Ageism Comes of Age

Original Research Report

Positive Portrayals of Old Age Do Not Always Have Positive Consequences

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Abstract

Objectives. The literature on “image of aging” suggests that exposure to positive portrayals of old age has positive downstream consequences for older adults. This study examined whether these positive consequences might have limits, such that they occurred for portrayals of old age that were positive, but not those that were extremely positive.

Method. Younger and older adults were allowed to selectively view (Study 1) or were experimentally exposed to (Studies 2 and 3) portrayals of old age of different levels of positivity. Their attention (Study 1) and physiological responses (Study 2) toward the portrayals, as well as perception of personal aging (Study 1) and memory performance (Study 3) after the exposure, were assessed.

Results. Findings from 3 studies suggested that older adults have a less negative perception of personal aging (Study 1) and a stronger calming physiological response (Study 2) when being exposed to portrayals of old age that were positive, but not extremely positive. Moreover, extremely positive portrayals lowered downstream memory performance (Study 3) and attracted less attention from older adults when they found these portrayals unrealistic (Study 1).

Discussion. These findings pinpoint the conditions under which positive portrayals of old age may benefit older adults.

Key Words: Age—Images of aging—Memory—Physiology—Visual attention

Given the widespread evidence concerning negative consequences of negative portrayals of old age (e.g., Levy, 2009; Sabik, 2013), the media and other public information providers have started to portray older adults in a positive
light. The literature on “image of aging” has indeed suggested that exposure to positive age stereotypes has positive downstream consequences for older adults, such as better performance on memory tests and less cardiovascular stress (Horton, Baker, Pearce, & Deakin, 2008). Meanwhile, in media research, a “reversed stereotype” was documented, such that older characters were portrayed as “riding motorcycles, performing modern dances with great abandon” or engaging in moderate to high physical activities (Kubey, 1980, p. 22). This study aimed at testing whether exposure to these portrayals of old age that were more positive than was typical for most older adults, which we labeled “extremely positive,” might give rise to similar beneficial effects as positive portrayals. Prior studies (see Levy, 2003, for a review) have generally measured the effects of positive images of old age in terms of attention and internalization (to test whether the images are encoded and internalized to become perception of personal aging), physiological reactions (to test whether exposure to the images reduces stress responses with known negative health consequences), and memory performance (to test whether downstream memory performance changes after viewing the images). These three types of effects were assessed by Studies 1–3, respectively.

### The Positive Consequences of Positive Portrayals of Old Age

Recent literature on adult development and aging has revealed that many cognitive and physical declines associated with aging are at least in part psychologically constructed (Levy, 2003). In particular, studies that compared people from cultures that held a positive or negative view of aging (Levy & Langer, 1994) and studies that examined self-reported perceptions of aging (Levy, Slade, & Gill, 2006; Levy, Slade, & Kasl, 2002; Levy, Slade, Kunkel, & Kasl, 2002) found that older people with a more negative view of aging showed worse memory performance, greater hearing declines, poorer functional health, and higher mortality. Moreover, being exposed to implicit (Hausdorff, Levy, & Wei, 1999; Levy, 1996; Levy, Hausdorff, Hencke, & Wei, 2000) or explicit negative aging stereotypes (Hess, Auman, Colcombe, & Rahhal, 2003) led to poorer performance on memory tests, slower walking speed, and greater cardiovascular stress among older adults.

Levy (2003) explains the previous findings in terms of internalization. People who are exposed to positive portrayals of old age internalize the positive age stereotypes. These positive age stereotypes increase their positive perception of personal aging and decrease their negative perception of personal aging. They thus behave accordingly, leading to better performance in memory and physical tasks (Levy & Leifheit-Limson, 2009). The reverse is true for those who are exposed to negative portrayals of old age. Although not specifically about portrayals of old age, studies on the age-related positivity effect—the phenomenon that with age, people selectively show greater cognitive processing of positively valenced stimuli than other stimuli (Reed & Carstensen, 2012)—found that some older people maintained a relatively more positive mood by looking toward happy faces and away from angry faces (Isaacowitz, Toner, & Neupert, 2009).

### Possible Limits to the Effect

This study aims at testing whether these beneficial consequences of being exposed to positive portrayals of old age would continue to hold true even when the portrayals were so positive that it became hardly likely. Although the effects of these extremely positive portrayals have not been systematically studied, the scant literature suggests that these portrayals might backfire. In an unpublished study, Löckenhoff and colleagues (personal communication; Rice, Löckenhoff, & Carstensen, 2002) took photos of older adults from publicly accessible magazines and advertisements. They selected images that had been rated in pilot studies as highly negative depictions or highly positive depictions of older adults, matched on sex and ethnicity. Older participants rated their emotional responses toward each image, using the same emotional checklist as employed in Carstensen, Pasupathi, Mayr, and Nesselroade (2000). They found that highly positive depictions of older adults elicited lower levels of positive emotions than did highly negative depictions (Rice et al., 2002).

Interpreting the findings of Löckenhoff and colleagues within the framework of Levy (2003), we argue that the findings might be attributable to the fact that the participants found the highly positive depictions of older adults unrealistic. Indirect support for this hypothesis is found in Mares and Cantor (1992). They randomly assigned older adults who were lonely or not lonely to view a negative (involving an unhappy, socially isolated old man) or a positive (involving a happy, socially integrated old man) portrayal of old age. They found that although lonely older adults showed greater interest in viewing negative than positive portrayals, the reverse was true for non-lonely older adults. These findings suggest that portrayals that are considered more realistic receive more attention. Study 1 tested this hypothesis by examining the interaction between age (at the individual level) and how realistic the image was (at the picture level) on attention toward extremely positive, positive, neutral, and negative portrayals of old age, as well as the associations between these age differences in attention and perception of personal aging. Studies 2 and 3 further examined whether extremely positive portrayals of old age exhibited other effects that had been found in prior studies on positive portrayals (Levy & Leifheit-Limson, 2009). In particular, Study 2 experimentally manipulated exposure to extremely positive, positive, neutral, and negative portrayals of old age and examined how it influenced the physiological responses of younger and older adults. Finally, Study 3 experimentally manipulated exposure...
to extremely positive, positive, and neutral portrayals of old age and examined its consequences on older adults’ downstream memory performance.

**Study 1**

In this study, at the individual level, we examined age differences in visual attention toward images that were extremely positive, positive, neutral, and negative. At the picture level, we tested whether individuals gazed less at images that they perceived as less unrealistic. We predicted that older adults, relative to their younger counterparts, would gaze less at extremely positive images that they found less realistic. Second, we tested whether gazing more at positive and extremely positive images would be associated with more positive perceptions of personal aging, and whether this association would differ by age.

**Methods**

**Participants**

One hundred and forty-nine residents in Hong Kong, China were recruited by probability sampling from a database representative of the population (Census and Statistics Department, 2011) by a professional research firm. The sample included 50 young adults (54% women; 18–35 years old), 49 middle-aged adults (49% women; 36–59 years old), and 50 older adults (50% women; 60–77 years old). Among them, 133 participants successfully completed the eye-tracking session (43 young adults, 46 middle-aged adults, and 44 older adults). Other participants failed to generate complete eye-tracking data because of reflective eyewear or obfuscation of the pupil. Each participant was paid HK$200.

**Measures and procedure**

First, “demographic information” including age, sex, education level, religion, household monthly income, and subjective health were recorded. Education level was measured as a five-level variable: no school or below primary school (1); primary school (2); secondary school (3), bachelor degree (4); and above bachelor degree (5). Monthly household income was measured in three levels: less than HK$15,000 (1); HK$15,000–HK$30,000 (2); and more than HK $30,000 (3). Subjective health was rated from 1 (bad) to 5 (excellent). As potential covariates and to screen out participants with visual problems, visual abilities were assessed by the Snellen Visual Acuity Test and the Pelli-Robson Contrast Sensitivity Test (Pelli, Robson, & Wilkins, 1988).

**Eye-tracking**

Then, participants were seated in front of a monitor. An eye-tracker (Applied Science Laboratories Gaze Tracker Model 504) was used to record their gaze point on the monitor. A 17-point calibration was completed to ensure that the eye-tracker was recording the accurate position of the participant’s gaze. Participants were asked to look at the screen naturally as if they were watching TV at home.

**Stimuli**

Prior studies on image of aging (see Levy, 2003, for a review) often use lexical stimuli. However, pictorial stimuli were used in this study because many older adults in our culture are illiterate. Pictorial stimuli may also have higher ecological validity than lexical stimuli as many portrayals of old age in mass media are pictorial. Participants were presented with 16 sets of pictures about daily activities of older adults, in the socioemotional (four sets), intellectual (seven sets), and physical (five sets) domains. Each set of pictures included four pictures of the same older adult carrying out the same activity in the same environment with four different valences (i.e., negative, neutral, positive, and extremely positive). The pictures were created with the following procedure: 10 younger (mean age = 20 years) and 10 older (mean age = 68 years) adults from the community, and 4 graduate students studying life-span developmental psychology, generated scenes that were common for older adults. They first generated the neutral version and then revised the neutral version to make it negative or positive. Next, they were asked to turn the positive version into “extremely positive,” which was defined as more positive than would be expected for most older adults in the culture. Pictures were made from the scenes generated by them. Then, these pictures were categorized by 44 adults (half younger and half older) on valence (extremely positive, positive, neutral, or negative) and domain (socioemotional, intellectual, or physical). Only pictures that were categorized by all raters as belonging to the expected category and domain were included in the study (see also manipulation check in the Results and Discussion).

The main character was women in eight sets of pictures and was men in the remaining eight sets of pictures. There were nine sets of pictures consisting of only one person, and seven sets of pictures consisting of two persons, and the sex of the other character in the picture was the same as the main character. The main characters were older adults aged 63–79 years, and the supporting characters were younger and middle-aged adults aged 20–42 years. For example, a set of pictures in the physical domain depicts an older adult carrying one bag in the neutral picture; the same person carrying two heavy bags in the positive picture; the same person lifting up the two heavy bags in the extremely positive picture; and the same person holding a walking stick and having difficulty in carrying one bag in the negative picture. The patterns of results were similar across the three domains of daily activities. Hence, we aggregated data across the three domains in the following analysis. The sex and number of characters included in the picture did not affect the results. For each set of pictures, pictures of the four valences were presented simultaneously.
to the participants for 15 s, in the upper left, upper right, lower left, and lower right parts of the screen, respectively. The position of the four valences was randomized across the 16 sets of pictures. The presentation order of the 16 sets of pictures was also randomized. One area of interest (AOI) was set for each of the four simultaneously presented pictures. Fixation was defined as a period during which participants fixated their gaze within one degree of visual angle for more than 100 ms. For each AOI, the percentage of fixation time was calculated by dividing the raw fixation in that AOI by the total fixation time in the complete presentation.

Perception of personal aging
Next, participants completed an adapted version (Cheng, Yip, Jim, & Hui, 2012) of the Image of Aging scale (Levy, Kasl, & Gill, 2004). The original scale asks participants to rate the extent to which each of nine positive words (e.g., wise) and nine negative words (e.g., slow) matches “your image or picture of old people in general” on a 7-point Likert scale (from 0 [furthest from what you think] to 6 [closest to what you think]). In this adapted version, participants were asked to rate the extent to which each word matched their perception of own aging. The positive and negative words (the two subscales) assess positive and negative perception of personal aging, respectively. Reliability of the negative subscale, as indicated by the Cronbach’s $\alpha$, was .76. For the positive subscale, one item (i.e., the item about whether the participant rated himself/herself as positive) was dropped, and the Cronbach’s $\alpha$ was increased from .64 to .77. A higher score in the positive (negative) subscale indicates a more positive (negative) perception of personal aging.

Potential covariates
Cognitive abilities were measured by the Digit Symbol Substitution Test (Wechsler, 1997) and the Category Naming Task (Spreen & Benton, 1977). These measures were used in previous eye-tracking studies (e.g., Isacowitz, Wadlinger, Goren, & Wilson, 2006) to capture basic cognitive functions, working memory, and verbal fluency, respectively, which significantly correlated with age and education.

Evaluation of the stimuli
At the end of the study, each of the 16 sets of pictures was presented to the participants again. Participants were asked to rank the pictures within each set according to how realistic the picture portrayed older adults, relative to the older adults they encountered in real life (from 1 [most realistic] to 4 [most unrealistic]). This was taken as the measure of subjective evaluation of how unrealistic the picture appeared. To cover other aspects of the pictures that might also affect attention, participants also evaluated (a) how positive each picture was (the subjective valence measure) on a 15-point Likert scale (from −7 [extremely negative], 0 [neutral], to 7 [extremely positive]) and (b) how they would perform when dealing with the same task compared with the older person in the picture (the perceived competence measure), on a 15-point Likert scale (from −7 [much worse], 0 [the same], to 7 [much better]).

Results and Discussion
Results from manipulation check revealed that for subjective ratings of valence, the age × valence interaction was not significant [$F(6, 378) = 1.89, ns$]; nor was the age main effect [$F(2, 126) = 1.14, ns$]. However, the main effect of valence was significant [$F(3, 378) = 719.58, p < .01, \eta^2 = .85$]. As we had expected, regardless of age, participants perceived the extremely positive pictures as the most positive (mean $M = 4.70$, standard deviation $SD = 1.30$), followed by the positive ($M = 3.19$, $SD = 1.19$), neutral ($M = 0.82$, $SD = 1.24$), and negative pictures ($M = −2.65$, $SD = 1.81$). For the unrealistic ranking of the pictures, the age × valence interaction was not significant [$F(6, 381) = 1.28, ns$]; nor was the age main effect [$F(2, 127) = 1.08, ns$]. But the main effect of valence was significant [$F(3, 381) = 72.50, p < .01, \eta^2 = .36$]. As expected, participants ranked the extremely positive pictures as the most realistic ($M = 3.08$, $SD = 0.60$), followed by the negative pictures ($M = 2.60$, $SD = 0.68$), positive pictures ($M = 2.29$, $SD = 0.40$), and neutral pictures ($M = 2.03$, $SD = 0.32$). Similar analyses were conducted on perceived competence. The age × valence interaction was significant [$F(6, 378) = 3.16, p < .01, \eta^2 = .36$]. Repeating the analysis for each age group, we found that for younger and middle-aged participants, perceived competence did not differ by valence [$F(3, 126) = 3.22, ns$] and [$F(3, 129) = 0.76, ns$], respectively. However, for older adults, they rated themselves to be performing the worst as compared with the characters in the extremely positive pictures ($M = 0.13$, $SD = 1.34$) and the best as compared with those in the negative pictures ($M = 1.53$, $SD = 1.71$), [$F(3, 123) = 17.96, p < .01, \eta^2 = .31$]. The ratings for the neutral pictures ($M = 0.64$, $SD = 1.14$) and positive pictures ($M = 0.31$, $SD = 1.12$) were in the middle.

Table 1 shows age differences in all potential covariates. Among them, significant age differences were found in perceived health, education level, cognitive abilities (i.e., Digit Symbol Substitution Test and the Category Naming Task), and visual abilities (i.e., Snellen Visual Acuity Test and Pelli-Robson Contrast Sensitivity Test). Hence, these variables were included as covariates in the following statistical analyses.

Percentage Fixation Time Toward Different Valenced Pictures
We first conducted a mixed model analysis of covariance with percentage fixation time toward different valenced pictures as a within-subject factor (valence: negative, neutral, positive, and extremely positive), age group as a between-subject factor (younger, middle aged, and older), and controlling
for the covariates. The valence main effect was significant \(F(3, 390) = 21.63, p < .001, \eta^2 = .14\). However, neither the valence \(\times\) age interaction nor the age main effect was significant \(F(6, 390) = 1.48, ns, \eta^2 = .02\) and \(F(2, 130) = .16, ns, \eta^2 < .01\), respectively. Least significant difference post hoc analyses revealed that, regardless of age, participants spent the highest percentage of fixation time on extremely positive pictures \((M = 17.65, SD = 5.54)\) and the least percentage of fixation time on neutral pictures \((M = 15.36, SD = 4.50)\), whereas the percentages of fixation time spent on positive \((M = 15.99, SD = 4.31)\) and negative pictures \((M = 16.50, SD = 4.82)\) were not significantly different.

Despite the fact that participants, regardless of age, spent the highest percentage of fixation time on extremely positive pictures, subjective evaluation of “how unrealistic each picture was” moderated the effect. We used Hierarchical Linear Modeling (HLM 6.0; Raudenbush, Bryk, Cheong, & Congdon, 2004) to test whether participants’ subjective evaluation of how unrealistic each picture was might be associated with their percentage of fixation time toward the picture and whether the association differed by age. The following analysis was conducted for pictures of each valence. However, significant results were found only among extremely positive pictures, and we thus only focus on results about extremely positive pictures in the following description. The dependent variable was the percentage fixation time toward each extremely positive picture. Within-participant (Level 1) predictors included the subjective valence and perceived competence ratings, as well as the variable of interest (i.e., the unrealistic ranking of each picture). Between-participant (Level 2) predictors included age (as a continuous variable and being grand-mean centered) and the covariates (education, perceived health, visual and cognitive abilities). In addition, the within-participant means of the unrealistic ranking, subjective valence, and perceived competence (i.e., averaged scores of all extremely positive pictures within a participant) were also included in the model to control for possible contextual effects, as suggested by Snijders and Bosker (1999). To further control for contextual effects, self-reported positive and negative perception of personal aging were included in the model as covariates. Finally, three cross-level interaction terms, unrealistic \(\times\) age, valence \(\times\) age, and comparison \(\times\) age, were added to the model (refer to Supplementary Appendix for the equations).

The results of the analysis are shown in Table 2. The age \(\times\) valence and age \(\times\) competence interactions were not significant \((\beta = 0.00, t = 0.19, ns\) and \(\beta = -0.01, t = -1.43, ns\), respectively). However, the age \(\times\) unrealistic ranking interaction was significant \((\beta = -0.03, t = -2.01, p = .04)\). Adopting the formula of Kreft and De Leeuw (1998), we estimated that this interaction explained 8% of total variance. The results revealed that unrealistic ranking positively predicted percentage fixation time \((\beta = 0.42)\); however, this relationship was moderated by age, such that when age increased by one year, the correlation coefficient between unrealistic ranking and percentage fixation time decreased by 0.03. These results suggested that participants gazed more at pictures that they perceived as more unrealistic, whereas they did so to a lesser extent with age.

### Table 1. Age Differences in Potential Covariates

<table>
<thead>
<tr>
<th></th>
<th>Study 1</th>
<th>Study 2</th>
<th>Study 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Middle aged</td>
<td>Old</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>(SD)</td>
<td>(SD)</td>
<td>(SD)</td>
</tr>
<tr>
<td>Young (n = 50)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex (women, %)</td>
<td>54.0</td>
<td>57.4</td>
<td>52.8</td>
</tr>
<tr>
<td>Education</td>
<td>3.72 (0.67)</td>
<td>3.84 (0.43)</td>
<td>2.92 (0.83)</td>
</tr>
<tr>
<td>Monthly income</td>
<td>2.12 (0.70)</td>
<td>1.92 (0.70)</td>
<td>—</td>
</tr>
<tr>
<td>Wechsler Digit Span forward</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Wechsler Digit Symbol Substitution Test</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Category Naming Task</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Snellen Visual Acuity Test</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Pelli–Robson Contrast Sensitivity Test</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Health</td>
<td>3.00 (0.79)</td>
<td>2.78 (0.87)</td>
<td>4.74 (1.20)</td>
</tr>
<tr>
<td>Expiratory flow rate</td>
<td>—</td>
<td>—</td>
<td>361.42 (103.35)</td>
</tr>
</tbody>
</table>

Notes. M = means; SD = standard deviation. Ms are outside parentheses, and SDs are inside parentheses. For each variable, values that did not share subscripts within a study were different at \(p < .05\) level.

1Participants finished the Digit Symbol Substitution Test within 60 s for Studies 1 and 3, whereas in Study 2, they finished the test within 30 s.

2Results of Snellen Visual Acuity Test were transformed according to the following rule: \(1 = 20/16, 2 = 20/20, 3 = 20/25, 4 = 20/32, 5 = 20/40, 6 = 20/50, 7 = 20/63, 8 = 20/80, 9 = 20/100, 10 = 20/125, 11 = 20/160.\)

### Influence of Percentage Fixation Time on Perception of Personal Aging

We conducted two hierarchical regression analyses to examine how attention toward valenced images influenced perception of personal aging for participants of different
In the first regression model, we regressed participants’ negative perception of personal aging on standardized age, standardized fixation duration toward the neutral, negative, positive, and extremely positive images, and the interaction terms between age and fixation duration toward the four kinds of images, controlling for perceived health, education, cognitive and visual abilities. The regression model was significant \[F(15, 104) = 3.86, p < .001, R^2 = .36\]. In particular, the coefficient of age was significant \[β = −.42, p = .003\], indicating that older age was associated with less negative perception of personal aging. Moreover, the interaction term age × fixation duration toward the positive image was significant \[β = −.42, p = .013\]. The coefficients of fixation durations toward the negative (β = −.13), neutral (β = .23), positive (β = −.23), and extremely positive image (β = .09) were all not significant, as well as the interactions between age and fixation durations toward the negative (β = .07), neutral (β = .10), and extremely positive image (β = .17). Then, we conducted a simple slope analysis to further interpret the interaction between age and fixation duration toward the positive image (Figure 1). For people with older age (M + 1 SD), fixation duration toward the positive image was significantly and inversely related to negative perception of personal aging (β = −.70, p = .004). For people with younger age (M − 1 SD), fixation duration toward the positive image was not significantly related to negative perception of personal aging (β = .24, ns).

We then entered positive perception of personal aging as the dependent variable and repeated the previously mentioned regression analysis. The regression model was also significant \[F(15, 104) = 2.31, p = .007, R^2 = .25\]. The coefficient of age was significant \(β = .35, p = .020\), indicating older age was associated with more positive perception of personal aging. However, all the other coefficients were nonsignificant.

Taken together, findings from Study 1 suggest that compared with positive portrayals of old age, extremely positive portrayals of old age may be less likely to have an effect on older adults, for two reasons: First, older adults gazed less at extremely positive portrayals when they perceived them

### Table 2. Multilevel Analysis of Associations Between Percentage Fixation Time, Age, and Unrealistic Evaluation in Study 1

<table>
<thead>
<tr>
<th>Predictor</th>
<th>(\beta)</th>
<th>SE</th>
<th>t</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept (Level 2)</td>
<td>15.40</td>
<td>0.98</td>
<td>15.75</td>
<td>.00</td>
</tr>
<tr>
<td>Age</td>
<td>0.06</td>
<td>0.07</td>
<td>0.96</td>
<td>.34</td>
</tr>
<tr>
<td>Health</td>
<td>−0.66</td>
<td>0.47</td>
<td>−1.38</td>
<td>.17</td>
</tr>
<tr>
<td>Education</td>
<td>0.92</td>
<td>0.80</td>
<td>1.15</td>
<td>.25</td>
</tr>
<tr>
<td>Cognition</td>
<td>0.95</td>
<td>0.77</td>
<td>1.23</td>
<td>.22</td>
</tr>
<tr>
<td>Visual</td>
<td>−0.38</td>
<td>0.61</td>
<td>−0.64</td>
<td>.53</td>
</tr>
<tr>
<td>Valence</td>
<td>0.77</td>
<td>0.36</td>
<td>2.13</td>
<td>.04</td>
</tr>
<tr>
<td>Comparison</td>
<td>−0.13</td>
<td>0.25</td>
<td>−0.52</td>
<td>.61</td>
</tr>
<tr>
<td>Unrealistic</td>
<td>−0.39</td>
<td>0.89</td>
<td>−0.44</td>
<td>.66</td>
</tr>
<tr>
<td>Positive perception of personal aging</td>
<td>−0.42</td>
<td>0.47</td>
<td>−0.90</td>
<td>.37</td>
</tr>
<tr>
<td>Negative perception of personal aging</td>
<td>−1.11</td>
<td>0.70</td>
<td>−1.60</td>
<td>.11</td>
</tr>
<tr>
<td>Valence (Level 1)</td>
<td>0.18</td>
<td>0.10</td>
<td>1.70</td>
<td>.09</td>
</tr>
<tr>
<td>Valence × age</td>
<td>0.00</td>
<td>0.00</td>
<td>0.25</td>
<td>.80</td>
</tr>
<tr>
<td>Comparison (Level 1)</td>
<td>0.02</td>
<td>0.12</td>
<td>0.19</td>
<td>.85</td>
</tr>
<tr>
<td>Comparison × age</td>
<td>−0.01</td>
<td>0.01</td>
<td>−1.43</td>
<td>.15</td>
</tr>
<tr>
<td>Unrealistic (Level 1)</td>
<td>0.42</td>
<td>0.25</td>
<td>1.67</td>
<td>.10</td>
</tr>
<tr>
<td>Unrealistic × age</td>
<td>−0.03</td>
<td>0.01</td>
<td>−2.01</td>
<td>.04</td>
</tr>
</tbody>
</table>

Note. SE = standard error.

![Figure 1. Simple slope analyses about the relationship between fixation duration toward positive image and negative perception of personal aging for participants with different ages in Study 1. **p = .004.](image)
as being less realistic. Second, although positive portrayals of old age were associated with less negative perception of personal aging among older adults, extremely positive portrayals of old age did not have such an association.

Study 2

Study 2 followed up on Study 1 to further differentiate the effects of being exposed to extremely positive and positive portrayals of old age. Levy, Haushof, Hencke, & Wei (2000) found that exposure to explicit positive age stereotypes led to less cardiovascular stress among older adults. In this study, we tested whether being exposed to extremely positive portrayals of old age decreased cardiovascular stress to the same extent as did positive portrayals of old age. As controls for comparison, the effects of exposure to neutral and negative portrayals of old age on cardiovascular stress were also examined. Pre-ejection period (PEP) was chosen as the measure for reduced cardiovascular stress.

Methods

Participants

The sample of this study included 108 young adults (M = 23.42, SD = 4.48, 18–35 years, 57% women) and 107 older adults (M = 65.51, SD = 5.83, 60–91 years, 65% women) residing in the community in Hong Kong, China. Similar to Study 1, participants of this study were recruited by probability sampling from a database representative of the population (Census and Statistics Department, 2011), by a professional research firm. Participants received HK$200 for participating in the study.

Stimuli

The stimuli were videos depicting older adults performing physical, intellectual, and social tasks. For each task, four versions of videos were created. The four versions of the same task were of different valence, namely extremely positive, positive, neutral, and negative. In negative videos, older adults in the videos showed difficulty to perform physical tasks (e.g., walking upstairs), exhibited frustrated feelings in performing intellectual tasks (e.g., trying to learn to use a computer), and had disagreements with others in social tasks (e.g., discussing with a young adult about which television channel to watch). In neutral videos, the same older adults performed the same tasks, with neutral facial expressions and emotions, and without apparent difficulty. In positive videos, the same older adults performed the same tasks with positive facial expressions and emotions, but at a level of performance that exceeded normal expectations (e.g., running upstairs for three floors).

Experimental design and manipulation

Participants were assigned randomly to one of the four conditions: extremely positive, positive, neutral, and negative. In each condition, participants watched a set of 10 videos of the same valence.

As a manipulation check, participants rated the affect of the main character (the older adult) in each video, using the “affect grid” (Russell, Weiss, & Mendelsohn, 1989). The participants placed a single mark somewhere within a 9×9 grid. The valence score and the arousal score both range from −4 (extremely negative/low arousal) to 4 (extremely positive/high arousal). There was a condition main effect on the affect of the main character in the video [F(3, 212) = 233.75, p < .001, η² = 0.77]. The valence of the extremely positive videos was rated the most positive (M = 2.07, SD = 0.72), followed by the positive videos (M = 1.68, SD = 0.81), neutral videos (M = 0.64, SD = 0.70), and negative videos (M = −1.70, SD = 1.02). Pairwise comparisons between different conditions all indicated significant differences (p < .018).

Procedure

First, the experimenter introduced the HIC3000T Integrated Impedance Cardiography System to participants. The experimenter described briefly how cardiovascular reactivity was measured and emphasized that the equipment would induce no harm. After getting approval from the participants, 11 electrodes were attached to the participant’s body to record their cardiovascular reactivity during video viewing. Then, a series of 10 videos of a particular valence was presented to the participants, which lasted for 30 min in total. During that period, the electrocardiogram (ECG) and the impedance cardiogram (ICG) were recorded continuously. Among all the possible indexes of cardiovascular reactivity, we focused on PEP. PEP is the isovolumic contraction time during which the left ventricle is contracting (Q point of ECG wave) prior to the opening of aortic valve (B point on ICG wave). It is a noninvasive cardiological measure that reflects cardiac contractility, a function that is primarily controlled by β-adrenergic mechanisms (Newlin & Levenson, 1979). It reflects the activation of the autonomic nervous system (Mauss, Cook, & Gross, 2007). A longer PEP indicates more parasympathetic activation, and thus a stronger calming effect. Finally, participants completed measures of cognitive abilities, health, and demographic information, in the same way as in Study 1.

Results and Discussion

Preliminary analyses (see Table 1) revealed that education level, monthly income, digit span test score (both forward and backward), and Digit Symbol Substitution Test score differed significantly across the two age groups. Younger adults had higher education level and monthly income, as
well as performed better in digit span test and Digit Symbol Substitution Test than did older adults. Statistically controlling for education level, monthly income, and cognitive abilities did not affect the following analyses reported.

PEP Changes Across Age Groups and Conditions
To capture participants’ cardiovascular reactivity while watching the 10 videos in the same valence, we averaged participants’ PEP (a) during the first to the third video, (b) during the fourth to the seventh video, and (c) during the eighth to the tenth video. These three averages represent PEP levels at the beginning, in the middle, and at the end of the video watching process. Then, we conducted a 3 (PEP: beginning, middle, and at the end) × 2 (age: young and old) × 4 (conditions: negative, neutral, positive, and extremely positive) mixed model analysis of variance (ANOVA), with PEP as the within-subject factor, and age and condition as the between-subject factors. The main effect of age was significant \[ F(1, 194) = 12.01, p = .001, \eta^2 = .06 \], so was the age × condition interaction \[ F(3, 194) = 3.17, p = .03, \eta^2 = .05 \]. More importantly, the PEP × age × condition interaction was significant \[ \Lambda = 0.93, F(6, 386) = 2.47, p = .02, \eta^2 = .04 \]. In particular, the PEP × condition interaction was only significant in older adults (see Figure 2, lower panel; \( \Lambda = 0.85, F(6, 182) = 2.66, p = .02, \eta^2 = .08 \), but not

![Figure 2](image_url)

**Figure 2.** Pre-ejection period (PEP) changes of young and older adults in the four conditions in Study 2. PEP change scores were calculated by subtracting PEP at the beginning of video viewing from that in the middle and at the end of video viewing. **\( p = .008 \).
in young adults (see Figure 2, upper panel; $\Lambda = 0.96, F(6, 202) = 0.62, ns, \eta^2 = .02$). Thus, we further examined older adults’ PEP in the four conditions separately, using repeated measure ANOVAs. Older adults’ PEP changed significantly only in the positive condition [$\Lambda = 0.63, F(2, 19) = 5.59, p = .01, \eta^2 = .37$], but not in the negative, neutral, or extremely positive condition ($p > .13$). Post hoc Bonferroni tests indicated that older adults’ PEP did not change significantly at the middle of the positive video watching process ($M = 120.93, SD = 16.83$) or at the beginning of the process ($M = 107.98, SD = 12.90, p = .008$). As PEP is an indicator of the parasympathetic nervous system, the results suggest that watching positive videos has a physiologically calming effect for older adults. Young adults’ PEP did not change significantly in any of the four conditions ($p > .09$).

Taken together, these findings suggest that among all four valences of portrayals of old age, only viewing positive portrayals of old age had a calming effect on the cardiovascular reactivity of older adults (but not younger adults). Viewing extremely positive portrayals of old age did not have this calming effect.

Study 3

Study 2 found that viewing positive but not extremely positive portrayals of old age had a calming effect on older adults. Levy (2009) has demonstrated that being exposed to positive age stereotypes could improve downstream memory performance, as one prominent negative age stereotype is losing memory with age. Study 3 further examined whether similar effects could be found when being exposed to positive and extremely positive portrayals of old age. We predicted that being exposed to positive, but not extremely positive, portrayals of old age would be related to increased memory performance of older adults. Because Studies 1 and 2 found significant results on older adults only, we only included older adults in this study.

Methods

Participants

Participants were 145 older adults between the age of 58 and 94 years ($M = 73.35, SD = 6.78$), including 68 men and 77 women. The participants were recruited from senior community centers. Each of them received a supermarket coupon of HK$50 for their participation.

Stimuli

Participants were randomly assigned to one of three conditions: control ($n = 49$, with 21 men and 28 women); positive ($n = 49$, with 25 men and 24 women); and extremely positive ($n = 47$, with 22 men and 25 women). The participants assigned to positive and extremely positive conditions watched one of the two television public health announcements actually produced and used by the Hong Kong government, respectively.

The positive announcement describes the activities of four older adults in a way that is consistent with normative positive aging. The first older adult (68 years old) works as a research assistant in a university and says that retirement does not mean the end of the working life. The second older adult (63 years old) is a hiking captain walking across a forest, who emphasizes the importance of maintaining good health. The third older adult is a 63-year-old man who is about to take a public examination. He takes a book from the library shelf to read and claims that we should always improve ourselves. The fourth older adult (78 years old) plays ball games with children and mentions that to make others happy is the secret to life satisfaction. The extremely positive announcement describes the activities of the same four older adults in a way that exceeds normative positive aging. The first older adult says that he has to keep pace with the trend of the world even after retirement. The hiking captain climbs rocks and jumps across a river, and says that nobody can get beyond him. The third older adult speaks in English (a foreign language, suggesting intellectual competence) instead of Chinese (the local language). The fourth older adult says that she feels really glad that she can make lots of people happy. Participants in the control condition were shown a neutral nonaging-related video clip about houses and buildings. All three videos lasted for 30 s.

After watching the respective video, participants were asked whether they felt that they were better than, similar to, or worse than other older adults in 15 different areas using a 7-point Likert scale ranging from −3 (worse than; Wheeler & Miyake, 1992) to +3 (better than; Levy, 2009). Sample items include “feeling tired easily,” “wiser,” and “more talkative.” These items were validated in previous research on personality (Benyamini, Leventhal, & Leventhal, 2003). The Cronbach’s $\alpha$ of this scale was .90, and we created a composite index by taking the mean of all items. We reasoned that if the extremely positive condition made participants think that other older adults were extremely competent, they should rate themselves the worst relative to other older adults, followed by the positive and the control conditions. As expected, participants in the extremely positive condition scored the lowest ($M = -.38, SD = 1.22$), followed by the positive condition ($M = -.11, SD = .90$) and the control condition ($M = .47, SD = .73$), $F(2, 43) = 3.42, p = .04$, Cohen’s $d = 0.87$. Further analysis using a planned linear contrast with control condition coded as 1, positive condition as 0, and extremely positive condition as −1 revealed that the more positive the video was, the worse the participants rated themselves relative to other older adults [$t(43) = 2.47, p = .02$, Cohen’s $d = 0.75$].

Measures and procedure

After watching one of the three videos, participants completed the Chinese Rey Auditory Verbal Learning Test.
(C-RAVLT), which measured memory performance. It was originally developed by Rey (1959). First, a list of 15 words (List A) was presented once and participants were asked to recall as many words as possible. This process was repeated for three trials (immediate recall). Then, an interference list of 15 words (List B) was presented and a free-recall test of that list followed (interference). After that, the participants were asked to free-recall the words of List A, without presentation of the words (recall after interference). A free-recall test of List A was also conducted without presentation of the words after a 30-min delay (delayed recall). During the 30-min delay, participants were administered the measures of the potential covariates (see the next paragraph). Finally, a list of words mixed with words from Lists A and B, and nonrelated words, were presented and participants had to identify whether the words belonged to List A (delayed recognition).

As potential covariates, participants completed cognitive measures and reported demographic information, as in Studies 1 and 2. To measure physical health, pulmonary peak expiratory flow rate was measured. The average peak flow rate of three attempts to exhale at maximum effort through a mini-Wright meter was recorded. This index has previously been reported as a predictor of total mortality and cardiovascular mortality (Cook et al., 1989), and as a correlate of cognitive and physical functions in both a large elderly population that contained many frail elderly persons (Cook et al., 1991) and in a group of well-functioning community-dwelling older persons (Cook et al., 1995). Self-rated health was also measured, by asking participants to rate their current health condition (a) independently and (b) relative to their counterparts. Participants also predicted their health in the next year (c) independently and (d) relative to their counterparts. Ratings were made on a 7-point Likert scale. A composite score was calculated by averaging the ratings of the four items (Cronbach’s α = .90). Statistically controlling for these covariates did not change the following reported results.

Results and Discussion

Table 3 shows the descriptive statistics of all indexes of the C-RAVLT by condition. Although the pattern of condition differences was highly similar across indices, significant condition differences were found on immediate recall and delayed recognition only. We first conducted repeated measure ANOVA for the immediate recall trials, with condition as a between-subjects factor and trial as the within-subjects factor. The main effect of condition was significant [F(2, 137) = 5.63, p = .004, η² = .08], and there was no interaction between conditions and trial [F(2, 137) = 0.28, ns, η² = .004]. A planned contrast (the weights for the extremely positive, positive, and control conditions were −1, 1, and 0, respectively) revealed that the immediate recall scores for the extremely positive group were the lowest, followed by the control condition and the positive condition, in the first [t(142) = 2.44, p = .016], second [t(142) = 2.46, p = .015], and third trials [t(142) = 1.97, p = .051]. The same pattern of condition differences showed up for the delayed recognition score [F(2, 142) = 4.99, p = .008, η² = .07]. A planned contrast revealed that the delayed recognition score for the extremely positive group was the lowest, followed by the control condition and the positive control [t(142) = −2.70, p = .008]. These results suggest that being exposed to extremely positive portrayals of old age lowers the subsequent memory performance of older adults while being exposed to positive portrayals enhances it.

General Discussion

The literature on image of aging (e.g., Levy, 2009) has revealed many positive consequences of being exposed to positive depictions of old age. These positive consequences occurred as individuals internalized the positive age stereotypes to become their own perception of personal aging (Levy, 2003). Meanwhile, the media literature suggested that some depictions of older adults might be extremely positive, to the point that they were unlikely to occur for most older adults (Kubey, 1980). There was some preliminary or indirect evidence that older adults might find these extremely positive depictions less attractive (Mares & Cantor, 1992) and react to them more negatively (Rice et al., 2002). Integrating these two literatures, our studies tested the consequences of being exposed to positive and extremely positive portrayals of old age on attention (Study 1), perception of personal aging (Study 1), physiological

<table>
<thead>
<tr>
<th>Condition</th>
<th>N</th>
<th>C-RAVLT trial I*</th>
<th>II*</th>
<th>III*</th>
<th>List B (interference list)</th>
<th>Trial V without List A presented</th>
<th>Delayed recall (after 30min)</th>
<th>Delayed recognition (after 30min)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>49</td>
<td>3.63 (1.78)</td>
<td>6.45 (2.32)</td>
<td>7.78 (2.58)</td>
<td>3.57 (1.78)</td>
<td>5.84 (3.03)</td>
<td>5.43 (3.01)</td>
<td>12.22 (2.93)</td>
</tr>
<tr>
<td>Positive</td>
<td>49</td>
<td>3.82 (1.65)</td>
<td>6.90 (2.30)</td>
<td>8.00 (2.03)</td>
<td>3.29 (1.65)</td>
<td>5.71 (2.27)</td>
<td>5.06 (2.73)</td>
<td>12.90 (2.44)</td>
</tr>
<tr>
<td>Extremely positive</td>
<td>47</td>
<td>3.02 (1.31)</td>
<td>5.81 (1.83)</td>
<td>7.09 (2.18)</td>
<td>3.13 (1.51)</td>
<td>4.87 (1.87)</td>
<td>4.56 (1.96)</td>
<td>11.15 (2.81)</td>
</tr>
</tbody>
</table>

For each column, *p < .05, **p < .005.
responses (Study 2), and downstream memory performance (Study 3). Findings revealed that paying more attention to (Study 1) and being exposed to (Study 2) positive portrayals of old age were related to a less negative perception of personal aging and a stronger physiological calming effect for older adults. These findings are consistent with prior literature on image of aging in attention and memory. Being exposed to positive portrayals of old age has similar positive effects as being exposed to words that represent positive age stereotypes (see Horton et al., 2008, for a meta-analytic review). However, such effects may be limited to a certain spectrum of positive valence. Our findings move beyond previous literature by showing that these benefits no longer occur for portrayals that are too positive. In fact, extremely positive portrayals lowered older adults’ downstream memory performance (Study 3) and attracted less attention when they perceived the portrayals as being unrealistic (Study 1). These findings have practical implications: Media professionals and public health campaigners should caution against portraying older adults in extremely positive light. Future studies should further explore the effectiveness and consequences of extremely positive portrayals of older adults on communication and public health outcomes.

In conclusion, we acknowledge that the studies were cross-sectional. Findings from Studies 1 and 2 revealed that only older adults, but not middle aged or younger adults, showed valence differences in reactions toward portrayals of old age. This may reflect a developmental phenomenon—as people grow older, they may be increasingly more likely to internalize and benefit from positive but not extremely positive images of aging. Alternatively, the findings may simply reflect that portrayals of old age are more relevant for older adults and the valence of the portrayals thus has more influences on them. Future studies should tease apart these two alternate explanations. In addition, we acknowledge that the stimuli used in the studies are new and have not been used in prior studies. Future studies should further test the reliability and validity of these stimuli. Moreover, although the samples for Studies 1 and 2 were recruited by probability sampling and thus were representative of the Hong Kong population, the sample for Study 3 was recruited by convenience sampling. This limits the generalizability of the findings, and future studies should attempt to replicate the findings in Hong Kong and other populations.

Despite these limitations, our findings add to the prior literature on image of aging by showing that not only does exposure to lexical positive age stereotypes (e.g., Levy, 2009) benefit older adults, but exposure to positive pictorial portrayals of old age also has positive benefits on the physiology and perception of personal aging for older adults. In addition, our findings caution that showing extremely positive portrayals of old age may backfire, as doing so lowers memory performance. Older adults also tend to pay less attention to these portrayals when they perceive them as unrealistic.

**Supplementary Material**

Supplementary material can be found at: [http://psychsocgerontology.oxfordjournals.org/](http://psychsocgerontology.oxfordjournals.org/)

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