Reframing Aging Through Images:

Research Methods Supplement

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Supplement A : Hypotheses, Image Categories, and Biometric Study

FrameWorks Institute and AARP researchers designed the study *Reframing Aging Through Images: Recommendations from Research* to determine whether authentic images that counter negative stereotypes about older people can generate more positive attitudes about aging and older people. Our hypotheses, based on prior work on reframing aging,[12] included the following:

- Images that show older people actively engaged with younger generations (i.e., intergenerational images) lead to more positive attitudes (implicit and explicit) about aging and older adults than same-generation depictions.
- Images of older people in community or workplace settings generate even more positive attitudes (implicit and explicit) about aging and older people than images of older adults in household settings.
- Images that show older people being comfortable and proficient with technology help counter the belief that they are technologically challenged and, in turn, generate more positive attitudes (implicit and explicit) about aging and older people.
- Images of older people that depict them as active generate more positive attitudes (implicit and explicit) about aging and older adults than images that depict them as passive.
- Images that depict older people in groups generate more positive attitudes (implicit and explicit) about aging and older people than images that show them by themselves.
- Extreme counter-stereotypes (the so-called "super seniors") reinforce (or at least don't disrupt) negative attitudes about aging.

FrameWorks and AARP operationalized these hypotheses into a series of image categories that were tested against a control group of no images. Additional image categories were also developed for comparison to one another and to the control. The final list of 13 image categories (reduced from 15 original categories) is available in Supplement D.

After agreeing on the hypotheses and image categories to be tested, FrameWorks and AARP researchers selected 180 images (12 for each of 15 original image categories). All

images were owned by AARP or licensed for use by AARP from Getty Images. This was done through a purposeful, non-probabilistic sample of images that fit the categories in the judgment of the researchers. A behavioral research company, *EyeSee Research*, then vetted the images through an online survey of 2,250 US adults aged 18-plus who were each exposed to 12 images (150 respondents per original category). Respondents identified the images that most or least represented a particular category and rated the believability of images. This process distilled the image collection from 12 images per category to three images per category for further testing. These images all had high believability scores, with an average of 93%. The survey questions asked during the pre-biometric phase of the study are listed further down below, along with the images that were tested.

Please see below for details on sample composition:

Demographic Variable	Online Survey (N = 2,250)
Age	
18-39	25%
40-55	25%
56-64	20%
65-74	20%
75+	10%
Gender	
Male	50%
Female	50%

Income	
$0-$34,999	25%
$35,000-$49,999	12%
$50,000-$74,999	19%
$75,000-$99,999	15%
$100,000 or more	25%
Prefer not to answer	4%
Education	
High school diploma or less	13%
Some college, associate degree, or job-specific training	31%
Bachelor's degree	28%
Some graduate school or graduate degree	27%
Ethnicity	
Hispanic/Latino	13%
Not Hispanic/Latino	87%
Race	
White	66%
Black/African American	17%
Asian	11%
Other race	5%
Prefer not to answer	1%

Political Views	
Conservative	28%
Moderate	39%
Liberal	29%
Prefer not to answer	5%

Next, EyeSee Research conducted a biometric study using eye tracking and facial coding as well as a brief questionnaire to gain additional insight about which elements or areas of 45 images (three for each of the original 15 image categories) were the most striking or visible. The study consisted of 900 US participants aged 18-plus. FrameWorks and AARP researchers used the data from the pre-biometric survey and biometric study to confirm final image selections to be tested in on-the-screen (OTS) interviews.

Please see below for details on sample composition:

Demographic Variable	**Biometric Study (N = 900)**
Age	
18-39	24%
40-55	27%
56-64	22%
65-74	22%
75+	5%
Gender	
Male	50%
Female	50%

Income	
$0-$34,999	19%
$35,000-$49,999	12%
$50,000-$74,999	24%
$75,000-$99,999	17%
$100,000 or more	28%
Prefer not to answer	1%
Education	
High school diploma or less	14%
Some college, associate degree, or job-specific training	29%
Bachelor's degree	34%
Some graduate school or graduate degree	23%
Ethnicity	
Hispanic/Latino	6%
Not Hispanic/Latino	94%
Race	
White	86%
Black/African American	7%
Asian	5%
Other race	2%

Political Views	
Conservative	28%
Moderate	41%
Liberal	30%
Prefer not to answer	1%

Pre-Biometric Study Questionnaire and Images Tested

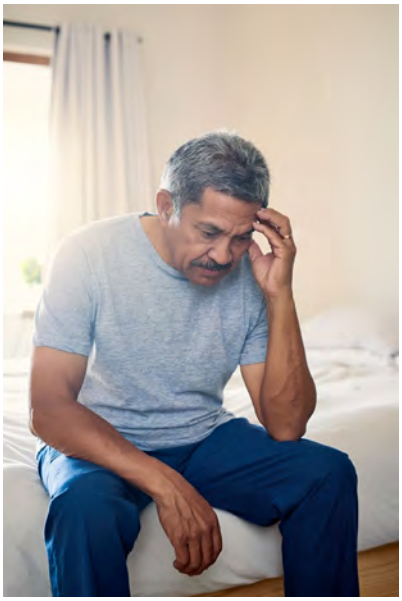
Questionnaire

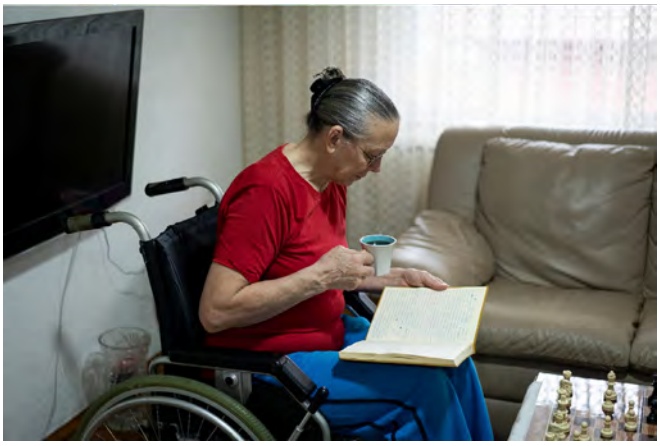
1. Please review the following images and select one image that you feel best represents and one image that you feel worst represents [image category]
2. You will now see some of the images that you have previously seen and answer some questions about those images. Please describe the image in a short sentence.
3. How believable is this image as a realistic image of what older people's experiences are like? Not at all believable, Not too believable, Somewhat believable, Very believable
4. Please explain why you feel this image [is/is not] believable.
5. In your opinion, how old are the people shown in this image? If there are people of different ages, please answer for older ones. 40–49, 50–59, 60–69, 70–79, 80 or older

Images Tested

Active (Level of Activity)

Alone





Community


25

Household

In Groups

Intergenerational

Limited Mobility and Health Statuses

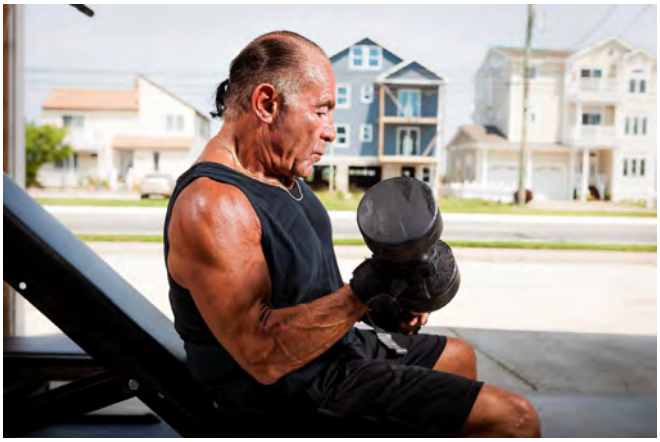
Normal Active (Typical Physical Activities)

Passive

Range of Mobility and Health Statuses

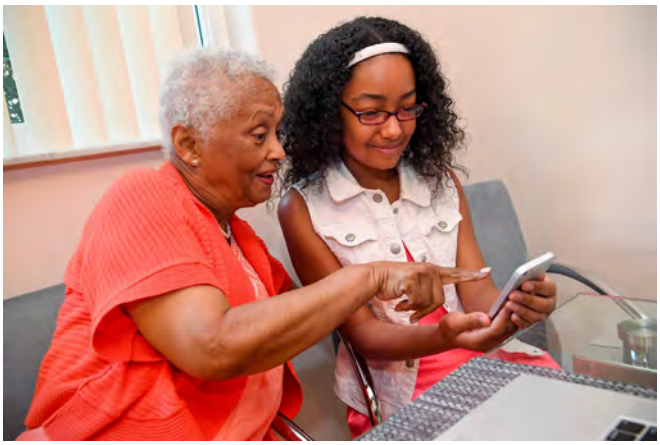
Same Generation

Super Active (Atypical/Extreme Physical Activities)



Technologically Competent

Technologically Incompetent



Workplace


FAST
DELIVERY

Biometric Study Questionnaire and Images Tested

Questionnaire (Questions that were asked in addition to taking biometric recordings):

- Please write down three words that first come to mind when you look at this image.
- What is your overall attitude towards this image? Very negative, Somewhat negative, Neutral, Somewhat positive, Very positive
- Why is that? Please explain your attitude toward this picture.
- How would you describe the person(s) in this image? If there are people of different generations, please focus on the older people only.
- Here are some attributes others used to describe people in this image. In each row, **select the attribute that better describes these person(s)**. If there are people of different generations in the image, please **focus on the older person(s).**
  - Competent---Incompetent
  - Pessimistic---Optimistic
  - Sociable---Unsociable
  - Weak---Strong
  - Interesting---Boring
  - Different than you---Similar to you
  - Having good health---Having poor health
  - Unproductive---Productive
  - Independent---Dependent
  - Foolish---Wise
  - Financially stable---Financially distressed
  - Limited mobility---Fully mobile
  - Active---Passive
  - Disengaged---Engaged

— Alone---In a group

— Different generations---Same generation

- Which of the following claims best describes your attitude towards how older persons are shown in this image: *a more positive way than I see it, the same way as I see it, a more negative way than I see it*
- Could you please elaborate your answer [why does this image show older persons in a more positive way than you see it/why does this image show older persons in a more negative way than you see it/How is this similar to the way you see older persons? Please elaborate.]?
- In your opinion, to what extent is the situation shown in this image realistic? Completely unrealistic, Somewhat unrealistic, Neither realistic nor unrealistic, Somewhat realistic, Very realistic
- What do you find [realistic/unrealistic] about this image?

Images Tested

Intergenerational

Same Generation

Community

Workplace

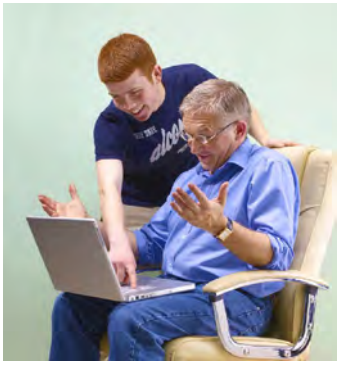
Household

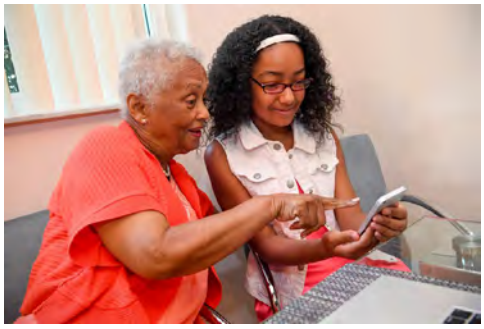
Range of mobility and health statuses

Limited mobility and health statuses

Technologically competent

Technologically Incompetent





Active (Level of Physical Activity)

Passive

Alone

In Groups

Normal Active (Typical Physical Activities)

Super Active (Atypical/Extreme Physical Activities)

Supplement B: On-the-Screen (OTS) Interviews

FrameWorks conducted 80 interviews via Zoom with a diverse sample of US adults aged 18-plus, who were recruited by the firm *Cambridge Focus*. Respondents were drawn from a national panel of prospective research participants. Potential participants received a blind online opt-in questionnaire inviting them to respond if they wished to be considered for the study. The questionnaire captured volunteered self-descriptions, which were used to prioritize candidates to be interviewed based on the following quota categories (categories are listed in the order of priority):

1. Age
2. Income
3. Political views
4. Race
5. Income
6. Gender
7. Residence/ Location
8. Employment status (employed vs. retired)

Additional questions excluded respondents for low acculturation and occupation or training in sensitive industries. If a respondent was not born in the United States, they were asked when and at what age they came to the country. Those who arrived when they were older than 12 years of age or have lived in the United States fewer than 10 years were excluded. Respondents who have been employed in any of the following sensitive occupations were excluded from the study:

- People working in marketing/advertising
- People who work in fields of social services, elder care, hospice, or nursing homes/ assisted living facilities
- People who teach or research geriatrics/gerontology, nursing, or social services

- People working at and/or volunteering at hospitals, adult day care centers, older people care centers, hospices, or nursing homes/assisted living facilities
- People working in positions in a city council or government job related to elderly care or social security

Email, text message, and/or telephone were used to communicate with respondents that they had been selected to participate, provide them with Zoom links, and remind them of their appointments. In the event a participant missed their appointment, the firm attempted to reschedule. If rescheduling was not possible, a replacement participant with similar demographic characteristics was used as a substitute. Each participant received a virtual honorarium payment of $20 in appreciation of their time. Participants received secure links via email from a third-party fulfillment vendor, which offered them numerous virtual gift card options to choose from. Data collection occurred between June 28 and July 7, 2021.

Interviews ranged from 10 to 15 minutes each. The purpose of the interviews was 1) to ensure that the images depicted the categories accurately, 2) to ensure that no images were causing idiosyncratic results, and 3) to gather information about how and why the images might impact participants' attitudes about aging and older people. Please see below for details on sample composition:

Demographic Variable	OTS interviews (N = 80)
Age	
18-29	21%
30-44	26%
45-59	27%
60+	26%
Gender	
Male	50%
Female	50%

Income	
$0-$39,000	20%
$40,000-$69,999	25%
$70,000-$99,999	30%
$100,000 or more	25%
Education	
High school diploma or less	40%
Some college/associate	30%
Bachelor's degree	20%
Graduate/professional degree	10%
Race/Ethnicity	
White	60%
Black/African American	10%
Hispanic/Latino	15%
Other race	15%
Political Party	
Democrat/lean Democrat	46%
Republican/lean Republican	38%
Independent/other	16%

Each interview began with a set of questions that established the participants' existing attitudes about aging and older people. Participants were then shown three images from a category, one at a time. Each participant was exposed to only one category. The order in which the images were shown was randomized for each participant to guard against ordering effects. After exposure to each image, participants were asked additional questions about their attitudes toward aging and older people. Finally, participants were shown all three images at the same time and were asked questions about the whole set. The questions asked during OTS are listed the next section, along with the images that were tested.

Through qualitative analysis, the interviews confirmed that most of the chosen images depicted the categories as intended. Adjustments were made to the images in some categories to account for some idiosyncratic results—for example, images that called attention to themselves for the wrong reasons or did not accurately depict a category. Through this process, researchers reduced the categories from 15 to 13 final categories to be tested in the survey experiment: *intergenerational, same generation, community, workplace, household, limited mobility/engaged, limited mobility/disengaged, technologically competent, technologically incompetent, active, passive, alone,* and *"super senior"*. Please see below for the definitions of all image categories:

Categories of Images	**Descriptions**
Generational composition of groups • Intergenerational • Same generation	• Intergenerational: groups composed of individuals from older and younger generations engaging with one another • Same generation: Groups composed of individuals from older generations only engaging with one another
Setting • Workplace • Community • Household	• Workplace: older people in workplace settings (not limited to offices), whether or not they are depicted in positions of authority • Community: older people portrayed as actively participating in community activities (e.g., at parks, restaurants, festivals) • Household: older people with friends or family at home
Mobility and engagement • Limited mobility/engaged • Limited mobility/disengaged	• Engaged: older people showing a range of limited mobility statuses who are engaged with others or their surroundings • Disengaged: older people showing a range of limited mobility statuses who are not engaged with others or their surroundings

Technology competence • Technologically competent • Technologically incompetent	• Competent: older people who seem comfortable using different kinds of technologies, including phones, tablets, and laptops • Incompetent: older people who seem uncomfortable using technology; will typically depict an older adult being helped
Level of activity • Active • Passive	• Active: older people engaged with others doing everyday things, including physical and mental forms of activity; the older adult is an active subject, not the object of action • Passive: older people disengaged from others who are involved in some type of activity
Presence of others • Alone	• Alone: older people by themselves, either sitting or engaged in an activity (e.g., reading)
Stereotype • "Super senior"	• "Super senior": older people engaged in extreme activities (e.g., skydiving, bodybuilding, surfing)

OTS Interview Questions and Images Tested

Questionnaire

Pre-exposure to images

1. What comes to mind when you think about aging?
2. What comes to mind when you think about older people?
3. What terms would you use to describe older people?

Post-exposure to images

4. What's your first reaction to this image? What strikes you about it?
5. After seeing this image, does anything new come to mind about older people?
6. (Optional) So, what do you think this image is saying about older people?

7. Looking at all three images together, what would you say they have in common?

— What would you say these images together say about aging?

8. Are there any differences between these images that stick out for you?

— Do these say different things about aging, or not so much

Images Tested

Intergenerational

Same Generation

Community

Workplace

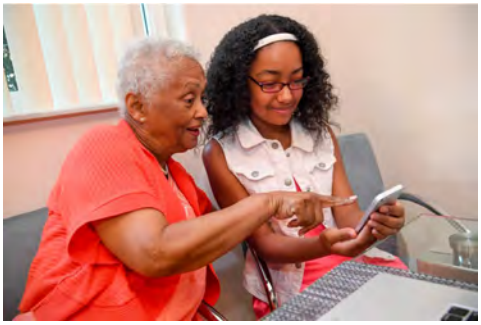
Household

Range of Health Statuses

Limited Health

Technologically Competent

Technologically Incompetent



Active

Passive

Alone

“Super Senior”

Supplement C: Pilot Study

Following the final selection of categories and images, FrameWorks conducted an online pilot survey using the SurveyMonkey platform. The pilot sample consisted of 1,130 adults who were recruited from Amazon's Mechanical Turk.[3] Participants were able to opt-in to take the survey if they met the following criteria:

1. 18 years of age or older
2. Located in the United States
3. Primary device is a computer (not a smartphone or tablet)
4. Must have a HIT approval rate of 95% or greater[4]

Data were collected August 24-25, 2021. All participants who completed the survey were paid $1.50, and participants were not allowed to complete the survey more than once. Participants who did not complete the survey in full were excluded from analysis and were not paid. To prevent bots and verify participation, FrameWorks randomly assigned each participant a validation code at the end of the survey, which they had to enter into the MTurk platform. No demographic quotas were used for the pilot, and the data were not weighted.

The primary purpose of the pilot was to determine the best method for showing images to participants in the full survey experiment. A secondary goal of the pilot was to test the preliminary psychometric properties of the survey questionnaires.

Four of the 13 categories were tested: *home, community, technologically competent,* and *technologically incompetent*. Participants were randomly assigned to view one of three types of conditions:

(1) no images (control), (2) a series of three images from one of the tested categories, or (3) a set of three images from one of the tested categories. If participants were assigned to view a series of images, they were shown each of the three images, one at a time, in random order. If participants were assigned to view a set of images, they were shown all three images at once on the screen, presented in random order. After an assignment was made to a condition, participants responded to 10 short batteries of questions assessing attitudes and stereotypes about older people and the aging process. All items were measured on a Likert scale with response options ranging from one *(strongly disagree)* to seven *(strongly agree*).

Exploratory factor analysis was used to determine the psychometric quality of each battery. Items with rotated factor loadings below |.40| were dropped from each battery. Once finalized, Cronbach's alpha (α) was used to assess internal consistency among the items in each battery. Given that there are various heuristics for determining acceptable internal consistency, we determined that batteries with internal consistency scores approaching |.60| or above would be considered acceptable.[5] After assessing internal consistency, we combined items within each battery into composite scores that indicated participants' average ratings of the attitudes or stereotypes measured by each battery.

Next, the battery composites were averaged across all possible orders of images within each category, for each condition.[6] We then used multiple regression analysis to determine whether there were significant differences in outcomes between the sets or series of images when compared to the control. We also compared outcomes for sets vs. series of images within each category (e.g., *home* series vs. *home* set). A threshold of $p < .05$ was used to determine whether the treatments had any significant effects. Significant differences were understood as evidence that an image category influenced a particular outcome (for example, attitudes toward aging or aging stereotypes).

Overall, results indicated that either image method would be viable for the full survey experiment. For example, the home set of images increased several negative stereotypes about older adults when compared to the control, but it was the only image set that influenced outcomes. On the other hand, several series of images *(community, technologically incompetent,* and *technologically competent)* increased negative stereotypes about older adults' abilities with technology when compared to the control. However, no other series of images influenced outcomes. For an example of how regression analyses were interpreted, please see Supplement E.

After holistically considering the patterns of regression coefficients for sets vs. series of images, image sets were chosen as the presentation method for the full survey experiment. This method was chosen, in part, to reduce methodological complexity and programming time.

As with all research, it is important to remember that results are based on a sample of the population, not the entire population. As such, all results are subject to margins of error.

Final Images Tested

Set 1. Limited Mobility/Engaged



Set 2. Limited Mobility/Disengaged



Set 3. Technologically Competent



Set 4: Technologically Incompetent



Set 5: Active



Set 6. “Super Senior”



Set 7. Workplace



Set 8. Community

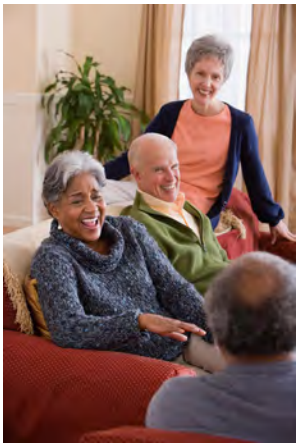


Set 9. Household



Set 10. Same Generation





Set 11. Alone



Set 12. Intergenerational



Set 13: Passive



Supplement D: Survey Experiment

Explicit Survey Experiment

FrameWorks fielded an online survey experiment to test the effects of images of older people on attitudes and stereotypes about aging and older people. The experiment included 3,166 participants aged 18-plus who were US residents. Target quotas were set according to national benchmarks for age, gender, household income, education level, race/ethnicity, region, and political party affiliation. See below for more information about the sample composition. Data were not weighted.

Demographic Variable	Survey Experiment (N = 3,166)	National Benchmark
Age		
18-34	24%	29%
35-49	25%	24%
50-64	23%	25%
65+	28%	22%
Gender		
Male	49%	48%
Female	51%	52%
Nonbinary/other	<1%	-
Income		
Less than $25,000	18%	16%
$25,000-$49,999	18%	22%
$50,000-$100,000	37%	31%

$100,000 or more	27%	31%
Education		
High school diploma or less	29%	38%
Some college/associate	32%	27%
Bachelor's degree	26%	22%
Graduate/professional degree	13%	13%
Ethnicity		
Hispanic	13%	17%
Non-Hispanic	87%	83%
Race [7]		
White	75%	62%
Black/African American	14%	12%
American Indian/Alaska Native	3%	1%
Asian	6%	6%
Native Hawaiian/Pacific Islander	1%	1%
Other race	6%	8%
Biracial/Multiracial[8]	-	10%
Region		
Northeast	20%	17%
Midwest	20%	21%
South	39%	38%
West	21%	24%

Political Party		
Democrat/lean Democrat	51%	46%
Republican/lean Republican	36%	38%
Independent/other	13%	16%

Data were collected September 8-21, 2021. Participant recruitment and survey hosting was completed by *Dynata*. Participants were recruited from some combination of the following sources: proprietary loyalty panels, open-invitation, or integrated channels that recruit from partnerships with external sources, such as publishers or social networks. All participants opted in to complete the survey. Participants with Dynata earn points for completing surveys, which they can then exchange for various rewards. These rewards vary by panel and recruitment method but may include things such as airline miles or gift cards.

Participants with Dynata are required to verify their identity at multiple points during survey enrollment and routing. Dynata uses various methods, such as third-party validation and digital fingerprinting, to detect fraud, identify bots, and monitor and detect suspicious activity from participants.

Participants were not allowed to complete the survey more than once. Participants who did not fully complete the survey were removed from the data and were not paid. In addition, participant data was removed if they completed the survey within one-third of the median survey time, if they straight-lined, or if they provided nonsensical responses to the two-open ended questions included in the survey.[9]

After providing consent to participate, respondents were randomly assigned to either one of the 13 image categories or to the control group, in which they saw no images. Respondents assigned to one of the 13 image dimensions were then randomly assigned to see one of six randomly ordered sets of images, which they were required to view for at least 30 seconds before they could proceed with the survey. Respondents in the control condition proceeded directly from the informed consent page to the questionnaire containing 10 aging related batteries.

The order of batteries was randomized. Respondents assigned to the control group were able to complete all 10 batteries without interruption. However, respondents assigned to

one of the 13 image categories were "re-dosed" with the same set of images for another 30 seconds after completing half of the questionnaire before they could complete the remaining questions.

See below for more information about final battery properties.

Batteries	# of items[10]	Internal Consistency (α)	Composite Mean[11]
Positive Attitudes Towards Aging	4	.81	5.30
Negative Attitudes Towards Aging	4	.81	4.34
Social/Community Stereotypes	4	.69	2.85
Mobility/Health Stereotypes	4	.87	4.00
Cognitive Ability Stereotypes	4	.87	4.14
Ability to Live a Full Life Stereotypes	3	.89	3.75
Old-Fashioned Stereotypes	3	.88	4.18
Technology Stereotypes	4	.57	3.92
Paternalism	4	.86	3.85
Lack of Diversity of the Aging Process	4	.83	4.03

Outcomes were averaged across all possible orders of image sets within each category.[12] We then used multiple regression analysis to determine whether there were significant differences on the outcomes between each of the image categories and the control group. We also tested whether outcomes for relevant image categories differed from each other (e.g., *technologically competent* vs. *technologically incompetent*). Please see below for a final list of image category comparisons. Finally, we used multiple regression analysis to explore whether the image categories influenced stereotypes and attitudes differently depending on participants' age groups or genders.

A threshold of $p < .05$ was used to determine whether treatments had any significant

effects. Significant differences were understood as evidence that an image category influenced a particular outcome (for example, attitudes toward aging or aging stereotypes). Below, an example is provided to illustrate how regression results were interpreted to inform the strategic guide. The table below provides the coefficient for the control group on explicit attitudes of paternalism as well as the coefficient for the *limited mobility/disengaged* condition on explicit attitudes of paternalism. The coefficient of 47.44 indicates that, when placed on a scale of 0-100, participants in the control condition scored an average of 47.44 on explicit attitudes of paternalism. The coefficient of 7.73 indicates that participants in the *limited mobility/disengaged* condition scored an average of 55.17 (47.44 + 7.73) on explicit attitudes of paternalism. The p-value of <.05 indicates that the coefficient for the *limited mobility/disengaged* condition is significantly different—in this case, significantly higher—than the coefficient of the control condition.

Explicit Attitudes of Paternalism		
Condition	**Coefficient**	**p-value**
Control	47.44	
Limited mobility/ disengaged	7.73	<.001

As with all research, it is important to remember that results are based on a sample of the population, not the entire population. As such, all results are subject to margins of error.

Implicit Survey Experiment

An implicit association test (IAT) was conducted October 12-November 17, 2021, and included 3,153 participants. The participants were US residents aged 18-plus. Target quotas were set according to national benchmarks for age, gender, household income, education level, race/ethnicity, and political party affiliation. Participants, recruited by Dynata, were directed to complete the test using Qualtrics, an online survey platform.

See below for more information about the sample composition. Data were not weighted.

Demographic Variable	IAT Experiment (N = 3,153)	National Benchmark
Age		
18-34	18%	29%
35-49	23%	24%
50-64	32%	25%
65+	27%	22%
Gender		
Male	48%	48%
Female	52%	52%
Nonbinary/other	<1%	-
Income		
Less than $25,000	15%	16%
$25,000-$49,999	22%	22%
$50,000-$100,000	34%	31%
$100,000 or more	29%	31%
Education		
High school diploma or less	21%	38%
Some college/associate	29%	27%
Bachelor's degree	31%	22%
Graduate/professional degree	19%	13%

Ethnicity		
Hispanic	10%	17%
Non-Hispanic	90%	83%
Race		
White	79%	62%
Black/African American	10%	12%
American Indian/Alaska Native	1%	1%
Asian	6%	6%
Native Hawaiian/Pacific Islander	<1%	1%
Other Race/Biracial/Multiracial	4%	18%
Political Party		
Democrat/lean Democrat	50%	46%
Republican/lean Republican	35%	38%
Independent/other	15%	16%

Participants were recruited from some combination of the following sources: proprietary loyalty panels, open-invitation, or integrated channels that recruit from partnerships with external sources, such as publishers or social networks. All participants opted in to complete the survey. Participants with Dynata earn points for completing surveys, which they can then exchange for various rewards. These rewards vary by panel and recruitment method but may include things such as airline miles or gift cards.

Participants with Dynata are required to verify their identity at multiple points during survey enrollment and routing. Dynata uses various methods, such as third-party validation and digital fingerprinting, to detect fraud, identify bots, and monitor and detect suspicious activity from participants.

Participants were not allowed to complete the survey more than once. Participants who did not fully complete the survey were removed from the data and were not paid. In addition, participants were removed and were not paid if their IAT could not be scored.[13]

Experimental methods replicated the first survey experiment in terms of the total number of image categories tested (13), the use of a control condition in which participants saw no images, and the random assignment process. However, instead of using batteries to measure explicit attitudes about older people, we tested whether the image categories would influence implicit, or unconscious, attitudes toward older people.

Implicit attitudes are often measured using an IAT, which asks participants to quickly sort words and images into different categories and creates a measure of implicit bias, called a "D-score" that is computed using response-time data.[14] To measure implicit attitudes toward older people, we used freely available stimulus materials from Project Implicit. We used these materials to generate an age IAT using a free software that could be easily integrated into the Qualtrics survey platform.[15] This same software was used to analyze response-time data to create D-scores for each participant.[16] D-scores range from -2 to +2, with D-scores of |.15|, |.35|, and |.65| indicating small, medium, and large effects, respectively. For this experiment, D-scores above 0 indicate an implicit preference for younger adults, whereas D-scores below 0 indicate an implicit preference for older adults.

Participants in the control group had an average D-score of 0.589, which differed significantly from 0 ($p < .001$). This indicates that, at baseline, adults in the United States have a moderately strong preference for younger adults over older adults.

D-scores were averaged across all possible orders of image sets within each category.[17] We used multiple regression analysis to determine whether there were significant differences in D-scores between each of the image categories and the control group. We also tested whether D-scores differed between relevant image categories (e.g., *technologically competent* vs. *technologically incompetent*; see below for the final set of image category comparisons). Finally, we used multiple regression analysis to explore whether the image dimensions influenced D-scores differently depending on participants' age group or gender. A threshold of $p < .05$ was used to determine whether treatments had any significant effects. Significant differences were understood as evidence that an image category influenced participants' implicit attitudes about older people.

As with all research, it is important to remember that results are based on a sample of the population, not the entire population. As such, all results are subject to margins of error.

Categories of Images	Dimension Comparisons (as per hypotheses)
Generational composition of groups • Intergenerational • Same generation	• Intergenerational vs. Control • Same generation vs. Control • Intergenerational vs. Same Generation
Setting • Community • Home • Workplace	• Community vs. Control • Workplace vs. Control • Home vs. Control • Community vs. Workplace • Community vs. Home • Workplace vs. Home
Mobility and engagement • Limited mobility/engaged • Limited mobility/disengaged	• Limited mobility engaged vs. Control • Limited mobility disengaged vs. Control • Limited mobility engaged vs. Limited mobility disengaged
Technologic competence • Technologically competent • Technologically incompetent	• Technologically competent vs. Control • Technologically incompetent vs. Control • Technologically competent vs. Technologically incompetent
Level of activity • Active • Passive	• Active older person vs. Control • Passive vs. Control • Active older person vs. Passive
Presence of others • Alone	• Alone vs. Control • Alone vs. intergenerational • Alone vs. Same generation
Stereotype • “Super senior”	• “Super senior” vs. Control • “Super senior” vs. Active older person

Survey Experiment Attitudinal Batteries

Battery A: Positive Attitudes Towards Aging
PA1. Getting older is a process of growth.
PA2. Getting older is something to embrace.
PA3. As people get older, they are better able to cope with life's challenges.
PA4. There are many pleasant things about getting older.

Battery B: Negative Attitudes Toward Aging
NA1. Getting older is something to fight against.
NA2. Getting older is inevitably a process of decline.
NA3. As people get older, it becomes harder for them to change and adapt.
NA4. Getting older is an unfortunate part of life.

Battery C: Social/Community Engagement
SC1. Older people aren't usually interested in socializing.
SC2. Most older people have quite a lot to contribute to their communities.
SC3. Realistically, most older people don't have it in them to be active members of their communities.
SC4. Most older people are happy to socialize with others.

Battery D: Mobility/Health
MH1. Older people are usually frail and weak.
MH2. Most older people can't move around very well.
MH3. Older people can't participate in most physical activities.
MH4. Older people usually have lots of health problems.
MH5. Most older people are active and healthy.

Battery E: Cognitive Decline
COG1. Most older people can't remember things like they used to.
COG2. Most older people can't think very quickly.
COG3. Older people usually need to be reminded of things.
COG4. Older people usually have a hard time understanding directions or instructions.
COG5. Most older people can think quickly.
COG6. Most older people can remember things well.

Battery F: Full Life

FL1. Most older people just don't have the energy to do very much.
FL2. Older people are usually unhappy because they can't do the things they used to.
FL3. Most older people have boring lives because they can't do a lot.
FL4. Most older people aren't limited by their age.
FL5. Most older people are able to live their lives how they want to.

Battery G: Old-Fashioned

OUT1. Older people usually struggle to learn new things.
OUT2. As people get older, it's usually hard for them to adapt when things change.
OUT3. Most older people can learn new things pretty quickly.
OUT4. Most older people are stuck in the past and don't want to learn new things.

Battery H: Technology

T1. Most older people aren't very good with technology.
T2. Most older people are easily confused by technology.
T3. Most older people can easily learn new technology.
T4. Older people can easily incorporate technology into their lives.

Battery I: Paternalism

PAT1. Older people shouldn't be allowed to do certain things because they might hurt themselves or others.
PAT2. Older people shouldn't work because they need too much help from their colleagues.
PAT3. We should protect older adults because they are unable to protect themselves.
PAT4. Older people should always be given help, even if they don't ask for it.
PAT5. We shouldn't make decisions for older people without their consent.
PAT6. Older people can make their own decisions about what's good for their lives.

Battery J: Diversity in the Aging Process

J1. Aging always involves substantial physical decline.
J2. Aging always involves substantial mental decline.
J3. The process of aging is different for everybody.
J4. Getting older is hard for some people, but not for everyone.
J5. Getting older is hard for everyone.
J6. The process of aging is similar for most people.

Survey Experiment Demographic Questionnaire

1. Demographics

age. What is your age in years?

gender. What is your current gender identity?

a. Man

b. Woman

c. Nonbinary

d. Other

trans. Some people describe themselves as transgender when they experience a different gender identity from their sex at birth. Do you consider yourself to be transgender?

a. Yes

b. No

c. Not sure

sexuality. Which term best describes how you currently identify? Select all that apply.

a. Straight or Heterosexual

b. Gay or Lesbian

c. Bisexual or Pansexual

d. Asexual

e. Queer

f. Questioning or something else

g. Prefer not to say

hispanic. Are you of Hispanic or Latino origin or descent?

a. Yes

b. No

race. Which of the following categories indicates the race or races that you consider yourself to be? Select all that apply

a. American Indian

b. Alaska Native

c. Asian

d. Black

e. African American

f. Native Hawaiian

g. White

h. Some other race, please specify:

married. What is your current marital status?

a. Married

b. Widowed

c. Divorced

d. Separated

e. Never married

f. Not married, living with partner

income. What was your total pre-tax household income from all sources in 2020?

a. $15,000 or less

b. $15,001 to $25,000

c. $25,001 to $35,000

d. $35,001 to $45,000

e. $45,001 to $55,000

f. $55,001 to $65,000

g. $65,001 to $100,000

h. $100,001 to $150,000

i. $150,001 or more

education. What is your highest level of education completed?

a. No formal education

b. 1st, 2nd, 3rd, or 4th grade

c. 5th or 6th grade

d. 7th or 8th grade

e. 9th grade

f. 10th grade

g. 11th grade

h. 12th grade, but no diploma

i. High school graduate with a high school diploma or the equivalent, or GED

j. Some college, no degree

k. Associate's degree

l. Bachelor's degree

m. Master's degree

n. Professional or doctorate degree

employment. Which statement best describes your current employment status?

a. Working as a paid employee

b. Working as self-employed

c. Not working, on temporary layoff from a job

d. Not working, looking for work

e. Not working and retired

f. Not working, due to a disability

g. Not working, for other reasons

wrkhours. Do you currently work full-time or part-time?

a. Full-time

b. Part-time

household. Please indicate the total number of persons living in your household, including yourself.

Houseage. Please indicate the number of people in your household in the following age ranges. Enter "0" if none.

Age 0-1:

Age 2-5:

Age 6-12:

Age 13-17:

Age 18+:

party. Generally speaking, do you usually think of yourself as a Democrat, Republican, Independent, or something else?

a. Democrat

b. Republican

c. Independent

d. Other

party2. Do you think of yourself as closer to the Republican or to the Democratic Party?

a. Closer to the Republican Party

b. Closer to the Democratic Party

c. Neither

vote. Are you currently registered to vote at your current address, registered at a different address, or not currently registered?

a. Registered at current address

b. Registered at a different address

c. Not currently registered

d. I'm not eligible to vote

e. Not sure

veteran. Have you ever served on active duty in the US Armed Forces, military Reserves, or National Guard? Active duty does not include training for the Reserves or National Guard, but does include activation, for example, for service in the US or in a foreign country, in support of military or humanitarian operations.

1. Yes

2. No

activeduty. Are you currently on active duty in the US Armed Forces, military Reserves, or National Guard?

a. Yes

b. No, please specify the year you left active duty:

state. In which state do you reside?

Geo. Please enter your zip code.

Region. Which region are you from?

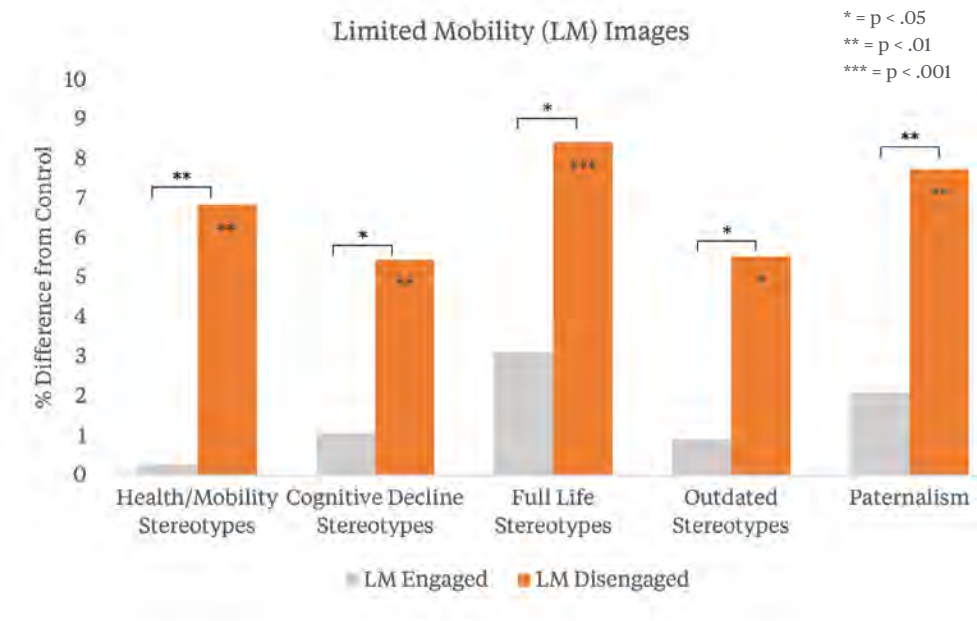
1. West (including Mountain West, Pacific Northwest, and Hawaii)
2. Midwest
3. South (including South Atlantic)
4. Northeast (including Middle Atlantic)

Supplement E: Evidence Supporting Recommendations

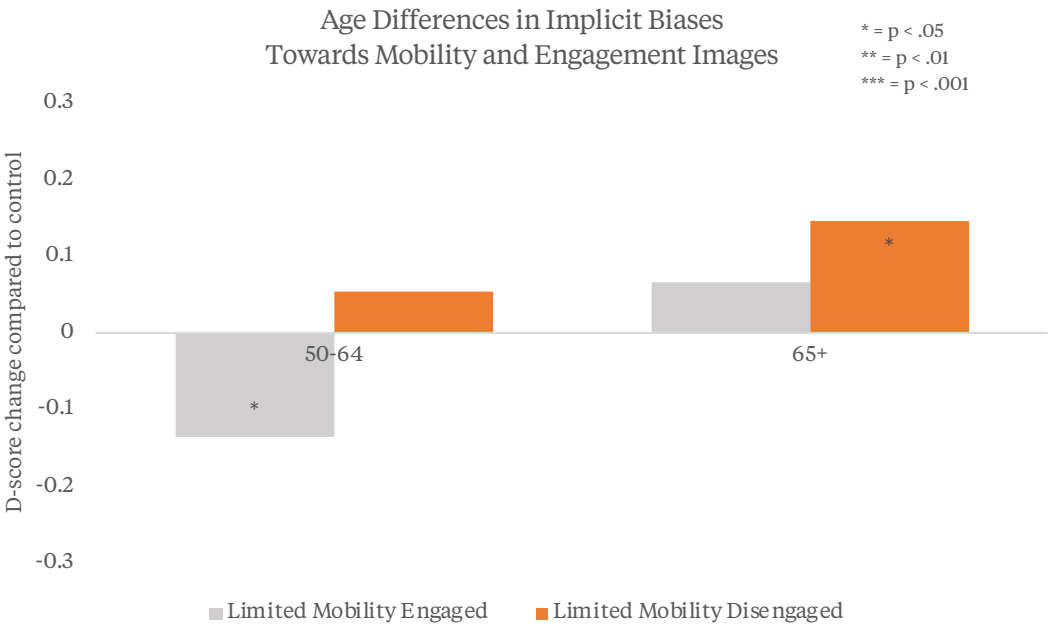
Below is graphical evidence to support each of the recommendations in *Reframing Aging through Images: Research-Based Recommendations*. For all graphs, asterisks inside of bars indicate where significant differences lie between the image category and control condition; brackets with asterisks indicate where significant differences lie between specific image categories (e.g., between *limited mobility engaged* and *limited mobility disengaged*); a single asterisk (*) indicates significance at the $p < .05$ level; two asterisks (**) indicate significance at the $p < .01$ level; and three asterisks (***) indicate significance at the $p < .001$ level.

Recommendation 1: When depicting older people with limited mobility, use images in which they are participating in activities or engaged with others.

As shown below, images depicting older people with limited mobility as *disengaged* significantly increased several explicit stereotypes and negative attitudes about older people when compared to the control group and limited mobility *engaged* images. More specifically, when compared to both the control group and participants who saw *limited mobility engaged* images, participants who saw *limited mobility disengaged* images reported more explicit agreement with paternalism and negative stereotypes about older people's health and mobility, cognitive decline, and ability to live a full life. These participants also reported more explicit agreement with outdated stereotypes about older people.

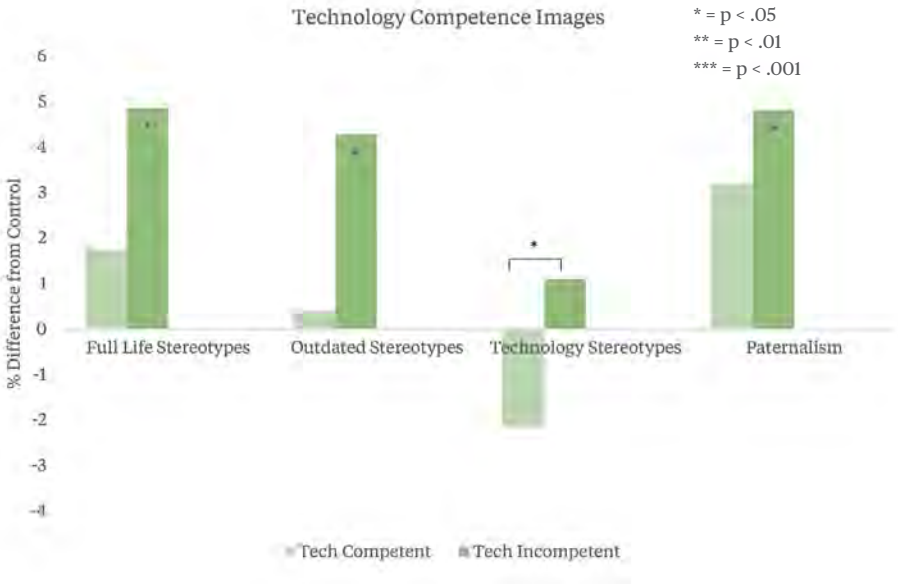


For participants aged 50-64, *limited mobility engaged* images significantly reduced implicit bias against older people. For participants aged 65-plus, *limited mobility disengaged* images significantly increased implicit bias against older people.



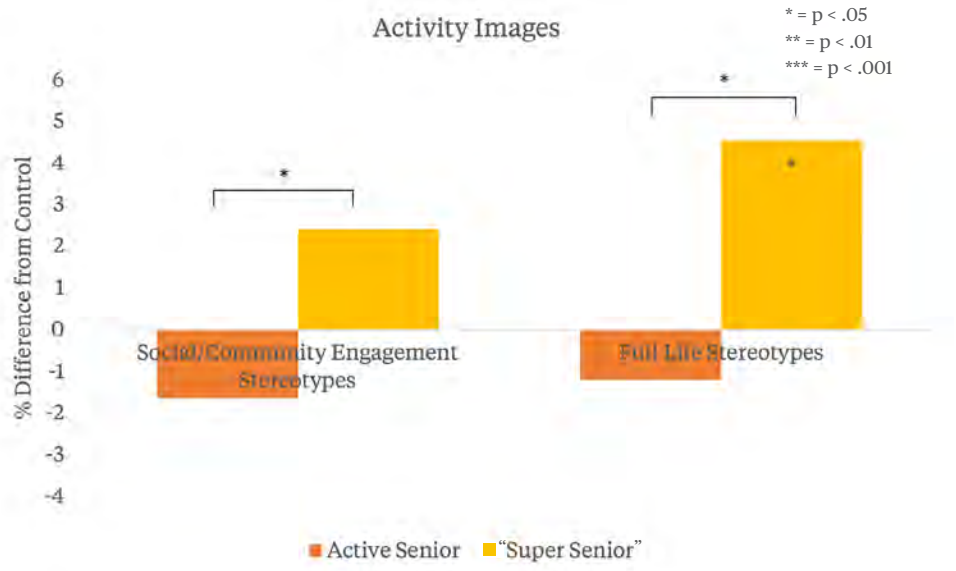
Recommendation 2: When showing older people using technology, show images that signal comfort and competence.

As shown below, images depicting older people as *technologically incompetent* increased explicit negative stereotypes and attitudes about older people. More specifically, when compared to the control group, participants who saw *technologically incompetent* images reported more explicit agreement with paternalism and negative stereotypes about older people's ability to live a full life, as well as reporting more explicit agreement with outdated stereotypes about older people. *Technologically competent* images, however, significantly decreased explicit agreement with negative stereotypes about older people's abilities with technology when compared to *technologically incompetent* images.



Recommendation 3: In most cases, avoid images of "super seniors".

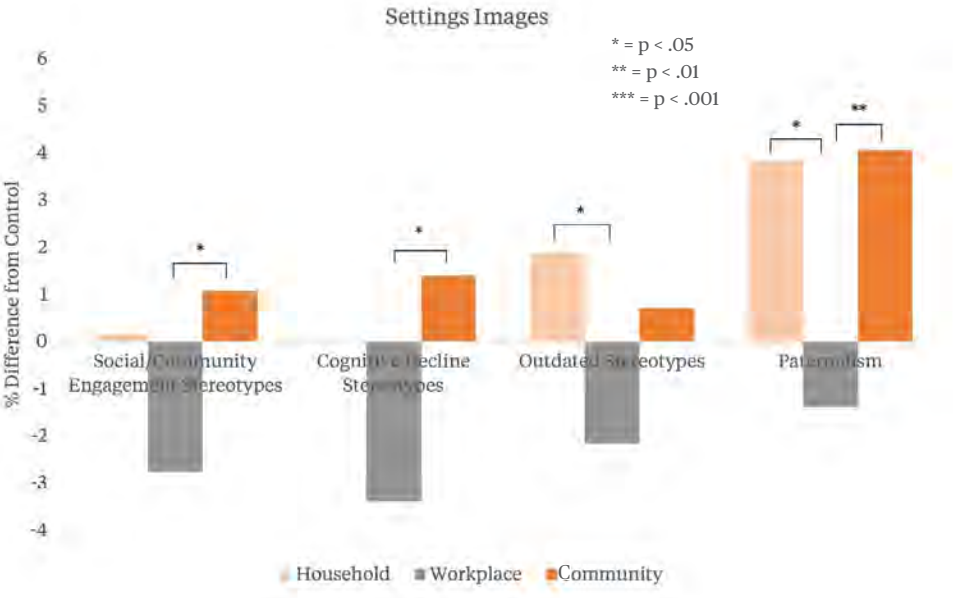
Images of *"super seniors"* significantly increased explicit agreement with negative stereotypes about older people's ability to live full lives when compared to the control group. When compared to the *active* category, images of *"super seniors"* also significantly increased explicit agreement with negative stereotypes about older adults' ability to live full lives, as well as negative stereotypes about older people's social/community engagement.



For participants aged 18-34, the *active* category significantly reduced implicit bias against older people when compared to the control group. *"Super senior"* images did not significantly influence implicit bias for this age group.

Recommendation 4: Use images of older people in workplace settings to help people see them as active contributors to their communities.

Workplace images significantly reduced explicit agreement with negative stereotypes about older people being outdated, as well as explicit feelings of paternalism toward older people, when compared to *household* images. *Workplace* images also significantly reduced explicit agreement with negative stereotypes about social/community engagement in older age, cognitive decline in older age, and explicit feelings of paternalism toward older people when compared to the *community* images.



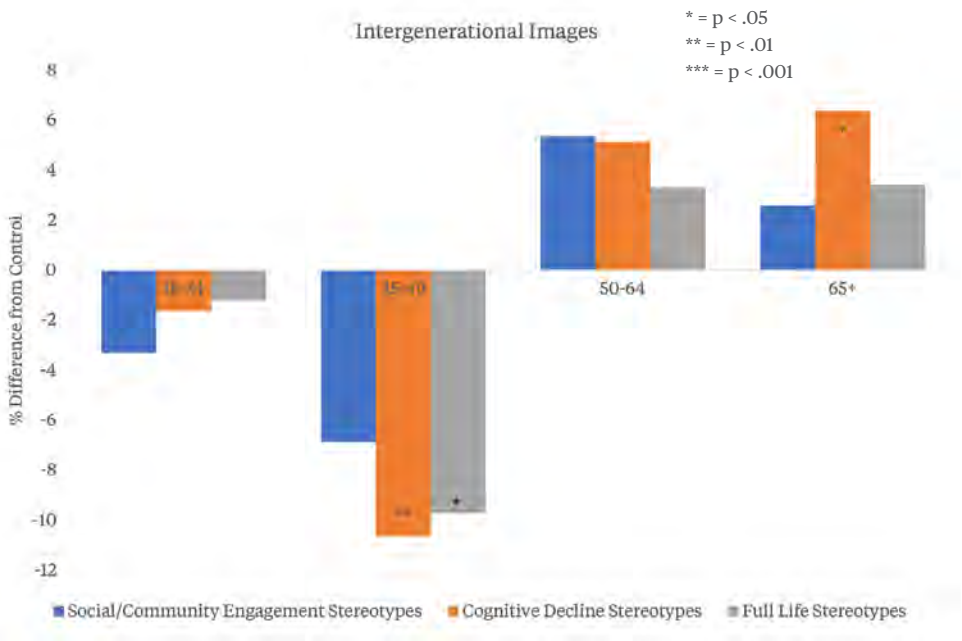
Recommendation 5: Use images that depict older people in positive settings and engaged in positive activities.

This recommendation is based on the qualitative research undertaken for this project.

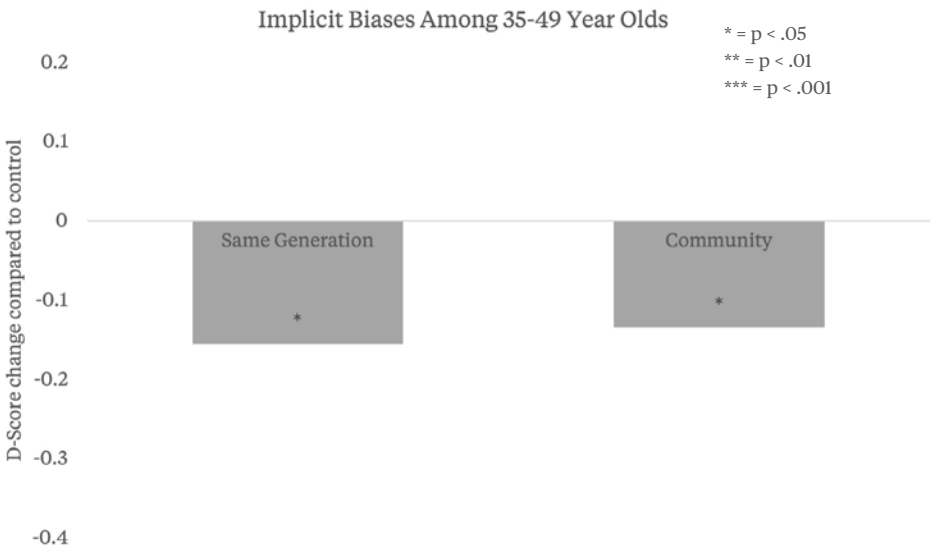
Recommendation 6: When possible, select images based on your target audience.

Age

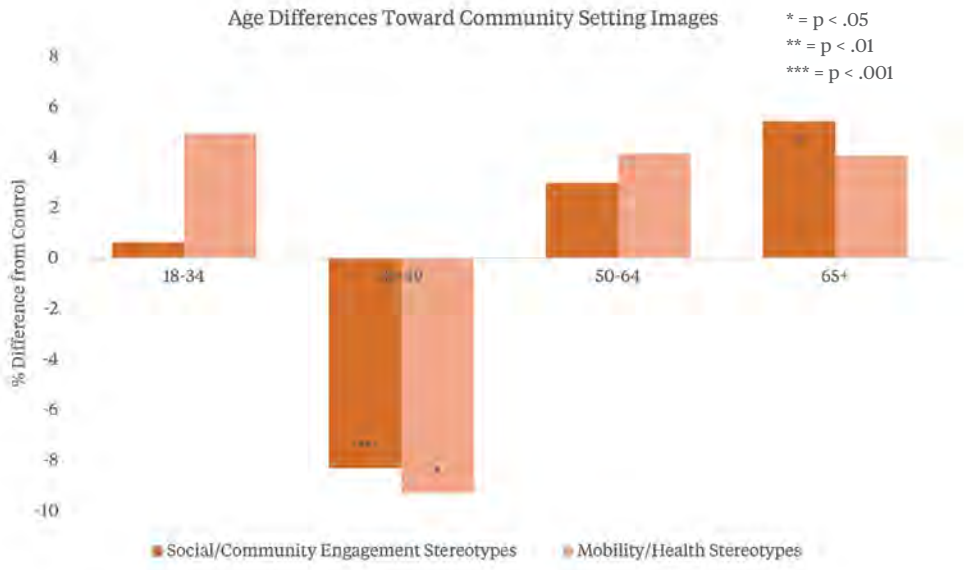
For participants aged 35–49, *intergenerational* images significantly reduced explicit agreement with negative stereotypes about older adults' social/community engagement, cognitive decline, and ability to live a full life. However, for participants aged 65-plus, the same images significantly increased explicit agreement with negative stereotypes about cognitive decline in older people.



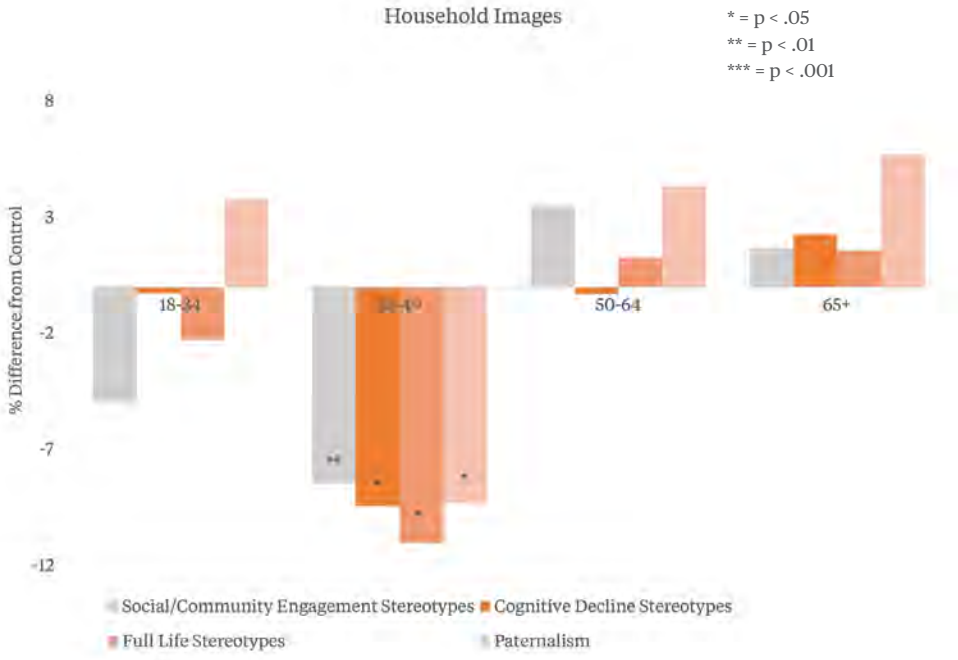
For participants aged 35–49, *same generation* and *community* images significantly reduced implicit bias against older people when compared to the control group.



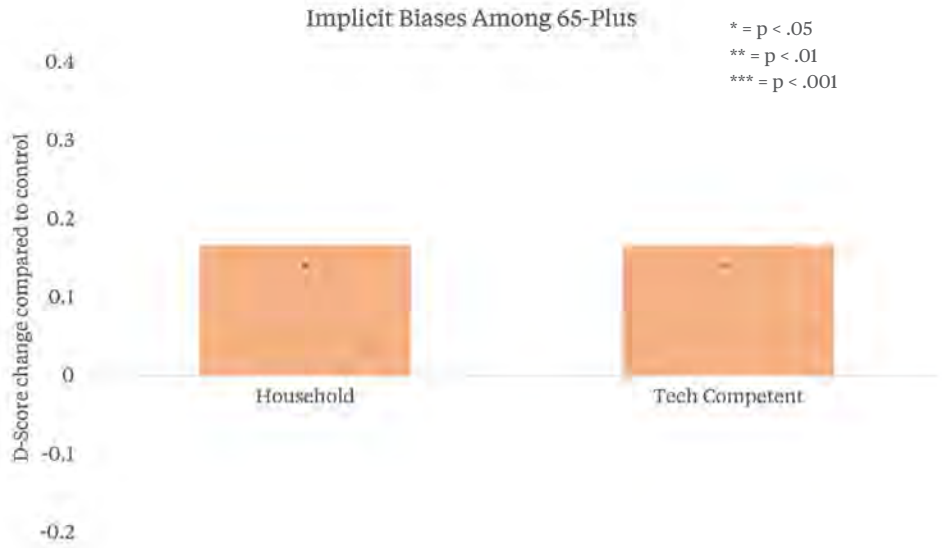
For participants aged 35-49, *community* images significantly reduced explicit negative stereotypes about social/community engagement and health/mobility among older people. However, for participants aged 65-plus, the same images increased explicit negative stereotypes about social/community engagement among older people.



For participants aged 35-49, *household* images also significantly reduced a number of explicit negative stereotypes and attitudes about older adults and aging, when compared to the control group.



For participants aged 65-plus, *household* and *technologically competent* images increased implicit bias against older people when compared to the control group.



Gender:

For men, images of older people in the *workplace* significantly reduced explicit agreement with negative stereotypes about older people's social/community engagement, mobility and health, and cognitive decline, and they reduced paternalistic attitudes toward older people.

Endnotes

1. Sweetland, J., Volmert, A., & O'Neil, M. (2017). *Finding the frame: An empirical approach to reframing aging and ageism*. Washington, DC: FrameWorks Institute. https://www.frameworksinstitute.org/publication/finding-the-frame-an-empirical-approach-to-reframing-aging-and-ageism/

2. Thayer, C., and Skufca, L. (2019). Media image landscape: Age representation in online images. Washington, DC: AARP Research, https://doi.org/10.26419/res.00339.001

3. Amazon Mechanical Turk (MTurk) is a crowdsourcing website for businesses (known as Requesters) to hire remotely located "crowdworkers" to perform discrete on-demand tasks that computers are currently unable to do, such as answer survey questions.

4. A HIT approval rate is a qualification used by MTurk to designate the overall quality of a given MTurk worker. Higher HIT rates generally correspond to higher quality responses.

5. Taber, K.S. (2011). The use of cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education*, 48, 1273-1296.

6. Order effects were found for three of the 10 batteries within the *community* image set condition. However, these order effects were not consistent across batteries, nor was there a clear indication of a particular image order that was influencing outcomes. For these reasons, as well as the lack of order effects for the remaining conditions, researchers did not believe that there was enough evidence to abandon the idea of using image sets as the presentation method for the full survey experiment. However, no further pilot analyses were conducted on the *community* set condition.

7. Participants were allowed to select multiple races. Percentage shown will exceed 100.

8. Because participants were able to select multiple races, bi/multiracial participants are captured within the given race categories.

9. The two open-ended questions were not analyzed.

10. Indicates number of items remaining in the scale after item reduction.

11. Composite means are shown for control condition only.

12. No order effects were found within image categories.

13. The IATgen software scores the IAT as recommended by the creators of the IAT. The IAT cannot be scored when participants are consistently taking too long (e.g., >10,000 milliseconds) to complete the trials or when participants are consistently moving too fast (e.g., <300 milliseconds) through the instrument. Please visit www.iatgen.wordpress.com for more information about scoring the IAT.

14. For more information about the IAT, please visit https://www.projectimplicit.net/ or www.iatgen.wordpress.com.

15. Carpenter, T.P., Pogacar, R., Pullig, C., et al. (2019). "Survey-software implicit association tests: A methodological and empirical analysis." *Behavior Research Methods*, 51, 2194-2208. https://doi.org/10.3758/s13428-019-01293-3

16. Please see www.iatgen.wordpress.com

17. One significant order effect was found for participants in the *Home* category. However, given the lack of order effects found in the first survey experiment, no theoretical or practical justification for a single order effect, and the lack of order effects for the remaining conditions, researchers decided to proceed with averaging D-scores across all possible orders of image sets within each category.

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AARP is the nation's largest nonprofit, nonpartisan organization dedicated to empowering Americans 50 and older to choose how they live as they age. With nearly 38 million members and offices in every state, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands, AARP works to strengthen communities and advocate for what matters most to families with a focus on health security, financial stability and personal fulfillment. AARP also works for individuals in the marketplace by sparking new solutions and allowing carefully chosen, high-quality products and services to carry the AARP name. As a trusted source for news and information, AARP produces the nation›s largest circulation publications, AARP The Magazine and AARP Bulletin. To learn more, visit www.aarp.org or follow @AARP and @AARPadvocates on social media.

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