90$, $SD = 1.57$).

Discussion

Study 1 successfully manipulated self-clarity as in Jiang et al. (2020), but contrary to their findings, there was no effect of reducing self-clarity on any measure of identity, and therefore no restorative effect of recollecting autobiographical memories. Moreover, although there were large differences in the importance and essentialness of autobiographical memories and general self-knowledge

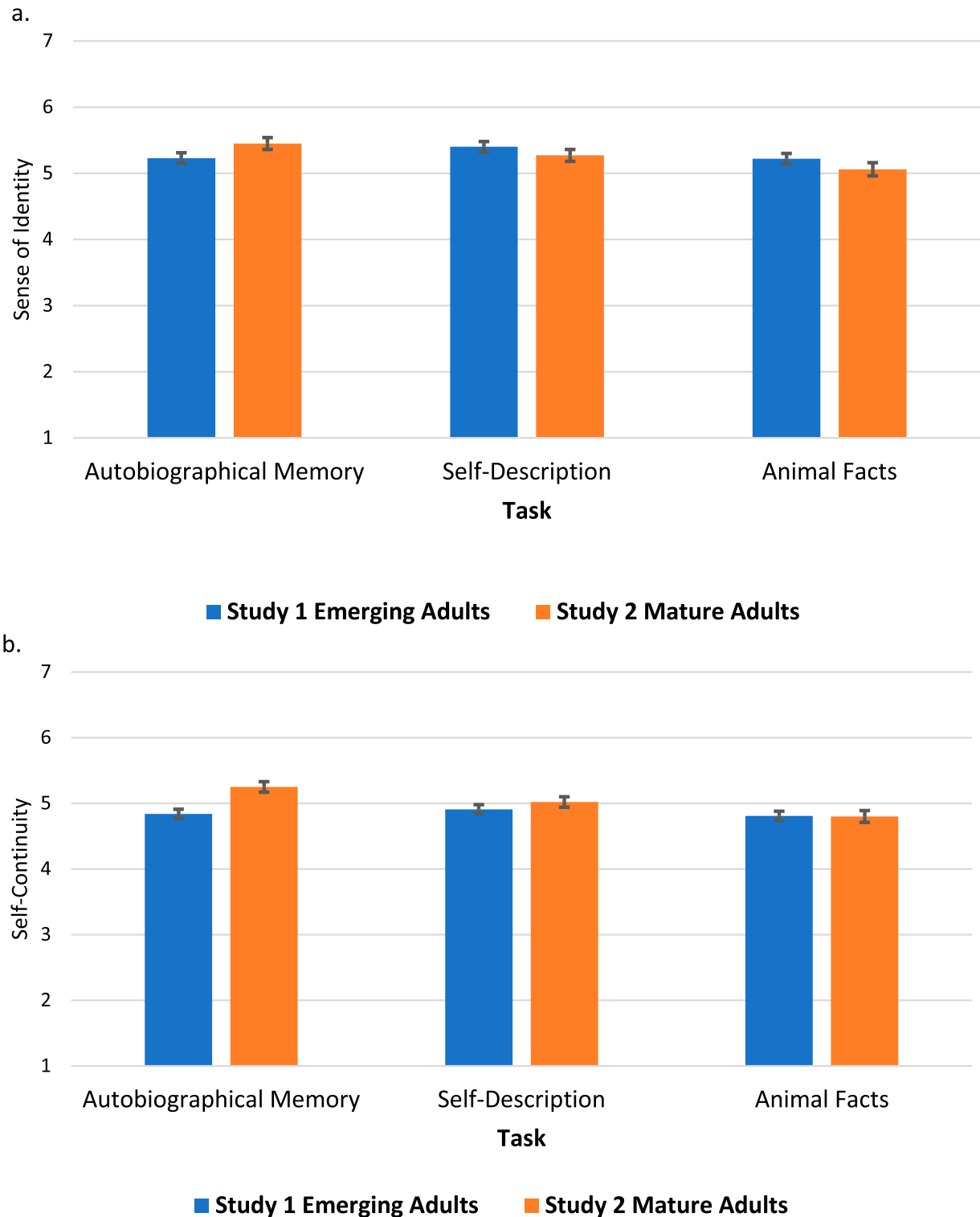


Figure 1. Study 1 and Study 2 Sense of Identity (panel a.) and Self-Continuity (panel b.). Note: Error bars represent ± 1 standard error of the mean.

relative to the importance and essentialness of facts about animals, there was no significant effect of recollecting these different types of information on any measure of identity strength. Instead, recollecting autobiographical memories reduced self-esteem relative to listing general descriptors of the self, demonstrating that identity

strength is distinct from self-esteem. Importantly, these emerging adults rated autobiographical memories as less important and less essential to their sense of self than the self-descriptors they listed.

It is important to note that we failed to replicate Jiang et al. (2020) despite (a) a successful manipulation of

self-clarity, and (b) using their instructions and measures. However, we had chosen a convenience sample of undergraduate students in General Psychology courses for the pilot study and Study 1. Jiang et al. (2020) intentionally recruited samples of mature adults 25 years of age or older, because they expected no relationship between self-clarity and self-continuity for younger adults. The results of the pilot study and Study 1 therefore suggest that autobiographical memory does not nourish identity in emerging adults. This null effect is informative because (a) we tested autobiographical memory recollection against a control condition twice, using two different control conditions, and (b) autobiographical memories were seen as significantly more essential to the self than the information in the control condition. If mature adults show the anticipated identity-strengthening effect of autobiographical memory recollection, then the results would support a developmental change in the actual effectiveness of autobiographical recollection to serve an identity function.

Study 2: mature adults

To test whether participant age determined the identity strengthening effects of autobiographical memory, we conducted Study 2 with mature adults. As our two prior attempts to manipulate need for identity and identity threat did not interact with recollection, we did not include the self-concept clarity manipulation. The findings of the pilot study and Study 1 led us to the prediction that, despite the mature adult sample, again we would find that listing self-aspects (but not autobiographical memories) would strengthen identity, relative to the control condition. The study employed a between-participants design with three conditions (specific autobiographical memories, self-descriptors, and animal facts control).

Method

Transparency and openness

Materials, measures, predictions, and a data-analytic plan for Study 2 were uploaded to OSF (https://osf.io/paqjh/?view_only=3c2fe4f2ba044cf0af542b7b72508254) prior to data collection.

Participants

To maintain consistency with Study 1, sample size was predetermined at 150 participants per cell for a total of 450 participants. Four hundred fifty-five participants were recruited from the TurkPrime (Litman et al., 2017; $n = 168$) or Prolific (prolific.co; $n = 287$) participant pool and were compensated at a predetermined estimated \$10 hourly rate (\$3.35; actual median completion time was 13.2 min). Exclusion criteria were any one or more

of the following: Writing gibberish or garbage for the autobiographical memories, self-knowledge, or animals written responses ($n = 1$); Choosing “disagree” or “strongly disagree” for the item about this being the first time they have taken this survey ($n = 3$); Having two or more indicators of being inattentive for the remaining four items (i.e., “disagree” or “strongly disagree” for “my responses were honest” or “I paid extremely close attention” or “agree” or “strongly agree” for “you shouldn’t use my response” or “I flew through this survey”; $n = 2$); or duration of the survey being more than three standard deviations from the mean (i.e., too fast or too slow; $n = 11$). Some participants met more than one exclusion criterion, resulting in 16 participants removed from all future analyses. Of the 439 remaining participants, 57.2% identified as female (42.3% identified as male and 0.5% identified as other), 85.9% identified as White (2.5% Latinx, 4.6% Black, 7.1% Asian, 0.5% Native American, 1.8% Other), and the mean age was 38.30 (range 23-73; five participants (1.1%) were under 25).

Materials and procedure

As in Study 1, participants were randomly assigned to list 20 autobiographical memories (Jiang et al., 2020) for the autobiographical memory condition, to list 20 self-descriptors by answering the question “Who am I?” (Kuhn & McPartland, 1954) for the general self-knowledge condition, or to complete an animal memory test in which participants estimated the length and diet of 20 animals for the control condition. After completing the assigned task, participants completed the same identity strength dependent measures and task-relevant items used in Study 1, with the addition of the full Self-Concept Clarity Scale (Campbell et al., 1996), which included items such as “My beliefs about myself often conflict with one another” (reverse scored). For Sense of Identity, $\alpha = .90$; for Sense of Self, $\alpha = .90$; for Self-Continuity, $\alpha = .90$; for Self-Concept Clarity, $\alpha = .94$. Next, participants completed the TIPI and items about attentiveness. Lastly, participants gave demographic information.

Results

Pre-experiment planned analyses

A series of one-way ANOVAs (autobiographical memory, general self-knowledge, control) were planned on each of the DVs of interest (Self-Continuity, Sense of Identity, Sense of Self, and Self-Clarity). Additionally, separate ANOVAs were planned on the task-relevant items (pleasantness, importance, and essentialness to sense of self) and self-esteem.

Differences among tasks

Table 1 displays the descriptive statistics regarding task differences. As intended, the information listed in the control task of listing facts about animals was rated as less important ($F(2, 433) = 198.35, p < .001, \eta_p^2 = .48$), and less essential to the sense of self ($F(2, 433) = 321.35, p < .001, \eta_p^2 = .60$), compared to the information listed in the autobiographical memory and the general self-knowledge tasks. However, unlike the emerging adults in Study 1, Tukey pairwise tests revealed that mature adults in this study rated the information listed in the general self-knowledge task as less important and less essential to the sense of self than that listed in the autobiographical memory test. Also, unlike the emerging adults in Study 1, the mature adults in this study did not find the information listed in the three tasks differentially pleasant in content ($p > .44$).

Effects of task type on identity strength outcome variables

See Figure 1. Consistent with the notion that autobiographical memory is linked to identity, participants who listed important autobiographical memories experienced a boost in Sense of Identity, with a significant pairwise difference from the control condition only ($F(2, 433) = 3.11, p = .046, \eta_p^2 = .014$). The same pattern obtained for Self-Continuity ($F(2, 433) = 5.76, p = .003, \eta_p^2 = .026$). Both patterns contrast with the effects obtained in the pilot study and Study 1, in which thinking about general aspects of the self-provided boosts to identity. No significant effects were obtained on Sense of Self ($p = .11$) or Self-Clarity ($p = .12$). It is important to note that the effect on self-continuity replicates Jiang et al.'s (2020) Study 5 low self-clarity condition, despite the fact that no self-clarity manipulation was used in the present study.

As in Study 1, the task manipulation affected Self-Esteem ($F(2, 433) = 3.46, p = .032, \eta_p^2 = .016$). The pattern differed slightly, as participants who completed the self-description task expressed higher self-esteem ($M = 4.36, SD = 1.78$) than those who listed facts about animals ($M = 3.84, SD = 1.77$), with participants who listed autobiographical memories falling in between ($M = 4.27, SD = 1.81$).

Discussion

In contrast to pre-experiment predictions on OSF, and to the pattern found with emerging adults in the pilot study and Study 1, mature adults who recollected important autobiographical memories experienced a boost in sense of identity and self-continuity relative to a control condition. A similar boost in self-continuity relative to a control condition occurred in the low (but not high) self-clarity condition of Jiang et al. (2020). We conclude that their low self-clarity condition was actually a baseline

control condition, with the high self-clarity condition putting participants into a different state than normal. In other words, Study 2 demonstrated that autobiographical memories can benefit identity, even when there has been no explicit challenge to the stability of the self or need for identity induced. As in Study 1, the pattern for self-esteem was different from that on the identity strength measures, with self-esteem highest after recollecting general self-knowledge.

To further illustrate the differences between emerging and mature adults, we conducted exploratory analyses using study as an additional independent variable. A significant interaction of study (age group) and task type occurred for all variables presented ($F_s > 3.0$). Table 1 and Figure 1 show the results of both age groups side by side, with bold values in the table and error bars in the figure highlighting where age group differences occurred. Note that autobiographical memories were rated as more pleasant, more important, and more essential to the self by mature adults than emerging adults.

Why does autobiographical memory enhance the strength of identity of mature, but not emerging, adults? One possibility is that many emerging adults do not yet have a coherent life story (Habermas & Bluck, 2000), making it difficult for emerging adults to use that life story as a guide to access their most important memories. Indeed, emerging adults rated their memories as less important than mature adults did. In other words, emerging adults may have struggled to recruit identity-enhancing memories. For example, an emerging adult who describes herself as outgoing might not use that self-knowledge to find important autobiographical memories. Instead, she might think about typical large events in life in her culture, such as high school graduation. A mature adult, on the other hand, might use her self-knowledge to access memories of being friendly or having enjoyable conversations with a just-met other (Conway & Pleydell-Pearce, 2000; Sanitioso et al., 1990). This explanation focuses on the content of the most important autobiographical memories *matching or failing to match* the content of the most important self-descriptions.

A second possible explanation of the developmental difference is a paucity of autobiographical reasoning, also referred to as self-event connections (Pasupathi et al., 2007), in emerging adults. Mature adults are more likely to report spontaneously why and how their important memories are linked to the self than are younger adults (Pasupathi et al., 2007). Therefore, emerging adults may have managed to access memories for events that matched their sense of self, without making explicit how and why the two are connected. This explanation focuses on a reasoning *process* that occurs or fails to occur after finding relevant memories.

A third possible explanation is the *events* to which the memories refer. Certain life experiences are considered

more significant than others in a given culture. These are called cultural life script events (Berntsen & Bohn, 2009). Typical cultural life script events in the U.S. include high school graduation, marriage, birth of a child, and death of a parent. The older one is, the greater the number of cultural life script events will have happened to an individual. Therefore, mature adults may be more successful at bringing to mind culturally important autobiographical memories than are emerging adults. The remaining studies tested these three explanations. Study 3 was an attempt to scaffold emerging adults into finding autobiographical memories that supported and enhanced their sense of self, Study 4 an attempt to scaffold them into autobiographical reasoning, and in Study 4 the content of important autobiographical memories of emerging versus mature adults was compared.³

Study 3: emerging adults

We next attempted to steer emerging adults to recall identity-enhancing autobiographical memories by using their general self-knowledge as a guide by completing the self-aspect task before the autobiographical memory task. Participants in self-aspect listing task first were predicted to recollect memories they judged to be more important and essential to the self than those who completed the autobiographical memory task first. Moreover, participants who completed the self-descriptor task first were expected to use this general self-knowledge as a cue to search for autobiographical memories. The result should be participants recalling more self-consistent memories after having first thought about the self.

Because all participants completed both the autobiographical memory task and the self-aspect listing task, the correspondence in content between the autobiographical memories recalled and the self-aspects listed could be calculated for each individual. Specifically, coders rated the personality “profile” conveyed by the list of autobiographical memories, and by the list of self-aspects. People can accurately assess others’ personalities by reading their social media posts or viewing photos of their dorm rooms or offices (Back et al., 2010; Gosling et al., 2002). Therefore, coders should be able to assess the type of person being conveyed by the information participants choose to list in each task. The similarity of content of the autobiographical memories and the self-aspects was calculated by comparing coder ratings of the Big Five personality characteristics apparent to them in each. The correlation between these ratings was predicted to be higher when the self-descriptor task was completed before the autobiographical memory task. Moreover, due to the greater importance and self-consistency of autobiographical memories recruited after general self-knowledge, participants in this condition were predicted to experience a boost in strength of identity relative to the other condition.

Method

Transparency and openness

All materials for Study 3 were uploaded to OSF (https://osf.io/paqjh/?view_only=3c2fe4f2ba044cf0af542b7b72508254) after data collection. That is, we did not commit to analyses or hypotheses until after the study was completed.

Participants

Sample size was predetermined at 150 participants per condition, consistent with Study 2. Two hundred ninety-eight University of Arkansas students began the survey, in exchange for partial fulfillment of a course requirement. Six participants did not complete the survey, and three indicated that this was their second time completing the survey. Of the 292 remaining participants, 59.2% identified as female (40.5% identified as male and 0.3% identified as other), 83.0% identified as White (9.0% Latinx, 8.7% Black, 3.5% Asian, 3.5% Native American, 0.3% Pacific Islander, 1.0% Other), and the mean age was 19.73 (range 18-42; seven participants (2.4%) were over 25).

Materials and procedure

All participants listed up to 20 autobiographical memories (Jiang et al., 2020) and up to 20 self-descriptors by answering the question “Who am I?” (Kuhn & McPartland, 1954) using the same methods as in Study 2. The order of these tasks was manipulated. Half the participants first listed autobiographical memories, then listed self-descriptors, while the other half first listed self-descriptors and then listed autobiographical memories.

After completing both tasks, participants were asked to indicate how difficult each task was on a 7-point scale (e.g., “How difficult was it to come up with all of the “Who Am I?” responses that you listed?”; 1 = *extremely easy*, 7 = *extremely difficult*). Next, participants were asked to indicate the extent to which they used eight possible strategies on a 4-point scale (1 = *not at all*, 4 = *for every single response*). The eight possible strategies included: “I thought about how I define myself in general”, “I thought about my life story”, “I thought about what in life is most important to me”, “I typed in whatever popped into my head first”, “I thought of recent experiences”, “I reflected on the current situation”, “I used each response to bring to mind the next one”, and “I asked someone to help me think of additional responses when I couldn’t think of anymore”.

Participants were then asked to reflect upon the reported autobiographical memories and indicate on a 5-point scale (1 = *none*, 5 = *all of them*) how many of the memories listed could be described by each of 11 phrases. These descriptive phrases included “enjoyable, pleasant experiences”, “important to my life story”, and “essential to my sense of self”, designed to map onto

Table 2. Ratings of memory qualities, identity strength, and self-esteem measures in Study 3 (emerging adults).

Measure	Self-knowledge, then autobiographical memories	Autobiographical memories, then self-knowledge
Pleasant	3.52 (1.01)	3.47 (1.05)
Important to life story	3.69 (1.08)	3.69 (1.13)
Essential to self	3.29 (1.10)	3.24 (1.17)
Sense of Identity	5.42 (1.00)	5.20 (1.19)
Self-Continuity	4.84 (0.88)	4.66 (0.95)
Sense of Self	2.88 (0.60)	2.81 (0.58)
Self Esteem	4.86 _a (1.47)	4.50 _b (1.65)

Notes: Values for the autobiographical memory ratings range from 1 (*none of the memories I listed*) to 5 (*all the memories I listed*). Values for Sense of Identity and Self-Continuity range from 1 (*strongly disagree*) to 7 (*strongly agree*). Values for Sense of Self range from 1 (*very uncharacteristic of me*) to 4 (*very characteristic of me*). Values in parentheses are standard deviations. Within a row, means not sharing subscripts differ at $p < .05$.

the three major task-relevant measures from Studies 1 and 2.

Participants were then asked to complete the same identity measures used in Study 1.⁴ For Sense of Identity, $\alpha = .88$; for Sense of Self, $\alpha = .82$; for Self-Continuity, $\alpha = .78$. Participants were then asked if they had completed this survey before to eliminate any duplicate responses. Finally, participants provided demographic information.

Results

Effects of task type on task measures

Contrary to predictions, participants did not find recollecting autobiographical memories easier, nor did they use a different strategy when they completed the self-description task first versus second ($ps > .20$ except for one at $.056$; see Supplemental Materials). Moreover, they did not rate the autobiographical memories they recalled in that condition as more pleasant, important or more essential to the self than those who completed the self-description task second (see Table 2).

Effects of task type on identity outcome variables

See Table 2. Partially consistent with predictions, participants who completed the self-description task first reported marginally higher sense of identity than those who completed the autobiographical memory task first ($t(287) = 1.71, p = .089$, Cohen's $d = .20$). There was no significant effect on Sense of Self or Self-Continuity. In addition, participants who completed the self-description task first reported significantly higher self-esteem than those who completed the autobiographical memory task first ($t(287) = 1.99, p = .024$, Cohen's $d = .19$).

Consistency of content of self-descriptions and autobiographical memories

With 292 participants completing both a list of self-descriptors and a list of autobiographical memories, the result was 584 lists, or "profiles". The profiles were separated and randomised. Six raters, blind to hypotheses and to which profiles belonged together, each coded one-third of the profiles in terms of the personality impression the profile conveyed. Two raters coded each profile for each of the Big Five personality dimensions. Interrater reliability for each dimension was significantly greater than zero (interrater correlations in parentheses; all $ps < .001$). They rated each profile on the extent to which it conveyed openness to experience ($r = .32$), conscientiousness ($r = .26$), extraversion ($r = .22$), agreeableness ($r = .20$), and neuroticism ($r = .26$). The ratings of the two raters were thus averaged together. Each participant's profiles were re-paired. The correlation between the ratings given to the autobiographical memory profile and the self-description profile on each of the Big Five dimensions was then calculated within conditions. These correlations were small in magnitude; none exceeded $r = .20$ and only three of the 10 differed from zero. The size of the correlation coefficients in the two conditions was compared with a z-test on Fisher z-transformed correlation coefficients. None differed significantly (two-tailed ps ranged from $.44$ to $.73$). In summary, there was little apparent consistency between the self-descriptions and the autobiographical memories of participants, and completing the general self-knowledge task first did nothing to increase this consistency.

Discussion

We designed Study 3 as an attempt to assist emerging adults in finding autobiographical memories that would boost their identity strength, by having them first reflect upon their self-concept. Contrary to predictions, the autobiographical memories emerging adults recalled after engaging in a self-description task were rated as no more important or essential to the self than those recalled without an initial task. In addition, even though coders agreed on the profiles conveyed by the content of the memories and self-descriptors, those profiles did not correspond highly in either condition. That is, emerging adults did not list autobiographical memories consistent with their description of the self. Nevertheless, partially consistent with predictions, Sense of Identity was marginally enhanced. Moreover, self-esteem was significantly higher when emerging adults started with a self-description task compared to completing that task after recollecting autobiographical memories.

If the manipulation failed to impact the self-consistency of the autobiographical memories recalled by emerging adults, how did it affect identity strength and self-esteem? Table 1 and Figure 1 show that the mean values of the importance, essentialness, and identity measures in

Study 1 (with only one recall task) and those in Study 3 (with two tasks varying in order only) are similar. Our interpretation is that participants anchored on the first task and were not much affected by the second task. That is, they completed the autobiographical memory and self-description tasks independently. Alternatively, the manipulation may have resulted in more positive or more essential self-aspects being listed when the self was described first, but we did not ask participants to rate these features of their self-aspects, only their autobiographical memories.

We were not, then, successful in scaffolding emerging adults into using the self-concept as a guide for retrieving identity-enhancing autobiographical memories. Perhaps priming emerging adults with the self-concept was not sufficient to enhance the accessibility of consistent autobiographical memories (Klein et al., 1989). Study 4 was designed to test whether a stronger and more explicit manipulation of self-event connections would enable emerging adults to gain a boost in identity after recollecting autobiographical memories.

Study 4: emerging vs. mature adults

Study 4 was designed to compare the effect of recollecting autobiographical memories on identity for emerging adults (participants below the age of 25) to mature adults (participants 25 and over), as well as testing whether guiding emerging adults to make self-event connections between their autobiographical memories and their sense of self would enhance identity strength in that age group only. In addition, we directly tested the notion that emerging adults were more likely to choose more culturally important events – cultural life script events – as their most important memories than mature adults. This study was a 2 (Age group: emerging or mature adult) X 3 (Recall task: specific autobiographical memories, specific autobiographical memories plus self-event connections, or control) between-subject design.

Our first pre-experiment hypothesis on OSF was that mature adults would not experience a difference in identity strength between the two experimental conditions but would experience greater identity strength for both experimental conditions compared to the control condition. Our second pre-experiment hypothesis on OSF was that emerging adults would experience a difference in identity strength between the two experimental conditions, whereby emerging adults in the autobiographical memory plus self-event connections condition would experience greater identity strength, relative to both the autobiographical memory-only and control conditions.

Method

Transparency and openness

Materials, measures, predictions, and a data-analytic plan for Study 4 were uploaded to OSF (<https://osf.io/paqjh/>

[view_only = 3c2fe4f2ba044cf0af542b7b72508254](https://osf.io/paqjh/)) prior to data collection.

Participants

Sample size was predetermined at 161 participants per cell for a total of 962 participants as a result of an *a priori* power analysis based on a prior experiment. The power analysis was based on power of .80 and alpha of .05, with the critical means (and standard deviations) in the prior experiment being 5.35 (.86) and 5.19 (0.87), with Cohen's $d = .18$.

Participants were recruited in two ways. Half were workers from Prolific compensated at a pre-determined estimated \$10 hourly rate (\$3.17; actual median completion time was 13.3 min), and half were students from a large university in exchange for partial fulfilment of a course requirement. Participants under 25 were categorised as emerging adults, and those 25 and over categorised as mature adults. Participants were assigned to age group independent of recruitment type. We anticipated that most of the emerging adult participants would be recruited from a General Psychology sample, but participants indicating that they were 25 or older were categorised with mature adults ($n = 9$). We further anticipated that most of the mature adult participants would be recruited from Prolific, but any participants indicating that they were under 25 were categorised as emerging adults ($n = 1$). Although we used Prolific's screening tool to recruit only participants 25 or older, we relied on participants' self-reported age in the survey to categorise mature and emerging adults. Per pre-registration, participants were excluded for writing nothing or gibberish for the task ($n = 6$) or having two or more indicators of being inattentive ($n = 12$). One participant was excluded for both reasons. Of the 962 remaining participants, 58.8% identified as female (40.3% identified as male and 0.9% identified as other), 82.5% identified as White (5.8% Latinx, 4.1% Black, 6.3% Asian, 1.5% Native American, 0.7% Pacific Islander, 1.6% Other). The mean age for the emerging adult sample was 19.15 (range 18-24) and for the mature adult sample was 41.45 (range 25-76). Degrees of freedom vary slightly across analyses due to missing responses.

Materials and procedure

Participants completed an online survey administered through Qualtrics. Participants were randomly assigned to complete one of three tasks: autobiographical memory task, the autobiographical memory task plus self-event connections, or an animal facts task (the same control task used in Studies 1 and 2). The autobiographical memory task asked participants to recall and list three autobiographical memories of an important event. The autobiographical memory plus reflection task required participants to explain why each AM was important to them. After completing the assigned task, all participants

Table 3. Ratings of information qualities, identity strength, and self-esteem measures in Study 4 by age group.

Measure	Age Group	Autobiographical Memories	Autobiographical Memories + Connections	Animal Facts
Pleasant	Emerging adults	5.16 _{ab} (1.70)	5.49 _a (1.65)	4.84 _b (1.36)
	Mature adults	5.61 _a (1.61)	5.46 _a (1.63)	5.00 _b (1.11)
Important	Emerging adults	5.44 _a (1.51)	5.68 _a (1.44)	2.55 _b (1.48)
	Mature adults	6.13 _a (1.16)	6.22 _a (1.13)	2.62 _b (1.48)
Essential to self	Emerging adults	4.47 _a (1.57)	5.11 _b (1.50)	2.38 _c (1.51)
	Mature adults	5.21 _a (1.51)	5.71 _b (1.25)	2.14 _c (1.38)
Self-Clarity	Emerging adults	4.28 (1.00)	4.23 (1.19)	4.24 (1.10)
	Mature adults	4.62 _a (1.29)	4.76 _a (1.27)	4.29 _b (1.30)
Sense of Self	Emerging adults	2.85 (0.54)	2.82 (0.61)	2.78 (0.60)
	Mature adults	2.98 _a (0.64)	3.00 _a (0.61)	2.84 _b (0.63)
Self-Esteem	Emerging adults	4.76 (1.54)	4.88 (1.50)	4.68 (1.72)
	Mature adults	3.92 (1.82)	4.16 (1.80)	3.87 (1.77)

Notes: Values range from 1 (*strongly disagree*) to 7 (*strongly agree*). Sense of Self ranges from 1 (*very uncharacteristic of me*) to 4 (*very characteristic of me*). Values in parentheses are standard deviations. Subscripts indicate significant pairwise differences among the three task conditions. Within each age group, means not sharing subscripts differ at $p < .05$ by LSD tests for that variable. Bold values indicate significant differences between emerging and mature adults for that variable and condition, $p < .05$.

completed the 16 task-relevant items also included in Studies 1 and 2.

Participants then completed the ten-item Personality Inventory (TIPI; Gosling et al., 2003) for exploratory purposes, and the same dependent measures used in Study 2. (One item was inadvertently left off the Self-Continuity Index, resulting in 7 rather than 8 items for this scale). For Sense of Identity, $\alpha = .88$; for Sense of Self, $\alpha = .86$; for Self-Continuity, $\alpha = .85$; for Self-Concept Clarity, $\alpha = .90$. Finally, participants provided demographic information.

Results

Pre-experiment analytic plan on OSF and additional analyses

A series of 2 (age: emerging or mature adults) \times 3 (condition: autobiographical memory, autobiographical memory plus self-event connections, animal control) between-subjects ANOVAs on each of the identity outcome variables (self-continuity, sense of identity, sense of self, and self-clarity), and on the task-relevant items (pleasantness, importance, and essentialness to sense of self) and self-esteem, were conducted as proposed on OSF.

In addition, to explore the patterns within age group more fully, simple main effects of the recall task manipulation main effect were conducted within age group, with pairwise Tukey tests performed comparing task conditions.

Differences among tasks

See Table 3. A series of 2 (age group) \times 3 (task) ANOVAs revealed main effects of condition on all four task ratings. There were main effects of condition on all measures ($F_s > 12.11$). As intended, the control task of listing facts about animals was rated as less important, less descriptive of, and less essential to the sense of self, compared to each of the two autobiographical memory

tasks, and also as less pleasant, by Tukey's HSD tests ($p_s < .001$). In addition, the autobiographical memory task including self-event connections was rated as containing information more descriptive of and essential to the self than the standard autobiographical memory task by Tukey's HSD tests ($p_s < .001$).

All task ratings varied by age group ($F_s > 3.91$). Moreover, the condition effect on three of the task ratings was qualified by age group ($F_s > 4.36$). Consistent with the findings from Studies 1 and 2, each of the autobiographical memory tasks was rated as containing information that was less important, less descriptive, and less essential to the self by emerging than mature adults, whereas the opposite pattern occurred for the control condition of listing facts about animals by Tukey's HSD tests ($p_s < .001$).

Effects of task type on identity outcome variables

See Figure 2. As hypothesised, the preregistered 2 \times 3 ANOVAs revealed a significant interaction on self-clarity ($F(2, 945) = 3.33, p = .036, \eta_p^2 = .007$). Contrary to predictions, no significant interactions obtained for sense of identity, self-continuity, or sense of self. However, there was a significant main effect of task condition on self-continuity ($F(2, 945) = 5.17, p = .006, \eta_p^2 = .011$), and a marginal effect of task condition on sense of identity ($F(2, 945) = 2.56, p = .078, \eta_p^2 = .005$) and sense of self ($F(2, 945) = 2.91, p = .055, \eta_p^2 = .006$), such that the two autobiographical memory recall conditions differed from the control condition but not from each other. There was no effect of task on self-esteem in this study, but emerging adults reported higher self-esteem and lower self-clarity than mature adults.

Exploratory analyses within age group revealed effects consistent with the predictions. As predicted, among emerging adults, there were no simple main effects of task type on any of the identity measures (all $p_s > .27$). As predicted, among mature adults, there was a significant effect of task type on Self-Continuity ($F(2, 945) = 4.69, p = .009, \eta_p^2 = .010$), Sense of Self ($F(2, 945) = 3.25, p = .039$,

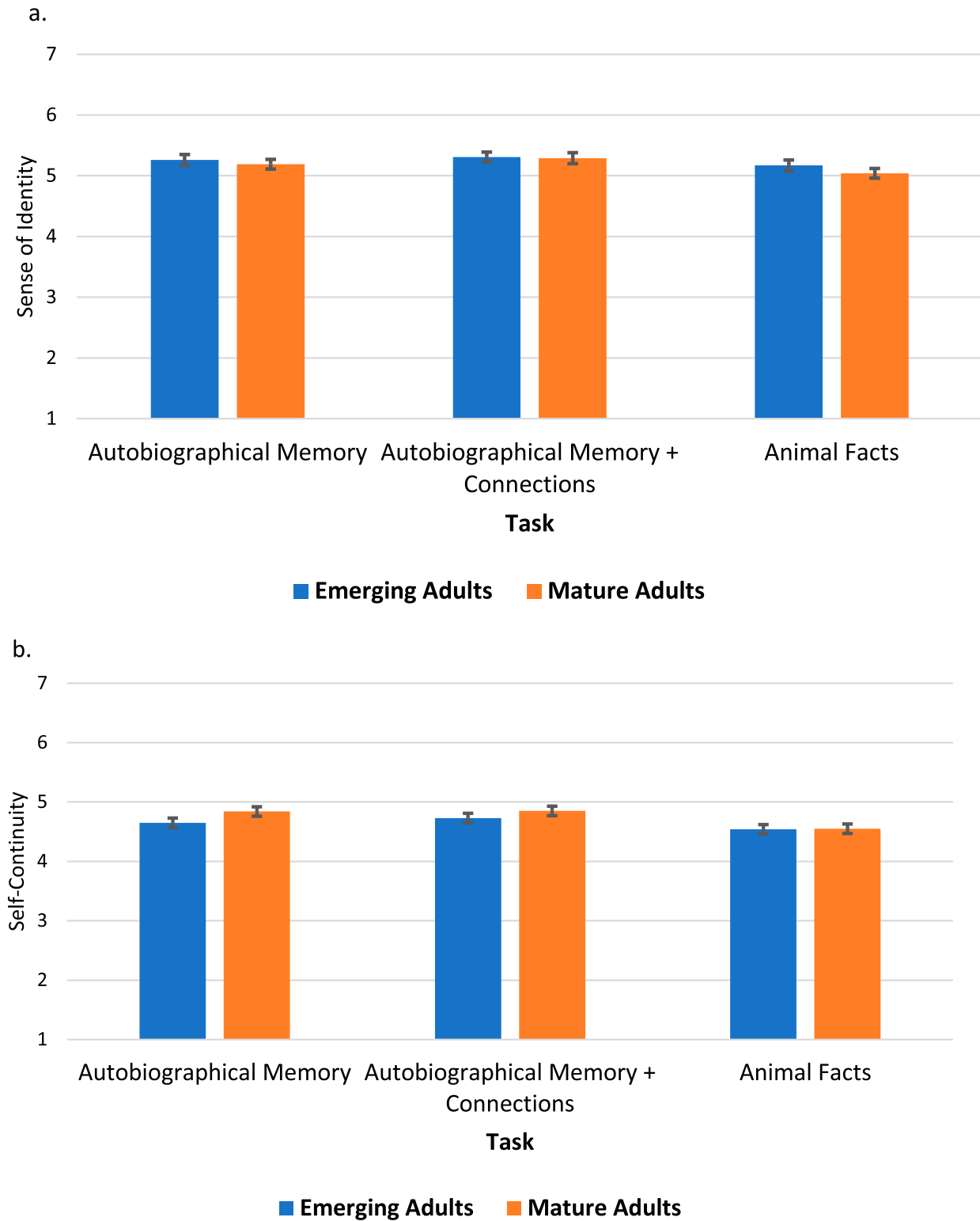


Figure 2. Study 4 Sense of Identity (panel a.) and Self-Continuity (panel b.). Note: Error bars represent ± 1 standard error of the mean.

$\eta_p^2 = .007$), and Self-Clarity ($F(2, 945) = 6.77, p = .001, \eta_p^2 = .014$). For all three variables, responses in the two autobiographical memory conditions differed from the control condition ($ps < .05$ by Tukey's HSD) but not from one another.

Cultural life script events

To test whether emerging adults were more likely than mature adults to choose cultural life script events as the three most important events in their lives, coding of

each recollected event in the two autobiographical memory conditions was conducted. Four trained coders rated each of the three events listed by each participant. Two coders were assigned to each event. The coders used a list of cultural life script items from Berntsen and Rubin (2004), modified slightly to better fit a U.S. sample. (For example, we removed the event “first communion” as our samples had relatively few Catholic participants). The number of cultural life script events (out of 3) listed by each participant was then used as the measure of interest. Interrater reliability was satisfactory ($r = .83, p < .001$).

Because the raters coded the life event memories that were listed before the manipulation, only a *t*-test comparing the cultural life script scores across the two age groups was meaningful. Contrary to predictions, mature adults recollected more cultural life script events than emerging adults ($t(642) = -6.37, p < .001$, Cohen’s $d = -.50$). Furthermore, the differential tendency to recollect cultural life script events cannot explain why autobiographical remembering boosts identity more for mature than younger adults, as the cultural life script score was unrelated to the measures of identity ($r_s = -.02$ to $.05, p_s > .21$).

Discussion

The results of Study 4 were largely consistent with predictions. Specifically, emerging adults did not experience a boost to identity strength after recollecting autobiographical memories, whereas mature adults did. It is also important to note that effects on self-esteem were not the same as those on identity strength, again supporting the difference between these constructs.

Both age groups rated the information they reported as more important after explicitly describing self-event connections compared to a standard autobiographical memory reporting task, supporting the effectiveness of our manipulation. Yet neither age group was influenced by this greater importance. We conclude that emerging adults are not influenced by self-event connections, whereas mature adults have already made these connections and do not need additional encouragement.

Moreover, emerging adults were less likely than mature adults to recollect cultural life script events as their three most important event memories. Mature adults have had more opportunities to experience life script events, including marriage and having children, which occur after age 25 in many people in the U.S. and the U.K. The number of important memories that were cultural life script events was unrelated to the identity measures, though, suggesting that the importance of particular experiences to one’s culture plays little role in whether the experience is seen as self-defining.

General discussion

Across four studies, we examined whether recollecting specific autobiographical memories increases strength of identity in both emerging and mature adults; i.e.,

whether autobiographical memories “nourish” identity. Put simply, our studies demonstrated that autobiographical memories nourish identity only for mature adults. The pilot study and Studies 1 and 4 failed to demonstrate an identity-enhancing effect of recollecting autobiographical memories in emerging adults. Studies 2 and 4 demonstrated an identity-enhancing effect of recollecting autobiographical memories in mature adults. Furthermore, Study 3 demonstrated that emerging adults showed no apparent correspondence in the content of their autobiographical memories and self-aspects, even when they first thought about the self.

Our studies also revealed progression in identity development across age cohorts. In Studies 1 versus 2, mature adults expressed more self-continuity and sense of self than emerging adults. In Study 4, mature adults again expressed more self-continuity and marginally stronger sense of self, as well as greater self-clarity. Hand-in-hand with these cohort differences were differences in the properties of autobiographical memories, with mature adults’ memories rated as more pleasant, important, and essential to the self than emerging adults’ memories, in both sets of studies. Both findings replicate prior research (Ikier & Duman, 2022; Pasupathi & Mansour, 2006), and suggest a link between autobiographical memory and identity. Consistent with the identity function of autobiographical memory, during adult development, as autobiographical memory becomes more pleasant and more central in one’s self-concept, identity solidifies. But a causal link between those memories and identity strength is not in place until mature adulthood.

Another important theoretical finding is the dissociation between strength of identity and self-esteem. Although the two measures were correlated, the manipulations affected identity strength and self-esteem differently. Thinking about general self-knowledge enhanced self-esteem (but not identity strength) for both emerging and mature adults, whereas listing important autobiographical memories led to greater identity strength but lower self-esteem in mature compared to emerging adults. These findings are consistent with other research showing that the developmental trajectories of identity strength and self-esteem differ (Orth et al., 2010; Troll & Skaff, 1997).

These findings align with previous research findings that younger adults tend to use autobiographical memory more to serve directive and social functions than older adults (Vranić et al., 2018). Though Vranić et al. found no differences in self-reported use of the identity function of autobiographical memory, it is important to note that their cohorts were grouped into older adults (aged 46–90 years) and younger adults (aged 18–45 years), so the developmental distinctions among emerging adults and mature adults may not have been apparent. The age-related differences in mature and emerging results in their use of autobiographical memory to

enhance identity observed in our research also explains why, in Study 1, we were unable to replicate the findings of Jiang et al. (2020). Whereas their Study 5 relied on a mature adult sample, our Study 1 was conducted using emerging adults.

We had anticipated that self-event connections might underlie the relationship between autobiographical memory and strength of identity, and therefore, might underlie the age differences obtained. We tested this mechanism in various ways. First, all studies included measures of how essential the autobiographical memories and/or self descriptions were to the self, but these measures did not mediate the effects of autobiographical memory on identity. Second, attempts to experimentally induce self-event connections were included in Studies 3 and 4, but these attempts did not increase the size of effect on strength of identity. Note that we examined whether the ability to make self-event connections enabled participants to receive a boost to identity strength and not vice versa. Previous research suggests that a certain level of psychological maturity precedes the ability to infer meaning from remembered life events (McLean & Pratt, 2006). Therefore, a well-developed sense of identity may be a necessary precondition for meaningful self-event connections to be made. Only thereafter does recollection of important autobiographical memories yield an immediate boost to identity.

Potential mechanisms

In addition to differences in self-event connections and other properties of their autobiographical memories, emerging and mature adults might differ in their tendency to use autobiographical memories to serve an identity function. First, as has already been stated, emerging and mature adults may differ in the functions for which they rely on autobiographical memory, because they differ in their formulation of identity. Mature adults, with a stronger and more established sense of identity, may call on specific memories to enhance their concept of the distinct self. On the other hand, emerging adults may not yet have solidified their identities, and therefore may not find autobiographical memory as useful a tool in establishing the self as mature adults.

Second, emerging adults, who report using autobiographical memories to fulfil a social and directive function more often than mature adults (Vranić et al., 2018), may prioritise these functions over the identity function. If developmentally, the social and directive function are more useful for emerging adults, it is possible that emerging adults are simply not yet good at using autobiographical memories to serve the identity function. As they mature and the other functions become less imperative, the identity function may rise in utility.

A third possibility is that emerging adults tend to prioritise social acceptance over uniqueness and being true to

oneself (Blakemore, 2018). Previous literature suggests that this need to conform is associated with a wide range of dangerous behaviours and poor decision making (Chierchia et al., 2020). In the context of the present research, it is possible that emerging adults could use autobiographical memories to strengthen identity, but that is not their goal. Rather, emerging adults use autobiographical memories as a social tool to gain acceptance. Only later in development does the concern move from how the past can make others accept us, to how the past makes us who we are.

The preceding explanations are speculative, as our studies did not test preferences or tendencies for using autobiographical memory. Rather, we manipulated whether participants brought to mind memories vs. general self-knowledge or nonself semantic knowledge. The studies therefore tested whether, should autobiographical memories come to mind, a boost in identity strength is experienced.

Age 25 as an inflection point

Although we found differences between emerging and mature adults, like Jiang et al. (2020), we found in exploratory analyses that age did not moderate effects of autobiographical memory recall on identity measures among those 25 years and older. What might explain age 25 as a point at which autobiographical memories and identity become closely intertwined? One possible explanation is that emerging adulthood in industrialised societies has become a unique developmental phase in which identity exploration is central (Arnett, 2000). Because emerging adults are still in the process of identity formation, recollection of previous events will have little impact on the strength of identity, which has yet to be fully developed.

An alternative explanation could follow the same logic as the cognitive account of the reminiscence bump; novel experiences followed by stability are the best recollected in a person's life (Berntsen & Rubin, 2002). Emerging adults live in a time of exploration; as such, almost all experiences are full of excitement and newness. It is possible that this enhances the recollection of these events and perhaps gives these events more importance, but only after a period of stability is experienced. This period of stability, likely coinciding with the end of emerging adulthood, could be essential in connecting experiences with identity by allowing identity integration processes to occur (Mitchell et al., 2021).

Another possibility is that the life story, or narrative identity, is still in its early stages of development for emerging adults and has not yet been shared socially enough times to solidify it (Pasupathi & Hoyt, 2009). A final possibility is that neither identity nor the life narrative changes dramatically at age 25. Instead, what changes is the psychological sense of ownership of these events (Beike, 2013). Rather than important life events being considered things that happened to the self, they become the

self. In other words, having a life narrative and a stable set of important autobiographical is not the same as embracing these memories as a part of the self.

Limitations and future directions

Limitations of this research remain to be addressed in future studies. First, there was some inconsistency across studies in which measure of identity strength was affected. In Studies 1 and 3, none were; in Study 2, it was self-continuity; and in Study 4, it was self-continuity and sense of self, with self-clarity showing the clearest age differences. We have no theoretical explanation for these patterns; instead, we see them as confirmation of our notion that identity strength is a multifaceted construct encompassing certainty, purpose, and continuity. We encourage other researchers to use multiple measures of identity strength, and to develop a single measure that might better tap into the construct. Some items on each of the measures likely assess identity strength better than others. As scale development was not the goal of the present research, we leave for future research to discern which items from each measure are most linked to the identity function of autobiographical memory.

Next, there is a possibility that the differences between emerging adults and mature adults was not due to age, but due to the study incentives. Like researchers before us (e.g., (Ardelt, 2010); (Singer et al., 2007; Tsai et al., 2021)), we recruited emerging adults from undergraduate psychology courses and compensated them with partial course credit for participation, whereas we recruited mature adults online and compensated them with payment for their participation. These monetary rewards could have made the mature adults more incentivised to pay attention during the survey. Indeed, the mature adult sample was more likely to complete the survey than the emerging adult sample. However, Prolific is set up such that participants receive payment only if they complete the survey; if they choose to withdraw, they also withdraw their acceptance of the job (making it impossible for the researcher to pay them). Therefore, the mature adults could only receive payment if they completed the survey, whereas the emerging adults could still receive credit if they started it but then withdrew. On the contrary, the mature adults by most measures appeared less motivated to attend to the survey. Mature adults completed the survey more quickly than emerging adults in both studies and listed fewer items in Study 2 than the emerging adults in Study 1. Neither time spent nor number of items listed were related to the identity outcome variables, further ruling out that incentive differences were relevant.

In fact, for incentive differences to explain the results, they would need to work in a very particular way. Simply being more or differently motivated would not suffice to explain the patterns obtained, because differences between mature and emerging adults were obtained in

the autobiographical memory conditions only. (See, e.g., Table 3). Thus, the payment would have to interact with condition to explain the results.

However, participants from both age groups rated their general self-knowledge as equally important, nor was there significantly more attrition in either age group, signifying that receiving payment could not explain all the results. It's also important to note that the incentive provided to mature adults was not large, as the study was not very long: About \$3. Finally, Prolific workers and undergraduate volunteers have previously been found not to differ (Casler et al., 2013).

We also tested and ruled out a similar explanation, that emerging adults were recalling different types of events as their most important autobiographical memories. Indeed, mature adults were more likely than emerging adults to include cultural life script events among their most important memories in Study 4. However, once again, the number of cultural life script events listed was unrelated to the rated importance of the memories and to the identity outcome variables. In other words, differences in recalling experiences seen as truly important could not account statistically for the patterns obtained on identity measures.

Relatedly, age group was confounded with college student status in these studies. Nearly 100% of emerging adults in the studies were college students, whereas 12% of the mature adults in Study 2 and 9% of the mature adults in Study 4 were college students. However, prior research shows that emerging adults age 18–25 who do not attend college define and experience this transitional phase similarly to those who do attend college (Arnett, 1997).

Another potential limitation in the current set of studies is that of a generational cohort effect. Emerging adults (born in the late 1990s and early 2000s) grew up in a world that impacted the way they rely on autobiographical memory differently than the mature adults in our sample. For example, the increased use of social media in the emerging adult generation could have significant impacts on the way humans use autobiographical memory. Social media are an avenue to socially share as well as record and remind emerging adults of their life experiences in a way that was not previously feasible. Growing up in a different time period and culture (even in the same country) could account for some difference in autobiographical memory usage across age groups. Future research is needed to rule out the possibility of a generational difference.

Lastly, our studies did not examine cultural differences in autobiographical memory functions. Although our samples varied (by design) in age, all participants were recruited from American samples. Given evidence that people from Eastern and Western cultures have differences in autobiographical memory formation and usage (Fivush et al., 2011; Wang, 2021), results of our studies may differ for participants from other cultures. A critical next step will be to explore whether the present findings are

culturally bound or reveal a more general developmental trend in autobiographical memory.

This research ruled out the possibility that self-event connections or cultural life scripts were the mechanism explaining the connection between autobiographical memory and identity. However, one possible mechanism that was not tested in the current set of studies is the experience of nostalgia when reflecting upon past experiences. Nostalgia is the bittersweet emotional result of recalling past events, which has been connected to authenticity and psychological well-being (Kelley et al., 2022). It is possible that mature adults, but not emerging adults, experience nostalgic emotions when they recollect previous life events. The emotional experience of nostalgia could contribute to the reported strengthening of identity in mature adults when recollecting past events. This suggests that nostalgia could be the mediator that explains the connection between autobiographical memory and identity. Future research should investigate this possibility.

Conclusions

Autobiographical memory boosts identity strength among mature adults over 25 years of age. Emerging adults, on the other hand, do not seem to be able to use autobiographical memories as a resource for identity in the same way. Self-event connections may play a role in how and when autobiographical memories serve an identity function, but mature adults do not seem to need reminders to create these connections, and emerging adults do not seem to be able to employ them.

Notes

1. We did not formally preregister these studies prior to manuscript submission. However, for Studies 1, 2, and 4, we uploaded documents to an OSF page (https://osf.io/paqjh/?view_only=3c2fe4f2ba044cf0af542b7b72508254) including materials, procedures, participant recruitment, hypotheses, and data analytic plan, prior to data collection. For Study 3, we uploaded the materials and procedure prior to manuscript submission, but after data collection and after all analyses had been run. We have included the datasets for Studies 1-4 and the pilot study on this OSF page. The data files do not include the individual memories and self-descriptions provided by participants, as many included identifiable information. To protect participants' confidentiality, we have replaced their responses to these prompts with "X."
2. These 16 task-relevant items were included in all studies. A full list of task-relevant items and analyses are available in the supplemental materials.
3. There were also methodological differences between Study 1 and 2 that might have led to differing results. Study 1 participants were unpaid students, whereas Study 2 participant were paid workers. Study 1 included a self-clarity manipulation prior to the tasks of listing autobiographical memories, self-aspects, or animal facts. However, for these differences rather than age group differences to account for why autobiographical memories enhanced strength of identity only in Study 2, they would have to interact with the task condition, such that being paid and/or completing a self-clarity manipulation influenced

measures of identity only in the autobiographical memory condition and not in the other two conditions. We find that possibility unlikely. Moreover, Study 4 used identical procedures for emerging and mature adults and it allowed us to test more directly whether being motivated by pay rather than class credit influenced responses to the identity strength measures only when recollecting autobiographical memories.

4. Study 3 was completed prior to Study 2. Therefore, Self-Clarity was not included among the identity measures.

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Data availability statement

The data that support the findings in this article are openly available in the Open Science Framework at https://osf.io/paqjh/?view_only=3c2fe4f2ba044cf0af542b7b72508254. All numeric responses, recorded response times, and coding are present in the data files on OSF. Individual listed responses (i.e., autobiographical memories, self-aspects, and animal facts) are not provided in order to protect participants' confidentiality, as some participants included information that could potentially identify them. Materials, methods, and SPSS syntax for analyses are also available at that site.

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ORCID

Denise R. Beike  <http://orcid.org/0000-0002-7810-9335>

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