# Holding on to Pieces of the Past: Daily Reports of Nostalgia in a Lifespan Sample

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This study was not preregistered. However, to further open science and replicability, all data and materials pertaining to this study will be made available to researchers via the Open Science Framework (OSF) Data Repository upon request.

**Abstract**

Nostalgia, the fond remembrance of one's past, is a common experience hypothesized to increase across the lifespan. Yet, data on the specific features of nostalgia, such as daily frequency and associated affect, are scarce. This study sought to address this limitation by assessing the daily experience of nostalgia using experience-sampling methods. A lifespan sample of 108 participants (47 young, 31 middle-aged, and 30 older adults) completed a two-week, twice-daily experience-sampling study that yielded data describing the frequency and emotions of everyday nostalgia. Multilevel logistic regression analyses supported increased nostalgia frequency at every life stage: young adults were 60% *less* likely to report nostalgia compared to middle-aged adults (OR = .40), while older adults were three times *more* likely than middle-aged adults to report nostalgia (OR = 3.05). Additionally, the experience of nostalgia was associated with significant heterogeneity in positive and negative affect. Approximately 72% of participants experienced an increase in positive affect, while 51% experienced an increase in negative affect. For young and middle-aged adults, a change in positive affect was associated with a two times larger increase in nostalgia likelihood, while change in negative affect was more strongly associated with a nostalgia experience in older adults. The current study provides increased evidence for the affectively mixed nature of nostalgia, and how the affective pattern differs for adults of different ages. Greater nostalgia frequency may be instrumental during life review when individuals make meaning of their lives, fulfilling developmental goals of late adulthood.

*Keywords*: lifespan development, daily assessment, naturalistic observation

**Holding on to Pieces of the Past: Daily Reports of Nostalgia in a Lifespan Sample**

Most people report that they are familiar with *nostalgia*, a wistful longing for times past, and are aware when they experience it. However, and the exact definition of nostalgia depends on the context, the person asking the question, and the perceiver. Foundationally, nostalgia is an autobiographical memory experience that coincides with an affective response; but several researchers further define nostalgia as a distinct, social emotion (e.g., Holak & Havlena, 1992; 1998; Hepper et al., 2012; Sedikides et al., 2004; Sedikides et al., 2008). The conceptualization of nostalgia as a social emotion is tied to the common targets of nostalgia, such as past and present social partners (Batcho, 1995; Wildschut et al., 2006), and associated outcomes like social support and interpersonal connectedness (Sedikides et al., 2016; Wildschut et al., 2010). In many ways, this definition of nostalgia is limited given that nostalgia can also be triggered by thoughts of places, things, and times past that are not directly tied to social partners. However, the unique affective signature associated with a nostalgic experience does support its status as a distinct form of autobiographical experience that is closer to an emotion: nostalgia is *bittersweet*.

While it is generally recognized that experiencing nostalgia is associated with both positive and negative emotional responses, the extent to which the positive or negative is emphasized has depended upon historical context and researcher definitions. Historically, nostalgic episodes have at times been conceptualized as symptoms of a mental disorder akin to clinical depression (Batcho, 2013; Sedikides et al., 2004), or as positive events that foster self-continuity and well-being (Sedikides et al., 2016). Definitions have reflected these shifts as nostalgia became less tied to *longing for one's past* and transitioned to bittersweet emotion (Batcho, 2013; Davis, 1979). Currently, more researchers prefer to highlight the associations between nostalgia and positive emotion in definitions (e.g., "*Remembering or reminiscing about*

*fond memories from the past*"), while demonstrating that it is both positive and negative in practice (*"considered an emotion, especially one of longing…happiness and loss";* Hepper et al., 2014). Thus, care should be taken when obtaining personal reports of individual's nostalgia in the framing of the nostalgia definitions provided, given that emphasizing the positive side of nostalgia may limit the affective range of responses. Nostalgia is viewed as a universal phenomenon common to most people (Sedikides et al., 2015), yet key characteristics associated with nostalgia, such as its relationship with age, frequency of occurrence, and how the associated emotions may change across the lifespan or in varying contexts are less clear.

One pioneering study utilizing a lifespan sample (ages 4-80 years) found that most respondents reported experiencing nostalgia about once per week (Batcho, 1995). Another survey found that most young adult participants (79%) reported experiencing nostalgia "once-a-week," while only 4% experienced nostalgia less frequently than "once-a-month" (Wildschut et al., 2006). However, some studies have found gender differences with women reporting more nostalgic and reminiscence experiences than men, and women being more likely to endorse a past time orientation (Ely & Mercurio, 2011; Madoglou et al., 2017). Importantly, in these studies the frequency data were collected retrospectively, introducing potential biases into the measurement. While self-report retrospective data are often useful for assessing relative differences, biases can render retrospective reports less accurate in terms of absolute magnitude or frequency. Further, nostalgia experiences, and their affective components, seem to differ depending on whether they are evoked spontaneously or in the lab. Newman and colleagues (2020) found that laboratory-induced nostalgia resulted in greater recollection of positive events and affect compared to nostalgia collected daily, which was associated with more negative feelings and reduced well-being.

Given these differences in nostalgia research, and the recent evidence from Newman et al. (2020) supporting divergent outcomes, one important consideration should be the distinction between spontaneous, *everyday* nostalgia and intentional, *active* nostalgia. At present, the majority of nostalgia research explores more *active* nostalgia paradigms, such as researcher-directed journaling about a nostalgic experience (e.g., Madoglou et al., 2017; Wildschut et al., 2006). These same active nostalgia paradigms also consistently report that nostalgia is a predominantly positive and frequent experience; however, based on the divergent affective outcomes reported with everyday experiences of nostalgia, it is possible alternative factors are at play, such as demand characteristics. Similarly, research investigating incidental emotion regulation (i.e., emotion labeling) compared to intentional emotion regulation (i.e., cognitive reappraisal) further illustrates the importance of distinguishing between spontaneous and active psychological processes: both incidental and intentional resulted in reduced distress ratings among participants, but incidental was found to blunt positive affect as well (Lieberman et al., 2011). Together, this accumulating evidence suggesting important differences in affect and well-being between spontaneous (compared to intentional) nostalgic experiences led us to narrowly define nostalgia as unplanned and spontaneous in the present study.

Nostalgia often arises from negative affect and elevates mood closer to a more neutral baseline, or to an intermixing of joy and sadness (Holak & Havlena, 1998; Wildschut et al., 2006). Thus, the affective concomitants of nostalgia are usually *bittersweet*—the mingling of a positive memory with the sadness that comes from knowing that memory cannot be relived (Batcho, 1995; Wildschut et al., 2006). Research on emotional complexity suggests older adults are more likely than their younger counterparts to simultaneously feel both positive and negative emotions (i.e., happiness and sadness; Carstensen et al., 2000). This age-related increase in

*poignancy* has been interpreted as a beneficial shift (Ersner-Hershfield et al., 2008). However, because most nostalgia research has been conducted exclusively with young adults, it is unclear whether nostalgia also increases with age.

Although rarely tested, it has been posited that with increasing age, the frequency and content of autobiographical remembrance shifts, perhaps to prepare for death (Batcho, 1995; Butler, 1963; Webster & McCall, 1999). The degree to which nostalgic remembrance is helpful versus hurtful for psychological well-being is a matter of some debate. Research on well-being and life review in later adulthood supports both positive (e.g., *ego-integrity*; Boylin et al., 1976; Erikson, 1968; Erikson & Erikson, 1997) and negative (e.g., increased proximity to mortality) consequences of nostalgia with age (Grühn et al., 2016; Juhl et al., 2010; Routledge et al., 2008). Classically, the central developmental goal of older adulthood is *Ego-Integrity versus Despair* (Erikson, 1968). In this stage, it becomes important to review one's life by weighing past choices, present situations, and the alignment between the two. If the outcome of this weighting is favorable, the individual has met the developmental goal and develops a positive outlook and psychological well-being (i.e., integrity). However, if the weighting is unfavorable, the individual would lament their age and lack of time left to change their circumstances (i.e., despair). Importantly, this deliberation involves self-reflection and comparison of past vs. present, which seems analogous to nostalgia.

Despite mixed findings on the relationship between nostalgia and well-being, reminiscence therapies are popular interventions for older adults with dementia or depression (Huang et al., 2015). Nostalgic experiences share marked similarities to life review and reminiscence therapies (Sedikides et al., 2016; Sedikides et al., 2018; Wildschut et al., 2006); however, there are some key distinctions. Life review and reminiscence are interventions in

which individuals verbally share key moments with a receptive audience, often with memory triggers such as photographs or music (Woods et al., 2018). In comparison, nostalgia appears to be a memorial experience that occurs relatively frequently amongst people of all ages (Batcho, 1995; Sedikides et al., 2015), and which often manifests in solitude (i.e., arising from loneliness; Wildschut et al., 2006; Wildschut et al., 2010; Zhou et al., 2008). Reminiscence has been theorized as a component of emotional well-being in later life by promoting continuity of the past with the present (Bluck & Alea, 2008; Parker, 1999). Nostalgia has been hypothesized to function in a similar role, promoting ego-integrity, self-continuity, and well-being (Madoglou et al., 2017; Sedikides et al., 2016; Sedikides et al., 2018). However, this mechanism cannot be directly examined without research pertaining to nostalgia from a lifespan framework. It seems likely that nostalgia is an experience that increases across the lifespan, yet how the emotions associated with nostalgia may shift based on age and cohort remain unidentified. Previous investigations of nostalgia, and nostalgia in everyday life (i.e., Newman et al., 2020) have reported differing affective outcomes depending on the context; however, these have been limited to examinations of young adult samples. The current study provides a key replication and extension of past work by extending daily reports of nostalgia to middle-aged and older adult participants. The goal of this study is to examine the daily incidence and emotions of nostalgia in an adult lifespan sample using experience-sampling methods. This study had two primary hypotheses:

*Hypothesis 1a*: Older adults, compared with young, will report greater nostalgia frequency based on increased salience of autobiographical remembering (i.e., *ego-integrity*); middle-aged adults will fall between young and older adults in frequency of nostalgia.

*Hypothesis 1b:* Women, compared with men, will report greater nostalgia frequency, as

women are more likely to endorse a past-time orientation (compared to present or future) and

report more reminiscence experiences (Ely & Mercurio, 2011; Madoglou et al., 2017).

*Hypothesis 2*: Given the classification of nostalgia as a mixed-affect experience, nostalgia

frequency will be associated with change in both positive and negative affect. Further, this

relationship may be stronger for older adults, given findings of increased poignancy with age.

## Method

**Participants and Design**

The present study employed ecological momentary assessment methods (EMA) utilizing

interval-contingent surveys on participants' smartphones to investigate the frequency and

associated emotionality of nostalgia[1]. This study included a pre-survey interview wherein

demographics, cognitive functioning, and training to use the smartphone application were

conducted (i.e., *Phase 1*). After completion of the pre-survey, participants then began the daily

assessment portion of the study (i.e., *Phase 2*). During this phase, participants were prompted

with two surveys per day, approximately every 12 hours, over 14 days. This study was approved

by the University of Akron Institutional Review Board (IRB; protocol #20181021) under

Exemption 2.

Estimating power and appropriate sample size in multilevel modeling (MLM) is less

straightforward than computing power in research designs that are not nested because researchers

need to be aware of sample sizes at multiple levels (i.e., number of observations at the within-

and between-person levels) as well as intercorrelations between variables of interest and variance

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[1] We were concerned that not all participants would be able to provide their own smartphones for this study, which could lead to a selection bias and skew the interpretation of results. However, all participants we recruited were able to provide their own smartphone devices.

(Maas & Hox, 2005; Scherbaum & Ferreter, 2009; Snijders, 2005). A general rule of thumb is to ensure that the highest level of multilevel analyses have an adequate sample. However, to explore fixed and random effects at lower levels there also needs to be sufficient variability (Snijders, 2005). In the current study, the highest level of analyses was between-person (Level-2), thus the key sample determination was based on number of participants. Following guidelines by Maas and Hox (2005), a power analysis revealed that for two observations per day over two weeks (up to 28 assessments at Level-1), with a suggested default intercorrelation of .30, and accounting for up to 20% missing observations, a total sample of 87 participants (29 per age group) was the minimum sample size necessary to detect significant relationships for within- (i.e., survey-level) and between-person analyses. Another interpretation of these values is that, if the data were not multilevel in nature, the effective sample size of the current study would be equivalent to $N = 690$ independent observations.[2]

A total sample of 47 young adults (ages 18–34 years; $M = 21.21$, $SD = 3.24$), 31 middle-aged adults (ages 40–60; $M = 52.90$, $SD = 5.23$), and 30 older adults (ages 61–78 years; $M = 69.43$, $SD = 3.89$) participated in this study. Young adults were recruited from undergraduate courses in psychology and were compensated for their participation with course credit. Middle-aged and older adults were recruited from the community and a pre-existing database of volunteers and were compensated $12 for their completion of Phase 1 and $1 additional payment per survey response during Phase 2 (possible total compensation of $40; see Table 1 for

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[2] A *post-hoc* sensitivity analysis conducted in G*Power 3.1.9.2 (Faul et al., 2007) using estimates from a repeated-measures ANOVA with three groups and 24 measurements (average number of completed surveys in present study) set to detect within- and between-effects and their interactions found that the current study was adequately powered to detect effects larger than Cohen's $f = .08$ (i.e., small effect size). This sensitivity analysis is more conservative given that repeated-measures ANOVAs listwise delete incomplete data, while MLM analyses are able to accommodate unequal assessments.

participant demographics). All participants reported having at least some college education, with middle-aged and older adults reporting significantly more years of formal education than young adults ($F(2, 107) = 17.77$, $p < .001$, $\eta^2_p = .25$). However, these young adults are still in the process of completing their education, at which point their highest level of education may be more comparable to that of the middle-aged and older adults in this sample. The racial categories were unequally represented across age, with the most diversity found in the young adult sample and the least found in the older adult sample ($\chi^2 (10) = 19.82$, $p = .03$). All participants scored 25 or above on the Mini-Mental State Exam, which indicates normal cognitive functioning (Folstein et al., 1975; Tombaugh & McIntyre, 1992).

Of the total sample, 100 people (43 young, 29 middle, and 28 older adults) completed the two-week protocol and submitted their data. The retention rate for the present study was 93%. There were no significant differences in demographic characteristics between participants who completed the protocol and those who did not (*p*s ranged from .05, 95% CI [-1.89, 1.32] to .96, 95% CI [-.11, .60]). We collected a total of 2,363 reports (of a possible 2,800 surveys), and participants completed an average of 24 daily questionnaires (*SD* = 4.56; range = 3 to 32).

**Materials and Procedure**

*Ecological Momentary Assessment.* Daily assessments of nostalgia were collected using the *Participation in Everyday Life* (PIEL) survey software (Jessup et al., 2012) on participants' smartphones. The PIEL survey software is a free program that was specifically developed for use in ecological momentary assessment (EMA) data collection. This program is compatible with iPhones and Android smartphones, and once programmed, does not require a data connection or access to wireless internet. Items administered with the PIEL software included several questions about the nature of the nostalgic experience, the participant's environment, the primary target of

the nostalgia, as well as the adapted version of the Positive and Negative Affect Schedule
(PANAS; Watson et al., 1988) to assess emotions associated with each nostalgic experience (see
supplementary Table 1 for full list of ESM prompts).

*Screening for Dementia.* Cognitive status was assessed using the Mini-Mental State
Exam (MMSE; Folstein et al., 1975) during the pre-survey interview and prior to receiving the
ESM software. The MMSE is a reliable screening tool for dementia (Cronbach's $\alpha$ = .80–.95 and
has high test-retest reliability) with high sensitivity for discriminating levels of cognitive
impairment on measures of criterion validity (Tombaugh & McIntyre, 1992). This exam uses a
30-point scale and assesses working memory, attention, orientation to time and place, and recall.
A score of 25 or above is considered normal cognitive functioning.

*Positive and Negative Affect Schedules.* An adapted form of the Positive and Negative
Affect Schedules (PANAS; Watson et al., 1988) was used as a primary outcome measure of the
emotionality associated with nostalgic remembrance. The traditional PANAS is a 20-item, 5-
point Likert-type scale that instructs participants to "*indicate to what extent you feel this way
right now, that is, at the present moment OR indicate the extent you have felt this way over the
past week*". The PANAS consists of two subscales: a positive affect subscale (e.g., interested,
excited, enthusiastic) and a negative affect subscale (e.g., hostile, jittery, distressed) with 10
items measuring each. In the current study, the PANAS was adapted to specify how they felt
during the nostalgic episode by asking participants *"During your nostalgic experience how much
did you feel each of these emotional states*". Participants selected from 1 (*very slightly or not at
all*) to 5 (*extremely*) for each of the 20 items. If participants responded affirmatively that they
experienced nostalgia in the last 12 hours, they received the adapted PANAS (i.e., modified
question prompts). In comparison, if participants did not experience nostalgia in the last 12

hours, the question prompt reflected the traditional format (i.e., *"indicate to what extent you feel this way right now, that is, at the present moment"*). The PANAS was presented in the same question order for all surveys. Internal consistencies for the two subscales were high in the present study, α = .92 for positive affect and α = .88 for negative affect; thus, composite scales were created reflecting positive and negative affect at each assessment.

    ***Procedure.*** After providing consent and completing the pre-survey measures of demographics and cognitive status, participants were requested to download the PIEL software onto their smartphone devices from their app stores, and provided with a unique survey code that included: (1) questionnaires, (2) response options assessing daily experience of nostalgia, and (3) adapted PANAS to measure affect. To ensure compliance with the protocol and facilitate a high response rate, participants were trained on how to complete the surveys, given a standardized definition of nostalgia, and provided with contact information for the researcher in case of technical difficulties, questions, and for sending the results.

    During the training, the researcher explained to the participant the three criteria for what constitutes nostalgia in this study with examples of each. The first criterion was: *"an experience of nostalgia is an emotional, autobiographical memory experience"*. The second criterion was: *"an experience of nostalgia is an experience in which you relive those moments, or it "takes you back"*. The final criterion was: *"an experience of nostalgia is an experience you were not actively seeking"*. These three criteria were selected *a priori* as they exemplified the key characteristics of nostalgia (i.e., personally relevant, retrospective emotional experience; Hepper et al., 2012; Hepper et al., 2014), while attempting to avoid possible affective demand characteristics associated with nostalgia (e.g., increased recall of memories for positive, golden times). Further, as a goal of the present study was to investigate spontaneous "everyday"

nostalgia, we specified that nostalgia should be passive (compared to active) to minimize

differences between people who sought out nostalgia in their lives from general, random

experiences of nostalgia among all participants.

In the final stage of training, participants were given researcher contact information and

explanations about the two-week study design. Participants were given a researcher contact card

that had the three criteria for nostalgia on the back. After ensuring that the participant was clear

on the instructions and all questions were answered, participants were compensated for their

participation in phase one.

The second phase of study lasted 14 days for each participant, with the first prompt

beginning the morning after installation of the PIEL program, leading to a total of 28 possible

responses. The PIEL program was structured to prompt participants to respond to a survey once

in the morning before 12 pm and once in the evening, before 12 am. Response prompts differed

for each participant aligning with their work or school schedules in order to maximize the

opportunity for participants to complete the surveys. However, times did not differ within the

two-week period; following programming of the PIEL, the participant was consistently prompted

at the same times each day (e.g., 7 a.m. and 7 p.m. for all 14 days). After the two-week study

period, following successful receipt of the survey data via email, participants received debriefing

information and final compensation.

**Results**

Because the primary goals of this study were to assess age and gender differences in the

frequency of nostalgia and the emotions associated with nostalgic episodes across the two-week

ESM period, multilevel modeling (MLM) was used to model the emotional change related to

nostalgia for each person, and whether these emotional patterns are similar for individuals of

different ages (Connor et al., 2009; Raudenbush & Bryk, 2002). MLM can account for the

possibility that some individuals may have greater or fewer experiences of nostalgia (e.g.,

different numbers of observations) by weighting the influence that each person-estimate

contributes to the group-level, thereby providing more precision in assessments of affect and

other outcomes of nostalgic remembrance.

The following analyses were conducted in SAS 9.4 using *proc glimmix* for multilevel

logistic regression (SAS Institute, 2016). A binomial distribution with a logit link function was

used because the outcome variable of nostalgia was dichotomous (i.e., the response for each

prompt could only be 0 or 1). All reported estimates are unstandardized coefficients and

presented with logit odds for intercepts and odds ratios (*OR*) for slope differences for ease in

interpretation; all are reported with 95% confidence intervals (CI). For *OR*, an estimate greater

than 1.0 indicates an increase in likelihood of an event occurring, while an estimate lower than

1.0 indicates a decrease in likelihood; a CI that contains 1.0 is not significant. When random

slopes were included in the model, we used the fixed and random variance to estimate the

percentage of the sample that had a positive slope for the variables of interest to better quantify

the pattern of response (Raudenbush & Bryk, 2002).

**Multilevel Model and Preliminary Analyses**

Initially, summary and descriptive statistics for variables of interest by age group and

total were calculated (see Table 2). Then, to examine whether there was significant variability in

the daily report of nostalgia, we tested the null model where Level-1 corresponds to within-

person analysis, or survey-level prompts, and Level-2 corresponds to observations between-

person (Model 0, Table 3):

$$\text{Level-1: Logit}(\textit{Nostalgia Likelihood}_{ij}) = \beta_{0j} + r_{ij}$$

$$\text{Level-2: } \beta_{0j} = \gamma_{00} + u_{0j}$$

At Level-1, the value of $\beta_{0j}$ is an intercept that reflects the likelihood of experiencing nostalgia at every daily prompt when the predictor is zero. In the null model above there is no predictor of nostalgia likelihood, so the interpretation of $\beta_{0j}$ is simply the likelihood of experiencing nostalgia at each prompt (i.e., within-person) using the sample average of nostalgia likelihood. At Level-2 $\gamma_{00}$ represents the sample average level of nostalgia likelihood collapsed across all participants (i.e., between-person). The symbols $r_{ij}$ and $u_{0j}$ are variances reflecting daily differences in nostalgia likelihood and person-differences from the sample average, respectively. The importance of the null model in this study is to establish that there is enough variability at the day-level (i.e., $r_{ij}$) that affects nostalgia likelihood beyond general between-person differences (e.g., variability in responding "yes" to daily nostalgia prompts) and enough variability between-person (i.e., $u_{0j}$) to examine between-person factors that may affect one's tendency to have nostalgia. For a logistic regression, $r_{ij}$ is always fixed at 3.29 as the residual cannot be normally distributed with a binary outcome. All future models built upon this baseline model by including predictors at Level-2 (i.e., age and gender; Model 2) and Level-1 (i.e., affect and age; Model 3); see Supplementary Appendix 1 for all additional MLM equations.

Nostalgia frequency was significantly associated with between-person variability, $u_{0j} = 3.04$, $SE = .59$. An intraclass correlation coefficient was computed to quantify the estimated within- and between-person variability. The obtained ICC $= .48$ can be interpreted as 48% of the total number of nostalgia experiences that participants reported is accounted for by differences between participants in how much nostalgia they have on average. Additionally, nostalgic experiences were found to occur relatively infrequently across the entire sample as the log odds

of reporting nostalgia on any prompt were approximately .23 [.16, .34], $\gamma_{00}$ = -1.46, *SE* = .19, *p* <

.001, 95% CI [-1.84, -1.07].

Before adding hypothesized predictors, we next added the control variable of Time of

Day (0 = morning, 1 = night) to the model at Level-1, based on the possibility that participants

may be more likely to report having experienced nostalgia in the evening based on greater

exposure to environmental factors throughout the day (e.g., work, school, social partners) that

could stimulate a nostalgic event (Model 1, Table 3). Time of Day was a significant predictor of

nostalgia likelihood, *b* = .47, *SE* = .11, *p* < .001, 95% CI [.24, .69], and participants were

approximately 60% more likely to report nostalgia in the evening (OR = 1.60; 95% CI [1.28,

2.00]. This variable was included in all subsequent analyses.

**Hypothesis 1: Age and Gender Differences in Nostalgia Frequency**

We hypothesized that with increased age there would be greater reported frequency of

nostalgia across the two-week study period, such that older adults would report the most

nostalgia compared to middle-aged adults, while young adults would report the least (*Hypothesis

1a*). Additionally, we hypothesized that women would report more nostalgia than men, based on

evidence of greater past-time orientation among women (*Hypothesis 1b*). To test this hypothesis,

we dummy-coded age group (young = -1, middle-aged = 0, and older = 1) and gender (0 =

women, 1 = men) and added it to the between-person level (i.e., Level-2) of the models.

Supporting Hypothesis 1, a likelihood ratio test confirmed that adding age group and gender into

the model resulted in substantially improved model fit compared to Model 1, $\chi^2(3)$ = 22.65, *p* <

.001, and a change in ICC (ICC = .408) from baseline suggested that adding these predictors

uniquely predicted approximately 7.20% of the interindividual variance (Model 2, Table 3).

Hypothesis 1a was supported: age group was a strong predictor of daily nostalgia

frequency, $F(2, 2259) = 12.29$, $p < .001$. The intercept for daily nostalgia frequency was $\gamma_{00} = -1.55$, $SE = .19$, $p < .001$, 95% CI [-1.92, -1.18], and the likelihood of reporting nostalgia was .21 [.15, .31]. Importantly, because middle-aged adults were coded as 0 for the present analysis, and the intercept reflects the mean nostalgia likelihood when predictors are 0, the intercept also reflects the likelihood of reporting nostalgia for a middle-aged adult. Next, using middle-aged adults as the comparison group, we found that young adults reported experiencing nostalgia approximately 60% less ($OR = .40$, 95% CI [.18, .88]). The likelihood of older adults reporting nostalgia was three times higher than middle-aged adults ($OR = 3.05$, 95% CI [1.30, 7.19]. The model examining age was then investigated with a random slope, but model fit tests did not show evidence of increased model fit, $\chi^2(1) = .75$, $p = .39$, thus the random slope for age was not included in Model 3.

In comparison to age group, gender was not a significant predictor of nostalgia frequency, $F(1, 2259) = .11$, $p = .74$. While non-significant, the pattern of results was surprising given past work: men were 12% more likely to report nostalgic experiences than women ($OR = 1.12$, 95% CI [.56, 2.23]). Further, there was no evidence of an age by gender effect ($p = .08$). Given the lack of support for hypothesis 1b and for gender differences in nostalgia frequency, this predictor was dropped from subsequent analyses.

**Hypothesis 2: Nostalgia, Affect, and Age**

Based on the classification of nostalgia as a mixed-affect experience, we hypothesized that nostalgia frequency would be associated with change in both positive and negative affect. Further, we believed this relationship would be stronger for older adults, given findings of increased poignancy with age (Carstensen et al., 2000; Ersner-Hershfield et al., 2008).

First, we examined whether nostalgia was more closely associated with within-person

differences in affect (i.e., daily fluctuations in affective reports) or between-person differences

(i.e., differences in average response by person) by placing both within-person centered and

person-mean centered variables in the logistic MLM model (e.g., Wang & Maxwell, 2015).

There was a trend for within-person fluctuations in positive affect to uniquely predict nostalgia

likelihood ($b = -.26$, $SE = .14$, $p = .06$). However, the majority of differences in nostalgia were

related to between-person differences on average ($b_{\text{Positive Affect}} = -.48$, $p < .001$, and $b_{\text{Negative Affect}} =$

$.99$, $p = .003$). Thus, in Model 4, we accounted for these between-person differences in the model

by including both the raw score of positive and negative affect, as well as their person-mean

centered scores (Enders & Tofighi, 2007; see Supplementary Appendix: Equation 3 for full

model build).

Consistent with our hypothesis, both positive, $\gamma_{20} = -2.35$, $SE = .88$, $p < .001$, 95% CI [-

4.09, -.62], and negative affect, $\gamma_{30} = -3.75$, $SE = 70$, $p < .001$, 95% CI [-5.12, -2.37], were

associated with participants reporting more daily nostalgia experiences. Specifically, for a person

at the sample mean of positive affect, the odds of reporting nostalgia were .10 [.02, .54], and for

a person at the sample mean of negative affect, the odds of reporting nostalgia were .02 [.01,

.09]. Given our interest in investigating the association between nostalgia and affective change,

and whether this relationship was differentially related to age group, we next examined how the

likelihood of experiencing nostalgia shifted depending on an increase in positive and negative

affect, by including interactions with age group (Model 3, Table 3). A likelihood ratio test

confirmed that adding these predictors, as well as random slopes for positive and negative affect

significantly improved model fit compared to Model 2, $\chi^2(7) = 182.45$, $p < .001$, and compared

to the model without random slopes, $\chi^2(5) = 96.47$, $p < .001$. Further, the significant random

slopes highlighted large variability in affective responses to nostalgia, indicating that nostalgia

was not consistently linked to positive and negative affect for all participants. Following

guidelines from Raudenbush and Bryk (2002), we calculated plausible range to estimate the

percentage of the sample that had a positive slope (reflecting increased affect ratings) and found

that 71.68% of individuals had an increase in positive affect, while 51.16% of participants had an

increase in negative affect. This result provides further support for the mixed-affect nature of

nostalgia, as well as individual differences and heterogeneity in response to a nostalgic

experience.

Examining age differences revealed that a change in positive affect was significantly

associated with nostalgia for both young ($OR = 2.52$, 95% CI [1.49, 4.25]) and middle-aged

adults ($OR = 2.02$, 95% CI [1.43, 2.86], such that nostalgia was more than twice as likely in the

presence of increased positive affect; however this effect was not found in older adults ($OR =$

1.62, 95% CI [.93, 2.84]). A significant interaction between age and negative affect emerged,

suggesting that equivalent levels of negative affect were not found by age group, $F(1, 2064) =$

8.08, $p < .001$. Partially supporting our hypothesis that the relationship between affect and age

would be stronger for older adults, a change in negative affect was associated with a nine times

greater increase in the likelihood of nostalgia for older adults ($OR = 9.34$, 95% CI [1.28, 68.30])

and an 87% reduction in nostalgia for young adults ($OR = .13$, 95% CI [.02, .85]). While not

significant for middle-aged adults, negative affect increased the likelihood of nostalgia by 12%

($OR = 1.12$, 95% CI [.32, 3.87]), thus the pattern of nostalgia by negative affect was that as age

group increased, negative affect was more prevalent and predictive.

**Discussion**

This study was the first to document age differences in nostalgia frequency and clarified

the affective profile associated with nostalgia using a lifespan sample. Two key contributions of

this naturalistic examination of nostalgia include: 1) nostalgia likelihood appears to increase across the lifespan, and 2) the degree to which nostalgia is associated with positive and negative affect changes by age group. In the current study, young adults' nostalgia was more closely tied to positive affect, while for older adults, nostalgia is more related to negative affect. Middle-aged adults fell between young and old in their pattern of response, but there was considerable heterogeneity in emotional responses to nostalgia, perhaps reflecting underlying differences in the types of nostalgia individuals experienced. It seems likely that memories for past social partners would stimulate greater variation in affect than remembering when one heard a song for the first time; however this was not explored in the present study.

Nostalgia has been theorized to increase across the lifespan for several reasons. First, older adults have greater life experiences to recall than younger adults. Second, considering that the central developmental goal of later life is to integrate the past with the present, older adults may naturally experience more nostalgia (i.e., *ego-integrity*; Erikson & Erikson, 1997). Indeed, this study found support for nostalgia frequency increasing across the lifespan, such that older adults reported more nostalgic episodes than middle-aged and young adults. Specifically, older adults were the most likely to report experiencing nostalgia at every prompt and three times more likely than middle-aged adults; young adults were only about 12% likely to report experiencing nostalgia on any given survey.

The design of the present study, utilizing three age groups, also permitted us to examine similarities and differences to previous nostalgia research in young adults. Young adults in this study reported experiencing daily nostalgia at lower rates compared to previous self-reported frequency estimates (collected via retrospective survey measures): approximately 50% of young adults reported experiencing nostalgia weekly compared to 79% in previous research (Wildschut

et al., 2006). One reason for the discrepancies between nostalgia measured daily compared to retrospectively could pertain to differences between prompted and spontaneous nostalgia. Specifically, laboratory-induced nostalgia leads to high rates of compliance (i.e., most participants can produce nostalgic experiences on demand) and has also demonstrated differing self-reported outcomes compared to daily nostalgia (Newman et al. 2020). Thus, it is possible that nostalgia frequency in young adults has been exaggerated.

One unexpected finding regarding nostalgia frequency in the current study was the lack of gender differences in daily assessments. Past work has found that women are more likely than men to report nostalgia episodes and endorse a past-time orientation (Ely & Mercurio, 2011; Madoglou et al., 2017), but in the present study nostalgia frequency was not predicted by gender of participant. One plausible reason for this divergent finding compared to previous studies is the limited nature of nostalgia research and gender; many studies completely disregard gender analysis given vastly unequal samples of men and women (cf. Sedikides et al., 2016 and Wildschut et al., 2006). One caveat to the present findings are that, while gender was more equally distributed in the present study, there were still disproportionately more women in the young adult group than men. However, gender was more balanced in the middle-aged and older adult groups.

The co-occurrence of positive and negative emotional states has been associated with advancing age or meaningful endings. Nostalgia is conceptualized as an experience that leads to feelings of *bittersweetness,* even in young adults. In the present study, the experience of daily nostalgia was differentially associated with positive and negative affect across age, and considerable diversity between people. Most people reported increased affect associated with their nostalgic experience, however the large variation may reflect underlying differences in the

types of experiences recalled. Replicating past work that defines nostalgia as "predominantly positive" (e.g., Hepper et al., 2014; Sedikides et al., 2008), nostalgia was more closely associated with increases in positive affect for young adults and demonstrated a large reduction in experience when negative affect was elevated. Importantly, an interaction emerged between age and negative affect such that among older adults a change in negative affect predicted a nine-fold increase in nostalgia likelihood. By extending this work to other aged groups, we found that at times middle-aged adults responded more like young adults, reflecting increases in positive affect, and also slightly elevated rates of negative affect, but this was non-significant.

This pattern of results generates an interesting question: why would nostalgia shift to becoming more negative at different stages of life, or over time? We believe there are two primary reasons, the first is the theorized role of nostalgia and ego-integrity (Erikson & Erikson, 1997), and the second is the increase in emotional blending across the lifespan akin to *poignancy* (Carstensen et al., 2011; Ersner-Hershfield et al., 2008). Nostalgia may facilitate ego-integrity by creating situations whereby a person remembers key moments of their lives and helps integrate them with their present self. It is likely that not all key moments that are relived will be positive, even if they are viewed through a temporally-remote filter. In fact, a recent review from Bowen and colleagues (2018) reported that the emotional content associated with a memory affects its retrieval, such that negatively valanced memories are often encoded more deeply. Thus, it is possible that many nostalgic memories recalled would have a negative tone, especially if individuals are potentially resolving a developmental milestone.

Second, nostalgia was associated with greater positive and negative affect in later life. Although the gain in positive affect was non-significant for older adults, perhaps reflecting more leveling-off from the higher rates in young and middle-aged adults, the association with

increased change in negative affect reflect previous findings of greater emotional blending and affective complexity in older adulthood. In a daily diary study, Carstensen and colleagues (2011) found that with increasing age, participants reported more instances of poignancy, defined as the co-occurrence of positive and negative affect. Given the similarities in emotional profiles between poignancy and nostalgia, it is possible that moments of nostalgia instigated these poignant moments. Further, some researchers have suggested that increased experience and acceptance of conflicting emotions across the lifespan stem from greater familiarity with mixed emotions due to practice (Charles et al., 2017). From this perspective, daily nostalgia may be a mundane experience that stimulates emotional growth in young adults leading to beneficial outcomes across the lifespan, compared to more momentous endings associated with poignancy. Together, evaluating daily nostalgia may provide a methodologically practical method of exploring mixed emotions.

**Limitations and Future Directions**

Although we collected data from participants across the lifespan, the cross-sectional nature of the design limits the developmental questions that could be addressed. We interpreted the pattern of results as providing evidence for the increasing frequency of nostalgia across the lifespan, however we cannot interpret the current results as demonstrating change across the lifespan. Given that cross-sectional studies cannot disentangle age and cohort, an alternative interpretation for these results is that older participants may have been more likely to demonstrate nostalgia because committing songs, places, and other environmental stimuli to memory was more important prior to the "internet age". Researchers have reported "*google effects*" on cognition, such that participants who believe information will be easily accessible via computer demonstrate worsened performance on later recall tasks (Sparrow et al., 2011). It is

possible that young adults will not demonstrate this bias towards increased nostalgia in later life, if personal history is cemented via the digital age. There are certainly other potential cohort differences that might account for these results.

A second limitation to this study regards possible issues with participant responsiveness and reporting accuracy stemming from the selection of a twice-daily *interval-contingent protocol* (i.e., responding to prompts at a fixed period throughout the day; Bolger et al., 2003). Experience-sampling and EMA methods are preferable to retrospective measures when assessing phenomena that may be context-dependent and transitory, such as emotional states and well-being (Scollon et al., 2009). The EMA design of the present study reduced the elapsed time between a nostalgic experience and the report to capture the associated emotions with greater fidelity, however the 12-hour delay between responses could have impacted reporting. Although closer in proximity to the nostalgic event, which potentially strengthens the salience of the related emotions, it is still possible that participants' momentary affective state at the time of the prompt influenced their recollection of the previous nostalgia. Past work investigating affective accuracy found that participants were often inaccurate in reporting the frequency of an emotion (e.g., happy 3 times that day), but were more accurate in identifying the relative amount of an emotion (e.g., more happy than sad; Schimmack, 2002). Thus, it is possible that participants were not completely accurate in their reporting of the emotions associated with nostalgia, but it is likely that the relative prevalence of positive and negative emotions related to the event were maintained. A related concern is that participants knew to expect their phone to provide surveys approximately every 12 hours; this may have influenced the frequency of reporting as they may have become more aware of these experiences (e.g., reactance effects). Alternatively, it is also possible that the twice-daily response led to underreporting of nostalgia given that the

questionnaires only requested details regarding one nostalgic experience since the last prompt.

As Scollen et al. (2003) noted there is always a trade-off between signal and response, with the

best quality responses closer to the event but also often reflecting the lowest retention. Reflecting

this trade-off, we selected an *interval-contingent protocol* as these are the least burdensome to

participants and facilitate greater compliance. However, an important future direction would be

to explore nostalgia frequency and affect using an *event-contingent protocol* (i.e., participant-

initiated responses).

Another limitation to the present findings regards the application of the original PANAS

(Watson et al., 1988) as our assessment tool to capture positive and negative affect. This

measurement tool, while widely used, potentially reduced the sensitivity and validity of affect

related to nostalgia by recording emotional states that are not associated with nostalgia, as well

as conflating the absence of emotion with low levels of emotion (i.e., 1 = *very slightly* and *not at

all*). Reflecting this possibility, we had overall low incident and endorsement of negative affect,

which may reflect range restriction resulting from misaligned adjectives (i.e., hostile, afraid);

however, the relatively large within-person standard deviations suggest there was variability in

response between surveys. More recently, some researchers have begun selecting subsets of

emotional descriptors that may reflect underlying characteristics of nostalgia, such as cheerful

and downhearted (e.g., Batcho, 2020; Batcho & Shikh, 2016). Given the unique bittersweet

profile associated with nostalgia perhaps a new "nostalgia state inventory" could better reflect

this unique emotion by capturing moods such as melancholy or wistful.

One final caveat regards the interpretation of the age by negative affect interaction as

indicating *poignancy* (Carstensen et al., 2000; Ersner-Hershfield et al., 2008). Given the

definition of poignancy as the bittersweet emotions people experience in the face of meaningful

endings, and the similarities to our operational definition of nostalgia (i.e., *bittersweet autobiographical memory experience that mentally transports a person back in time*), we have noted parallels between the two phenomena. However, in the present study we did not assess the degree to which meaningful endings were captured in the participants' self-reported nostalgia experiences or examine whether salient endings prompted nostalgia, thus we cannot be certain that these two experiences are more than superficially alike.

### Conclusions

Nostalgia has been conceptualized as a common occurrence found amongst people of all ages and cultures. Given how common nostalgic experiences are, it is surprising that so little is known about them. This study clarified the affective profile of nostalgic experiences and quantified age differences in how often individuals experience a wistful longing for times past. These results expand the existing description of nostalgia as bittersweet by showing significant variability in both positive and negative affect with neither valence dominating a nostalgic experience. Similar to past work, positive affect was more closely tied to nostalgia in young adulthood, but by extending this examination across different life stages we found that this effect appears to shift to highlighting negative affect in later life. We contend that it is actually this yin and yang of nostalgia that facilitates meaning-making as individuals look back across their lives. If nostalgia is a tool or by-product of life review, then it certainly makes sense that it would increase with age. The large increase in frequency of nostalgia from young adulthood to middle-age, and again from middle-age to late adulthood, indicates that while nostalgia *is* a common experience, it also appears to be tailored for each life stage.

References

Batcho, K. I. (1995). Nostalgia: A psychological perspective. *Perceptual and Motor Skills*, *80*(1), 131-143. https://doi.org/10.2466/pms.1995.80.1.131

Batcho, K. I. (2013). Nostalgia: The bittersweet history of a psychological concept. *History of Psychology, 16*(3), 165-176. http://dx.doi.org/10.1037/a0032427

Batcho, K. I. (2020). When nostalgia tilts to sad: Anticipatory and personal nostalgia. *Frontiers in Psychology, 11*, 1186. https://doi.org/10.3389/fpsyg.2020.01186

Batcho, K. I., & Shikh, S. (2016). Anticipatory nostalgia: Missing the present before it's gone. *Personality and Individual Differences, 98*, 75-84. https://doi.org/10.1016/j.paid.2016.03.088

Bluck, S., & Alea, N. (2008). Remembering being me: The self-continuity function of autobiographical memory in younger and older adults. In F. Sani (Ed.) *Individual and collective self-continuity: Psychological perspectives* (pp. 55-70). Psychology Press.

Bolger, N., Davis, A., & Rafaeli, E. (2003). Diary methods: Capturing life as it is lived. *Annual Review of Psychology*, *54*(1), 579-616. https://doi.org/10.1146/annurev.psych.54.101601.145030

Bowen, H. J., Kark, S. M. & Kensinger, E. A. (2018). NEVER forget: Negative emotional valence enhances recapitulation. *Psychonomic Bulletin & Review,* 25, 870–891. https://doi.org/10.3758/s13423-017-1313-9

Boylin, W., Gordon, S. K., & Nehrke, M. F. (1976). Reminiscing and ego integrity in institutionalized elderly males. *The Gerontologist*, *16*(2), 118-124.

Butler, R. N. (1963). The life review: An interpretation of reminiscence in the

    aged. *Psychiatry*, *26*(1), 65-76. https://doi.org/10.1111/j.1532-5415.1963.tb00551.x

Carstensen, L. L., Pasupathi, M., Mayr, U., & Nesselroade, J. R. (2000). Emotional experience in

    everyday life across the adult life span. *Journal of Personality and Social*

    *Psychology*, *79*(4), 644-655. https://doi.org/10.1037/0022-3514.79.4.644

Carstensen, L. L., Turan, B., Scheibe, S., Ram, N., Ersner-Hershfield, H., Samanez-Larkin, G.

    R., Brooks, K. P., & Nesselroade, J. R. (2011). Emotional experience improves with age:

    Evidence based on over 10 years of experience sampling. *Psychology and Aging, 26*(1),

    21–33. https://doi.org/10.1037/a0021285

Charles, S. T., Piazza, J. R., & Urban, E. J. (2017). Mixed emotions across adulthood: When,

    where, and why? *Current Opinion in Behavioral Sciences*, *15*, 58-61.

    https://doi.org/10.1016/j.cobeha.2017.05.007

Conner, T. S., Tennen, H., Fleeson, W., & Barrett, L. F. (2009). Experience sampling methods:

    A modern idiographic approach to personality research. *Social and Personality*

    *Psychology Compass*, *3*(3), 292–313. https://doi.org/10.1111/j.1751-9004.2009.00170.x

Ely, R., & Mercurio, A. (2011). Time perspective and autobiographical memory: Individual and

    gender differences in experiencing time and remembering the past. *Time & Society*,

    *20*(3), 375-400. https://doi.org/10.1177%2F0961463X10366081

Enders, C. K., & Tofighi, D. (2007). Centering predictor variables in cross-sectional multilevel

    models: A new look at an old issue. *Psychological Methods, 12*(2), 121–

    138. https://doi.org/10.1037/1082-989X.12.2.121

Erikson, E. H. (1968). Generativity and ego integrity. In B. L. Neugarten (Ed.) *Middle-age and*

    *aging* (pp. 85-87). University of Chicago Press.

Erikson, E. H., & Erikson, J. M. (1997). *The life cycle completed* (Expanded edition). W. W.

     Norton & Company, Inc.

Ersner-Hershfield, H., Mikels, J. A., Sullivan, S. J., & Carstensen, L. L. (2008). Poignancy:

     Mixed emotional experience in the face of meaningful endings. *Journal of Personality*

     *and Social Psychology, 94*(1), 158-167. https://dx.doi.org/10.1037/0022-3514.94.1.158

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using

     G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research*

     *Methods*, *41*, 1149-1160.

Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). "Mini-mental state": A practical

     method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric*

     *Research*, *12*(3), 189-198.

Grühn, D., Sharifian, N., & Chu, Q. (2016). The limits of a limited future time perspective in

     explaining age differences in emotional functioning. *Psychology and Aging*, *31*(6), 583–

     593. https://doi.org/10.1037/pag0000060

Hepper, E. G., Ritchie, T. D., Sedikides, C., & Wildschut, T. (2012). Odyssey's end: Lay

     conceptions of nostalgia reflect its original homeric meaning. *Emotion, 12*(1), 102–

     119. https://doi.org/10.1037/a0025167

Hepper, E. G., Wildschut, T., Sedikides, C., Ritchie, T. D., Yung, Y.-F., Hansen, N.,

     Abakoumkin, G., Arikan, G., Cisek, S. Z., Demassosso, D. B., Gebauer, J. E., Gerber, J.

     P., González, R., Kusumi, T., Misra, G., Rusu, M., Ryan, O., Stephan, E., Vingerhoets,

     A. J. J., & Zhou, X. (2014). Pancultural nostalgia: Prototypical conceptions across

     cultures. *Emotion, 14*(4), 733–747. https://doi.org/10.1037/a0036790

Holak, S. L., & Havlena, W. J. (1992). Nostalgia: An exploratory study of themes and emotions in the nostalgic experience. In J. F. Sherry & B. Sternthal (Eds.), *NA – Advances in Consumer Research* (pp. 380-387). Association for Consumer Research.

Holak, S. L., & Havlena, W. J. (1998). Feelings, fantasies, and memories: An examination of the emotional components of nostalgia. *Journal of Business Research*, *42*(3), 217-226. https://doi.org/https://doi.org/10.1016/S0148-2963(97)00119-7

Hox, J. J., Moerbeek, M., van de Schoot, R. (2018). *Multilevel Analysis*. Routledge.

Huang, H. C., Chen, Y. T., Chen, P. Y., Hu, S. H. L., Liu, F., Kuo, Y. L., & Chiu, H. Y. (2015). Reminiscence therapy improves cognitive functions and reduces depressive symptoms in elderly people with dementia: A meta-analysis of randomized controlled trials. *Journal of the American Medical Directors Association*, *16*(12), 1087-1094. https://doi.org/10.1016/j.jamda.2015.07.010

Jessup, G., Bian, S., Chen, Y. W., & Bundy, A. (2012). Manual of PIEL survey application. [iPhone/iPod Touch/iPad/iPad mini application]. *Sydney, Australia: The University of Sydney*.

Juhl, J., Routledge, C., Arndt, J., Sedikides, C., & Wildschut, T. (2010). Fighting the future with the past: Nostalgia buffers existential threat. *Journal of Research in Personality*, *44*(3), 309-314. https://doi.org/10.1016/j.jrp.2010.02.006

Lieberman, M. D., Inagaki, T. K., Tabibnia, G., & Crockett, M. J. (2011). Subjective responses to emotional stimuli during labeling, reappraisal, and distraction. *Emotion, 11*(3), 468-480. http://dx.doi.org/10.1037/a0023503

Maas, C. J. M., & Hox, J. J. (2005). Sufficient sample sizes for multilevel modeling. *Methodology: European Journal of Research Methods for the Behavioral & Social Sciences, 1*, 85-91.

Madoglou, A., Gkinopoulos, T., Xanthopoulos, P., & Kalamaras, D. (2017). Representations of autobiographical nostalgic memories: Generational effect, gender, nostalgia proneness and communication of nostalgic experiences. *Journal of Integrated Social Sciences*, *7*(1), 60-88.

Newman, D. B., Sachs, M. E., Stone, A. A., & Schwarz, N. (2020). Nostalgia and well-being in daily life: An ecological validity perspective. *Journal of Personality and Social Psychology, 118*(2), 325–347. https://doi.org/10.1037/pspp0000236

Parker, R. G. (1999). Reminiscence as continuity: Comparison of young and older adults. *Journal of Clinical Geropsychology*, *5*(2), 147-157. https://doi.org/10.1023/A:1022931111622

Raudenbush, S.W. & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods*. Sage.

Routledge, C., Arndt, J., Sedikides, C., & Wildschut, T. (2008). A blast from the past: The terror management function of nostalgia. *Journal of Experimental Social Psychology*, *44*(1), 132–140. https://doi.org/10.1016/j.jesp.2006.11.001

SAS Institute. (2016). *Base SAS 9.4 procedures guide*. SAS Institute: Cary, NC.

Scherbaum, C. A., & Ferreter, J. M. (2009). Estimating statistical power and required sample sizes for organizational research using multilevel modeling. *Organizational Research Methods, 12*(2), 347–367. https://doi.org/10.1177/1094428107308906

Schimmack, U. (2002). Frequency judgments of emotions: The cognitive basis of personality

    assessment. In P. Sedlmeier & T. Betsch (Eds.), *Frequency Processing and Cognition*

    (pp. 189-204). Oxford University Press.

Scollon, C. N., Prieto, C. K., Diener, E. (2009). Experience sampling: Promises and pitfalls,

    strength and weaknesses. In E. Diener (Ed.), *Assessing Well-Being* (pp. 157-180).

    Springer. https://doi.org/10.1007/978-90-481-2354-4_8

Sedikides, C., Cheung, W. Y., Wildschut, T., Hepper, E. G., Baldursson, E., & Pedersen, B.

    (2018). Nostalgia motivates pursuit of important goals by increasing meaning in

    life. *European Journal of Social Psychology*, *48*(2), 209-216.

    https://doi.org/10.1002/ejsp.2318

Sedikides, C., Wildschut, T., Arndt, J., & Routledge, C. (2008). Nostalgia: Past, present, and

    future. *Current Directions in Psychological Science*, *17*(5), 304–307.

    https://doi.org/10.1111/j.1467-8721.2008.00595.x

Sedikides, C., Wildschut, T., & Baden, D. (2004). Nostalgia: Conceptual issues and existential

    functions. In J. Greenberg, S. Koole, & T. Pyszczynski (Eds.), *Handbook of experimental*

    *existential psychology* (pp. 200-214). Guilford Press.

Sedikides, C., Wildschut, T., Cheung, W. Y., Routledge, C., Hepper, E. G., Arndt, J., Vail, K.,

    Zhou, X., Brackstone, K., & Vingerhoets, A. J. (2016). Nostalgia fosters self-continuity:

    Uncovering the mechanism (social connectedness) and consequence (eudaimonic well-

    being). *Emotion*, *16*(4), 524-539. https://doi.org/10.1016/j.tics.2016.01.008

Sedikides, C., Wildschut, T., Routledge, C., Arndt, J., Hepper, E. G., & Zhou, X. (2015). To

    nostalgize: Mixing memory with affect and desire. *Advances in Experimental Social*

    *Psychology, 51*, 189-273. https://doi.org/10.1016/bs.aesp.2014.10.001

Snijders, T. A. B. (2005). Power and Sample Size in Multilevel Linear Models. In B.S. Everitt &

    D.C. Howell (eds.), *Encyclopedia of Statistics in Behavioral Science* (pp. 1570–1573).

    Wiley.

Sparrow, B., Liu, J. & Wegner, D. M. (2011). Google effects on memory: Cognitive

    consequences of having information at our fingertips. *Science, 333*, 776–778.

    https://doi.org/10.1126/science.1207745

Tombaugh, T. N., & McIntyre, N. J. (1992). The Mini-Mental State Examination: A

    comprehensive review. *Journal of the American Geriatrics Society*, *40*(9), 922–935.

    https://doi.org/10.1111/j.1532-5415.1992.tb01992.x

Wang, L. (P.), & Maxwell, S. E. (2015). On disaggregating between-person and within-person

    effects with longitudinal data using multilevel models. *Psychological Methods, 20*(1),

    63–83. https://doi.org/10.1037/met0000030

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures

    of positive and negative affect: The PANAS scales. *Journal of Personality and Social

    Psychology*, *54*(6), 1063-1070. https://doi.org/10.1037/0022-3514.54.6.1063

Webster, J. D., & McCall, M. E. (1999). Reminiscence functions across adulthood: A replication

    and extension. *Journal of Adult Development*, *6*(1), 73-85.

    https://doi.org/10.1023/A:1021628525902

Wildschut, T., Sedikides, C., Arndt, J., & Routledge, C. (2006). Nostalgia: Content, triggers,

    functions. *Journal of Personality and Social Psychology*, *91*(5), 975-993.

    https://doi.org/10.1037/0022-3514.91.5.975

Wildschut, T., Sedikides, C., Routledge, C., Arndt, J., & Cordaro, P. (2010). Nostalgia as a

    repository of social connectedness: The role of attachment-related avoidance. *Journal of*

    *Personality and Social Psychology, 98*, 573–586.

Woods, B., O'Philbin, L., Farrell, E. M., Spector, A. E., & Orrell, M. (2018). Reminiscence

    therapy for dementia. *Cochrane Database of Systematic Reviews*, (3), 2-9.

    https://doi.org/10.1002/14651858.CD001120.pub3

Zhou, X., Sedikides, C., Wildschut, T., & Gao, D.-G. (2008). Counteracting loneliness: On the

    restorative function of nostalgia. *Psychological Science, 19*(10), 1023–1029.

    https://doi.org/10.1111/j.1467-9280.2008.02194.x

Table 1

*Participant Demographic Characteristics*

| Total (*N* = 108) | Young (*n* = 47) | Middle (*n* = 31) | Older (*n* = 30) |
|---|---|---|---|
| **Age in years** | 21.21 (3.24) | 52.90 (5.23) | 69.43 (3.89) |
| **Hispanic** | 4.26 % | 3.22 % | 0 |
| **Race** | | | |
| White | 74.46 % | 83.89 % | 96.67 % |
| Black | 14.89 % | 3.22 % | 0 |
| Asian | 2.13 % | 0 | 3.33 % |
| Native American/ | 4.26 % | 0 | 0 |
| Pacific Islander | | | |
| Other | 0 | 9.67% | 0 |
| **Gender** | | | |
| **Women** | 70.21 % | 58.06 % | 46.67 % |
| **Education in years** | 13.66 (1.31) | 15.39 (2.40) | 16.20 (2.14) |
| **Health on a 5-point scale** | 3.79 (.88) | 3.45 (.96) | 4.00 (.95) |
| **Mini-Mental State Exam** | 29.28 (1.16) | 28.84 (1.49) | 29.27 (1.11) |

*Note.* Standard deviations are reported in parentheses with means.

Table 2

*Descriptive Statistics for Focal Variables by Age Group and Total* (*N* = 100)

| | **Young** | **Middle** | **Older** | **Total** |
|---|---|---|---|---|
| **Nostalgia Count (0 – 28)** | 3.28 (3.07) | 6.69 (6.30) | 10.96 (8.60) | 6.42 (6.75) |
| **Nostalgia Frequency (% Yes)** | 14.1% | 28.1% | 45.8% | 27.2% |
| **Positive Affect (1 – 5)** | | | | |
| Within-Person | .15 (.70) | .29 (.84) | -.01 (.80) | .15 (.77) |
| Between-Person | 2.06 (.68) | 2.18 (.67) | 2.33 (.53) | 2.17 (.64) |
| **Negative Affect (1 – 5)** | | | | |
| Within-Person | .05 (.56) | -.04 (.14) | -.06 (.27) | -.01 (.40) |
| Between-Person | 1.28 (.29) | 1.11 (.09) | 1.19 (.27) | 1.20 (.25) |

*Note.* Within-person estimates are centered at the Level-1 mean (i.e., centered around each person's average affect and reflect daily variability) and between-person estimates are the Level-2 mean (i.e., person-level positive and negative affect).

Table 3

*Estimates and Odds Ratios for Multilevel Logistic Regression Models Examining Daily Nostalgia*

| Parameter Estimate | Model 0: Null Model | | Model 1: Time of Day | | Model 2: Age & Gender | | Model 3: Age & Affect | |
|---|---|---|---|---|---|---|---|---|
| | Estimate (*SE*) | *OR* (95% CIs) | Estimate (*SE*) | *OR* (95% CIs) | Estimate (*SE*) | *OR* (95% CIs) | Estimate (*SE*) | *OR* (95% CIs) |
| **Level-1: Within-Person** | | | | | | | | |
| Intercept[a] | -1.46 (.19)*** | .23 (.16, .34) | -1.70 (.20)*** | .18 (.12, .27) | -1.55 (.19)*** | .21 (.15, .31) | -3.88 (1.00)*** | .02 (.003, .15) |
| Time of Day - Evening | | | .47 (.11)*** | 1.60 (1.28, 2.00) | .47 (.11)*** | 1.60 (1.28, 2.00) | .49 (.13)*** | 1.63 (1.25, 2.12) |
| Change in Positive Affect | | | | | | | | |
| Young | | | | | | | .92 (.27)*** | 2.52 (1.49, 4.25) |
| Middle-Aged | | | | | | | .70 (.18)*** | 2.02 (1.42, 2.86) |
| Older | | | | | | | .49 (.29) | 1.62 (.93, 2.84) |
| Change in Negative Affect | | | | | | | | |
| Young | | | | | | | -2.01 (.94)* | .13 (.02, .85) |
| Middle-Aged | | | | | | | .11 (.63) | 1.12 (.32, 3.87) |
| Older | | | | | | | 2.23 (1.01)* | 9.34 (1.28, 68.30) |
| **Level-2[b]: Between-Person** | | | | | | | | |
| Young | | | | | -.93 (.41)* | .40 (.18, .88) | -2.87 (1.34)* | .06 (.004, .79)[a] |
| Older | | | | | 1.12 (.44)** | 3.05 (1.30, 7.19) | -4.90 (1.46)*** | .007 (.004, .13)[a] |
| Man | | | | | .12 (.35) | 1.12 (.56, 2.23) | | |
| Woman | | | | | -.12 (.35) | .89 (.45, 1.77) | | |
| **Random Effects** | | | | | | | | |
| Intercept | 3.04 (.59) | | 3.10 (.60) | | 2.27 (.46) | | 28.88 (10.60) | |
| Positive Affect | | | | | | | 1.49 (.48) | |
| Negative Affect | | | | | | | 14.44 (6.66) | |
| **Model Fit** | | | | | | | | |
| -2 Log-Likelihood | 2188.81 | | 2171.77 | | 2149.12 | | 1961.63 | |
| Intraclass Correlation (ICC) | .480 | | .485 | | .408 | | .897 | |

*Note.* * *p* < .05, ** *p* < .01, *** *p* < .001.

[a] Reported with log odds estimates—*Nostalgia Likelihood*—instead of odds ratios (*OR*).

[b] Estimates and odds ratios for middle-aged adults are not presented as they are the reference group for young and older adults, and coded to be 0 (i.e., equivalent to the intercept).