**Supplemental Materials: Linguistic content of the time horizon writing activity in Experiments 1 and 2**

**Experiment 1:**

In Experiment 1 younger and older adults reflected on either a limited or expansive time horizon before completing an emotional memory task. More specifically, participants were asked to spend five minutes completing a writing activity in which they either reflected on either a shortened or expanded life expectancy (for more details, please see the Method of Experiment 1). Although not the primary aim of this study, we predicted that our time horizon manipulation would influence the topics that people included in the writing activity. Based upon socioemotional selectivity theory (Carstensen, Isaacowitz, & Charles, 1999), participants in the limited time horizon condition were expected to write about deepening their social relationships and completing activities that would bring them emotional satisfaction. In contrast, participants in the expansive time horizon condition were expected to write about achieving new knowledge and skills.

To test these predictions in Experiment 1 we examined the linguistic content of the writing activity; transcriptions of the handwritten responses were analyzed using the Linguistic Inquiry and Word Count (LIWC2007) program (Pennebaker, Booth, & Francis, 2007). This program calculated the number of words in each transcription coming from each of the 55 default categories in the LIWC2007 dictionary.[[1]](#footnote-1) These categories map onto a variety of social (e.g., words pertaining to family or friends), emotional (e.g., words pertaining to anxiety or sadness), linguistic (e.g., words that are pronouns or verbs), and cognitive concepts (e.g., words that describe certainty or causation). In the following analyses, we focus on the social processes, emotional processes, biological processes, and personal concerns categories as they have the most relevance to socioemotional selectivity theory and thus to the positivity effect. For example transcriptions from both younger and older adults in each of the conditions, see Appendix A of the main manuscript.

Within a 2 (Age group) X 2 (Time horizon) MANOVA we observed language differences as a function of time horizon condition (using a Bonferroni-adjusted alpha level of *p* = .0009 to correct for multiple comparisons; see Supplementary Table 1). Overall, the two time horizon groups did not differ in the total number of words used, *F*(1, 149) = 0.68, *MSE* = 1349.09, *p* = .41, *ηp²* = .005, or in their tendency to use either positively-valenced, *F*(1, 149) = 0.26, *MSE* = 8.37, *p* = .61, *ηp²* = .002, or negatively-valenced, *F*(1, 149) = 1.49, *MSE* = 0.61, *p* = .22, *ηp²* = .01, emotional words.

However, participants in the limited time horizon condition included more words related to their family, *F*(1, 149) = 29.70, *MSE* = 2.93, *p* < .0001, *ηp²* = .17, to their friends, *F*(1, 149) = 13.04. *MSE* = 1.04, *p* = .0004, *ηp²* = .08, to sex, *F*(1, 149) = 16.48, *MSE* = .54, *p* < .0001, *ηp²* = .10, and to their homes, *F*(1, 149)= 24.62, *MSE* = 2.72, *p* < .0001, *ηp²* = .14. They also included more words related to ingesting food or drinks, *F*(1, 149) = 8.03, *MSE* = 1.39, *p* = .005, *ηp²* = .05, and to religion, *F*(1, 149)= 4.82, *MSE* =.52, *p* = .03, *ηp²* = .03, although these effects did not reach our Bonferroni-adjusted level of significance. None of these effects significantly interacted with age when using our adjusted alpha level; however, we do note that older adults were numerically more likely than younger adults to include words related to their families, *F* (1, 149) = 9.75, *MSE* = 2.93, *p* = .002, *ηp²* = .06, and homes, *F* (1, 149) = 5.87, *MSE* = 2.72, *p* = .02, *ηp²* = .04, when reflecting on a limited time horizon.

In contrast, participants in the expansive time horizon condition included more words related to work, *F*(1, 149) = 28.67, *MSE* = 5.39, *p* < .0001, *ηp²* = .16, to achievements, *F*(1, 149)= 23.88, *MSE* = 3.62, *p* < .0001, *ηp²* = .14, and to their health, *F*(1, 149)= 58.97, *MSE* = 1.37, *p* < .0001, *ηp²* = .28. They also included more words reflecting a need to inhibit or stop activities (e.g., ‘*reduce spending’* or *‘not retire’*), *F*(1, 149)= 15.65, *MSE* = 1.40, *p* < .0001, *ηp²* = .10. None of these effects significantly interacted with age.

Taken together, these results are consistent with socioemotional selectivity theory. Reflecting on a limited time horizon led people to focus on deepening existing relationships with loved ones and investing in activities that would bring them emotional satisfaction (such as ingesting food or participating in religious activities). For example, one younger adult participant stated that having six months left to live would cause her to “*not focus on school as much but rather spend time with friends and family*”. Similarly, one older adult participant stated that she would want to spend her last days with her husband, “*holding each other -- laughing, sharing stories, drinking a glass of wine”.* In contrast, reflecting on an expansive future time horizon led people to focus on acquiring new knowledge and skills. For example, one older adult participant stated that if she lived to be 120, she would *“develop more areas of interest”* and *“pursue further education”.* Similarly, when one younger adult reflected on a life expectancy of 120 years she stated: “*I think I would be more open to trying new activities as opposed to just sticking to the activities I’m most comfortable with”.*

**Experiment 2:**

In Experiment 2 participants were randomly assigned to one of three time horizon groups. As in Experiment 1, some participants were asked to reflect on a limited time horizon and others were asked to reflect on an expansive time horizon. Novel to this study, we also included a control writing condition, in which participants were not oriented to think about time in a particular manner, but rather described activities that they had completed that day. The instructions for the writing activities used in the limited and expansive time horizon conditions were identical to those used in Experiment 1 with one exception. Here, the sentences stating that participants should assume good health were printed in bold and underlined.

Prior to analyzing the content of the writing activities, we first examined completion times. In Experiment 1 participants were allotted up to ten minutes to complete the writing activity, however, writing completion times were not recorded. In contrast, completion times were recorded in Experiment 2. Results from a one-factor (Condition) ANOVA revealed that the three conditions significantly differed on this measure, *F*(2, 108) = 18.73, *MSE* = 12814.66, *p* < .001, *ηp²* = .26. Participants in the control condition spent significantly less time writing (*M* = 58.64 s) than participants in the expansive time horizon (*M* = 195.45 s) and limited time horizon (*M* = 197.48 s) conditions. Accompanying this was a significant difference among the three conditions in the total number of words written, *F*(2, 108) = 25.35, *MSE* = 2519.39, *p* < .001, *ηp²* = .32. Participants in the control condition wrote significantly fewer words (*M* = 19.69) than participants in the expansive time horizon (*M* = 90.62) or limited time horizon (*M* = 90.91) conditions. For example responses from the control condition, see Appendix B of the main manuscript. Linguistic information from the control condition is included in Supplementary Table 2, however, because of these differences we restricted our analyses of the linguistic content below to include only participants in the expansive and limited time horizon conditions.

We next examined whether we replicated our Experiment 1 findings that reflecting on an expansive versus limited future affected the topics that people included in the writing activity. To do so, we again used the LIWC2007 program (Pennebaker et al., 2007), and limited our analyses to only the expansive and limited time horizon conditions. Within a series of independent t-tests, we again observed language differences among the two time horizon conditions (see Supplementary Table 2). Participants in the expansive time horizon condition included more words related to work, *t*(70) = 3.16, *p* = .002, *d* = .76. In contrast, participants in the limited time horizon condition included more words related to their family, *t*(70) = 3.23, *p* = .002, *d* = .77, and to their friends, *t*(70) = 2.74, *p* = .008, *d* = .66. They were also numerically more likely to include words related to ingesting food or drinks, *t*(70) = 1.90, *p* = .06, *d* = .45, and to their homes, *t*(70) = 1.70, *p* = .09, *d* = .41, but these two effects failed to reach statistical significance in this new sample.

Although these effects replicate those observed in Experiment 1, there were additional Experiment 1 linguistic differences that failed to replicate. In contrast to Experiment 1, participants in the expansive time horizon condition were not more likely to write about achievements, *t*(70) = .004, *p* = .997, *d* = .001, about the need to inhibit behaviors, *t*(70) = 1.50, *p* = .14, *d* = .36, or about their health (likely because the instructions more strongly emphasized to participants in both conditions that they should assume good health), *t*(70) = .09, *p* = .93, *d* = .02. Furthermore, participants in the limited time horizon condition were not more likely to write about either sex, *t*(70) = 1.38, *p* = .17, *d* = .33, or religion, *t*(70) = .65, *p* = .52, *d* = .15.

**Supplementary Table 1**

Linguistic content of the writing activity as a function of time horizon condition and participant age in Experiment 1 (as determined by the LIWC2007; Pennebaker, Booth, & Francis, 2007).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  | Expansive time horizon condition | Limited time horizon condition |
|  |  |  | Younger | Older | Younger | Older |
|  | Word Count a |  | 122.28 (37.65) | 73.03 (30.28) | 123.42 (43.00) | 81.65 (34.92) |
| **Social Processes** |  |  |  |  |  |
|  | Family a, b, c | *(e.g., wife, cousin)* | 1.27 (1.02) | 1.25 (1.50) | 1.92 (1.50) | 3.62 (2.51) |
|  | Friends b | *(e.g., coworker, pal)* | 0.52 (0.56) | 0.57 (1.11) | 0.99 (0.89) | 1.28 (1.36) |
|  | Humans | *(e.g., group, woman)* | 0.65 (0.93) | 0.89 (1.52) | 0.69 (0.71) | 1.03 (1.45) |
| **Personal Concerns** |  |  |  |  |  |
|  | Home b, c | *(e.g., kitchen, house)* | 1.02 (0.88) | 0.90 (1.54) | 1.70 (1.38) | 2.87 (2.44) |
|  | Religion b | *(e.g., church, mosque)* | 0.04 (0.22) | 0.31 (0.75) | 0.45 (0.94) | 0.41 (0.77) |
|  | Work b | *(e.g., job, class)* | 3.44 (2.33) | 4.14 (3.14) | 1.87 (1.67) | 1.70 (1.83) |
|  | Achievement b | *(e.g., goal, win)* | 3.08 (2.13) | 2.91 (2.45) | 1.59 (1.27) | 1.40 (1.48) |
|  | Leisure a | *(e.g., cook, movie)* | 3.29 (2.86) | 5.40 (4.12) | 3.21 (2.34) | 4.67 (3.08) |
|  | Money | *(e.g., cash, owe)* | 3.89 (1.92) | 3.85 (2.72) | 4.73 (1.96) | 3.49 (2.28) |
|  | Death | *(e.g., bury, coffin)* | 0.17 (0.38) | 0.06 (0.26) | 0.19 (0.44) | 0.16 (0.37) |
| **Biological Processes** |  |  |  |  |  |
|  | Health b | *(e.g., pill, sick)* | 1.90 (1.38) | 2.20 (1.54) | 0.52 (0.64) | 0.68 (0.86) |
|  | Sexual b | *(e.g., love, horny)* | 0.23 (0.47) | 0.06 (0.26) | 0.66 (0.89) | 0.59 (1.06) |
|  | Ingestion b | *(e.g., eat, taste)* | 0.25 (0.46) | 0.41 (0.88) | 0.66 (0.94) | 1.09 (1.95) |
|  | Body | *(e.g., hands, ache)* | 0.10 (0.31) | 0.33 (1.89) | 0.17 (0.44) | 0.21 (0.78) |
| **Affective Processes** |  |  |  |  |  |
|  | Positive emotion | *(e.g., love, good)* | 5.88 (2.55) | 5.70 (3.39) | 5.57 (1.98) | 6.49 (3.41) |
|  | Negative emotion a | *(e.g., hurt, enemy)* | 0.51 (0.67) | 0.30 (0.67) | 0.76 (0.92) | 0.36 (0.84) |
| **Cognitive Processes** |  |  |  |  |  |
|  | Inhibition b | *(e.g., stop, constrain)* | 1.11 (0.83) | 1.75 (1.72) | 0.69 (0.93) | 0.66 (1.02) |
|  | Insight | *(e.g., think, know)* | 1.50 (1.37) | 1.63 (1.70) | 1.09 (1.20) | 1.19 (1.30) |
|  | Causation c | *(e.g., because, effect)* | 2.17 (1.44) | 1.55 (1.54) | 1.45 (1.59) | 1.87 (1.54) |
|  | Discrepancy a | *(e.g., should, could)* | 6.35 (2.45) | 4.28 (2.50) | 6.04 (1.98) | 4.42 (2.57) |
|  | Tentative a | *(e.g., maybe, guess)* | 3.45 (2.20) | 2.23 (2.00) | 3.79 (1.89) | 2.11 (1.74) |
|  | Certainty b | *(e.g., always, never)* | 1.25 (1.05) | 0.68 (1.16) | 1.94 (1.62) | 1.62 (2.11) |
|  | Inclusive b | *(e.g., and, with)* | 4.77 (1.88) | 5.33 (3.13) | 6.88 (2.90) | 7.52 (3.15) |
|  | Exclusive a | *(e.g., but, without)* | 2.41 (1.70) | 1.47 (1.48) | 2.58 (1.70) | 1.67 (1.73) |

*Note:* Word count is reported in total words, but all other numbers represent the percentage of the total number of words written coming from a variety of social, emotional, linguistic, and cognitive categories. Numbers in parentheses represent standard deviations. Within a multivariate 2 (Age group) X 2 (Time Horizon) ANOVA, significant differences (*p* < .05, not corrected for multiple comparisons) are designated as follows:

a Age group
b Time horizon condition
c Interaction between age group and time horizon condition

**Supplementary Table 2**

Linguistic content of the writing activity as a function of time horizon condition in Experiment 2 (as determined by the LIWC2007; Pennebaker, Booth, & Francis, 2007).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | Expansive time horizon condition | Limited time horizon condition | Control condition |
|  | Word Count b, c | 90.62 (56.42) | 90.91 (68.21) | 19.69 (7.62) |
| **Social Processes** |  |  |  |
|  | Family a, b | 0.71 (1.13) | 1.91 (1.97) | 0.38 (1.90) |
|  | Friends a, b | 0.27 (0.63) | 1.05 (1.65) | 0.21 (0.91) |
|  | Humans a, b | 0.34 (0.64) | 1.01 (1.39) | 0.23 (1.46) |
| **Personal Concerns** |  |  |  |
|  | Home c | 0.94 (1.29) | 1.59 (1.92) | 2.67 (4.45) |
|  | Religion | 0.03 (0.22) | 0.10 (0.56) | 0.37 (2.29) |
|  | Work a, b, c | 2.84 (2.15) | 1.42 (1.54) | 5.83 (6.38) |
|  | Achievement | 2.42 (2.18) | 2.42 (1.75) | 2.94 (3.50) |
|  | Leisure b, c | 3.23 (2.21) | 3.66 (4.54) | 7.49 (10.13) |
|  | Money | 4.03 (2.53) | 4.09 (2.59) | 4.71 (5.44) |
|  | Death b | 0.31 (1.01) | 0.43 (0.85) | 0.00 (0.00) |
| **Biological Processes** |  |  |  |
|  | Health | 1.31 (1.23) | 1.36 (3.27) | 0.89 (2.78) |
|  | Sexual | 0.21 (0.60) | 0.44 (0.81) | 0.21 (1.33) |
|  | Ingestion b, c | 0.19 (0.57) | 0.66 (1.44) | 11.99 (8.56) |
|  | Body b, c | 0.27 (0.63) | 0.23 (1.16) | 2.18 (3.81) |
| **Affective Processes** |  |  |  |
|  | Positive emotion b ,c | 5.85 (3.37) | 5.46 (3.37) | 1.02 (2.36) |
|  | Negative emotion a, b, c | 0.57 (0.88) | 1.30 (2.04) | 0.09 (0.55) |
| **Cognitive Processes** |  |  |  |
|  | Inhibition b, c | 1.38 (1.06) | 0.98 (1.21) | 0.00 (0.00) |
|  | Insight b, c | 1.57 (1.64) | 1.09 (1.33) | 0.22 (0.97) |
|  | Causation | 1.82 (1.68) | 1.61 (1.77) | 0.96 (2.34) |
|  | Discrepancy b, c  | 7.63 (2.85) | 6.35 (2.67) | 0.00 (0.00) |
|  | Tentative b, c | 3.96 (3.19) | 3.87 (2.38) | 2.10 (4.06) |
|  | Certainty a, b | 0.83 (1.19) | 1.66 (1.52) | 0.55 (1.53) |
|  | Inclusive a, b  | 3.92 (2.43) | 6.31 (4.48) | 3.52 (3.87) |
|  | Exclusive b, c | 2.51 (1.92) | 2.49 (2.29) | 0.45 (1.38) |

*Note:* Word count is reported in total words, but all other numbers represent the percentage of the total number of words written coming from a variety of social, emotional, linguistic, and cognitive categories. Numbers in parentheses represent standard deviations. We compared each of the conditions to one another in separate multivariate ANOVAs. Significant differences (*p* < .05, not corrected for multiple comparisons) are designated as follows:

a Limited vs. expansive time horizon writing conditions
b Limited time horizon vs. control writing conditions
c Expansive time horizon vs. control writing conditions

1. We did not use the LIWC2007 output for the spoken word categories because the responses were written. In determining the number of categories (and thus, the appropriate correction to our alpha level), we counted only the number of subordinate categories. [↑](#footnote-ref-1)