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Older adults remember more positive aspects of the COVID-19 pandemic

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Abstract

The initial phase of the COVID-19 pandemic changed our lives dramatically, with stay-at-home orders and extreme physical distancing requirements. The present study suggests that how adults remember these disruptions depends, in part, on their age. In two surveys collected from American and Canadian participants during summer 2020 (n=551) and fall 2020 (n=506), older age (across ages 18–90) was associated with greater reflections on positive aspects of the initial phase of the pandemic. While the pandemic is a shared experience, the way it is remembered may differ across generations, with older age leading to a greater focus on the positive aspects.

Keywords

Memory; Aging; Emotion; Affect; Valence; COVID-19; pandemic

Life consists of highs and lows. We ride this affective rollercoaster in real-time as our lives unfold, and we revisit past events through our memories. Previous research suggests that age can impact how we remember affectively laden past events. Compared to younger adults, older adults are more likely to focus on the high points (see meta-analysis by Reed, Chan, & Mikels, 2014) and have a tendency to remember more positive relative to negative events (Mather & Carstensen, 2005). Furthermore, older adults' memories of negative events often include a focus on the positive aspects: When remembering negative events from their personal pasts, older adults use proportionally more positive words than younger adults, incorporating positive content into even the most negative of their autobiographical narratives (Ford, DiGirolamo & Kensinger, 2016).

This tendency for older adults to focus on the positive elements of an otherwise-negative event extends to public, high-arousal events. For example, in a study of adults living in the Boston area during the 2013 Boston Marathon bombings, increased age was associated with

a greater tendency to reflect on positive details like the city coming together or the heroism displayed by first responders (Ford, DiBiase & Kensinger, 2018). Although the initial survey did not reveal any age-related differences in how often individuals reported thinking about the negative aspects of the bombings, when these same individuals were asked about their reflections six months later, older adults showed a reduction in the negativity of their memories, while younger adults did not (Ford, DiBiase, Ryu & Kensinger, 2018). These results reveal that older adults don't curtail reflection on the negative impact of an event soon after its occurrence; instead, they incorporate positive as well as negative aspects into their memories. Over time, this may allow them to abstract positive life lessons from its occurrence and reframe the event in a less negative light.

In these prior studies, the event itself was over by the time the memories were queried. It is one thing to look back at a life event that has resolved and to remember the good that came of it. Yet, different processes may be required to adopt this positive memory perspective when an event is still unresolved. The protracted duration of the COVID-19 pandemic provides a unique opportunity to examine whether age is associated with an increased focus on positive aspects even when people are remembering an earlier time-period from a sustained negative event that has not yet reached its resolution. The current study is part of a larger study in which participants provided daily ratings of affective experience and behavior (Cunningham, et al., *in press, conditionally accepted*), extending these prior analyses by focusing on how participants *reflect back* on their experiences months later.

The first wave of the COVID-19 pandemic hit the United States and Canada in early spring 2020. As cases rose rapidly, many Americans and Canadians were under stay-at-home orders that kept them home from work and school, out of restaurants and stores, and isolated from their loved ones. Although the full effects of contracting the virus were still unknown, it was reported very early that older age was one of the greatest risk factors for significant complications (CDC, 2020). The primary goal of the current study was to examine how people reflect on the initial wave (i.e., March-May 2020) of the pandemic. A first survey was administered during the summer of 2020, when the United States and Canada were just beginning to relax restrictions on activities such as dining or gathering in groups. Participants were asked to rate the valence of their overall reflections of the spring phase (on a valence scale of negative to positive) as well as the extent to which their reflections of that period focus on specific positive (e.g., hope that things would get better) or negative (e.g., fear of contracting the virus) aspects. They were also asked to report memories of their most positive and most challenging events from that period and to rate their phenomenological experience of remembering. We hypothesized that older age would be associated with greater positivity, a greater tendency to remember the positive aspects that arose during that spring phase of the pandemic, and greater richness (vividness and re-experience) of memories for positive, but not challenging, events.

When it became clear that the spread was continuing, a second survey was administered in October 2020. This second survey included all of the same memory measures and was added to examine a secondary research question of how the prolonged nature of the pandemic influenced age-related differences in memory changes over time. Prior research examining memory for the marathon bombings (Ford, DiBiase, Ryu & Kensinger, 2018)

suggests that, with further time from the event, increased age would be associated with greater decreases in focus on the negative aspects, as well as decreases in challenging event richness. Alternatively, it is possible that time, alone, is insufficient to cause such age-related changes, and that an important factor contributing to the previously reported decreases in negativity was the conclusion of the negative event. In this case, the continuation of the pandemic into the retrieval windows of both surveys may mean that age-related effects on memory look similar at both time points.

Our memories create the lens through which we interpret our past and provide the data-points we use to make our decisions. To understand the affective outcomes of the COVID-19 pandemic, it is therefore critical to understand how the event is remembered (see Kahneman & Riis, 2005). The present study provides an important step toward this understanding.

METHODS

Participants

Participants in the current memory study were all recruited from an ongoing study examining individuals' affective responses to the pandemic (see *"Initial recruitment of participants"* in supplementary materials and Cunningham et al., *in press* for more details on the original sample and Cunningham et al., *conditionally accepted* for the annotated dataset from this original sample).

The analysis addressing our first research question—the effects of age on memory for the initial phase of the pandemic—included 551 participants from the United States and Canada who completed an initial memory survey. An additional 90 participants from outside the US and Canada completed the memory survey, but were not included in this analysis due to the heterogeneity in the time-course of the pandemic around the globe. Participants ranged in age from 18 to 90 ($M_{T1}=39.99$, $SD_{T1}=17.79$ years, 458 female¹). Although the sample was more heavily skewed to young adults, 21% of participants (114) were 60 and above (see *"Age distribution of participants"* in supplementary materials). Respondents were primarily non-Hispanic (4.5% reported Hispanic ethnicity) and white (87.8% self-reported as white). Participants were generally well-educated; all but 14% of participants had completed a college degree. 8% of respondents reported a serious medical problem, and the likelihood of reporting was predicted by increasing age ($B=.02$, odds ratio=1.02, Wald $\chi^2(1)=5.90$, $p=.02$, Nagelkerke $R^2=.02$).

The analysis addressing our second research question—the effect of time on age-related memory patterns—included 401 participants from the United States and Canada ($M=40.87$, $SD=17.93$ years, 332 female) who completed both the initial (T1) and a second (T2) survey². In this within-subjects analysis sample, 22% (90 participants) were 60 and above (see *"Age distribution of participants"* in supplementary materials), 3.7% reported Hispanic

¹The considerably greater number of female relative to male participants in our sample (83%) may influence some results. Although the small number of male participants also makes it impossible to include sex as a factor, we ran exploratory analyses to examine the effects. See *"Interactions of age with biological sex"* in supplementary materials for exploratory analysis of age-by-sex interactions.

²See *"Between-subject comparison of Time 1 and Time 2"* and *"Time 2 analyses"* in supplementary materials for analyses conducted with all 506 participants from T2 and for a between-subjects comparison of the 150 participants who completed Time 1 only and the 105 participants who completed Time 2 only.

ethnicity, 88.8% self-reported as white, 8% reported a serious medical problem, and all but 13% of participants had completed a college degree.

Because participants were free to skip questions, the exact number of responses varies for each question. In the small number of cases where a participant completed the same survey twice (e.g., because they forgot they had previously responded), we used the first set of responses. Compensation was in the form of raffle entries for gift cards. The Boston College Institutional Review Board approved all consent and testing procedures.

Materials

Memory surveys were developed and sent to all participants actively enrolled in the study at the time of data collection (T1: June 15 through July 15, 2020, N=1462; T2: September 28 through November 17, 2020, N=1542). In both surveys, participants were asked to think back on how they reflect on the initial phase of the pandemic (i.e., March-May 2020). The questions were identical except that T1 asked participants to think back on “the past 2–3 months” while T2 asked them to think back to “March through May”. The survey can be found at: <https://osf.io/rjsyt/>. The questions that served as tests of our hypotheses were as follows³:

Positive and negative aspects of the pandemic.—To specifically interrogate the extent to which participants were focusing on particular factors related to the pandemic, the survey included six questions asking about their reflections of the spring (on a 5-point Likert scale: 0=Strongly disagree, 1=Disagree, 2=Neither disagree nor agree, 3=Agree, 4=Strongly Agree): **“When I think about the past 2–3 months, I remember...”**

- a. my fears related to the spread of the illness
- b. the community working together under difficult circumstances
- c. feeling hope that the efforts will save lives
- d. the social isolation
- e. the financial uncertainty
- f. feeling interconnected with others even while being physically distant.

A Nonlinear Principal Components Analysis (NLPCA; Linting & van der Kooij, 2012) was used to confirm a two-dimension solution in which dimension 1 (i.e., *positive aspects*) included ratings for community, hope, and interconnectedness, and dimension 2 (i.e., *negative aspects*) included fears, social isolation, and financial uncertainty⁴. Composite scores for *negative aspects* and *positive aspects* that were used in all analyses were created by averaging together the ratings for the respective measured variables.

³The analyses reported here were selected based on their relevance to the research question and their similarity to measures in prior studies showing age-by-valence interactions in memory (e.g., Ford, DiBiase, Ryu & Kensinger, 2018). However, the surveys included several additional emotional memory measures that are reported in the supplementary materials (“*Additional emotional memory analyses*”).

⁴See supplementary materials for information on NLPCA for T1 and for full Spearman’s rho correlation matrix of all outcome variables (“*Nonlinear principal components analysis*” and “*Spearman’s rho correlations between observed variables*”).

Affective reflections on the pandemic.—Because the six specific questions described above could not cover all possible thoughts and feelings associated with the pandemic, the survey also asked participants to consider their *overall reflections* on the spring phase of the pandemic: “When I think about the past 8 weeks, my memories are (5-point Likert scale: 1=Entirely negative, 2=Mostly negative, 3=An equal mix, 4=Mostly positive, 5=Entirely positive).”

Richness of specific memories remembered from the pandemic.—The current study also explored participants’ memories for specific events during that time period. We asked participants to report “one of the most challenging moments” and “one of the most positive moments” from the past 8 weeks and to rate the vividness of each memory (on a 1–4 scale: 1=Extremely vague, 2=Fairly vague, 3=Fairly vivid, 4=Extremely vivid) and the extent to which they felt like they were re-experiencing the event at the time of retrieval (on a 1–4 scale: 1=Not at all, 2=Somewhat, 3=Moderately, 4=Completely).

Data Analysis

Composite *positive aspects* and *negative aspects* scores at T1 were examined using a mixed model ANCOVA with valence (positive v. negative) as a within-subject variable of interest and age (mean-centered) as a between-subject covariate. We examined the main effect of age as well as the age-by-valence interaction. Significant interactions were further interrogated using two linear regression models, with age predicting positive and negative aspects separately. Because the *overall reflections*, *vividness*, and *re-experiencing* variables were all measured on ordinal scales with a limited number of possible options⁵, ANOVA and linear regression models were not appropriate. Instead, age effects on T1 *overall reflection*, *vividness*, and *re-experiencing* ratings were tested using ordinal logistic regression analyses (SPSS ordinal regression with a logit link function) with age as a continuous predictor (see Agresti, 2010).⁶

Effects of time were examined in a subset of participants (N=401) who completed both T1 and T2 surveys. Within-subject changes from T1 to T2 were examined using a mixed model ANCOVA with valence (positive v. negative) and time (T1 v. T2) as within-subject variables of interest and age as a between-subject covariate. Because the difference between two ordinal measures is, itself, not necessarily ordinal, time-related changes for ordinal variables were examined by calculating the difference between the two ordinal values (e.g., T2 minus T1) and categorizing participants as increasing, decreasing, or staying the same over time. Ordinal logistic regression analyses were conducted to examine the effect of age on the likelihood of increasing or decreasing over time. All results were considered significant at $p < .05$.

⁵See “*Distribution of outcome variables as a function of age*” in supplemental materials.

⁶Although the current analysis uses ordinal logistic regression analyses to analyze ordinal data, the authors appreciate that traditional analytic approaches are more familiar to readers. These analyses were conducted and revealed the same patterns reported here. See “*Alternate analytical approaches*” in supplemental materials.

RESULTS

Age-related effects on emotional memories for the spring phase of the COVID-19 pandemic

Positive and negative aspects of the pandemic.—Participants reported focusing more on the *negative* ($M=2.87$, 95% CI:2.81 to 2.93) relative to *positive aspects* ($M=2.57$, 95% CI:2.51 to 2.64; $F(1,525)=43.95$, $p<.001$, $\eta_p^2=.08$) and age was associated with higher ratings overall ($F(1,525)=13.68$, $p<.001$, $\eta_p^2=.03$). Importantly, these effects were qualified by a significant age-by-valence interaction ($F(1,525)=18.81$, $p<.001$, $\eta_p^2=.04$; see Figure 1, left panel⁷). As predicted, older age was associated with significantly higher reporting of *positive aspects* (standardized $\beta=.24$, $t=5.75$, $p<.001$; $R^2=.05$); there was no age-related difference in reporting *negative aspects* ($\beta=-.02$, $t=-.46$, $p=.65$; $R^2<.001$).

Overall reflections.—When participants were asked to reflect on their memories for the spring phase of the pandemic, increased age was associated with more positive *overall reflections* (Est=.01, 95% CI:.003 to .02; odds ratio=1.01; Wald $\chi^2(1)=7.18$, $p=.007$; Nagelkerke pseudo $R^2=.02$).

Richness of specific memories from the pandemic.—For participants' memories of their "most positive moment", increased age was associated with higher vividness ratings (Est=.01, 95% CI:.004 to .02; odds ratio=1.01; Wald $\chi^2(1)=7.27$, $p=.007$; $R^2=.02$) and, marginally, greater feelings of re-experiencing at the time of retrieval (Est=.01, 95% CI:.000 to .02; odds ratio=1.01; Wald $\chi^2(1)=3.75$, $p=.05$). There were no such effects of age on memories for participants' "most challenging moment" (vividness: Est=.005, 95% CI:-.005 to .02; odds ratio=1.01; Wald $\chi^2(1)=1.02$, $p=.31$; re-experience: Est=-.001, 95% CI:-.01 to .008; odds ratio=1.00 Wald $\chi^2(1)=.10$, $p=.76$; see "Graph depicting age-related effects on vividness and re-experiencing ratings" in supplementary materials for figure and further discussion of this analysis).

Effects of time on age-related differences in emotional memory

Positive and negative aspects of the pandemic.—Although there was a significant effect of time ($F(1,371)=17.08$, $p<.001$, $\eta_p^2=.04$)—with participants reporting thinking about the emotional aspects of the pandemic more in the T1 survey ($M=2.72$, 95% CI:2.67 to 2.78) compared to the T2 survey ($M=2.55$, 95% CI:2.50 to 2.61)—the most common pattern for participants was to not change scores from T1 to T2 (22.5% of participants for *positive aspects* and 26.6% for *negative aspects*). Time did not interact with age ($F(1,371)=1.99$, $p=.16$, $\eta_p^2=.005$), valence ($F(1,371)=.18$, $p=.68$, $\eta_p^2<.001$), or age and valence ($F(1,371)=1.08$, $p=.30$, $\eta_p^2=.003$). This suggests that the age-by-valence interactions were not significantly different from one another at T1 and T2. Consistent with the Time 1 analysis, there was a main effect of valence ($F(1,371)=39.22$, $p<.001$, $\eta_p^2=.10$) and age ($F(1,371)=12.70$, $p<.001$, $\eta_p^2=.03$), qualified by a significant age-by-valence interaction [$F(1,371)=14.70$, $p<.001$, $\eta_p^2=.04$; see Figure 1 for T1 (left panel) and T2 (right panel) data]. To explore the age-by-valence interaction, two mixed-model

⁷The reported analysis includes all participants who completed the T1 survey. The left panel of Figure 1 depicts the age-by-valence interaction from the within-subjects analysis (reported below) conducted in a subset of T1 participants who also completed T2. The patterns are the same as the interaction reported here.

ANCOVAs were conducted with age and time predicting *positive aspects* and *negative aspects*, separately. As predicted, older age was associated with higher ratings of *positive aspects* ($F(1,375)=27.35, p<.001, \eta_p^2=.07$); there was no age-related difference in reporting *negative aspects* ($F(1,374)=.02, p=.90, \eta_p^2<.001$).

Affective reflections on the pandemic.—Age was not associated with changes in *overall reflections* ratings over time (Est=.002, 95% CI:–.009 to .01; odds ratio=1.00; Wald $\chi^2(1)=.08, p=.78; R^2<.001$). 50.4% of participants reported the same rating at T1 and T2.

Richness of specific memories remembered from the pandemic.—Age was not associated with changes in any phenomenological ratings over time (positive event vividness: Est=–.007, 95% CI:–.02 to .005; odds ratio=.99; Wald $\chi^2(1)=1.26, p=.26; R^2=.005$; challenging event vividness: Est=.001, 95% CI:–.01 to .01; odds ratio=1.00; Wald $\chi^2(1)=.01, p=.90; R^2<.001$; positive event re-experiencing: Est=–.007, 95% CI:–.02 to .006; odds ratio=.99; Wald $\chi^2(1)=1.13, p=.29; R^2=.005$; challenging event re-experiencing: Est=–.001, 95% CI:–.01 to .01; odds ratio=1.00; Wald $\chi^2(1)=.01, p=.92; R^2<.001$). For both memory questions, the most common pattern across participants was to report the same rating at T1 and T2 (positive event vividness: 48.1%; challenging event vividness: 58.1%; positive event re-experiencing: 37.6%; challenging event re-experiencing: 44.4%).

DISCUSSION

Memory is the trace that remains after an event has occurred, playing a privileged role in guiding our decisions and setting expectations about the future (Pillemer, 2003). Here, we show that although the spring phase of the COVID-19 pandemic was associated with abrupt negative changes for most individuals, it is remembered differently depending, in part, on a person's age. Older adults report reflecting more on the positive aspects of the pandemic than young adults. Memories of the pandemic create a strong test of the tendency for older adults to view events from the past through a rosier lens for two primary reasons. First, participants have to reflect on an *earlier phase of an ongoing event* rather than one that had already resolved (as in Ford, DiGirolamo, & Kensinger, 2016; Ford, DiBiase & Kensinger, 2018). Second, especially during the spring phase, older age was presented as a dominant risk factor for greater physical-health consequences. Even so, the results confirm older adults' tendency to focus on the positive elements.

While society has necessarily focused on the physical-health consequences of COVID-19 and its disproportionate effects on older adults, the present study suggests that when affective outcomes of the societal responses to the pandemic are considered, older adults may fare better than young adults. Increased age is associated with both a tendency to experience the current pandemic as more positive and less negative in real-time (Cunningham et al., *in press*; Klaiber et al., 2020) and a tendency to view prior segments of this ongoing event in a more positive way. These patterns provide an important counter to negative stereotypes of aging, and suggest the importance of younger adults recognizing the wisdom that older generations can offer during difficult times (see Ayalon et al., 2020). More positive memory for past phases of the pandemic may have mental health impacts: If individuals are able to look back at the spring phase of the pandemic with an increased focus

on the positive, this may enable them to better weather the ongoing psychosocial challenges presented by the pandemic (see Philippe, Lecours, & Beaulieu-Pelletier, 2009). Future work should explore the relation between these increases in positive reflections and mental health consequences.

Age differences in reflections on the pandemic are most notable in the incorporation of positive aspects into memories, replicating a prior project examining memory for the 2013 Boston Marathon bombings. When memory was assessed soon after the bombings, adults of all ages reported reflecting often on the negative aspects of the event; age differences reflected older adults' tendency to additionally reflect on the event's "silver linings" (Ford, DiBiase & Kensinger, 2018). The present results are generally consistent with this pattern: While all adults focus on the negative aspects of the pandemic, older adults also focus their memories more on the hope, feelings of interconnectedness, and sense of community than do younger adults. They also report more positive tone to their memories overall. Older adults may be able to adopt this more positive memory perspective by relying on their life story to provide a context in times of challenge such as the current pandemic (Lind, Bluck, & McAdams, 2020).

In the prior study of the Boston Marathon bombings, age-related decreases in negative affect were not present in initial memory but were identified when memory was tested months later (Ford, DiBiase, Ryu & Kensinger, 2018). In the current study, age effects were specific to positive aspects at both time points, separated by approximately 4 months. Specifically, there were no age-by-time interactions on any emotional memory effects. These findings suggest that time, alone, may not be sufficient to support age-related reductions in negativity. It may be that it is only after a negative event has ended that its negativity can be diminished by older adults. Indeed, ratings in the current study showed very little change over time. Future work conducted following the eventual, successful management of the pandemic may be able to better explore whether this closure contributes to age-related decreases in negativity.

An important limitation to the generality of these findings is that our sample was generally well-educated, few reported serious medical concerns, and access to technology (and comfort using it) was a requirement for participation in the study. Our results do not inform how adults who were experiencing significant stressors, such as housing instability, or who may have had an inability to connect with others even virtually, may have reflected on the spring phase of the pandemic. Our sample was also primarily white and non-Hispanic. It is increasingly clear that the negative impacts of the pandemic are disproportionately affecting those already marginalized in society; our results cannot speak to how age affects the experiences and reflections of these individuals, which necessitates further investigation in these underrepresented populations. Our sample is also heavily weighted toward females, and so the effects reported in the current manuscript could be driven by age-related differences in females⁸.

We all are experiencing the effects of the COVID-19 pandemic, but not all of us will be left with the same memories of this event. The present results suggest that older generations

⁸See "Interactions of age with biological sex" in supplementary materials for exploratory analysis of age-by-sex interactions

have translated more positive content from the spring phase of the pandemic into memory than younger generations. Despite warnings that older adults were at increased risk of physical harm from COVID-19, at least for some subsets of the population (see earlier caveats about limitations of the sample), older age may convey advantages to mental wellbeing, helping individuals to be more positive in the moment (Cunningham et al., *in press*) and also bolstering their tendency to remember and reflect upon the good that arose from the challenging spring time-period.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Author note: The current study contains memory data collected in June/July 2020 and October/November 2020. These memory surveys were part of an ongoing study that includes daily surveys examining participants' affective and behavioral responses to the COVID-19 pandemic starting in March 2020. In addition to the memory data, the current study utilizes a subset of these daily affective ratings to control for participants' initial affective experiences, reported in the supplementary materials ("*Controlling for initial affective experience*"). More detailed information about daily reports of affect, mental health, and overall well-being are reported in Cunningham, Fields, Garcia & Kensinger (*in press*) and preliminary findings from these memory analyses have been presented in posters at the Gerontological Society of America's 2020 Annual Meeting, the Boston College 2020 Advancing Research and Scholarship Day, and the 2021 Society for Affective Science Annual Conference. Memory data analyzed for these participants and daily surveys are available at <https://osf.io/rjsyt/> (DOI 10.17605/OSF.IO/RJSYT). See <https://osf.io/4gy3c> for preregistration of Time 1 analyses and <https://osf.io/7zg5v> for preregistration of Time 2 analyses. Dr. Cunningham is currently funded by the Research Training Program in Sleep, Circadian and Respiratory Neurobiology (NIH T32 HL007901) through the Division of Sleep Medicine at Harvard Medical School and Brigham & Women's Hospital. Dr. Fields is currently funded by NIH NRSA T32 NS007292 through Brandeis University. Drs. Cunningham and Kensinger conceived of the daily-survey questions and Drs. Ford, Kensinger, and Cunningham conceived of the memory survey questions. Dr. Cunningham and Ms. Garcia secured IRB approval for the research and Dr. Cunningham oversaw survey distribution and data collection, with some assistance from Ms. Garcia. Drs. Cunningham and Fields handled data management, and Dr. Fields cleaned and summarized the daily-survey data used here. Dr. Ford took a lead role in analyzing the memory survey data and in using the daily-survey data (that had been summarized by Dr. Fields) in control analyses, with some assistance provided by Dr. Kensinger. Drs. Ford and Kensinger drafted the manuscript, and Dr. Ford prepared the tables and figures. All authors edited the manuscript.

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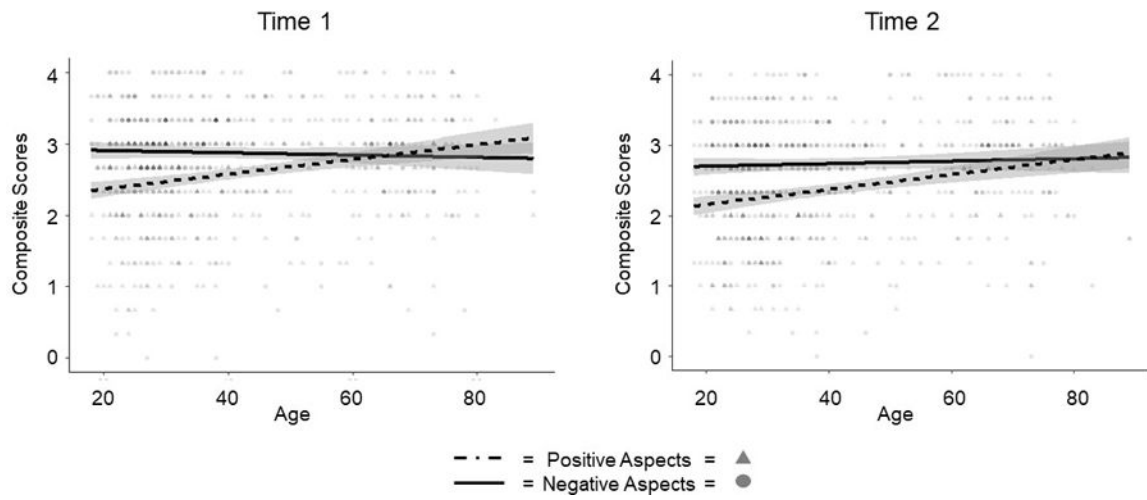


Figure 1. Composite scores of positive aspects (triangles, dashed line) and negative aspects (circles, solid line) as a function of age at Time 1 (left panel) and Time 2 (right panel). These graphs only represent individuals who completed T1 and T2 surveys and, therefore, were included in the within-subject analysis.