

Time Capsule: Nostalgia Shields Psychological Wellbeing From Limited Time Horizons

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Nostalgia is a bittersweet—albeit predominantly positive—self-relevant and social emotion that arises from reflecting on fond and meaningful autobiographical memories. Nostalgia might facilitate successful aging by serving as a socioemotional selectivity strategy in the face of limited time horizons. Four studies tested the role of nostalgia in maintaining psychological wellbeing across the adult life span and across differing time perspectives. In Study 1, community adults ($N = 443$, age 18–91) completed measures of nostalgia proneness and 6 psychological wellbeing dimensions. Age was more positively related to wellbeing for those high than low on nostalgia proneness: High-nostalgic individuals showed a maintenance or increase in psychological wellbeing with age, whereas low-nostalgic individuals did not. In Study 2 ($N = 35$, age 18–25), experimentally inducing a limited time perspective—a core trigger of socioemotional selectivity—in young adults prompted greater nostalgia. In Study 3 ($N = 93$, age 18–33) and Study 4 ($N = 376$, age 18–55), experimentally inducing a limited time perspective reduced some aspects of wellbeing among those who recalled an ordinary (Study 3) or lucky (Study 4) autobiographical memory, but this effect was eliminated among those who recalled a nostalgic memory. Nostalgia buffers perceptions of limited time and facilitates the maintenance of psychological wellbeing across the adult life span.

Keywords: nostalgia, life span, aging, psychological wellbeing, socioemotional selectivity

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“Now the harvest of old age is, as I have often said, the memory and rich store of blessings laid up earlier in life.”



Cicero, *Cato Maior de Senectute* (44 BC)

Maintaining psychological wellbeing across the life span can be challenging, as different life stages present assorted transitions and threats. The strategies on which people rely to navigate those stages vary with age, and understanding the ability to experience “successful aging” (Baltes & Baltes, 1990) is of particular importance. Socioemotional selectivity theory (SST; Carstensen, 1992, 2006) holds that older adults are aware of the

limited time they have remaining, and so to maximize social and emotional gains they prioritize emotional meaning over knowledge acquisition. The maintenance or even growth in psychological wellbeing that occurs with age (Charles & Carstensen, 2007; Ryff & Keyes, 1995) may reflect this strategy.

One resource for emotional meaning that older adults possess is their “rich store” of nostalgic memories. Nostalgia, “a sentimental longing or wistful affection for the past” (The New Oxford Dictionary of English, 1998, p. 1266), is a bittersweet—albeit predominantly positive—self-relevant, and social emotion that arises when people reflect on personally meaningful memories (Hepper, Ritchie, Sedikides, & Wildschut, 2012; Wildschut, Sedikides, Arndt, & Routledge, 2006). Nostalgia is a common experience that serves key psychological functions (Routledge, Wildschut, Sedikides, & Juhl, 2013; Sedikides, Wildschut, Routledge, Arndt, Hepper, et al., 2015), and nostalgia proneness is a trait-level individual difference that reflects the extent to which one experiences and values nostalgia (Barrett et al., 2010; Routledge, Arndt, Sedikides, & Wildschut, 2008). We propose and test that nostalgia helps individuals to maintain or enhance psychological wellbeing, as they grow older and face limited time horizons. That is, we examine the

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proposition that nostalgia is a resource that supports socioemotional selectivity and promotes successful aging.

Wellbeing and Socioemotional Selectivity in Older Adulthood

Older persons are generally successful at maintaining wellbeing (Charles & Carstensen, 2007). Despite decreased physical health and social activity, subjective and psychological wellbeing levels remain stable or rise with age (Diener, Suh, Lucas, & Smith, 1999; Ryff, 1989). Similarly, the frequency of positive affect in daily life stays constant (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; Charles, Reynolds, & Gatz, 2001) or increases (Mroczek & Kolarz, 1998). However, older adults' wellbeing is not hedonistic, but reflects more complex processes. For example, their experiences contain mixed emotions such as poignancy equally or more often than younger adults' (Carstensen et al., 2000; Ersner-Hershfield, Mikels, Sullivan, & Carstensen, 2008)—which may reflect greater emotional meaning (e.g., appreciating the value of a negative experience; Carstensen, Fung, & Charles, 2003). Moreover, hedonic measures such as satisfaction with life show a decline in the years immediately before death (Gerstorf et al., 2010). Thus, older adults do not necessarily maintain wellbeing by prioritizing positivity over negativity (i.e., hedonic or subjective wellbeing), but instead by aiming for a thriving and meaningful life (i.e., eudaimonic or psychological wellbeing; Keyes, Shmotkin, & Ryff, 2002). Accordingly, it is important to understand the strategies that people develop to regulate psychological wellbeing in older age, and it is this aspect of wellbeing with which we are concerned.

SST is a generative framework for understanding these developments (Carstensen, 1992). It states that older people's limited time perspective leads them strategically to focus less on expansive future-oriented goals and more on emotion-regulating or meaning-oriented goals. For example, older adults redirect their social interactions toward relatively few close relationships, and manifest more positive recall of their past. Cross-sectional, longitudinal, and experimental evidence supports this age-related shift and shows that it reflects limited time perspective (Carstensen, 2006; Carstensen et al., 2003; Mather & Carstensen, 2005). Similar patterns emerge in younger adults who perceive limited time due to impending relocation, health threats, sociopolitical changes, or graduation (Carstensen & Fredrickson, 1998; Fung & Carstensen, 2004; Fung, Carstensen, & Lutz, 1999). Although SST does not focus on wellbeing specifically, evidence indicates that perceptions of limited time—regardless of age—lower happiness and psychological wellbeing (Demiray & Bluck, 2014; Kotter-Grühn & Smith, 2011; Yeung, Fung, & Lang, 2007). Together, these literatures imply that the SST strategies of investing in emotionally meaningful experiences allow individuals to maintain wellbeing despite the threat of limited time horizons. Thus, it is characteristic and adaptive for older adults to prioritize internal emotion-regulation and meaning. But on what psychological resources do people draw to achieve this shift? We propose that one vital resource is nostalgia, an emotion derived from one's store of personal memories.

Nostalgia

Nostalgia permeates everyday life. Thought to be experienced by almost everyone (Boym, 2001), 79% of undergraduate students

report feeling nostalgic at least once a week (Wildschut et al., 2006). Although historically regarded as an illness or disorder (Batcho, 2013; Sedikides, Wildschut, & Baden, 2004), contemporary evidence indicates that nostalgia's negative reputation was undeserved (Sedikides & Wildschut, 2019b; Sedikides, Wildschut, Routledge, Arndt, Hepper, et al., 2015). Using a prototype approach, Hepper et al. (2012) found that laypersons view nostalgia as a bittersweet, but primarily positive, emotion arising from fond and personally meaningful memories that usually involve childhood or close relationships. Nostalgia often entails rose-tinted views of the memory, missing it, and a desire to return to the past; one typically feels sentimental and happy with a tinge of longing (Hepper et al., 2012). Indeed, nostalgic narratives contain expressions of both positive affect and (to a lesser degree) negative affect (Holak & Havlena, 1998; Wildschut et al., 2006). These conceptions of nostalgia, which dovetail with the aforementioned Oxford Dictionary definition, are consistent across individuals (Hepper et al., 2012) and across cultures (Hepper et al., 2014). Note that we focus on *personal nostalgia* for events that one experienced directly in the past. This differs from *historical nostalgia*, which refers to preference for objects common in the past, and does not necessarily evoke personal memories or the above emotions (Davis, 1979).

Nostalgia is related to, but distinct from, other past-oriented psychological constructs. Autobiographical memory, reminiscence, and longing are prototypical features of nostalgia (Hepper et al., 2012). However, nostalgia possesses other aspects that distinguish it from each one. For example, autobiographical memory encompasses diverse personal experiences that do not necessarily evoke emotion (Cheung, Wildschut, & Sedikides, 2018; Conway & Pleydell-Pearce, 2000). Similarly, reminiscence is defined as the "process of recollecting memories of one's self in the past" (Bluck & Levine, 1998, p. 188) and may not involve feeling emotional or nostalgic (Davis, 1977). Moreover, although nostalgia is often triggered by reminiscing, it can also be prompted by keepsakes, music, or scents (Barrett et al., 2010; Hepper et al., 2012; Reid, Green, Wildschut, & Sedikides, 2015). Life longing, or *Sehnsucht*, is defined as "intense desire for alternative states and realizations of life" (Scheibe, Freund, & Baltes, 2007, p. 778). *Sehnsucht* entails bittersweet emotion, but, unlike nostalgia, it can refer to present and future targets and involves feeling incomplete (Scheibe, Blanchard-Fields, Wiest, & Freund, 2011). Finally, nostalgia is more social than the other three constructs, prototypically concerning memories of social experiences and relationships (Abeyta, Routledge, Roynance, Wildschut, & Sedikides, 2015; Hepper et al., 2012). In sum, the emotion of nostalgia is often prompted when individuals reminisce about, or long for, certain autobiographical experiences, but is unique in its focus on *fond and personally meaningful* memories, its sociality, and its affective signature.

Nostalgia has regulatory properties. Individuals spontaneously turn to personal nostalgia for comfort and strength in the face of psychological threats, and inducing it confers psychological benefits (Routledge et al., 2013; Sedikides & Wildschut, 2019a, 2019b; Sedikides, Wildschut, Routledge, Arndt, Hepper, et al., 2015;). For example, experimental and cross-sectional studies show that individuals recruit and experience nostalgia in times of loneliness, discontinuity, and existential doubt (Routledge et al., 2011; Sedikides, Wildschut, Routledge, & Arndt, 2015; Zhou,

Sedikides, Wildschut, & Gao, 2008). Nostalgia then repairs and enhances social connectedness, self-regard, and meaning in life (Routledge et al., 2011; Vess, Arndt, Routledge, Sedikides, & Wildschut, 2012; Zhou et al., 2008; see Ismail, Cheston, Christopher, & Meyrick, 2018, for a meta-analytic review). Effects of nostalgia are often stronger in conditions of threat, highlighting its homeostatic function (Routledge et al., 2008; Sedikides & Wildschut, 2018; Van Dijke, Leunissen, Wildschut, & Sedikides, 2019; Wildschut, Sedikides, & Cordaro, 2011). Across this research, convergent evidence has been obtained from studies that examined state nostalgia in response to experimental manipulations and those focusing on individual differences in proneness to nostalgia. Nostalgia also triggers perceptions of growth, authenticity or intrinsic self-expression, optimism, and inspiration (Baldwin, Biernat, & Landau, 2015; Baldwin & Landau, 2014; Cheung et al., 2013; Stephan et al., 2015). Thus, nostalgia maintains and promotes wellbeing across a wide range of domains.

The Role of Nostalgia in Older Adulthood

We propose that nostalgia is relevant to the regulatory priorities of older age and facilitates successful aging in the face of limited time horizons. Specifically, drawing on nostalgic recollections is an effective tactic to gain emotional meaning and feel connected to close others—functions emphasized by SST (Carstensen et al., 2003). Thus, nostalgia is a key resource from which older adults can achieve socioemotional selectivity goals when faced with limited time. This function of nostalgia should then buffer the negative impact of limited time perspective on wellbeing (Demiray & Bluck, 2014) and allow individuals to achieve the often-observed stability or even growth in psychological wellbeing across the life span (Ryff & Keyes, 1995). The pattern may be further bolstered, because nostalgia restores self-continuity (a sense of connection between one's past and one's present; Sedikides, Wildschut, Routledge, & Arndt, 2015, 2016) in times of life transitions. These transitions include events such as changes in health or living conditions, which temporarily induce limited time horizons (Pruzan & Isaacowitz, 2006). Transitions also occur in older age in the forms of retirement, physical changes, or bereavement (Brandtstädter & Greve, 1994). The above-reviewed literature indicates that nostalgia is a valuable resource for adults of all ages when they are psychologically threatened. However, we argue that, with advancing age, nostalgia will become more essential to fostering psychological wellbeing, given the chronic awareness of limited time that permeates older adulthood. Successful aging will be facilitated by nostalgia or even depend on it. It is this proposal that we set out to test.

Overview

In four studies, we examined the relevance of nostalgia as a facilitator of wellbeing in contexts that entail socioemotional selectivity. In line with past investigations (Routledge et al., 2008; Seehusen et al., 2013; Stephan et al., 2015; Zhou et al., 2008), we aimed for convergence between dispositional and state operationalizations of nostalgia. *Nostalgia proneness* is a dispositional tendency to experience nostalgia frequently and to value it (Barrett et al., 2010; Routledge et al., 2008; Zou, Wildschut, Cable, & Sedikides, 2018). *State nostalgia* can be induced experimentally

using validated manipulations, such as reflecting on a relevant memory (Hepper et al., 2012, 2014; Wildschut et al., 2006). In line with past SST investigations (Fredrickson & Carstensen, 1990), we examined age and manipulated time perspective as two alternative triggers of socioemotional selectivity. Accordingly, Study 1 was a cross-sectional survey, in which we assessed levels of nostalgia proneness and psychological wellbeing across the adult life span. Studies 2–4 were experiments, in which we manipulated perceptions of limited time. Study 2 examined whether limited time perspective triggers state nostalgia, whereas Studies 3–4 induced state nostalgia via recall of a nostalgic (vs. control) event and assessed psychological wellbeing. We were concerned with two research questions, elucidated below.

The Moderating Role of Nostalgia in Levels of Psychological Wellbeing

Our primary aim was to examine the role of nostalgia in buffering the relation between age (Study 1) or limited time horizons (Studies 2–4) and psychological wellbeing. We focused on the eudaimonic approach to psychological wellbeing, which entails realizing one's potential in multiple domains (Ryan & Deci, 2001; Ryff, 1989). The key domains are autonomy (e.g., evaluating oneself by internal standards), environmental mastery (e.g., competence), personal growth (e.g., self-development), positive relationships (e.g., trust), purpose in life (e.g., meaning), and self-acceptance (e.g., positive attitude to oneself). Autonomy and environmental mastery tend to increase across the life span, positive relationships and self-acceptance remain stable, and personal growth and purpose in life decrease (Ryff, 1989; Ryff & Keyes, 1995). In addition, women generally report having more positive relationships than men (Ryff, 1989; Ryff & Keyes, 1995). However, all six domains reflect a higher-order wellbeing factor (Keyes et al., 2002; Wu, Liu, Gadermann, & Zumbo, 2010).

In Study 1, we tested whether nostalgia proneness moderates the association between age and wellbeing across the adult life span. In Studies 3–4, we aimed to replicate conceptually the pattern in an experimental setting—and isolate a key underlying mechanism—by manipulating limited time perspective. Limited time perspective correlates with age (Demiray & Bluck, 2014) and accounts for age effects on SST processes (Carstensen, 2006). We hypothesized that wellbeing would remain stable or improve with age (Study 1) or with limited time perspective (Studies 3–4), but only for individuals who are high in nostalgia proneness (Study 1) or state (i.e., experimentally induced) nostalgia (Studies 3–4). For those low in nostalgia proneness or state nostalgia, age or limited time perspective would reduce wellbeing, in accordance with prior research (Demiray & Bluck, 2014). Finally, in Study 4, we tested the specificity of nostalgia's buffering effect on wellbeing by including a positive-memory control condition and controlling statistically for positive affect.

Research suggests that nostalgia's psychological benefits are broad (Sedikides & Wildschut, 2019a, 2019b; Sedikides, Wildschut, Routledge, Arndt, Hepper, et al., 2015). Also, the literature points to links with each dimension of psychological wellbeing. That is, nostalgia enhances constructs akin to autonomy (authenticity; Baldwin et al., 2015), environmental mastery (optimism, inspiration, goal pursuit; Cheung et al., 2013; Sedikides et al., 2018; Stephan et al., 2015), personal growth (growth-related self-

perceptions; Baldwin & Landau, 2014), positive relationships (social connectedness; Wildschut et al., 2006), purpose in life (meaning; Routledge et al., 2011), and self-acceptance (self-regard; Vess et al., 2012). Based on these findings and the structure of wellbeing (Wu et al., 2010), we expected nostalgia's moderating role to be similar across wellbeing dimensions. We also explored each dimension separately to provide depth of understanding and to enable comparisons with past research that focused on separate dimensions or specific aspects of wellbeing (e.g., relationships, existential meaning).

Levels of Nostalgia as a Function of Age and Limited Time Horizons

Our second aim was to examine whether nostalgia is prompted by the context of limited time horizons. If nostalgia is recruited naturally as a response to the threat of limited time, then nostalgia proneness might be especially high in old age (Study 1) and state nostalgia would be heightened by experimentally manipulated limited time perspective (Study 2). Here we aimed to add to understanding of nostalgia across the life span. Past research indicates that older (vs. younger) adults rate songs from their youth as more emotional (Schulkind, Hennis, & Rubin, 1999), remember their childhood as more positive (Field, 1981), and experience more positive emotions when reminiscing (Pasupathi & Carstensen, 2003). However, if nostalgia is also recruited in response to transitions, nostalgia proneness might not only be high among older adults (Brandtstädter & Greve, 1994), but also among younger adults given their likely transitions to university, employment, or independence (Davis, 1979) and the challenge of forging adult identities (Bluck & Alea, 2002). Indeed, most undergraduates report frequent occurrences of nostalgia (Wildschut et al., 2006). Thus, in Study 1 we also tested the possibility of a curvilinear pattern of nostalgia proneness across the adult life span.

To our knowledge, no published research has examined levels of personal nostalgia systematically across the life span. In the closest investigation, Batcho (1995) assessed the extent to which U.S. individuals aged 4–80 years missed 20 items from their past, finding that overall nostalgia levels peaked during college years and declined with increasing age, with some variation by type of object (e.g., *music* and *family* increased in older age). However, this study had an unbalanced age distribution (46% were aged 18–21) and analyzed age as six broad categories, collapsing the 8% of participants aged 50 or older into a single category. More recently, Madoglou, Gkinopoulos, Xanthopoulos, and Kalamaras (2017) conducted latent class analysis on a range of nostalgia-related ratings among three adult age-groups in Greece, finding that older (compared with young or middle-aged) women were most likely to be classified as high (i.e., above the scale midpoint) in nostalgia proneness. However, this study treated both age and nostalgia categorically. Hence, both studies may have lacked sensitivity to detect the curvilinear pattern we propose. In addition, two studies obtained no association between age and historical nostalgia (Holbrook, 1993; Schindler & Holbrook, 2003), and one study found age-related increases in state nostalgia in response to advertisements (Kusumi, Matsuda, & Sugimori, 2010). However, it is unclear to what extent participants in those studies experienced personal nostalgia.

Finally, we tested if nostalgia proneness differs by gender. Evidence is mixed: Some studies find higher nostalgia in women (Best & Nelson, 1985), others find higher nostalgia in men (Kusumi et al., 2010), but most find no difference (Batcho, 1995; Routledge et al., 2011; Wildschut et al., 2006; Zhou et al., 2008). We note that all studies were approved by the relevant institutional Ethics Committee, and that all participants provided informed consent and were debriefed.

Study 1: Psychological Wellbeing Across the Adult Lifespan

In Study 1, we used a cross-sectional design to determine how nostalgia proneness shapes the association between age and psychological wellbeing. We also examined the link between age and nostalgia proneness. We focused on chronological (as opposed to subjective) age to enable comparisons with literature on psychological wellbeing across the life span (Ryff, 1989; Ryff & Keyes, 1995). A large sample of adults, distributed across ages and genders, reported their nostalgia proneness and current psychological wellbeing levels. We hypothesized that nostalgia proneness would moderate (i.e., buffer) wellbeing across the adult life span. High-nostalgic (vs. low-nostalgic) individuals would manifest a more positive association between age and wellbeing (i.e., stability rather than decline, or growth rather than maintenance). We also explored whether nostalgia moderated the link between gender and wellbeing. Lastly, we hypothesized that nostalgia proneness levels would be high across ages and genders, but would peak at the younger and older ends of the adult life span.

Method

Participants and procedure. Participants were 443 adults resident in the United Kingdom and aged between 18 and 91 years ($M_{\text{age}} = 50.23$, $SD_{\text{age}} = 20.02$), who volunteered for a survey on “personality and life attitudes.” Power calculations were not possible given the absence of prior research, so we aimed to recruit a minimum of 25 participants (to include at least 10 women and 10 men) in each 5-year age category, and due to the recruitment strategy we eventually exceeded this minimum in many cells. A sensitivity analysis (G^*Power 3.1; Faul, Erdfelder, Buchner, & Lang, 2009) indicates that our obtained sample provided 80% power to detect a small effect ($\Delta R^2 = .018$ for a regression coefficient, two-tailed $\alpha = .05$). Table 1 reports sample characteristics. Participants included 366 community members who responded to local advertisements or snowball recruitment (most of whom received £10 compensation; $M_{\text{age}} = 51.73$ years, $SD_{\text{age}} = 17.65$, range = 20–91), 34 older adult research panel members who took part without compensation ($M_{\text{age}} = 73.38$ years, $SD_{\text{age}} = 8.94$, range = 55–91), and 43 undergraduates who received course credit ($M_{\text{age}} = 19.21$ years, $SD_{\text{age}} = 3.14$, range = 18–29). Controlling for age, the three subsamples did not differ significantly on any of the nostalgia or wellbeing variables.

All participants completed questionnaires at home in their own time; nostalgia measures preceded wellbeing measures, followed by demographic information. As shown in Table 1, the sample was predominantly White and had a median annual household income of £20,000–£40,000 (\$33,000–\$66,000). Participants reported their education level (1 = *less than secondary school*, 5 = *post-*

Table 1
Sample Characteristics in Study 1

Variable	Category	N	%
Gender	Female	246	55.5
	Male	196	44.2
Age	Did not state	1	0.2
	18–30	92	20.8
	31–40	52	11.7
	41–50	72	16.3
	51–60	74	16.7
	61–70	69	15.6
	71–80	53	12.0
Ethnic background	81 and over	31	7.0
	Caucasian	414	93.5
	Asian	7	1.6
	Black	5	1.1
	Other/mixed	10	2.3
Employment status	Did not state	5	1.1
	Employed	198	44.7
	Retired	149	33.6
	Student	75	16.9
	Stay-at-home parent/caregiver	11	2.5
	Unemployed/between jobs	9	2.0
	Did not state	2	0.5
	Highest level of education	Less than secondary school	56
Secondary school/further education degree	151	34.1	
Some university education	54	12.2	
University degree	71	16.0	
Postgraduate/professional degree	104	23.5	
Annual household income	Did not state	7	1.6
	Less than £10,000 (~U.S. \$15,000)	64	14.4
	£10,000–20,000	86	19.4
	£20,000–40,000	150	33.9
	£40,000–60,000	74	16.7
	£60,000–80,000	32	7.2
	More than £80,000 (~U.S. \$124,000)	9	2.0
Did not state	29	6.5	

graduate/professional degree). The sample was well-educated (median for each subsample = 3 [some university education]), and most older adults lived in their own home. Due to missing data, sample sizes for analyses vary from 429–443.

Measures.

Nostalgia. Participants completed two measures of nostalgia proneness, preceded by The New Oxford Dictionary of English (1998) definition. Prior research has operationalized nostalgia proneness either as the extent to which people miss objects and experiences from their past (Batcho, 1995) or the extent to which people experience nostalgia frequently and value its role in their life (Barrett et al., 2010; Routledge et al., 2008). We assessed both aspects in order to capture the construct comprehensively.

The Nostalgia Inventory (NI; Batcho, 1995) asks participants to rate how nostalgic they feel about 18 people (e.g., “my family,” “my friends”), objects (e.g., “my childhood toys,” “TV shows, movies”), or concepts in their life (e.g., “someone I loved,” “not knowing sad or evil things;” 1 = *not at all nostalgic*, 5 = *very nostalgic*; $\alpha = .91$; $M = 3.11$, $SD = 0.81$). We excluded two additional items (“heroes/heroines,” “church/religion”), as prior research revealed very low means and restricted range in British populations (Wildschut et al., 2006).

The seven-item Southampton Nostalgia Scale (SNS; Barrett et al., 2010; Seehusen et al., 2013) assesses the extent to which

one is prone to frequent nostalgic engagement and values nostalgic experiences ($\alpha = .95$; $M = 4.25$, $SD = 1.54$). Each item has a 7-point response scale (e.g., “How often do you experience nostalgia?,” *very rarely—very frequently*; “How valuable is nostalgia for you?,” *not at all—very much*). The NI and SNS were strongly correlated, $r(425) = .63$, $p < .001$. Following prior research (Zhou et al., 2008), we standardized the two scales and combined them to index nostalgia proneness ($M = 0$, $SD = 0.91$). Separate analyses for each scale revealed results virtually identical to those reported.

Psychological wellbeing. Participants completed Ryff’s (1989) 84-item wellbeing scale (1 = *disagree strongly*, 5 = *agree strongly*) comprising six subscales: autonomy (e.g., “My decisions are not usually influenced by what everyone else is doing;” $\alpha = .87$), environmental mastery (e.g., “I am quite good at managing the many responsibilities of my daily life;” $\alpha = .90$), personal growth (e.g., “For me, life has been a continuous process of learning, changing, and growth;” $\alpha = .90$), positive relationships (e.g., “I enjoy personal and mutual conversations with family members or friends;” $\alpha = .91$), purpose in life (e.g., “I enjoy making plans for the future and working to make them a reality;” $\alpha = .90$), self-acceptance (e.g., “I like most aspects of my personality;” $\alpha = .92$). The subscales correlated moderately and signif-

icantly, $r_s = .23-.77$, mean $r = .53$ (for full correlation matrix see online supplemental materials, Table S1).

Results

Data analytic strategy. To test the hypothesis that nostalgia moderates the association between age and wellbeing, we conducted two sets of analyses. First, we examined each wellbeing dimension separately, to provide a fine-grained understanding and enable comparison with relevant literature. Specifically, we regressed each of the six wellbeing dimensions onto nostalgia proneness, age, age², gender, and education (in Step 1, standardizing continuous predictors) and the two-way interactions between nostalgia proneness and age, age², and gender (in Step 2). We anticipated a significant Nostalgia × Age interaction. We included age² to test quadratic effects. We also controlled for education level, because it correlated with nostalgia proneness, $r(434) = -.20, p < .001$, and with three wellbeing dimensions, r_s ranging from .02, $p = .72$, to $-.24, p < .001$, mean $r = .10$. Preliminary analyses indicated that the Age × Gender interaction was not significant in any model, and so we excluded this term.

Second, we tested whether the role of nostalgia differed across dimensions or (as hypothesized) exerted similar effects. We analyzed all wellbeing subscales simultaneously and examined if wellbeing dimension (as a within-subjects factor) moderated the effects of nostalgia. Given that there were missing data on several subscales, it was necessary to conduct multilevel analysis. For example, a Nostalgia × Age × Wellbeing Dimension ANCOVA would have excluded 35 participants with missing data, thus reducing the power and representativeness of results. Multilevel analysis is robust to missing data (Raudenbush & Bryk, 2002), allowing us to include all participants, and providing sufficient power to detect interactions involving within-subjects and between-subjects effects. The model tested the effects of wellbeing dimension (Level 1), nostalgia proneness, age, age², gender, education and the above-described two-way interactions (Level 2), and—crucially—the interaction between wellbeing dimension and each Level 2 effect to find out if the Nostalgia × Age effect differed across subscales. We grand-mean centered continuous predictors and coded wellbeing dimension as a categorical variable with positive relationships as the reference category. We used SPSS MIXED with restricted maximum likelihood estimation, and modeled all predictors as fixed effects, with the intercept and the

residual as the only random effects using a scaled identity covariance structure.

Finally, we examined levels of nostalgia proneness across the adult life span by regressing nostalgia proneness on age, gender, and education level. We entered age², given that we hypothesized highest nostalgia levels at both the youngest and oldest ends of the adult life span. Here, we included Age × Gender, as demographic effects were of primary interest.

Nostalgia moderates the pattern of wellbeing across the adult life span. We conducted regressions predicting each wellbeing dimension (see Table 2). In Step 1, age was positively associated with autonomy and environmental mastery, and was negatively associated with personal growth. Quadratic age effects for environmental mastery, purpose in life, and self-acceptance showed that wellbeing declined or remained stable from early to midadulthood, but recovered or increased in older adulthood. These average patterns are largely consistent with prior research, with the exception of purpose in life, which often decreases with age (Ryff, 1989; Ryff & Keyes, 1995).

Crucially, in Step 2, nostalgia proneness significantly moderated the associations between age and both environmental mastery ($sr = .10$) and positive relationships ($sr = .13$). The equivalent interaction for the remaining subscales did not reach statistical significance but displayed a similar pattern. Figure 1 depicts the interaction for all six wellbeing dimensions for ease of comparison. Across dimensions, age was more positively (or, for personal growth, less negatively) related to wellbeing for high-nostalgics than for low-nostalgics. For each significant Nostalgia × Age interaction, we used the Johnson & Neyman (1936) technique (Hayes & Matthes, 2009) to identify the region(s) of nostalgia proneness for which the association between age and wellbeing was statistically significant ($p < .05$).

Environmental mastery increased more strongly with age for high-nostalgics than for low-nostalgics (Figure 1, panel b). The Johnson-Neyman region of significance starts at a nostalgia proneness score of $Z = -0.82$. This indicates that age was significantly and positively related to mastery for participants who scored higher than $Z = -0.82$ on nostalgia proneness. Age was unrelated to mastery for participants lower on nostalgia proneness.

Positive relationships also increased more strongly with age for high-nostalgics than low-nostalgics (Figure 1, panel d). Age was significantly and positively related to relational wellbeing for

Table 2
Study 1: Dimensions of Psychological Wellbeing as a Function of Nostalgia Proneness and Demographic Variables

Dependent variable	Step 1					Step 2				Model R ²
	Nostalgia	Age	Age ²	Gender	Education	Nostalgia × Age	95% CI	Nostalgia × Age ²	Nostalgia × Gender	
Autonomy	-.08	.12*	.05	-.10*	.04	.04	[-.029, .079]	-.07	.03	.04*
Environmental mastery	-.11*	.25***	.09*	.04	.06	.12**	[.018, .126]	-.12	-.03	.10***
Personal growth	-.05	-.17***	.01	.02	.19***	.03	[-.034, .065]	-.02	-.01	.09***
Positive relationships	.04	.02	.06	.18***	.02	.10*	[.003, .120]	-.13	-.01	.05**
Purpose in life	-.02	.01	.11*	.01	.21***	.07	[-.013, .102]	-.05	-.06	.07***
Self-acceptance	-.08	.10*	.10*	-.02	.12*	.07	[-.016, .107]	-.12	-.02	.05**

Note. Values are standardized beta coefficients. 95% confidence intervals (CI) refer to the unstandardized B coefficient and are presented only for the focal Nostalgia × Age interaction to save space. Coefficients for the main effects did not alter in significance in Step 2. R² reflects the amount of variance explained by the final model (i.e., at Step 2 with all predictors).

* $p < .05$. ** $p < .01$. *** $p < .001$.

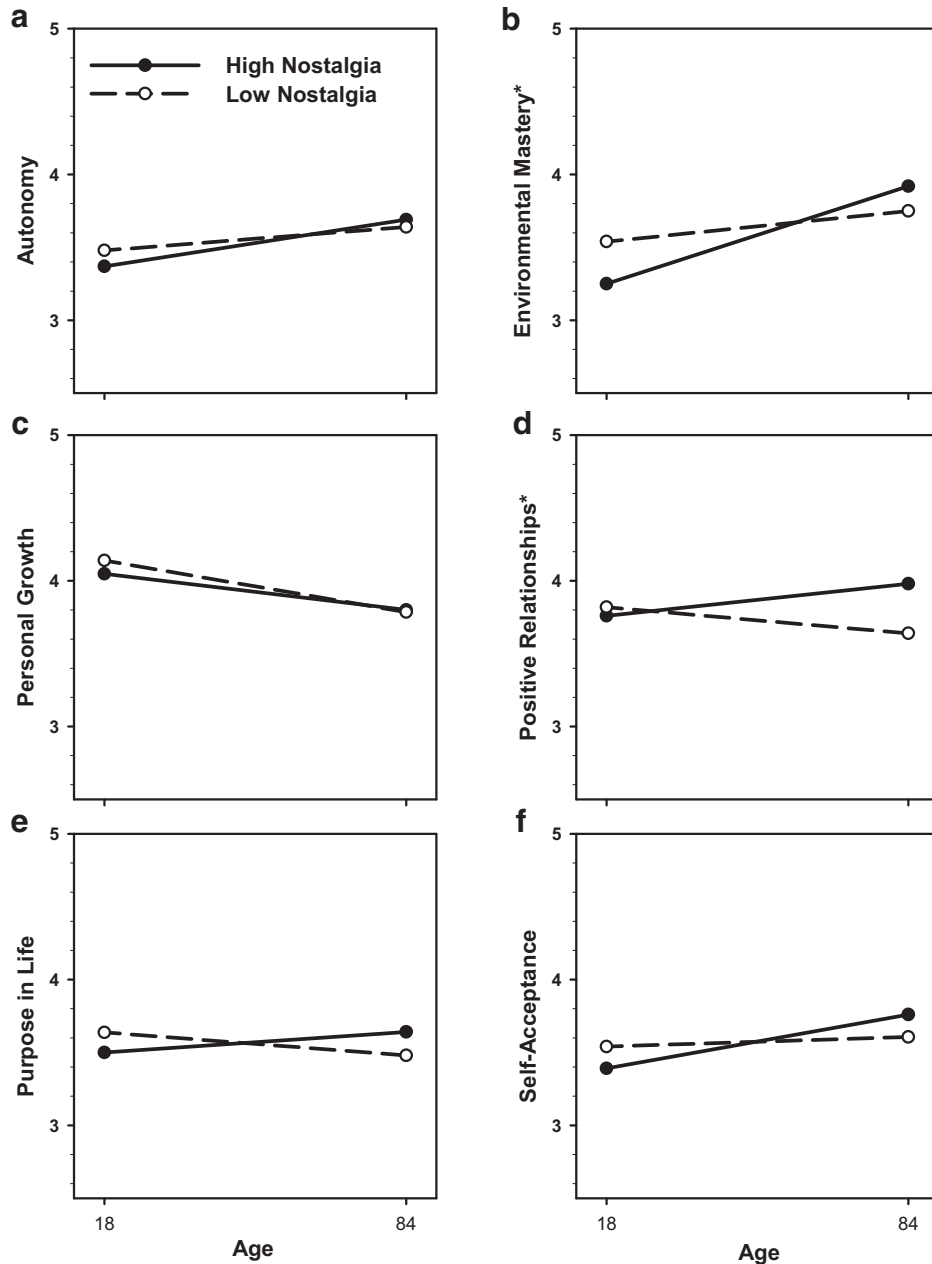


Figure 1. Nostalgia proneness moderating the association between age and dimensions of psychological wellbeing in Study 1. Slopes for age are plotted at values of nostalgia proneness 1 *SD* above and below the mean. * indicates that the Nostalgia \times Age interaction was individually significant for that dimension (although the magnitude of the interaction did not differ significantly across dimensions).

individuals who scored higher than $Z = 2.03$ on nostalgia proneness, and was unrelated to relational wellbeing for individuals lower than $Z = 2.03$ on nostalgia proneness.

Next, we ran the above-described multilevel model to find out if effects differed across wellbeing dimensions (see Table 3). The overall Nostalgia \times Age interaction was again significant. Psychological wellbeing increased more strongly with age for high-nostalgics than low-nostalgics (Figure 2, left panel). Age was significantly and positively related to wellbeing only for individ-

uals higher than $Z = 0.33$ on nostalgia proneness. Cross-level interactions (Table 3, right hand column) indicated that the main effects of age, age², and gender differed significantly across subscales (reflecting that some wellbeing dimensions increased with age on average whereas others decreased, as illustrated in Figure 1). Crucially, however, none of the effects involving nostalgia differed across subscales. Thus, the magnitude of the focal Nostalgia \times Age interaction pattern does not vary significantly across the six wellbeing dimensions. Because of this, it is appropriate to

Table 3
Study 1: Multilevel Analysis Testing the Generality of the Nostalgia × Age Effect Across Wellbeing Dimensions

Variable	Level 1 effect		Moderating effect of wellbeing dimension	
	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>
Intercept (i.e., mean wellbeing level)	12904.14	<.001***	32.03	<.001***
Nostalgia proneness	0.04	.85	1.67	.14
Age	1.80	.18	16.35	<.001***
Age ²	4.10	.04*	1.38	.23
Gender	0.71	.40	8.53	<.001***
Education	8.69	.003**	4.22	.001***
Nostalgia × Age	4.65	.03*	1.32	.25
Nostalgia × Age ²	2.18	.14	1.17	.32
Nostalgia × Gender	0.38	.54	0.90	.48

Note. Variance estimates were significant for both the intercept random effect ($b = .18$, Wald $Z = 12.72$, $p < .001$) and the residual ($b = .16$, Wald $Z = 32.37$, $p < .001$). Degrees of freedom for individual effects vary due to missing data on some Level 1 variables.

* $p < .05$. ** $p < .01$. *** $p < .001$.

interpret the moderating role of nostalgia as generalizable across psychological wellbeing dimensions and to consider differences in individual significance levels only with caution.

Levels of nostalgia across the adult life span. We regressed nostalgia proneness on the demographic variables. Nostalgia proneness was higher among women ($M = 0.10$, $SD = 0.88$) than men ($M = -0.14$, $SD = 0.91$), $\beta = .14$, $t = 2.94$, $p = .004$, $sr = .14$, and among less-educated participants, $\beta = -.21$, $t = 4.56$, $p < .001$, $sr = -.21$. Although there was no linear age effect, $\beta = -.03$, $t = 0.66$, $p = .56$, there was a small yet statistically significant quadratic age effect, $\beta = .10$, $t = 2.06$, $p = .04$, $sr = .10$ (see Figure 3). Nostalgia proneness was higher in younger and older adulthood, with a slight dip in midadulthood. The Age × Gender interaction was not significant, $\beta = -.07$, $t = 1.56$, $p = .12$.

To enable comparison with Wildschut, Sedikides, Arndt, and Routledge's (2006) finding that 79% of undergraduates experience nostalgia at least once a week, we examined responses to the item: "Specifically, how often do you bring to mind nostalgic experiences?" We divided the sample into five approximately equal age categories (see Table 4). Over half of participants in each category reported experiencing nostalgia at least once a week. Consistent with the curvilinear pattern above, participants aged under 30 and over 75 reported most frequent nostalgia. Despite the gender difference, a similar proportion of women (60.76%) and men (61.70%) reported experiencing nostalgia at least once a week. Nostalgia proneness is prevalent across the adult life span and across genders, but especially high in younger and older adulthood.

Discussion

Results support the hypothesis that maintenance or increase of psychological wellbeing with age may be contingent upon nostalgia proneness. High-nostalgics evinced a positive link between age

and wellbeing, echoing typical trajectories (Charles & Carstensen, 2007; Ryff & Keyes, 1995), whereas low-nostalgics showed no link—or even a negative link—between age and wellbeing. Of the six wellbeing dimensions, the Nostalgia × Age interaction reached statistical significance for two, positive relationships and environmental mastery. We will revisit specific subscales in the General Discussion. However, the key interaction was significant for the overall score, and its magnitude did not differ significantly across subscales, suggesting that nostalgia plays a consistent role across dimensions of wellbeing. This generality aligns with evidence that the six wellbeing dimensions reflect a common higher-order factor (Keyes et al., 2002; Wu et al., 2010). Thus, regular recruitment of nostalgic memories may be a vital mechanism for fostering positive psychological functioning with age, in accord with the proposal that nostalgia promotes successful aging by helping individuals to achieve their socioemotional selectivity goals. Given its cross-sectional design, this study cannot confirm the causal direction of effects; it is also plausible, then, that older participants higher in wellbeing were subsequently more likely to experience nostalgia. This possibility may explain why, at younger ages, the association between nostalgia proneness and wellbeing appeared null or slightly negative (see Figure 1). That is, evidence shows consistently that people spontaneously recruit nostalgia when under psychological threat (Sedikides, Wildschut, Routledge, Arndt, Hepper, et al., 2015). The observed negative relation may thus reflect a tendency for younger adults with lower (vs. higher) wellbeing to rely more on nostalgia. Hence, in our remaining studies we sought to establish whether nostalgia in socioemotional selectivity contexts leads to greater wellbeing.

Additionally, results confirmed that nostalgia is prevalent across the adult life span, with especially high levels in younger and older adulthood, reinforcing the claim that nostalgia is near-universal (Boym, 2001; Hepper et al., 2014). The curvilinear trend is compatible with evidence that reminiscence peaks in both younger and older age (Hyland & Ackerman, 1988; Merriam & Cross, 1982), and aligns with findings that nostalgia is particularly valued in times of transition (Sedikides, Wildschut, Routledge, & Arndt, 2015; Zou et al., 2018). Results further suggested that women are more prone to nostalgia than men. Past findings have been mixed, with some supporting women's higher nostalgia (Best & Nelson, 1985), but most showing no difference (Batcho, 1995; Routledge et al., 2008, 2011; Wildschut et al., 2006; Zhou et al., 2008). It is possible that, in this large sample, we detected a true tendency for women to use and value nostalgia more than men, but future research should reexamine this issue. Finally, nostalgia proneness was negatively associated with education level, an unforeseen (albeit peripheral) finding also in need of replication.

Studies 2–4: Experimentally Manipulated Limited Time

Study 1 was cross-sectional, leaving causality unclear. Further, although we were interested in the effects of age per se, the findings do not identify the underlying mechanism. SST and past evidence point to perception of limited time as the active ingredient in age-related socioemotional shifts (Carstensen, 2006). For example, in cross-sectional research, self-reported time percep-

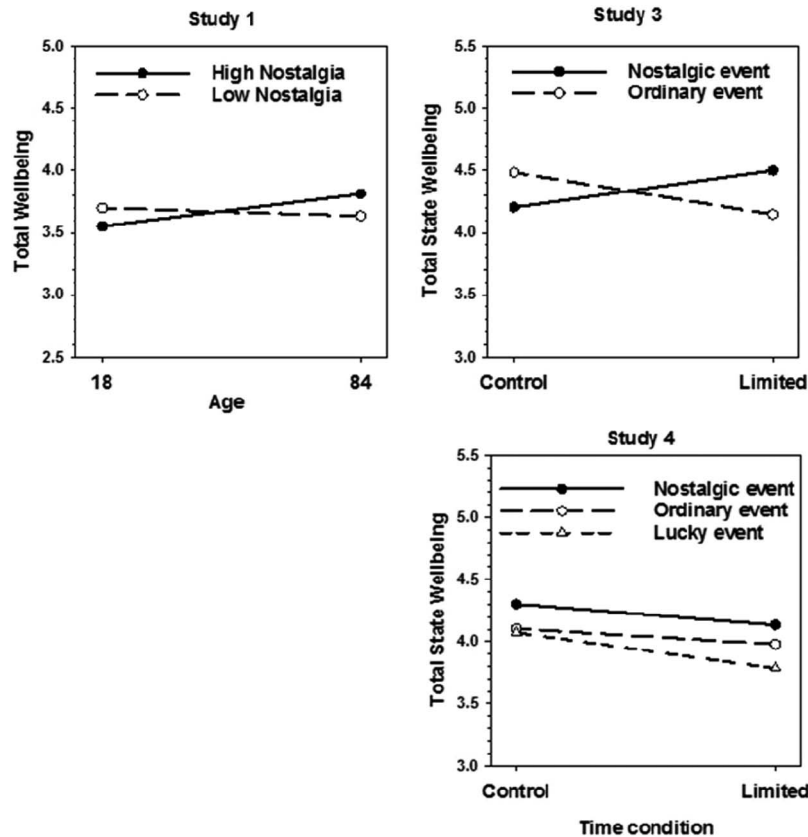


Figure 2. Patterns of overall wellbeing by age and nostalgia (Study 1) and by time and memory condition (Studies 3 and 4). Wellbeing was measured on a 1–5 scale in Study 1 and on a 1–6 scale in Studies 3–4. Values are estimated from regression equations.

tive predicts the extent to which individuals (regardless of age) prioritize emotionally meaningful goals over expansive goals (Lang & Carstensen, 2002). SST studies have commonly isolated the role of time perspective by observing the socioemotional strategies adopted by younger adults when they face limited time horizons. This is a useful approach, because younger (vs. older) adults have a relatively expansive baseline time perspective, allowing such situations to exert an influence. Some studies have capitalized on perceived endings such as graduation, personal or national health threats, and sociopolitical changes. Young adults facing limited time before such endings resemble older adults in their socioemotional choices and patterns (Fung & Carstensen, 2006; Pruzan & Isaacowitz, 2006; Sullivan-Singh, Stanton, & Low, 2015). Other studies have manipulated time perspective experimentally, by asking young adults to imagine that they have limited time before a relocation or that the world will soon end. Young adults in such conditions again mimic older adults' choices and biases (Cypryńska et al., 2014; Fredrickson & Carstensen, 1990; Fung & Carstensen, 2004).

In our subsequent studies, we followed the latter approach in order to test experimentally nostalgia's capacity to shield wellbeing from limited time horizons in young adults. Focusing on state (rather than trait) nostalgia allows for inference of causality, following past investigations that obtained convergent patterns for trait and state nostalgia (e.g., Routledge et al., 2008). Note that

attempting to induce limited time perspective in older adults would result in truncated effects, because such a sample would have a more time-limited baseline. Past research indicates that state nostalgia is prompted by threat similarly in older and younger adults (Stephan et al., 2014). Likewise, the psychological benefits of inducing state nostalgia are comparable in older adult samples (Abeyta & Routledge, 2016; Hepper et al., 2012) and unmoderated by age in samples with wide age-ranges (Cheung et al., 2013). Hence, our approach of testing analog effects of limited time perspective in young adults is likely to mirror how state nostalgia functions for older adults in this context as well.

Specifically, we instructed undergraduates to perceive their time at university as limited (vs. a neutral or expansive control condition). This manipulation is conceptually similar to prior experiments with young samples (Fung et al., 1999) and targets a previously studied social ending context (Pruzan & Isaacowitz, 2006). Although these prior experiments did not assess wellbeing outcomes, the literature indicates that limited time perspective relates negatively to psychological wellbeing (Demiray & Bluck, 2014; Kotter-Grühn & Smith, 2011; Yeung et al., 2007). Accordingly, we expected manipulated limited time horizons to reduce state wellbeing. We examined whether, in the face of this limited time perspective, individuals report increased state nostalgia (Study 2), then tested whether induced state nostalgia restores psychological wellbeing (Studies 3–4).

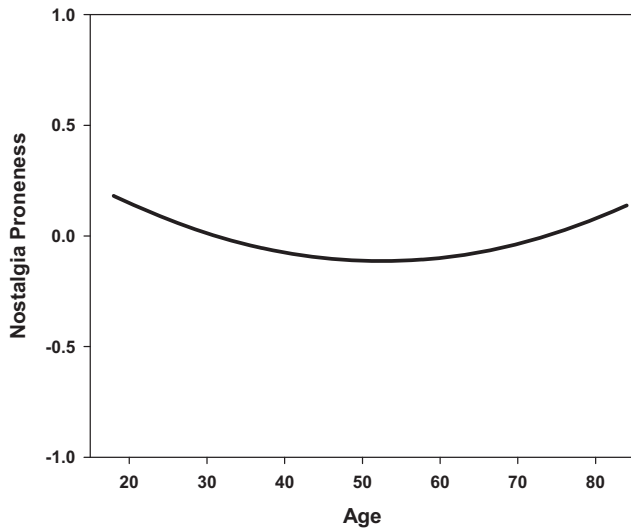


Figure 3. Quadratic association of age with levels of nostalgia proneness across the adult life span in Study 1, controlling for gender and education level. Nostalgia proneness is a composite of standardized scores on the Batcho (1995) Nostalgia Inventory and Southampton Nostalgia Scale (Barrett et al., 2010; Seehusen et al., 2013).

Study 2

If nostalgia serves a socioemotional selectivity role, it should fulfill the need for emotional meaning and social connectedness that is activated by limited time horizons. The first implication is that individuals would turn naturally to nostalgic memories when they experience such threat. Such a pattern would fit with accumulated evidence that nostalgia is prompted by inductions of threats such as loneliness (Zhou et al., 2008), existential doubt (Routledge et al., 2011), and discontinuity (Sedikides, Wildschut, Routledge, & Arndt, 2015). Study 2 aimed to test this hypothesis. Specifically, students reported state nostalgia after focusing on their graduation from the perspective of (a) the limited time remaining at university, and (b) beginning a new life chapter (i.e., expansive horizons), in a within-subjects design. The use of expansive time perspective as a control condition is standard in the SST literature (Barber, Opitz, Martins, Sakaki, & Mather, 2016; Fung & Carstensen, 2004; Fung et al., 1999). We hypothesized

that state nostalgia would be higher in the limited-time (vs. expansive-time) condition.

Method

Participants and design. Participants were 35 University of Southampton undergraduates (21 women, 14 men) aged 18–25 years ($M_{age} = 21.09, SD_{age} = 1.38$). They took part in classrooms and campus workspaces. We instructed participants to imagine both leaving university for the final time (limited-time condition) and starting a new chapter in their life (expansive-time condition), counterbalanced in a within-subject design. We assessed state nostalgia after each imagined event. Power calculations (G*Power 3.1) indicated a required N of 34 for achieving 80% power to detect a medium effect size ($d = 0.50$; two-tailed $\alpha = .05$). We based this effect-size estimate on prior experiments in which induced threat increased state nostalgia (Routledge et al., 2011; Sedikides, Wildschut, Routledge, & Arndt, 2015; Van Tilburg, Igou, & Sedikides, 2013; $d_s = .52-.60$). We achieved the target sample size.

Materials and procedure. We administered the experiment in paper-and-pencil format. In the limited-time condition, participants read the following instructions:

When students begin their third year at university, they often notice how rapidly time is passing. It is at this moment that the majority of students realize that their time at university is extremely limited and that their student lifestyle will not last for much longer. They often find that their remaining time left at university passes very quickly.

We then instructed them to spend 5 min imagining themselves leaving university for the final time, and to list five aspects of their university life that they will no longer be able to experience after having finished university.

In the expansive-time condition, instructions were:

When students begin their third year at university, they often notice how rapidly time is passing. It is at this moment that the majority of students realize that they will soon graduate and start a new chapter in their life. Students begin to make plans for this exciting new period in the years ahead.

We subsequently instructed them to spend 5 min imagining the start of this new chapter in their life, and to list five aspects of their future life that they hope will happen in the years ahead. After

Table 4

Study 1: Frequency of Nostalgia by Age Category

Age	N	Percent endorsing each frequency option					Summary		
		At least once a day	3–4 times a week	Approx. twice a week	Approx. once a week	Once or twice a month	Less often ^a	% at least once a week	Median
18–30	92	16.3	22.8	14.1	20.7	10.9	15.2	73.9	Twice a week
31–45	88	17.0	11.4	13.6	14.8	22.7	20.5	56.8	Once a week
46–60	104	10.6	15.4	14.4	18.3	19.2	22.1	58.7	Once a week
61–75	91	15.4	11.0	13.2	16.5	24.2	19.8	56.0	Once a week
76–91	51	17.6	21.6	11.8	9.8	29.4	9.8	60.8	Twice a week
Total	426	15.0	16.0	13.6	16.7	20.4	18.3	61.3	Once a week

Note. Seventeen participants did not complete this item from the Southampton Nostalgia Scale.

^a This includes the options once every couple of months and once or twice a year.

imagining each event, participants completed the following measures.

Manipulation check. Two items assessed perceptions of limited time specifically with regard to university: “Right now, I feel that my time at university is running out” and “Right now, I feel my time remaining at university is limited.” Two items also assessed perceived scarcity of time in general: “Right now, I feel time is a scarce resource” and “Right now, I feel time is plentiful” (reversed). Items were rated on a 6-point scale (1 = *strongly disagree*, 6 = *strongly agree*). A principal components analysis revealed that the four items loaded on single factor, which accounted for 58% of the variance. Accordingly, we averaged the four items to form a single index of limited time ($\alpha_{\text{limited}} = .73$; $\alpha_{\text{expansive}} = .75$).

Nostalgia. We assessed state nostalgia with three items (Wildschut et al., 2006; 1 = *strongly disagree*, 6 = *strongly agree*): “Right now, I am feeling quite nostalgic,” “Right now, I am having nostalgic feelings,” and “I feel nostalgic at the moment” ($\alpha_{\text{limited}} = .90$; $\alpha_{\text{expansive}} = .98$).

Results and Discussion

Participants perceived time as more limited in the limited-time condition ($M = 4.89$, $SD = 0.83$) than in the expansive-time condition ($M = 4.34$, $SD = 1.06$), $F(1, 34) = 17.79$, $p < .001$, $\eta^2 = .34$. The limited-time manipulation was successful. As hypothesized, participants reported higher levels of nostalgia in the limited-time condition ($M = 4.44$, $SD = 1.14$) than in the expansive-time condition ($M = 3.58$, $SD = 1.21$), $F(1, 34) = 20.36$, $p < .001$, $\eta^2 = .37$. Imagining leaving university for the last time (compared with starting a new chapter in one’s life) increased nostalgia. As an additional test, we examined whether participants felt more nostalgic when they *personally* perceived their time to be more limited (i.e., individual manipulation check ratings). We Fisher-Z transformed the correlations between perceived limited time and state nostalgia in each condition, averaged them, and transformed back, yielding a positive and significant overall correlation, $r(33) = .45$, $p = .007$. Thus, inducing a sense of limited (vs. expansive) time prompted participants to turn to nostalgia.

This result might partly reflect, not only the hypothesized effect of limited time increasing nostalgia, but also a greater future focus in the expansive time condition decreasing nostalgia. We note that a future focus does not necessarily decrease nostalgia. For example, people experience heightened nostalgia when thinking about future uncertainty and mortality (Juhl, Routledge, Arndt, Sedikides, & Wildschut, 2010), and often experience *anticipated nostalgia* when thinking about future meaningful events or losses (Batcho & Shikh, 2016; Cheung et al., 2019). Moreover, nostalgia co-occurs with self-reported, behavioral, and neurological indicators of approach orientation (Bocincova, Nelson, Johnson, & Routledge, 2019; Stephan et al., 2014), with future-oriented optimism (Cheung et al., 2013), and future-focused pursuit of personal, work-related, and social goals (Abeyta, Routledge, et al., 2015; Sedikides et al., 2018; Van Dijke et al., 2019; see Sedikides & Wildschut, 2019a, for a review). Nevertheless, in our subsequent studies we adopted a neutral (rather than expansive) control condition to address this potential limitation and facilitate clearer interpretation of effects.

Study 3

Having established that young adults naturally turn to nostalgia when experiencing limited time perspective, we next addressed the proposal that nostalgia buffers psychological wellbeing in such contexts. In Study 3, we again manipulated limited time in undergraduates. This time, we used a between-subjects design and included a neutral (rather than expansive) control condition, to ensure that effects were driven by the threat of limited time rather than any effects of expansive time. We then induced state nostalgia by instructing participants to recall a nostalgic (vs. ordinary) autobiographical memory, and assessed wellbeing.

We hypothesized that induced nostalgia moderates the effect of time perspective on the six wellbeing dimensions (i.e., autonomy, environmental mastery, personal growth, positive relationships, purpose in life, self-acceptance). That is, whereas limited time perspective (vs. control) decreases wellbeing, recalling a nostalgic (vs. ordinary) memory will buffer wellbeing. This would replicate conceptually the Study 1 results and identify a mechanism that may underlie them. As in Study 1, we anticipated the pattern to be similar across subscales, but examined them individually for a more in-depth understanding. We again included gender in our analyses, although we did not expect it to moderate the results.

Method

Participants and design. Participants were 93 University of Southampton undergraduates (71 women, 19 men, three undisclosed) aged 18–33 years ($M_{\text{age}} = 19.32$, $SD_{\text{age}} = 2.40$). They took part in a classroom setting. Power calculations (G*Power 3.1) indicated a required N of 126 for achieving 80% power to detect an interaction of medium effect size ($\eta^2 = .06$; two-tailed $\alpha = .05$). We invited all students in the class to participate but did not quite achieve the target, yielding 80% power to detect a medium-large effect ($\eta^2 = .08$). We randomly assigned them to the conditions of a 2 (time perspective: limited-time, control) \times 2 (nostalgia: nostalgic-memory, ordinary-memory) between-subjects design. Participants completed materials in the following order.

Materials and procedure.

Time perspective manipulation. Participants in the *limited-time* condition read the same passage as in Study 2, adapted to open with “When students reach the second semester of the academic year . . .” to reflect the timing of the session, and added that “Many students begin to think about graduation and what they will do after their degree.” Participants then spent a few minutes imagining their graduation, and listed five ways in which they expected their life to change after leaving university. Participants in the *control* condition proceeded directly to the nostalgia manipulation.

Nostalgia manipulation. Participants completed the Event Reflection Task (Sedikides, Wildschut, Routledge, Arndt, Hepper et al., 2015), a validated nostalgia induction (Hepper et al., 2012; Wildschut et al., 2006). Participants in the nostalgic-memory condition were instructed to recall “a nostalgic event in your life . . . a past event that makes you feel most nostalgic.” Participants in the ordinary-memory condition were instructed to recall an ordinary past event from their life. All participants summarized their event with four keywords and spent a few minutes focusing on the relevant memory.

Psychological wellbeing. Participants completed Ryff's (1989) wellbeing scale (1 = *strongly disagree*, 6 = *strongly agree*): autonomy ($\alpha = .80$), environmental mastery ($\alpha = .81$), personal growth ($\alpha = .73$), positive relationships ($\alpha = .63$), purpose in life ($\alpha = .76$), self-acceptance ($\alpha = .80$). The subscales correlated significantly, $r_s(91) = .21-.67$, mean $r = .43$, except for autonomy and positive relationships, $r(91) = .05$, $p = .61$ (Table S1).

Manipulation checks. To assess time perspective, participants rated the item: "My remaining time at university is . . ." (1 = *limited*, 7 = *expansive*). To assess state nostalgia, participants rated two items ("Right now, I am having nostalgic feelings," "I feel nostalgic at the moment;") 1 = *strongly disagree*, 7 = *strongly agree*; $\alpha = .96$; Wildschut et al., 2006).

Results and Discussion

Both manipulation checks were successful (see Table 5). As intended, participants reported a more limited time perspective in the limited-time than control condition ($\eta^2 = .366$). Further, participants reported higher state nostalgia in the nostalgic-memory than ordinary-memory condition ($\eta^2 = .114$).

Data analytic strategy. To test the hypothesis that nostalgia buffers the effect of limited time on wellbeing, we followed the same analytic strategy as in Study 1. First, we examined each wellbeing dimension separately in a series of 2 (nostalgia: nostalgic-memory, ordinary-memory) \times 2 (time perspective: limited-time, control) \times 2 (gender: male, female) analyses of variance (ANOVAs). Second, we tested whether the key Nostalgia \times Time Perspective interaction differed significantly across dimensions. There were no missing data, allowing us to use a 2 (nostalgia) \times 2 (time perspective) \times 2 (gender) \times 6 (wellbeing subscale) ANOVA with repeated measures on the last factor. An equivalent analysis using multilevel modeling (as in Study 1, where missing data required this approach) yielded identical results.

Nostalgia moderates the effect of limited time on wellbeing. First, we conducted individual ANOVAs on each dimension of

wellbeing (see Table 5). There were gender differences only in autonomy ($M_{\text{female}} = 3.91$, $SD_{\text{female}} = 0.75$; $M_{\text{male}} = 4.35$, $SD_{\text{male}} = 0.59$) and positive relationships ($M_{\text{female}} = 4.75$, $SD_{\text{female}} = 0.64$; $M_{\text{male}} = 4.29$, $SD_{\text{male}} = 0.78$). No main effects of time perspective or nostalgia were significant. Crucially, the Nostalgia \times Time Perspective interaction was significant for environmental mastery, personal growth, purpose in life, and self-acceptance. The pattern of means was similar for the other two subscales (see Table 5 for descriptive statistics).

We probed the four significant Nostalgia \times Time Perspective interactions via simple-effects tests. As expected, the limited-time (vs. control) condition decreased wellbeing, but this effect was buffered by recalling a nostalgic memory. Specifically, for those who recalled an *ordinary* memory, the limited-time (vs. control) condition reduced wellbeing (marginally or significantly) for personal growth, $F(1, 82) = 3.93$, $p = .051$, and purpose in life, $F(1, 82) = 5.76$, $p = .019$, but not for environmental mastery, $F(1, 82) = 0.83$, $p = .365$, or self-acceptance, $F(1, 82) = 1.32$, $p = .255$. However, for those who recalled a *nostalgic* memory, the pattern was reversed, such that wellbeing was higher in the limited-time (vs. control) condition (significantly or marginally) for environmental mastery, $F(1, 82) = 4.17$, $p = .044$; purpose in life, $F(1, 82) = 5.88$, $p = .018$; and self-acceptance, $F(1, 82) = 3.51$, $p = .065$; but not for personal growth, $F(1, 82) = 0.87$, $p = .355$. The simple effects of nostalgia (vs. ordinary) memory for purpose in life, personal growth, and self-acceptance were more positive in the limited condition, $F_s(1, 82) = 7.06, 11.45, 2.88$, $p_s = .009, .001, .094$, compared with the control condition, $F_s(1, 82) = 0.13, 2.48, 1.95$, $p_s = .723, .119, .167$; for environmental mastery the simple effect was less negative in the limited condition, $F(1, 82) = 0.47$, $p = .494$, than the control condition, $F(1, 82) = 4.98$, $p = .028$. Nostalgia generally enabled participants to maintain or even enhance wellbeing despite limited time horizons.

Next, we tested whether the interaction effect varied across wellbeing subscales using a mixed ANOVA. The overall Nostalgia \times Time Perspective interaction was significant, $F(1, 82) = 6.29$, $p = .014$, $\eta^2 = .071$ (see Figure 2). Once again, the

Table 5
Study 3: Manipulation Checks and Wellbeing Dimensions as a Function of Time Perspective (Control vs. Limited) and Nostalgia (Ordinary vs. Nostalgic Memory Recall)

Dependent variable	Ordinary memory		Nostalgic memory		F(1, 82)			F(1, 82)	η^2
	Control	Limited-time	Control	Limited-time	Time perspective	Nostalgia	Gender		
Manipulation checks									
Time perspective	4.74 (1.68)	2.78 (1.31)	5.08 (1.41)	2.48 (1.12)	47.31***	0.18	7.51**	1.09	.013
State nostalgia	3.76 (1.83)	4.50 (1.48)	5.27 (1.16)	4.96 (1.14)	0.11	10.55**	1.05	2.29	.027
Wellbeing									
Autonomy	4.22 (0.76)	3.87 (0.65)	4.02 (0.77)	3.92 (0.76)	1.92	0.15	5.92*	0.14	.002
Environmental mastery	4.46 (0.78)	4.17 (0.58)	3.91 (0.66)	4.20 (0.83)	0.88	1.54	2.05	4.57*	.053
Personal growth	4.72 (0.71)	4.42 (0.52)	4.63 (0.49)	4.84 (0.49)	0.37	2.15	0.55	4.02*	.047
Positive relationships	4.81 (0.55)	4.51 (0.81)	4.69 (0.56)	4.63 (0.78)	0.45	0.01	6.43*	0.46	.006
Purpose in life	4.46 (0.71)	4.11 (0.74)	4.20 (0.63)	4.58 (0.58)	0.06	1.04	2.25	11.59**	.124
Self-acceptance	4.49 (0.71)	4.21 (0.67)	3.97 (0.67)	4.42 (0.88)	0.43	0.00	0.16	4.69*	.054

Note. Values in parentheses are SDs. F-tests are from 2 (nostalgia) \times 2 (time perspective) \times 2 (gender) ANOVAs. No interactions involving gender were significant for any dependent variable, $F_s(1,82) < 3.26$, $p_s > .074$, $\eta^2 < .038$.
* $p < .05$. ** $p < .01$. *** $p < .001$.

limited-time (vs. control) condition reduced wellbeing for those who recalled an ordinary memory, $F(1, 82) = 4.13, p = .045$, but not for those who recalled a nostalgic memory, $F(1, 82) = 2.42, p = .124$. Similarly, the simple effect of nostalgia was positive in the limited condition, $F(1, 82) = 4.57, p = .035$, but not in the control condition, $F(1, 82) = 2.16, p = .146$.

The effect of gender was significantly moderated by subscale, $F(3.84, 314.63) = 5.41, p < .001, \eta^2 = .062$ (Greenhouse-Geisser corrected df), reflecting gender differences specific to autonomy and positive relationships (see Table 5). Importantly, none of the other effects, including the focal Nostalgia \times Time Perspective interaction, were moderated by subscale, $F_s(3.84, 314.63) < 1.88, p_s > .117, \eta^2 < .023$. The magnitude of the interaction pattern did not vary significantly across the six subscales. As in Study 1, we interpret the moderation effect as consistent across wellbeing dimensions and consider differences in statistical significance between subscales with caution.

In summary, results supported the hypothesis that nostalgia buffers psychological wellbeing in the face of limited time horizons. Limited time perspective (vs. control) reduced wellbeing when participants recalled an ordinary memory (in line with past correlational and longitudinal research that controlled for age; Demiray & Bluck, 2014; Kotter-Grühn & Smith, 2011; Yeung et al., 2007). However, wellbeing was maintained or even enhanced when participants recalled a nostalgic memory and therefore had access to psychological resources to buffer this threat. This pattern, which did not differ significantly across wellbeing dimensions, replicates conceptually Study 1 and prior findings that effects of nostalgia are greater under threat (Routledge et al., 2008; Van Dijke et al., 2019; Wildschut et al., 2011).

Study 4

Results of Study 3 were generally consistent with the hypothesis that nostalgia buffers threats to psychological wellbeing activated by limited time horizons. However, the memory control condition entailed recalling an ordinary autobiographical memory. Although most ordinary memories were pleasant, the two conditions may have differed not only on state nostalgia but also on positivity. Moreover, the Study 3 analyses may have been somewhat underpowered. Thus, in Study 4 we aimed to replicate the buffering effect of nostalgia in a larger sample and test whether it was explained by positive affect. We did so by both (a) implementing an additional control condition and (b) measuring positive affect before measuring wellbeing. Specifically, we manipulated limited time in the same way as Study 3, and then instructed participants to recall either a nostalgic memory, an ordinary memory, or a positive lucky memory. Prior research showed that lucky memories, compared to nostalgic memories, induce equivalent positive affect but less nostalgia (Sedikides et al., 2016). We hypothesized that recalling a nostalgic memory would buffer wellbeing compared with both control conditions, whereas recalling a lucky (compared to ordinary) memory would not buffer wellbeing. We further hypothesized that the buffering effect of nostalgia would remain significant when controlling for positive affect. As before, we examined subscales individually but tested for overall effects, and included gender in our analyses.

Method

Participants, design, and procedure. Participants were 376 University of Southampton and University of Surrey undergraduates (327 women, 47 men, two other) aged between 18 and 55 years ($M_{\text{age}} = 20.24, SD_{\text{age}} = 2.40$). Power calculations (G*Power 3.1) estimated a required N of 106 to detect the interaction effect observed in Study 3 ($\eta^2 = .071, 80\%$ power), but we expected effects to be smaller in Study 4 given the conservative, lucky-memory control condition, and so we recruited as many participants as we could in the academic year. We randomly assigned participants to the conditions of a 2 (time perspective: limited-time, control) \times 3 (nostalgia: nostalgic-memory, lucky-memory, ordinary-memory) between-subjects design. Participants took part either in the laboratory or online, and completed materials in the following order (materials were identical in both cases).

Materials.

Time perspective manipulation. Participants in the limited-time condition read the same passage as in Study 3, adapted to open with “While students work to complete their degree . . . ,” given that this study was completed across cohorts and semesters. Participants then spent a few minutes imagining leaving university, listed three aspects of student life that they would no longer experience afterward, and marked the point at which they would finish university on a continuous line anchored with “now” and “the year 2050.” Participants in the control condition proceeded directly to the nostalgia manipulation.

Nostalgia manipulation. Participants completed the Event Reflection Task as in Study 3. The nostalgic-memory and ordinary-memory conditions were identical to Study 3. Participants in the lucky-memory condition were instructed to recall a lucky past event from their life. All participants listed four keywords and spent a few minutes focusing on the relevant memory.

Positive affect. Participants indicated their transient affect as follows: “Right now, I feel . . . happy;” “. . . excited;” “. . . enthusiastic;” “. . . calm;” “. . . relaxed” (1 = *not at all*, 7 = *extremely*; $\alpha = .84$).

Psychological wellbeing. Participants completed Ryff’s (1989) wellbeing scale, with the stem “Right now, I feel . . .” (1 = *strongly disagree*, 6 = *strongly agree*): autonomy ($\alpha = .80$), environmental mastery ($\alpha = .80$), personal growth ($\alpha = .78$), positive relationships ($\alpha = .78$), purpose in life ($\alpha = .76$), self-acceptance ($\alpha = .88$). All subscales correlated significantly, $r_s(374) = .28-.79$, mean $r = .53$ (Table S1).

Manipulation checks. To assess time perspective, participants responded to the same item as Study 3 directly after the time manipulation. To assess state nostalgia, participants responded to three items at the end of the study (“When I recalled my past memory . . . I was feeling quite nostalgic;” “. . . I had nostalgic feelings;” “. . . I felt nostalgic;” 1 = *strongly disagree*, 6 = *strongly agree*; $\alpha = .97$).

Results

Both manipulations were successful. As intended, participants reported a more limited time perspective in the limited-time condition ($M = 2.69, SD = 1.19$) than the control condition ($M = 3.69, SD = 1.51$), $t(374) = 7.08, p < .001, d = 0.74$. Further, as intended, participants reported higher state nostalgia in the nostalgic-memory than both the lucky-memory and ordinary-

memory conditions, and in the lucky- compared with the ordinary-memory condition (shown by regression coefficients in Table 6). They also reported higher state nostalgia in the limited-time compared to the control condition (see Table 6), replicating Study 2 and suggesting that some threatened participants may have used the lucky or ordinary memory task as an opportunity to recruit nostalgia.

Data analytic strategy. To test the hypothesis that nostalgia buffers the effect of limited time on wellbeing, we again examined Nostalgia \times Time Perspective interactions. Given the three memory conditions in this experiment, we used Process for SPSS (Model 3; Hayes, 2017), which implements contrast codes for multicategorical variables and their interactions. Specifically, we contrasted (a) nostalgia versus control (lucky/ordinary) and (b) lucky versus ordinary. Again, we first examined each wellbeing dimension separately in a series of models that tested the interactive effects of memory condition, time perspective condition, and gender. Second, we tested whether the key Nostalgia \times Time Perspective interaction differed significantly across dimensions. We used the same multilevel analysis approach as in Study 1 in order to test the same contrasts as the Process analyses and whether they varied by dimension of wellbeing. The model tested the effects of wellbeing dimension (Level 1), memory condition (contrast coded as above), time condition, gender, and their interactions (Level 2), as well as—crucially—the interaction between wellbeing dimension and each Level 2 effect to test whether effects of nostalgia differed across subscales. We excluded from analyses involving gender the two participants who did not identify as female or male.

Nostalgia moderates the effect of limited time on wellbeing. First, we conducted individual Process analyses on each wellbeing dimension (see Table 6). Gender differences indicated that women reported higher positive relationships ($M = 4.72$, $SD = 0.80$) and purpose in life ($M = 4.33$, $SD = 0.77$) than men ($M = 4.39$, $SD = 0.93$; $M = 4.09$, $SD = 0.86$, respectively). Significant main effects of time perspective indicated that limited time reduced environmental mastery and positive relationships. The main effect of nostalgia (vs. control) was significant for autonomy and personal growth, indicating that recalling a nostalgic memory increased these aspects of wellbeing, whereas all main effects of lucky (vs. ordinary) memory were nonsignificant. The key Nostalgia \times Time Perspective interaction was significant only for positive relationships. Participants in the limited-time condition reported lower positive relationships than those in the control condition if they recalled a control (lucky/ordinary) memory ($B = -.312$, $p < .001$), but not if they recalled a nostalgic memory ($B = -.034$, $p = .750$). The effect of nostalgic (vs. control) memory was positive and significant in the limited condition ($B = .450$, $p = .017$) but not in the control condition ($B = -.106$, $p = .584$). The patterns of means were similar for environmental mastery and personal growth, but the interactions were nonsignificant; this may reflect the tendency for nostalgia to boost wellbeing in both conditions in this study (limited-time and control), and not only under threat.

The Lucky (vs. Ordinary) \times Time Perspective interaction was significant only for autonomy. The simple effects of time condition were in opposite directions, but nonsignificant for participants who recalled either a lucky memory ($B = -.208$, $p = .070$) or an ordinary memory ($B = .171$, $p = .091$). The effect of lucky (vs. ordinary) memory was negative and significant in the limited

condition ($B = -.556$, $p = .016$), but not in the control condition ($B = .201$, $p = .419$). Thus, recalling a lucky memory—one that is positive but not nostalgic—when time is limited actually reduced feelings of autonomy.

Next, we tested whether effects of nostalgia varied across wellbeing subscales using a multilevel model (for Level 2 effects, see Table 6, bottom row). The overall nostalgia (vs. control) main effect was significant, whereas the lucky (vs. ordinary) main effect was not. Neither of these effects was moderated by subscale, respective $F_s(1, 362) = 0.45$ and 0.34 , $ps = .817$ and $.889$. The time perspective main effect was not significant, but was significantly moderated by subscale, $F(5, 1810) = 2.68$, $p = .020$, reflecting the larger negative effects of time condition for positive relationships and mastery.¹ The overall Nostalgia (vs. Control) \times Time Perspective interaction was not significant (Table 6, see Figure 2 for pattern). However, it was significantly moderated by subscale, $F(5, 1810) = 2.79$, $p = .016$, reflecting that the interaction was strongest for positive relationships.² Subscale also moderated the main effect of gender, $F(5, 1810) = 5.19$, $p < .001$, but no other effects, $F_s(5, 1810) < 2.13$, $ps = .060$. Thus, in this study, the Nostalgia \times Time Perspective interaction was only reliable for the positive relationships dimension of wellbeing, unlike Studies 1 and 3.

The role of positive affect. Consistent with the notion that both limited time perspective and nostalgia are relevant to eudaimonic rather than hedonic wellbeing, positive affect did not differ significantly by condition (see Table 6). However, positive affect correlated with psychological wellbeing (Table S1, $rs = .26-.44$, $ps < .001$). Thus, we reran the Process models for each wellbeing dimension, controlling for positive affect. Crucially, the Nostalgia (vs. Control) \times Time Perspective interaction remained significant for positive relationships, $B = .33$, $t = 2.64$, $p = .009$, but nonsignificant for the other dimensions, $B_s < 1.121$, $t_s < 0.92$, $ps > .36$. The main effects of time perspective also remained significant for positive relationships, $B = -.22$, $t = 3.66$, $p < .001$, and environmental mastery, $B = -.15$, $t = 2.48$, $p = .014$. The main effects of nostalgia (vs. control) were similar but became weaker for autonomy, $B = .22$, $t = 1.67$, $p = .095$, and personal growth, $B = .20$, $t = 1.94$, $p = .053$. Thus, some general effects of nostalgia may overlap with boosted positive mood, but its buffering effect on relational wellbeing in the face of limited time is unique and independent of mood.

Discussion

Results of Study 4 replicated the key interaction pattern for the dimension of positive relationships: Although the threat of limited

¹ Contrasts indicated that, compared with the Positive relationships reference category, the effect of time condition for environmental mastery and purpose in life did not differ significantly ($B_s = .072$, $.123$, $ps = .272$, $.060$), whereas the effects for autonomy, personal growth, and self-acceptance were significantly smaller ($B_s = .201$, $.183$, $.157$, $ps = .002-.016$).

² Contrasts indicated that the Nostalgia (vs. Control) \times Time Perspective interaction term for autonomy and purpose in life differed significantly from positive relationships ($B_s = -.42$, $-.44$, $ps = .002$, $.001$) but the interactions for environmental mastery, personal growth, and self-acceptance did not differ from positive relationships ($B_s = -.22$ – $-.25$, $ps = .058-.097$), suggesting that they showed a similar, albeit weaker, buffering pattern.

Table 6
Study 4: State Nostalgia and Wellbeing Dimensions as a Function of Time Perspective (Control vs. Limited) and Nostalgia (Ordinary vs. Nostalgic vs. Lucky Memory Recall)

Dependent variable	Ordinary memory			Nostalgic memory			Lucky memory			B					
	Control	Limited-time	Control	Limited-time	Control	Limited-time	Control	Limited-time	Time perspective	Nostalgia (vs. control)	Lucky (vs. ordinary)	Gender	Nostalgia × Time	Lucky × Time	
Manipulation check															
State nostalgia	3.48 (1.39)	3.68 (1.39)	4.87 (0.92)	4.92 (0.86)	4.08 (1.39)	4.06 (1.27)	.20*	1.14***	.54*	-.02	-.38	-.16			
Affect	4.48 (1.00)	4.17 (1.05)	4.53 (1.12)	4.61 (1.01)	4.41 (1.20)	4.66 (1.09)	.01	.30	.03	.09	-.17	.26			
Wellbeing															
Autonomy	3.68 (0.86)	3.92 (0.94)	3.94 (0.85)	3.88 (0.65)	3.71 (0.82)	3.72 (0.81)	-.02	.28*	-.18	-.12	-.14	-.38*			
Env. mastery	3.87 (0.80)	3.67 (0.91)	3.82 (0.76)	3.81 (0.70)	3.90 (0.93)	3.74 (0.79)	-.15*	.14	.01	.02	.06	.07			
Personal growth	4.13 (0.65)	4.15 (0.69)	4.14 (0.62)	4.24 (0.58)	4.05 (0.72)	4.10 (0.65)	-.04	.26*	-.14	.02	.05	-.04			
Pos. relationships	4.70 (0.82)	4.67 (0.85)	4.65 (0.86)	4.73 (0.80)	4.81 (0.85)	4.46 (0.77)	-.22**	.17	-.09	.18**	.28*	-.05			
Purpose in life	4.26 (0.71)	4.31 (0.86)	4.38 (0.86)	4.24 (0.74)	4.40 (0.83)	4.26 (0.76)	-.10	.25	-.15	.14*	-.16	-.01			
Self-acceptance	3.81 (0.99)	3.93 (1.10)	3.90 (0.97)	3.98 (0.82)	3.87 (1.04)	3.83 (0.88)	-.06	.30	-.14	.05	.03	-.08			
Ryff total score	4.08 (0.64)	4.11 (0.71)	4.14 (0.62)	4.15 (0.58)	4.11 (0.65)	4.09 (0.61)	3.53	4.89*	0.78	0.90	0.03	0.40			

Note. Values in parentheses are SDs. Env. = environmental; Pos. = positive; B = coefficients are from Process models, which contrast-coded nostalgia (vs. control) and lucky (vs. ordinary) memory conditions and controlled for all interaction effects with gender. Full results are available on request. Gender (1 = female, -1 = male) did not moderate any of the Nostalgia (vs. Control) × Time interactions, $B_s < |0.13|$, $t_s < |1.67|$, $p_s > .096$.

* F -tests for the total score are from a multilevel analysis that tested all main effects and interactions as well as the moderating effect of subscale.

** $p < .05$. *** $p < .001$.

^a $F(1, 362)$ from multilevel analysis^a

time perspective reduced relational wellbeing, recalling a nostalgic event buffered participants against this threat. Importantly, Study 4 indicated that the buffering effect of nostalgia is not explained by resultant positive mood. First, recalling a positive (i.e., lucky) event did not buffer relational wellbeing from the threat of limited time. Second, the moderating effect of nostalgia (vs. control) remained significant after controlling for self-reported positive affect. Thus, there is something special about nostalgia that goes above and beyond affective positivity.

Although one wellbeing dimension showed the key interaction effect, we note that the effect was not evident for the overall wellbeing index or the other subscales (although the interaction effects for environmental mastery, personal growth, and self-acceptance did not differ significantly from positive relationships). Instead, nostalgia (vs. control) exhibited a main effect on wellbeing, which was not evident in Study 1 or 3. We note that participants in Study 4 reported on their positive affect before completing the wellbeing measure. Although this was necessary to rule out the alternative mood explanation, doing so is likely to have primed them generally to think more in terms of affect and may also have provided an opportunity to self-affirm, thereby weakening the limited-time threat. Threat effects may also have been weakened by participants completing the study online (e.g., off-campus), which may reduce the perceived salience of their impending transition. Nevertheless, results once again support the relevance of nostalgia in limited time horizons.

General Discussion

Past research has highlighted nostalgia's potential to repair wellbeing in the face of psychological threats (Routledge et al., 2013; Sedikides & Wildschut, 2018; Sedikides, Wildschut, Routledge, Arndt, Hepper, et al., 2015). As individuals get older, the chronically salient threat of limited time can undermine psychological wellbeing (Demiray & Bluck, 2014; Kotter-Grühn & Smith, 2011; Yeung et al., 2007). SST holds that these limited time horizons stir a motivational shift toward deriving emotion regulation and meaning from internal resources and close relationships (Carstensen, 1992, 2006; Carstensen et al., 2003). We proposed that nostalgia—a rich internal resource for social connectedness and emotional meaning—provides a readily accessible means of achieving this shift and buffers psychological wellbeing. Nostalgia can act as a catalyst for successful aging. Accordingly, we tested whether nostalgia moderates the pattern of wellbeing across the adult life span (Study 1) and in response to manipulated limited time perspective (Studies 3–4). We also examined the possibility that nostalgia is prevalent in older adulthood (Study 1) and is triggered by induced limited time perspective (Study 2). We followed a well-established approach of converging studies concerning trait and state nostalgia (Routledge et al., 2008; Seehusen et al., 2013; Stephan et al., 2015; Zhou et al., 2008). Taken together, results from these diverse methodological approaches are consistent with the buffering role of nostalgia and illuminate directions for future research.

Nostalgia Buffers Psychological Wellbeing in the Face of Limited Time Horizons

The present findings corroborate nostalgia's potential to maintain psychological wellbeing when individuals are confronted with

limited time horizons. In Study 1, nostalgia proneness moderated the pattern of wellbeing across the adult life span. The association between age and wellbeing was more positive for high (vs. low) nostalgic individuals. Whereas high-nostalgics evinced the established pattern of maintained or increased wellbeing with age (Ryff, 1989; Ryff & Keyes, 1995), low-nostalgics did not. This finding, albeit cross-sectional, supports our proposal that nostalgia can facilitate growth in wellbeing across the life span and buffer it from the chronically limited time horizons posed by older age. In Studies 2–4, we conceptually replicated the above pattern in experimental context, allaying concerns about its causal direction and testing the role of limited time explicitly. Following SST tradition (Fung & Carstensen, 2004; Fung et al., 1999), we manipulated limited time perspective among young adults, who ought to have an expansive baseline time perspective. Results of Study 2 showed that this limited time perspective prompted state nostalgia (and the pattern replicated in Study 4 even though most participants were instructed to recall a lucky or ordinary memory). This is consistent with past findings that nostalgia is prompted under conditions of psychological threats including loneliness, existential doubt, and avoidance motivation (Routledge et al., 2011; Zhou et al., 2008; including in older samples; Stephan et al., 2014), and indicates that people turn to nostalgia naturally when facing limited time horizons.

In Studies 3–4, after manipulating limited time perspective, we induced state nostalgia via autobiographical recall. Results indicated that nostalgia buffered wellbeing from limited time horizons—overall in Study 3, and for positive relationships in Study 4. Whereas limited time perspective reduced wellbeing when participants recalled an ordinary memory, wellbeing was maintained or even enhanced when participants recalled a nostalgic memory. The studies converged in this key moderation pattern, and Study 4 confirmed that the pattern was not driven by nostalgia boosting positive mood: Nostalgia's buffering effect on relational wellbeing was not accounted for by positive affect, nor was it achieved by recalling a positive, lucky memory. Although participants in our samples would have varied in their baseline perceptions of time, time perspective grows reliably more limited with increasing age (Demiray & Bluck, 2014; Kotter-Grühn & Smith, 2011; Lang & Carstensen, 2002) and parallels or accounts for documented age effects (Carstensen, 2006). Thus, the findings of Studies 3–4 isolate one likely mechanism underlying those of Study 1: Nostalgia buffers the impact of limited time on wellbeing.

Our findings concerning the role of nostalgia build on other empirical demonstrations that young adults resemble older adults in terms of socioemotional choices or patterns when they face limited time, whether experimentally manipulated (Cypryńska et al., 2014; Fredrickson & Carstensen, 1990; Fung & Carstensen, 2004) or caused by perceived impending endings (Fung & Carstensen, 2006; Pruzan & Isaacowitz, 2006; Sullivan-Singh et al., 2015). Therefore, we add nostalgia to the repertoire of psychological strategies by which individuals with limited time horizons can achieve socioemotional selectivity goals such as emotion-regulation and meaning (Carstensen et al., 2003). Our findings also suggest for the first time that these strategies help to buffer psychological wellbeing, extending the scope of SST. Nostalgia might be an especially valuable strategy for older adults, because it harnesses internal resources that can be accessed at any time, even when social interaction opportunities are limited. Further

research would do well to examine nostalgia in older adulthood in more depth, given that most nostalgia research has used younger samples. Nostalgia may also be adaptive when time is limited by impending endings throughout the life span (e.g., ill health, relocation, sociopolitical changes; Carstensen, 2006). Future research could examine nostalgia's role in such naturally occurring contexts.

Across Studies 1, 3, and 4, we examined the six psychological wellbeing dimensions separately and then tested if effects varied across dimensions. In two of the three studies, the key nostalgia moderation effect did not vary significantly across wellbeing dimensions, and was significant overall when analyzed across subscales. In Study 4, the effect was most evident for the positive relationships dimension, albeit three further dimensions did not differ statistically from this effect. Further, Study 4 effects may have been weakened by the interim measurement of positive affect as a control variable. Thus, although the relevant interaction did not reach statistical significance individually for every subscale, it may be appropriate to discuss the pattern as a general phenomenon. Despite variation between wellbeing dimensions in their average age-related trajectories (Study 1) or overall effects of limited time (Studies 3–4), nostalgia exerted a generalizable buffering effect in most cases. There was also some overlap in the subscales that reached significance in Study 1 (environmental mastery, positive relationships), Study 3 (environmental mastery, personal growth, purpose in life, self-acceptance) or Study 4 (positive relationships). Hence, there is no clear distinction in the dimensions that nostalgia buffers in the differing limited time horizons of older age versus an impending ending. The nonsignificant moderation effect on Autonomy across studies might suggest that nostalgia does not buffer independence as strongly as other dimensions, perhaps due to nostalgia's inherent sociality. However, we speculate with caution, as it would be inappropriate to overinterpret differences between subscales that are not statistically significant. Similarly, the simple effects of nostalgia on aspects of wellbeing varied across dimensions, although in general nostalgia was more positively related to wellbeing in older age (Study 1) or in limited (than relatively expansive) time conditions (Studies 3–4). This fits with past research (Routledge et al., 2008; Van Dijke et al., 2019; Wildschut et al., 2011) in indicating that nostalgia becomes more relevant, and hence more potent, when under psychological threat. Given that threats prompt individuals to seek meaning, emotional richness, and social connections, those who nostalgize in such contexts may do so in a more profound way and gain maximum benefits from it—not only restoring but often exceeding the wellbeing of those who are not currently threatened or who nostalgize in the absence of threat.

The current findings demonstrated convergence between dispositional and state nostalgia (Routledge et al., 2008, 2011; Seehusen et al., 2013; Stephan et al., 2015). Inducing state nostalgia buffered short-term wellbeing from limited time perspective in similar ways that nostalgia proneness appeared to buffer longer-term wellbeing in older age. Engaging in regular doses of state nostalgia when needed, and experiencing the corresponding boosts in short-term wellbeing, may have a cumulative effect in preserving longer-term psychological wellbeing. Nostalgia-prone individuals are those who make use of the resource of state nostalgia most effectively (Cheung, Sedikides, & Wildschut, 2016). This may reflect part of an armory of strategies deployed by those who are effective at

regulating emotions (Wildschut, Sedikides, & Alowidy, 2019). Future research could examine whether individual differences in emotion-regulation predict the propensity to draw on nostalgia.

Our research builds on literatures recognizing the relevance of past memories in older adulthood, including life review (Butler, 1963), integrative reminiscence (Bluck & Levine, 1998), and life story (McAdams, 2001). The emotion of nostalgia might be one reason for the benefits of such past-oriented practices. Our findings might also have therapeutic implications. Reminiscence has been implemented in therapies and self-help techniques for depression in older adults, but methods and success levels vary, partly reflecting poor understanding of underlying mechanisms (Bohlmeijer, Smit, & Cuijpers, 2003). Given that reminiscence often triggers nostalgia—yet nostalgia includes additional affective, social, self-relevant, and existential features (Sedikides, Wildschut, Routledge, Arndt, Hepper, et al., 2015)—nostalgia may be an essential, active ingredient in such interventions. Future research is needed to test whether targeting nostalgia in such therapies might strengthen their impact.

Levels of Nostalgia Across the Adult Life Span

Study 1 showed that nostalgia is a common experience across the adult life span: Over half of participants in each age category experienced nostalgia at least once a week. However, levels of nostalgia proneness were slightly higher at the lower and upper ends of the adult life span. This pattern aligns with the idea that nostalgia is recruited not only when people face limited time horizons, but also to maintain self-continuity in times of transition (Davis, 1979; Sedikides, Wildschut, Routledge, & Arndt, 2015). Older adults' high nostalgia proneness is consistent with nostalgia playing a role in socioemotional selectivity and transitions to retirement or declining health (Brandtstädter & Greve, 1994). Young adults' high nostalgia proneness may reflect their transitions to living independently, university, or employment. Conversely, most of our midadulthood participants would have been in long-term relationships and occupations, facing (on average) less fundamental transitions. Their nostalgia proneness was correspondingly lower, although the quadratic age effect was small.

Other processes may also contribute to higher nostalgia proneness at certain life stages and warrant examination. For example, older adults may attempt to integrate their past experiences in order to maintain identity (Bluck & Levine, 1998; Butler, 1963). Although reminiscence studies have shown a similar curvilinear age pattern (Hyland & Ackerman, 1988; Merriam & Cross, 1982), our research constitutes the first systematic examination of nostalgia across the adult life span. Reasons for reminiscence are thought to differ for older adults (e.g., to assuage mortality concerns) versus younger adults (e.g., to reduce boredom; Webster & McCall, 1999). It would be useful to examine motives or functions of nostalgia at different ages and to link these to time perspective and transition experiences. It would also be relevant to explore reasons for women's higher nostalgia proneness compared with men, which suggested that women may acknowledge or appreciate the value of nostalgia more.

Limitations and Future Directions

Study 1 was a cross-sectional survey of chronological age. Although Studies 2–4 demonstrated experimentally that limited

time prompted nostalgia, and that nostalgia buffered wellbeing, a bidirectional link between nostalgia proneness and the age-related pattern of wellbeing is plausible. For example, individuals who enjoy greater wellbeing might be more likely, or more able, to experience nostalgia. Similarly, age may moderate the link between nostalgia and wellbeing; for example, nostalgia may relate to wellbeing differently, or be differently triggered, for younger versus older adults. Longitudinal research would be informative, and would also rule out cohort effects. Nevertheless, we anticipate that, even if older (vs. younger) adults focus on different specific memories (e.g., family vs. holidays; Batcho, 1995), the emotion prompted should be equivalent and engender the same psychological functions. Studies that included older adults indicate that the effects of experimentally induced nostalgia on reported state nostalgia, mood, and psychological benefits are comparable in older and younger samples (Abeyta & Routledge, 2016; Cheung et al., 2013; Hepper et al., 2012). Although in the present investigation we recruited young samples for Studies 2–4 due to the nature of the manipulation, future research ought to include wider age ranges and older-adult samples to better understand these nuances.

Moreover, in Study 1 we did not assess impending transitions in participants' lives, physical health changes, or their subjective age or time perspective, which would be key aims for future life span studies of nostalgia. We note, though, that chronological age is closely related to the latter variables. For example, subjective age increases linearly with chronological age, although most people feel younger than they are (Rubin & Berntsen, 2006), especially after becoming nostalgic (Abeyta & Routledge, 2016). Similarly, future time perspective and perceptions of nearness to death are strongly associated with age (Kotter-Grühn, Grühn, & Smith, 2010). Thus, we might expect to obtain similar findings.

The Study 1 sample was recruited and compensated in various ways, including convenience and snowball sampling. This practice may have resulted in participant self-selection and influenced their motivation. Yet, the three subsamples did not differ on the key variables. Also, the study advert materials did not mention nostalgia, and so the sample is likely representative of the population on nostalgia proneness. Still, participants were well-educated, and most older adults were living independently, with few over the age of 85. It remains to be seen whether the role of nostalgia is consistent in less-advantaged populations and in advanced older age, when wellbeing may decline due to failing health (Gerstorf et al., 2010). Given that perceptions of limited time acquire heightened salience in advanced old age (Carstensen et al., 2003), nostalgia might be an increasingly vital resource in this age group.

Individual differences may qualify the results. For example, some psychological functions of nostalgia are moderated (e.g., strengthened or weakened) by attachment avoidance (Wildschut, Sedikides, Routledge, Arndt, & Cordaro, 2010) and narcissism (Hart et al., 2011). Similarly, short-term effects of nostalgia may be less positive for individuals high in habitual negative thinking (Verplanken, 2012), implying that such individuals may benefit less from nostalgia when facing limited time horizons. Gender might also be relevant. In Study 1, which included 44% men, the key interaction pattern did not differ by gender, but Studies 2–4 contained fewer male participants rendering moderation tests underpowered. In light of women's higher nostalgia proneness in Study 1, future research ought to test gender effects more consistently. Nevertheless, studies of induced nostalgia have typically

found no, or very small, gender differences in effects (Abeyta & Routledge, 2016; Cheung et al., 2013; Hepper et al., 2012; see Ismail et al., 2018 for meta-analytic test), implying that men benefit equally when experiencing state nostalgia.

Finally, future research would do well to assess additional aspects of wellbeing. For example, a complementary literature focuses on hedonic wellbeing—the experience of pleasure—which is similarly maintained through most of older age (Charles et al., 2001; Diener et al., 1999; Gerstorf et al., 2010). Given that nostalgia is a bittersweet emotion that sometimes, but not always, increases positive affect and also entails traces of loss and longing (Hepper et al., 2012), its psychological functions may focus primarily on maintaining eudaimonic rather than hedonic wellbeing. In fact, recent evidence suggests that experiencing mixed, rather than hedonically positive, emotions can be adaptive (Hershfield, Scheibe, Sims, & Carstensen, 2013). Further, more objective measures of wellbeing would inform our understanding of coping and successful aging (Baltes & Baltes, 1990; Schulz & Heckhausen, 1996). For example, does nostalgia, by facilitating positive perceptions of relationships, enable older adults to maintain more social interaction and support provision? Similarly, does nostalgia, by facilitating a sense of mastery, enable more efficacious health-oriented behaviors or greater intellectual productivity in older adulthood? These questions are especially promising given recent evidence that nostalgia in younger adults increases social goal pursuit (Abeyta et al., 2015), intrinsic motivation in employees (Van Dijke et al., 2019), and healthy physical activity (Kersten, Cox, & Van Enkevort, 2016).

Concluding Remarks

Across the life span, individuals face numerous physical and psychological challenges, not least the looming endings of life stages and life itself. However, they also possess an indispensable resource: A “rich store” of meaningful memories that can evoke nostalgia and remind them of their value, ability, and belonging. The human capacity to experience nostalgia may buffer the threat of limited time horizons and provide one strategy in people's psychological toolkit to facilitate successful aging.

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