NBER WORKING PAPER SERIES

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Working Paper 28328
http://www.nber.org/papers/w28328

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
January 2021

This research was supported by the Sloan Foundation. Any views expressed are our own and not those of the Sloan Foundation. This experiment was approved by the UCI Institutional Review Board, HS# 2015-2107. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

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NBER Working Paper No. 28328
January 2021
JEL No. J14,J71,K31

ABSTRACT

We explore whether ageist stereotypes in job ads are detectable using machine learning methods measuring the linguistic similarity of job-ad language to ageist stereotypes identified by industrial psychologists. We then conduct an experiment to evaluate whether this language is perceived as biased against older workers. We find that language classified by the machine learning algorithm as closely related to ageist stereotypes is perceived as ageist by experimental subjects. The scores assigned to the language related to ageist stereotypes are larger when responses are incentivized by rewarding participants for guessing how other respondents rated the language. These methods could potentially help enforce anti-discrimination laws by using job ads to predict or identify employers more likely to be engaging in age discrimination.

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Introduction

There is an extensive body of research testing for employer discrimination against older workers in labor markets, using correspondence studies to test for discrimination in hiring (e.g., Bendick et al., 1997, 1999; Lahey, 2008; Neumark et al., 2019a, 2019b). This research focuses on measuring employer behavior – specifically, whether there is less hiring of qualified older workers. There is little work that studies how workers respond to discrimination in the labor market. In this paper, we explore potential worker responses to one manifestation of discrimination in the labor market, in particular, whether workers perceive job requirements using language related to ageist stereotypes as biased against older workers. The use of ageist stereotypes in job ads, if it discourages older workers from applying for jobs, can have the same adverse outcome on the hiring of older workers.[1]

Utilizing ageist language in job ads may be rational for employers, despite it being illegal to discriminate against older workers. Employers who do not want to hire older workers might, in order to avoid unnecessary search costs, discourage older workers from applying by signaling their ageism. Shaping the applicant pool by discouraging older applicants has an additional benefit for discriminatory employers, because of the incentives created by age discrimination laws. A lower representation of older workers in their applicant pool can make it easier to justify a lower representation of older workers among employees, making it easier to rebut an allegation of age discrimination in hiring.

In this paper, we use evidence from a large sample of job ads to explore how job-ad language is interpreted by potential job applicants. First, we use machine learning methods, partly developed in Burn et al. (2020), to identify phrases in job ads that are linguistically related to ageist stereotypes drawn from the industrial psychology literature.[2] We use these phrases to construct typical job-ad language (in the form of sentences) that reflects specific age stereotypes. We show that machine learning methods are

[1] Viewed in the context of labor market search, direct discrimination by employers reduces the likelihood that employers make an offer to an older workers, whereas discouraging them from applying reduces the likelihood that older workers find a match. Both thus reduce the arrival rate of job offers, lengthening unemployment durations.

[2] The job ads were collected as part of a large-scale correspondence study of age discrimination (Neumark et al., 2019). This research, in turn, is being used to develop a field experiment on how actual job applicants respond to ageist language in job ads.

sensitive enough to detect the presence of stereotyped language, even when only one sentence in the job ad is highly related to the ageist stereotype. Second, we conduct an MTURK experiment that asks whether respondents perceive this job-ad language – which the machine learning algorithm classified as related to ageist stereotypes – as ageist. Our experimental evidence shows that sentences that are classified as closely related to ageist stereotypes by the machine learning algorithm are also rated as ageist by respondents in many cases.

Our paper makes two contributions to the literature. First, we contribute to the literature in industrial psychology on employer and worker beliefs about stereotypes. Much of the previous literature in industrial psychology utilizes surveys to understand how employers view older workers or how workers view job ads. To incentivize the elicitation of respondents' true beliefs, we asked respondents to guess how the average respondent to our survey rated each statement, and respondents were paid based on how close to the true value their answers were. When asked to state their own beliefs, respondents in our survey were less likely to rate a statement as ageist. But when asked how they thought the average respondent would view the same statement, they rated statements as more ageist on average. These findings suggest that standard surveying methods that do not incentivize responses may lead to an underreporting of perceptions of ageism; one potential explanation is that it is not socially desirable to perceive the language we use as ageist, since doing so indicates that one attributes the characteristics of people used in this language as applying more to older people.

Second, our results show the promise of machine learning methods to help reduce age discrimination in the labor market. The potential for age stereotypes or other language in job ads to deter applications from older job seekers is real. An extreme version of such language is stating maximum experience levels in job ads – as occurred recently in *Kleber v. Carefusion Corp.* – which will clearly act to exclude many older applicants.[3] More generally, the U.S. Code of Federal Regulations covering the ADEA currently states, "Help wanted notices or advertisements may not contain terms and phrases that

[3] See *Kleber v. Carefusion Corp.* (http://www.aarp.org/content/dam/aarp/aarp_foundation/litigation/pdf-beg-02-01-2016/kleber-amended-complaint.pdf, viewed November 8, 2017). Button (2019) discusses the ruling in this case.

limit or deter the employment of older individuals. Notices or advertisements that contain terms such as age 25 to 35, young, college student, recent college graduate, boy, girl, or others of a similar nature violate the Act unless one of the statutory exceptions applies" (§1625.4). Thus, our research asking whether we can reliably detect age stereotyping in job ads can provide information and tools to parties that enforce age discrimination laws on job-ad language that may predict employer discrimination in hiring.[4]

Conceptual Framework and Implications of the Evidence

Why might employers use stereotyped language in job ads? One hypothesis is that employers who discriminate based on age use stereotyped language to try to shape the applicant pool, to reduce the likelihood that age discrimination is detected. Using language that conveys positive stereotypes related to young workers might discourage older workers from applying for the job (as might language conveying negative stereotypes related to older workers – although that seems less likely and is, in fact, less common in our data). This discouragement from applying would lead to the underrepresentation of older applicants in the applicant pool. This underrepresentation, in turn, is potentially valuable to a discriminating employer, because the probability of an age discrimination claim and of an adverse outcome for the employer is smaller the higher is the ratio of job offers to applicants for older applicants vs. younger applicants.[5]

A second hypothesis is more closely related to statistical discrimination. Different jobs may have different requirements, which could be stated in job ads. But employers may hold stereotypes about older job applicants' abilities to meet these job requirements – for example, assuming that older workers are less likely to be able to do the heavy lifting that a job requires. In this case, employers posting such ads

[4] In particular, this information can be useful for government enforcement agencies as well as attorneys representing plaintiffs in age discrimination actions.

[5] In legal cases, the most compelling data on hiring discrimination comes from comparing hiring rates of the group in question (older workers, in our case) relative to the applicant pool. In the absence of data on applicants, the analysis of a firm's workforce relative to the age structure of the relevant workforce in the population is sometimes used, but such analyses pose a greater challenge to establishing evidence consistent with age discrimination.

and offering fewer callbacks to older workers would be engaging in pure statistical discrimination.

While social scientists are interested in the nature of discriminatory behavior, both statistical and taste discrimination are illegal under U.S. law. EEOC regulations state: "An employer may not base hiring decisions on stereotypes and assumptions about a person's race, color, religion, sex (including pregnancy), national origin, age (40 or older), disability or genetic information."[6] A somewhat different and more complicated question is whether job requirements reflected in stereotyped language in job ads, to the extent they result in less hiring of older workers, are legal. The legality of these requirements generally requires an employer to show that the use of these requirements is based on a reasonable factor other than age (RFOA), even if that factor is correlated with age. An RFOA is defined as "a non-age factor that is objectively reasonable when viewed from the position of a prudent employer mindful of its responsibilities under the ADEA under like circumstances."[7] In other words, a job requirement that is associated with less hiring of older workers is not necessarily illegal, but it may be.

Age discrimination is an important policy issue. Reducing age discrimination in hiring is an important component to lengthening work lives because many seniors transition to part-time or shorter-term "partial retirement" or "bridge jobs" at the end of their careers (Cahill et al., 2006; Johnson et al., 2009), or return to work after a period of retirement (Maestas, 2010). If ageist stereotypes in job ads discourage older applicants from applying for jobs, the EEOC could utilize our evidence in two ways to help reduce age discrimination in hiring. First, it could use the text of job ads to monitor for possible age discrimination in hiring (as could plaintiffs' attorneys who help enforce the law). Second, the EEOC could issue guidance to employers to avoid language that might discourage older workers from applying. Thus, rigorous evidence on the role of ageist language in job ads could potentially influence policy to reduce age discrimination in hiring and contribute to lengthening work lives.

[6] See http://www1.eeoc.gov//laws/practices/index.cfm?renderforprint=1 (viewed September 15, 2019).
[7] See https://www.federalregister.gov/documents/2012/03/30/2012-5896/disparate-impact-and-reasonable-factors-other-than-age-under-the-age-discrimination-in-employment (viewed September 15, 2019).

Studying Job Ads

Very few studies explore job ads, and fewer still focus on discrimination. Among studies of issues other than discrimination, Modestino et al. (2016) use text data from job ads to document that "downskilling" occurred during the recovery from the Great Recession, with firms reducing skill requirements in their job ads. Deming and Kahn (2018) use text data in job ads to measure how ten different skills relate to wages. Marinescu and Wolthoff (2020) match text data from job ads to job application data to study the matching process between jobs and applicants. And He et al. (forthcoming) study how job flexibility conditions influence job application behavior. Kuhn and Shen (2013) and Kuhn et al. (2018) explore how gender preferences feature explicitly or implicitly in job ads in China, and Hellester et al. (2020) explore age and gender preferences in job ads in China and Mexico.

Two studies, to date, connect the text of job ads to measured discriminatory behavior of employers.[8] Tilcsik (2011) identifies words in job ads related to masculine stereotypes (decisive, aggressive, assertive, and ambitious) and links those to hiring outcomes in a correspondence study of discrimination against gay men. And, in the most systematic study of how the text of job ads is associated with discrimination, Burn et al. (2020) identify common age stereotypes from the research literature in industrial psychology, use machine learning to calculate the relationship between the text of the job ads and specific age stereotypes, and then test whether job-ad language related to the stereotypes predicts hiring discrimination against older workers in a correspondence study. As already noted, the present paper builds on this prior work.

There has been no research on whether the ageist language in job ads is actually perceived as ageist by potential job applicants. Obviously, the use of this kind of language in job ads is much more troublesome if, in fact, it is perceived as ageist and thus discourages older workers from applying for jobs.

[8] Though they did not focus on job ads, Hanson et al. (2011) and Hanson et al. (2016) study language used by mortgage originators and connect this language to their behavior. Hanson et al. (2011) study subtle discrimination through "keywords" used by landlords responding to prospective tenants. Hanson et al. (2016) had research assistants subjectively (and blindly) code the helpfulness and other characteristics of mortgage loan originator responses to prospective borrowers.

If this happens, it would rightly be viewed as another dimension of age discrimination in hiring – one that has not been studied or detected in the research literature that studies hiring discrimination, mainly using correspondence studies.[9]

What is known about how job applicants read job ads focuses exclusively on gender bias in job ads. Gaucher et al. (2011) found that job ads for male-dominated occupations used masculine wording (i.e., words associated with male stereotypes, such as "leader," "competitive," or "dominant") more frequently than advertisements for female-dominated occupations, and women find job advertisements less appealing when they contained more masculine wording than feminine wording (Bem and Bem, 1973; Gaucher et al., 2011).

Methods

Selecting the Stereotypes

To select the stereotypes we study, we start with a list of 17 ageist stereotypes from the industrial psychology literature. These are listed in Table 1. See Burn et al. (2020) for documentation of the sources used to identify these stereotypes and the larger set of phrases that correspond to them. Note that a few of these appear as both positive and negative stereotypes about older workers.

For our analysis, we selected a subset of these stereotypes that met the following criteria. First, the stereotype is commonly expressed in job-ad language about the ideal or preferred candidate skills or attributes; we did not want to focus on stereotypes that are not often included in job ads (e.g., hearing and memory), even if, according to the industrial psychology literature, employers hold these stereotypes. Second, we focus on stereotypes for which we had evidence of a correlation between discrimination and the stereotype (from Burn et al., 2020) and evidence that the stereotype captures a skill that employers view older workers as less likely to possess (from van Borm et al., 2019). Third, older workers should be aware that employers held the stereotype. As evidence, we drew on various reports put out by AARP; see

[9] These include Baert et al. (2016); Bendick et al. (1997, 1999); Carlsson and Eriksson (2019); Farber et al. (2017, 2019); Lahey (2008); Neumark et al. (2016, 2019a, 2019b); and Riach and Rich (2006, 2010).

Brenoff (2019) and Terrell (2019). Our final list of stereotypes is three skills or abilities for which older workers are stereotyped as deficient: communication skills, physical ability, and technological skills.[10]

Industrial psychology research focuses on the skills that employers desire in workers, but in which older workers are deficient. That is, the literature typically frames the phrasing of these skills or requirements in the negative. In contrast, job ads rarely seek candidates using negative formulations of a skill requirement, but instead turn the language to a positive formulation (e.g., ads will ask that a candidate be "adaptable," rather than that they are "not stubborn"). When describing skills and requirements related to our stereotypes, employers use words like "outgoing" (Stewart and Ryan, 1982), "sociable" (Kite et al., 1991), and "conversational skills" (Ryan et al., 1992; Schmidt and Boland, 1986) to describe communication skills. Physical ability is expressed using words like "energy," "speed," and "physical capability" (Levin, 1988; van Dalen et al., 2009). And technological skills focus on the ability to use "new technology," or on "technological competence" (AARP, 2000; McCann and Keaton, 2013; McGregor and Gray, 2002)

Creating the Treatment (Stereotyped) and Control Job-Ad Language

To test whether stereotyped language is perceived as ageist by workers, we create two sets of phrases: treatment phrases and control phrases. The treatment and control job-ad sentences differ in the job requirements expressed and the type of language used in these phrases; we try as much as possible to have the treatment and control phrases describe similar skills while allowing for some differences to be appropriate to the occupation (see Table 2).[11] As just noted, the requirements we manipulate have to do with a candidate's communication skills, physical ability, and technology skills. Our control sentences express job requirements that are also appropriate for the job but use age-neutral language not related to

[10] Communication skills are one of three stereotypes in Table 1 that appear both positively and negatively. Later, we discuss the implications of this for our evidence.

[11] For example, for the machine learning treatment for communication skills, the phrase for administrative assistants is "You must have good communication skills and teamwork on tasks," while for retail sales the phrase is "You must have good communication skills with customers and staff." In contrast, the control phrase – "You must be good at working without supervision" – is the same.

these age-stereotyped skills or abilities, while our treatment sentences use language highly related to these ageist stereotypes.

Our main method for generating phrases and sentences highly related to ageist stereotypes uses measures of semantic similarity generated by machine learning methods. Moreover, to isolate the effects of the different stereotypes, we used the results from these machine learning methods to construct sentences that were highly related to only one of the three stereotypes we use. We calculate the semantic similarity of nearly one million (997,562) phrases from the approximately 14,000 job ads collected in Burn et al. (2019) to the communication skills, physical ability, and technology skills stereotypes, measuring semantic similarity by the cosine similarity score.

The machine learning methods are explained fully in Burn et al. (2020). Briefly, though, this includes the following steps.

1. We scrape the text of the job ads, deleting so-called "stopping words" (like "of," "and," "the"), which do not convey any real content.
2. We use as the "corpus" the entirety of English-language Wikipedia, which contains all words in the English language. With this corpus, we compute the semantic similarity between any two words, based on the frequency with which they appear together in either sentences or paragraphs of the Wikipedia corpus, a common procedure in computational linguistics. The resulting measure is the "cosine similarity score," which ranges from −1 (the words never appear together) to 1 (they always appear together).
3. We use the resulting scores to compute the similarity between all three-word phrases in our ads and the stereotypes (from Table 1).[12] Thus, we can calculate the cosine similarity score (or semantic similarity score) of any phrase constructed using words from our job ads to the stereotypes (see Burn et al., 2020).

As an example, Figure 1 shows the distribution of cosine similarity scores of all three-word

[12] Burn et al. (2020) discuss and document why three-word phrases are appropriate to capture the job requirement content.

phrases (trigrams) with a particular stereotype (communication skills); the distribution is centered above zero, which makes sense since we are looking at the text from job ads. To provide some examples, trigrams at the lower end of the distribution are highly unrelated. These include, for example, "christmas season near" and "hotel near seattle" (both with scores of −0.3). Examples of trigrams with scores close to 0.0 are "every Sunday pm" and "work year round." Trigrams at the top of the distribution with scores of 1.0 include "excellent communication skills" and "prioritizing skills communication."

We use the list of words and phrases from our job ads to construct our treatment sentences. We iteratively edited the sentences to ensure that only the cosine similarity score of the manipulated stereotype substantively differed between the treatment and control sentences, whereas the cosine similarity scores for the other stereotypes listed in Table 1 (including the other two treatment stereotypes) were similar for the treatment and control sentences. For example, if the treatment language related to communication skills was also highly related to the stereotype about personality, we identified which words in the sentence were highly related to personality, and then we selected synonyms that were less related to personality. Our control sentences were created to express requirements for similar jobs without referring to ageist stereotypes about skills or abilities. We iteratively removed words and phrases that were highly related to our stereotypes to minimize the semantic similarity. The resulting sentences, for the treatment and control groups, are listed in columns (3) and (4) of Table 2, along with their cosine similarity scores with the stereotype.

We also use a second stereotype treatment that conveys bias by using ageist language identified by the AARP as related to communication skills, physical ability, and technology skills. We select three AARP examples that best correspond to our respective stereotypes: "cultural fit," "energetic person," and "digital native" (Brenoff, 2019; Terrell, 2019). We adapted the language to fit our job ads and created three sentences, one for each stereotype (Table 2, column (5)). Using the text about cultural fit, we created the sentence "You must be up-to-date with current industry jargon and communicate with a dynamic workforce" to reflect stereotypes about communication skills, emphasizing the communication aspect of fitting in. Using the text about energetic persons, we created the sentence "You must be a fit and

energetic person" to reflect stereotypes about physical ability. Using the text about digital natives, we created the sentence "You must be a digital native and have a background in social media" to reflect stereotypes about technology skills by emphasizing social media.

We thought it useful to use these rather blatant examples of stereotyped language suggested by AARP as a way of validating our methods. One might think that if these phrases are not identified as ageist, one might view it as less likely that our more subtle sentences would be. Conversely, at the other extreme, the experimental responses to the AARP phrases might give a sense of the upper bound of perceived stereotyping we could expect. On the other hand, note that – as shown in Table 2 – in every case, the cosine similarity score with the stereotype for the machine learning phrase is higher than for the AARP language. This does not necessarily mean that the AARP language is less ageist; rather, the AARP language may be perceived as more ageist, while the language is less directly aligned with a particular ageist stereotype. As an example, the AARP language we use for the communications stereotype includes "up-to-date," "jargon," and "dynamic," all of which may be reflect ageist stereotypes that are not strongly related to communications. This is not surprising since the AARP stereotypes were not chosen by machine learning with the goal of high semantic similarity with a specific stereotype and not with others. Indeed, as we noted earlier, the AARP language used for communications is in fact described as "cultural fit," which could be much broader.

It is also true that the treatment phrases for some stereotypes are stronger than for others. In particular, the cosine similarity score is always lowest for the phrase corresponding to technological skills than for the phrases corresponding to the other two stereotypes. As it turns out, the same is true for the control phrases. Thus, the impact of the difference between treatment and control phrases may not be expected to differ as much across stereotypes (if, in fact, they are perceived as ageist).

Validating the Treatment vs. Control Differences

While the AARP language is quite blatant and should be perceived as ageist by workers, a first question is how well the stereotyped vs. neutral sentences generated from the machine learning results leads to ads that convey the intended stereotypes. In the language of epidemiology, we would like our

treatment sentences to have high "sensitivity" (conveying ageist stereotypes) and "specificity" (conveying information about the specific ageist stereotype intended).

To test whether our phrases are powerful enough to be detected in a job ad, we embedded the treatment and control sentences in job-ad templates we created to correspond to actual job ads. In particular, we created 12 templates per occupation using actual ads collected in Neumark et al. (2019) as a guide to creating our experimental job ads. We supplemented the sample of ads with recent real ads posted on the same job boards used in that study to capture contemporaneous patterns of behavior. Figure 2 provides a few examples, and online Appendix A provides the full set of job-ad templates.

The treatment and control ads differ in the job requirements (denoted in bold with asterisks in each template), with three sentences assigned to be either a treatment phrase (stereotyped) or a control phrase (not stereotyped). As explained above, the requirements we manipulate have to do with a candidate's communication skills, physical ability, and technology skills. Our control phrases express job requirements that are also appropriate for the job but use age-neutral language not related to these age-stereotyped skills or abilities, while our treatment phrases use language highly related to these ageist stereotypes.

Figures 3-5 illustrate how the semantic similarity differs across the templates for the treatment and control job ads and show that our treatment job ads do activate the intended stereotypes.[13] Information on the distribution of all phrases found in the ads is shown in grey, information for the treatment job-ad language is shown with dashed black lines, and information for the control neutral job-ad language with solid black lines. The figures show the median to 99th percentile range and the average (with plotting symbols).

These figures display a few key results. First, the biased (treatment) job ads have considerably higher 99th percentiles than the control job ads, as well as higher means (and medians, although less so). For example, this is apparent in Figure 3, looking at the bars and symbols for the Physically Able

[13] As explained above, words have been aggregated up to three-word phrases to ensure that we measure semantic meaning more accurately.

stereotype in the upper left-hand panel, the bars and symbols for the Technology stereotype in the upper right-hand panel, and the bars and symbols for the Communication stereotype in the lower left-hand panel. (In these three panels, we manipulate *only* the indicated stereotype, using the neutral language for the other two.) On the other hand, for the remaining stereotypes – the ones we do *not* manipulate – the control/neutral templates, treatment templates, and collected ads generally have similar medians, means, and 99th percentiles; see, for example, the bars for Dependable in the upper right-hand panel in Figure 3.[14] The implication of the differences in the means and especially the upper tails of the distributions is that the ads we write using the treatment sentences do, in fact, create ads with notably stronger age stereotypes for the "target" stereotype we are trying to convey. But our manipulated treatments do *not* create similarity with the other stereotypes (besides the three we are trying to study). That is, our treatment ads only generate a shift in similarity for the stereotypes we are seeking to activate, hence isolating those stereotypes in the job ads.

This key result is also apparent from the lower right-hand panel in each figure, where we use the treatment ads in which we manipulate all three stereotypes at once. If one compares the bars and symbols for any of the three manipulated stereotypes in this panel to the corresponding bars and symbols in the first three panels, the results look almost identical. Again, this reinforces the conclusion that machine learning generated semantic similarity scores are powerful enough to pick up the presence of stereotyped language, even when only one or a few sentences in the ad are actually related to the ageist stereotype.

In addition, the treatment effect is accentuated by using the control ads rather than simply using all the collected ads (as we would expect). The figures show that the control ads are more neutral than the full set of collected ads, as evidenced by the much lower values of the 99th percentiles for the control ads than for the collected ads, for each of the stereotypes we manipulate, but not for the other stereotypes; for example, compare the bars for Physically Able and for Hearing in the upper left-hand panel of Figure 3.

Experimental Evidence

[14] There are infrequent exceptions – e.g., for Ability to Learn in the lower left-hand panel.

Our final step – and the key new contribution of this paper – was to conduct an experiment using Amazon MTURK to measure whether and to what extent job-ad language using phrases with high cosine similarity scores with age-related stereotypes, as identified by machine learning methods, are perceived as ageist by potential job applicants, including older applicants.

We recruited participants through the Amazon MTURK online platform. We restricted the sample to U.S. residents. To guarantee that the median age of the sample was roughly 50, we used age-based quotas with a third of the sample in each of the following age bins: 25 to 35, 45 to 55, and 55+. Because the age bins are pre-set by Amazon MTURK, and MTURK's age data may not be up-to-date, we ask participants to self-report their age. The bins we use to collect self-reported age (25 to 35, 35 to 50, and 50+) broaden the MTURK bins to cover a gap in the age distribution and adjust the highest cutoff to 50, in line with our benchmark age for older workers in the survey. We did not balance the recruitment sample on race or gender.[15]

Our experiment consisted of two parts, the baseline survey and the incentivized survey, which were conducted using Qualtrics. In the baseline survey, we recruited 50 respondents who met our criteria and passed the manipulation checks. The responses from the baseline survey were used solely to provide "correct" answers for the next step when we incentivize our second group of respondents to predict the responses of this first group. For the incentivized survey, we recruited 151 respondents who met our

[15] Respondents who met the sample restrictions were excluded if they failed a manipulation check as the first step of the survey. This manipulation check acted as both a Turing test (ensuring our respondents were human) and a check for American English language fluency (to reduce the chance someone has masked their location). All questions were free response to prevent individuals or computer programs from clicking through and getting the right answers by accident. The first three questions test for English understanding by asking respondents to complete the analogy (e.g., Canine is to Dog as Feline is to ___, for which cat, kitten, Cat, or cats would all be correct). One of these questions (Pen is to Whiteout as Pencil is to ___) was designed to elicit different responses between American and U.K. English speakers. If participants listed "eraser," the correct answer in American English, they were allowed to proceed, while participants who responded with "rubber," the answer in U.K. English, were excluded. The last question was a free response that asked respondents to write two sentences of at least 140 characters telling us who their favorite band or artist is and why. These were checked after the fact to ensure the participant was paying attention and was capable of writing in coherent English sentences. The manipulation checks overall screened out nine respondents.

criteria and passed the manipulation checks. For both surveys we used the manipulation check questions seen in online Appendix Figure B1.[16]

In Table 3, we report the self-reported demographic composition of our sampled MTURK respondents. The sample is relatively more-educated, white, and female than the U.S. population as a whole. Consistent with the age-based quotas we set for recruiting participants, the sample is also relatively older, which may explain some of the differences in the other demographic characteristics. In line with our target, we generated a sample with a median age near 50, finding roughly 55% of participants over that threshold and 45% below.

Baseline Survey

The baseline survey had three separate blocks of questions. In the first block of questions, subjects were asked to give their informed consent to participate in the survey (Appendix Figure B2). In the second block, participants were shown a series of job requirements and told they were from job ads posted online. An example is shown in Figure 6. For each requirement, respondents were asked whether they personally agreed or disagreed with the statement that "[Treatment or control requirement] is biased against workers over 50."

Within each of the blocks that asked about whether or not phrases were perceived as biased, there were three pages for each respective stereotype: communication, physical, and technology. All the treatment and control phrases were tested on their respective pages, but the pages were not labeled by stereotypes that respondents viewed. Respondents had to proceed sequentially through the pages and could not go back or skip between them. The ordering of the questions was randomized within each page. We adopted this approach to force respondents to compare treatment and control phrases in a specific stereotype category without prompting them about the specific age-related stereotype in question. The order of questions on a page was randomized for each respondent. Responses to the questions were given

[16] We recruited 150 respondents initially – 50 in each age bin – but one person completed the survey and then refused to accept payment. Thus, we ended up with 151 subjects because the quota filling on MTURK only counts people who accepted payment.

on a Likert scale with the options: Strongly agree, Somewhat agree, Neither agree nor disagree, Somewhat disagree, Strongly disagree.

In the third block, we concluded by collecting the demographic characteristics of our sample (Appendix Figure B3). They were asked to report their age, gender, education, and race/ethnicity.

Incentivized Survey

The second survey was split into five blocks of questions. The first asked the participants to give their informed consent. The second block of questions repeated questions from the baseline survey and asked respondents about their own opinions on job requirements.

The next two parts formed the crux of the incentivized survey. In each part, the respondents were asked to guess how the participants in the baseline survey rated the job requirements, and they were rewarded for how correctly they guessed. Before starting each of these blocks of questions, respondents were sent to a landing page that emphasized the new prompt and cash incentive.

The third set of questions asked respondents to predict what the previous survey respondents answered when they were shown job requirements from the job ads (Figure 7). For each requirement, they were asked whether they thought previous respondents agreed or disagreed with the statement that "This job requirement is biased against workers over 50." They were shown the same Likert scale shown to the baseline respondents. Respondents were informed that either the third set of questions in the survey or the fourth (described below) would be randomly selected for a cash incentive based on their answers to the questions in that part. They were told they would earn bonus pay, which was to be calculated based on how close they were to the correct answer. If they correctly predicted what the average participant said, they would earn \$0.32 per question.[17] Incorrect answers received less money, with the penalty increasing the further they were from the correct answer. Payouts were calculated using the quadratic scoring rule

$$[1] \qquad P_{iq} = 0.32 - 0.02 \times (\overline{A_q} - A_{iq})^2 ,$$

[17] Average pay was \$7.22.

where P_{iq} was the payout to individual i for question q based on the average response to question q by previous respondents ($\overline{A_q}$) and their answer about how previous respondents answered question q (A_{iq}).[18] For example, they would earn \$0.24 if the correct answer was "somewhat agree," and they guessed "somewhat disagree." All the treatment and control phrases were tested on their respective pages, but the pages were not labeled by stereotypes that respondents viewed. Respondents had to proceed sequentially through pages and could not go back or skip between them. The question order was randomized within each page.

The fourth block of questions differed from the third in that we asked respondents to guess how the older participants in the baseline survey (those over 50 years old) responded; see Figure 8. Before starting this block of questions, respondents were sent to a landing page that emphasized both the scoring rule and the age of respondents for whom they were guessing. The instructions read, "For each requirement, please state whether you think previous respondents over the age of 50 agree or disagree with the statement that "This job requirement is biased against workers over 50." The structure of this section was identical to the third block of questions.

Analyses

To test for differences in how the treatment and control phrases were perceived, we employ a series of regression models. We begin with a simple regression testing for differences in respondent beliefs between treatment and control phrases conditional on observable characteristics:

$$[2] \qquad A_{iq} = \alpha + \beta T_{iq} + X_i\delta + \varepsilon_{iq}$$

The ranking that individual i gave to question q (A_{iq}) is the dependent variable. We include controls for gender, level of education, race, and age (X_i). If respondents view the treatment phrases as more biased against older workers than the control phrases, we should find that β is less than zero,

[18] Respondents were told that their earnings, "would be calculated according to the formula: M=\$0.32 − \$0.02 *(Average Previous Answer − Your Prediction)^2." To illustrate their payoff, respondents were told they would earn \$0.24 if the correct answer was "somewhat agree," and they guessed "somewhat disagree."

because the responses (A_{iq}) range from 1 for strongly agree to 5 for strongly disagree. If we observe β is positive, then this is evidence that treatment phrases were rated as less biased by respondents. In Equation [2], and all subsequent regressions, the standard errors are clustered at the respondent level.

Our next step is to explore two forms of heterogeneity in our estimated treatment effects.[19] The first examines whether respondents view treatment phrases differently depending on the stereotype to which the requirement is related. To test this, we define dummy variables for each of our three pairs of a stereotype treatment and the corresponding control (omitting one from the regression), and interactions between these dummy variables and the dummy variables for each stereotype treatment (communication skills, physical ability, or technology skills):

$$[3] \quad A_{iq} = \alpha + \beta_1\left(T_q \times ComSkill_q\right) + \beta_2\left(T_q \times PhysAb_q\right) + \beta_3\left(T_q \times TechSkill_q\right) + \gamma_1\left(PhysAb_q\right) + \gamma_2\left(TechSkill_q\right) + \delta \mathrm{X_i} + \varepsilon_{iq}$$

Thus, the coefficients β_i, i = 1, 2, 3, capture how biased respondents view the treatment phrase for the stereotype relative to the control phrase.

The second form of heterogeneity we examine is the difference between the machine learning derived treatment phrases and the AARP treatment phrases. To do this, we add an additional interaction for when the treatment phrase is the AARP phrase:

$$[4] \quad A_{iq} = \alpha + \beta_1\left(T_q \times ComSkill_q\right) + \beta_2\left(T_q \times PhysAb_q\right) + \beta_3\left(T_q \times TechSkill_q\right) + \theta_1\left(T_q \times ComSkill_q \times AARP_q\right) + \theta_2\left(T_q \times PhysAb_q \times AARP_q\right) + \theta_3\left(T_q \times TechSkill_q \times AARP_q\right) + \gamma_1\left(PhysAb_q\right) + \gamma_2\left(TechSkill_q\right) + \delta \mathrm{X_i} + \varepsilon_{iq}$$

The coefficients θ_i , i = 1, 2, 3, identify how much more biased respondents view the AARP treatment phrases relative to the machine learning derived treatment phrases for the same stereotype.

Results

[19] We also examine heterogeneous differences in the treatment phrases across demographic groups. We find little evidence to support the hypothesis that different groups view job requirements differently. The pattern of results observed in Table 4 holds for by sex, age, education, or race. These results are available upon request.

Figure 9 provides a graphical depiction of the answers from the MTURK survey participants. Across the three blocks of the survey that solicited respondents' self-assessments of age-bias, their predictions of previous' respondents' answers, and their predictions of the answers of respondents over the age of 50, our results were fairly consistent. The participants, on average, strongly disagreed with the notion that anyone would perceive the control phrases as biased against workers over the age of 50. Respondents rated the physical and technology-biased phrases derived from our cosine similarity score index as more biased than the control phrases, but viewed the communication skills stereotyped phrases as roughly identical to the controls. Opinions of the AARP-derived treatment phrases were starker, as all three were rated as far more age biased than their respective control counterparts.

The absence of evidence for bias for the language related to communication stills may reflect the fact that older workers are not always stereotyped as having worse communication skills, but are sometimes, as Table 1 showed, perceived as having better communication skills. In that sense, one might view the evidence of ageist ratings for the physical ability and technology-related stereotypes but not the communications stereotype as further confirmation that respondent perceptions accord with the industrial psychology literature. (Note that the cosine similarity scores from the machine learning do not detect positive vs. negative uses of the language.)

In Table 4, we estimate regression models for the survey responses that delve into more detail. In all cases, standard errors are clustered at the respondent level. In column (1), we report the estimated coefficient from a simple model of the responses for self-beliefs on a dummy variable for whether the response is to any treatment phrase. The estimated coefficient of −0.886 implies that responses are lower by almost one category of the Likert scale. Recall that the responses range from 1 for strongly agree to 5 for strongly disagree, so a negative estimate implies the phrase was perceived as more ageist. The

estimate is strongly statistically significant. To help interpret the magnitude, the third number (in square brackets) reports the implied effect in terms of standard deviations of the responses.[20]

Column (2) expands the specification to differentiate the treatment by the type of stereotype – communications, physical ability, or technology skills – without differentiating the machine learning phrases from the AARP phrases. We find significant negative effects (implying more ageist phrases) for all three, with the largest estimate (whether looking at the coefficient or the standard deviation effect) for physical ability, followed by technology skills, and the smallest estimate for communications. In this model, we also include controls for the different stereotype phrases (whether treatment or control) so that the Treatment × stereotype interactions measure the differences relative to the paired control phrase.

Column (3) expands the specification further to differentiate between machine learning and AARP treatment phrases. In this column, the estimated coefficients of the Treatment × stereotype coefficients measure the effects of the machine learning phrases, and the Treatment × stereotype × AARP estimates measure the differential effects of the AARP treatments relative to the machine learning treatments. We see that in every case the estimated effects of the AARP treatments are larger, in the direction of more perceived bias. All of the estimated differences for the AARP phrases are statistically significant, and the magnitudes are considerably larger for the communications and technology skills stereotypes. For the machine learning stereotypes, the estimated treatment effects for physical ability and technology skills are sizable, significant, and negative, while the effect for communications is near zero and insignificant (paralleling what we found in the raw data). On the one hand, this suggests that the phrases generated by machine learning for communications stereotypes do not evoke ageism, while the phrases in the AARP treatment do; on the other hand, recall the earlier caution that the stronger evidence for the AARP treatment for communications may not isolate the communications stereotype well.

[20] We estimated the specifications in Table 4 using an ordered probit model as well, to account for the fact that our dependent variable is actually ordinal, rather than cardinal. This led to qualitatively very similar results, so we report the OLS results for simplicity. Results available upon request.

Columns (4)-(6) report estimates of the same specifications, but for the beliefs about other respondents – i.e., how respondents think others would perceive the language. The qualitative pattern of estimates is the same. However, one important difference is that the estimated impacts of the treatments are generally larger. This can be seen most simply by comparing the estimated treatment effects between columns (5) and (2). The estimated coefficients are substantially larger – especially for the physical ability and technology skills stereotypes – and in all three cases, the differences are strongly statistically significant (as indicated by the "daggers"). Comparing columns (6) and (3) indicates that the differences between self-beliefs and perceived beliefs of others for the physical ability and technology stereotypes are driven by the machine learning phrases, as their estimated coefficients are substantially larger in column (6) than in column (3), whereas the estimated interactions with the AARP phrases are not uniformly larger or smaller. As noted earlier, the differences in responses for perceived beliefs of others and self-beliefs may reflect the incentives we offered in eliciting the former, which could counter social desirability biases.

Finally, columns (7)-(9) focus on the perceived beliefs of those over age 50. These estimates are quite similar to those in columns (3)-(6), suggesting that respondents did not particularly believe that older individuals were more likely to perceive language as ageist.[21] Of course, given that the stereotyped language *was* perceived as ageist, the impact on behavior would likely be stronger the older is the person reading job ads with these phrases.

Our last analysis compares the perceptions (self-beliefs, or of others) to the cosine similarity scores for the phrases we use (see Table 2), providing a useful graphical depiction of our survey results that captures many of our key points. Figure 10 does this for self-beliefs. Note the vertical axis is decreasing in the reported belief because a lower number implies stronger perceived ageism. Consider first the points plotted for control phrases. Referring back to Table 2, there are two control phrases for

[21] As further evidence that these perceptions that younger and older people to not perceive the ageist phrases differently, the estimated effects of the treatments on self-beliefs of respondents aged 50 or under and over age 50 were very similar. Results available upon request.

physical ability and two for communications, so there are two circles for each of these. But there are three circles for technology skills, for which there are three control phrases. The horizontal axis measures the cosine similarity score for these, and they are clustered towards zero. The vertical height measures the perceived bias of these phrases, and – by design – they are low.[22] The triangles are for the machine learning phrases. As Table 2 showed, these generally have the highest cosine similar scores with the corresponding stereotypes. The squares are for the AARP stereotypes, which generally have lower cosine similarity scores; there are only three of these plotted because there are only three phrases. Comparing the height of the triangles to the squares, we see that the AARP phrases are generally perceived as more biased, even though the cosine similarity scores with the stereotypes are lower.

Figures 11 and 12 show the same kind of evidence of beliefs about others' perceptions in general, and then for others over age 50. The qualitative patterns are the same, but Figures 11 and 12, in comparison to Figure 10, show the stronger perceived bias reported when asked about others' perceptions and how this shift is driven relatively more by the machine learning phrases.

Conclusions and Discussion

In this paper, we explore whether the type of ageist stereotypes used in job ads is detectable in job ads using machine learning methods and whether this language is perceived as biased against older workers. This is important for three reasons. First, workers may respond to this language, with older workers applying to a narrower set of jobs or perhaps choosing not to apply at all, hence diminishing their job market opportunities. Second, the mechanism we study is plausible, as employers who want to discriminate against older workers but also want to avoid getting caught might manipulate job-ad language to discourage older workers from entering the applicant pool. And third, if ageist job-ad language can be detected by machine learning methods, then these methods could, in principle, be used to help enforce anti-discrimination laws by helping to predict or identify employers more likely to be engaging in age discrimination.

[22] We do this analysis for the mean survey responses, rather than the regression coefficients, because we want to depict these for each occupation, and the regressions do not estimate separate effects by occupation.

We use machine learning methods to identify phrases in job ads that are linguistically related to standard ageist stereotypes from the industrial psychology literature. We use these phrases to construct typical job-ad language that reflects specific age stereotypes. We show that machine learning methods are sensitive enough to detect the presence of stereotyped language, even when only one sentence in the job ad is highly related to the ageist stereotype. We then conduct an MTURK experiment that asks whether respondents perceive this job-ad language – which the machine learning algorithm classifies as related to ageist stereotypes – as ageist. We also used some "classic" ageist phrases identified by AARP.

Our experimental evidence shows that sentences that are classified as closely related to ageist stereotypes by the machine learning algorithm are generally perceived as ageist by respondents in our MTURK experiment (and more so when asked, with incentives, how they will be perceived by others). The AARP phrases were perceived as the most ageist. These results imply that the different age stereotypes we study capture real ageist sentiments and will be perceived as such by job applicants.

Although the AARP phrases were perceived as more ageist than those generated by our machine learning methods, the latter were more directly and more distinctly related to specific ageist stereotypes. This is potentially significant from a policy perspective, as it implies that machine learning can be used to identify ageist stereotypes in job ads the pertain to *specific* stereotypes. Because the legality of an age stereotype in a job ad might hinge on whether the language pertains to a job requirement based on a reasonable factor other than age (RFOA), it is important to be able to ascertain the type of job requirement to which the language might refer. In contrast, the AARP phrases we use, while perceived as more ageist, are harder to tie to specific stereotypes and hence, perhaps, to specific job requirements.

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Table 1: Age Stereotypes from Industrial Psychology Literature

Health	Personality	Skills
Less Attractive	Less Adaptable	Lower Ability to Learn
Hard of Hearing	Careful	Better Communication Skills
Worse Memory	Less Creative	Worse Communication Skills
Less Physically Able	Dependable	More Experienced
	Negative Personality	More Productive
	Warm Personality	Less Productive
		Worse with Technology

Note: See Burn et al. (2020).

Table 2: Control and Treatment Phrases by Occupation

Occupation	Stereotype	Control	Machine Learning Treatment	AARP Treatment
(1)	(2)	(3)	(4)	(5)
Administrative Assistants	Communication skills	You must be good at working without supervision (CSS = 0.20)	You must have good communication and teamwork on tasks (CSS = 0.48)	You must be up-to-date with current industry jargon and communicate with a dynamic workforce (CSS = 0.23)
Administrative Assistants	Physical ability	You must enter bills and keep track of invoices (CSS = 0.11)	You must be able to lift 40 pounds (CSS = 0.41)	You must be a fit and energetic person (CSS = 0.30)
Administrative Assistants	Technological skills	You must produce and distribute documents such as correspondence memos, faxes and forms (CSS = 0.08)	You must use accounting software systems like Netsuite, Freshbook, and QuickBooks (CSS = 0.29)	You must be a digital native and have a background in social media (CSS = 0.22)
Retail sales	Communication skills	You must be good at working without supervision (CSS = 0.20)	You must have good communication with customers and staff (CSS = 0.34)	You must be up-to-date with current industry jargon and communicate with a dynamic workforce (CSS = 0.23)
Retail sales	Physical ability	You must enter bills and keep track of invoices (CSS = 0.11)	You must be able to lift 40 pounds (CSS = 0.41)	You must be a fit and energetic person (CSS = 0.30)
Retail sales	Technological skills	You must help to clean and organize the store (CSS = 0.09)	You must use software such as Microsoft Office/Excel or Google Sheets (CSS = 0.27)	You must be a digital native and have a background in social media (CSS = 0.22)
Security guard	Communication skills	You must follow instruction from supervisors (CSS = 0.21)	You must maintain communication about tasks with supervisors (CSS = 0.38)	You must be up-to-date with current industry jargon and communicate with a dynamic workforce (CSS = 0.23)
Security guard	Physical ability	You need to carry a flashlight (CSS = 0.20)	You must be able to lift 50 pounds (CSS = 0.41)	You must be a fit and energetic person (CSS = 0.30)
Security guard	Technological skills	You must write patrol records in journal notebook (CSS = 0.03)	You must type patrol entries into a journal application on a computer system (CSS = 0.24)	You must be a digital native and have a background in social media (CSS = 0.22)

Note: See text for a description of how each sentence was created. The average cosine similarity score with the stereotype for each phrase (averaging over the cosine similarity score of each word contained in the phrase) is reported in parentheses. CSS = "cosine similarity score."

Table 3: Demographics of MTURK Sample

Demographic Characteristic	Number of Respondents	Percent of Sample
A. Level of Education		
Postgraduate Degree	25	16.6%
Bachelor's Degree	60	39.7%
Some College or 2 Year Degree	49	32.4%
High School Graduate or Less	17	11.3%
B. Age Group		
21 to 35 years old	45	29.8%
35 to 50 years old	23	15.2%
Over 50 years old	83	55.0%
C. Sex		
Female	83	55%
Male	68	45%
D. Race and Ethnicity		
White	125	82.8%
Black or African American	8	5.3%
Asian	6	4.0%
Hispanic or Latino	4	2.7%
Other	3	2.0%
Two or More	5	3.3%

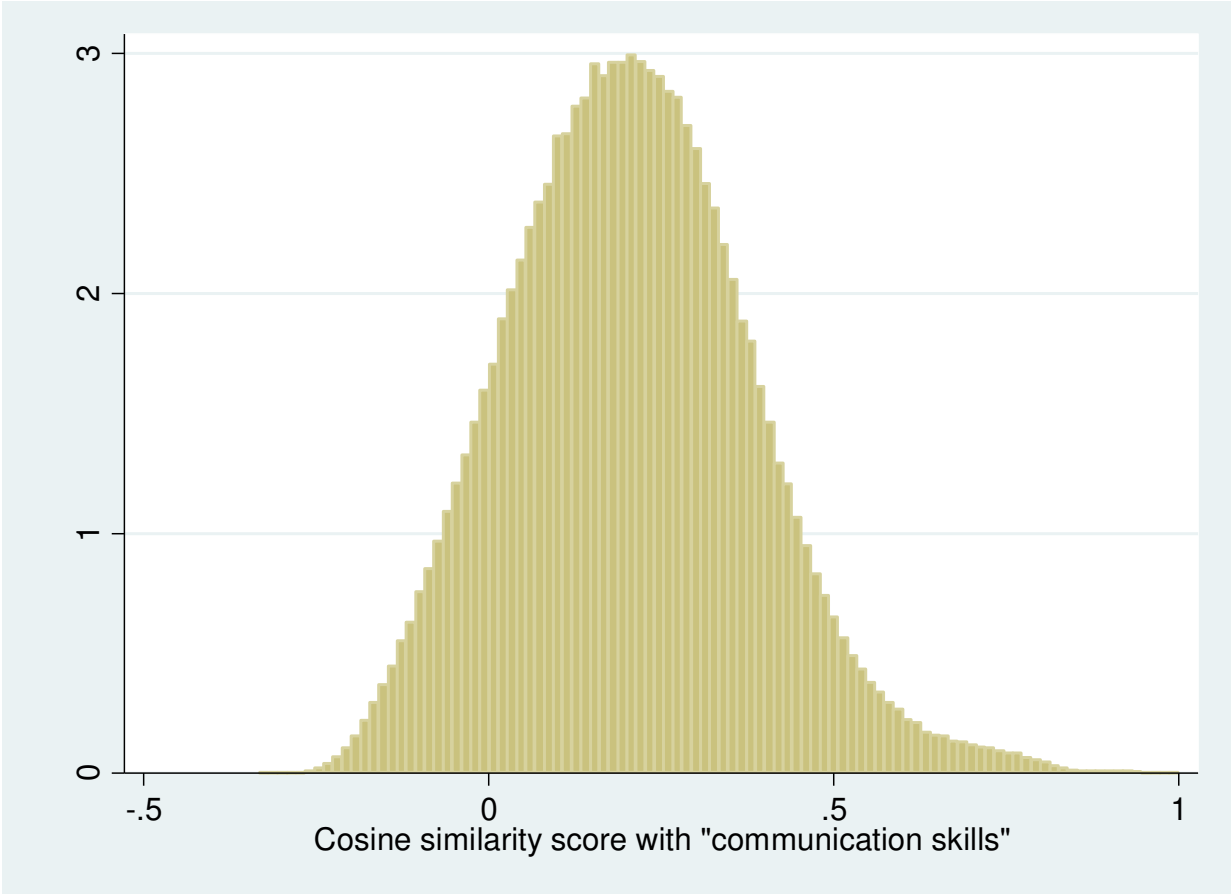
Note: MTURK participants self-reported their demographic characteristics. Respondents who selected two or more of the race and ethnicity categories were grouped into the "Two or More" group.

Table 4: Differences in Beliefs by Treatment (Negative Implies More Biased Against Older Workers)

	Self-beliefs			Beliefs about all respondents			Beliefs about respondents over 50		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treatment	-0.886***			-1.266***†††			-1.248***		
	(0.047)			(0.050)			(0.053)		
	[-0.718]			[-0.900]			[-0.873]		
Treatment × Communications		-0.316***	0.015		-0.465***†††	0.001		-0.450***	0.004
		(0.033)	(0.022)		(0.050)	(0.046)		(0.045)	(0.038)
		[-0.256]	[0.013]		[-0.330]	[0.001]		[-0.315]	[0.003]
Treatment × Physical ability		-1.623***	-1.526***		-2.153 ***†††	-2.060 ***†††		-2.079***	-2.066***
		(0.098)	(0.106)		(0.091)	(0.099)		(0.101)	(0.108)
		[-1.315]	[-1.237]		[-1.531]	[-1.465]		[-1.454]	[-1.445]
Treatment × Technology skills		-0.895***	-0.488***		-1.403***†††	-1.040***†††		-1.432***	-1.108***
		(0.064)	(0.063)		(0.072)	(0.078)		(0.078)	(0.083)
		[-0.725]	[-0.395]		[-0.998]	[-0.739]		[-1.001]	[-0.775]
Treatment × Communications × AARP			-1.327***			-1.865***†††			-1.819***
			(0.105)			(0.106)			(0.114)
			[-1.705]			[-1.326]			[-1.272]
Treatment × Physical ability × AARP			-0.288***			-0.281***			-0.040
			(0.091)			(0.076)			(0.076)
			[-0.233]			[-0.200]			[-0.028]
Treatment × Technology skills × AARP			-1.629***			-1.455***†			-1.296***
			(0.099)			(0.090)			(0.096)
			[-1.320]			[-1.035]			[-0.906]
Physical ability		0.179***	0.179***		0.172***	0.172***		0.152***	0.152***
		(0.046)	(0.046)		(0.053)	(0.053)		(0.056)	(0.056)
		[0.145]	[0.145]		[0.122]	[0.122]		[0.106]	[0.106]
Technology skills		0.011	0.011		-0.052	-0.052		-0.079	-0.079
		(0.049)	(0.049)		(0.060)	(0.060)		(0.062)	(0.062)
		[0.009]	[0.009]		[-0.037]	[-0.037]		[-0.056]	[-0.056]
Adjusted R^2	0.149	0.230	0.353	0.211	0.332	0.452	0.205	0.321	0.422
Observations	2,718	2,718	2,718	2,718	2,718	2,718	2,718	2,718	2,718

Note: * indicates statistical significance of the coefficient. * p<0.1,** p<0.05,*** p<0.01. † indicates significant differences between the same coefficients in the Beliefs about all respondents and the Self-beliefs models. † p<0.1, †† p<0.05, ††† p<0.01. In each regression, we include a constant and controls for gender, level of education, race, and age (not reported). Numbers in parentheses are robust standard errors clustered at the respondent level; numbers in brackets are coefficients normalized to standard deviations of the outcome variable. Negative numbers indicate higher levels of perceived bias against older workers, as the outcome ranges from 1 for "strongly agree" to 5 for "strongly disagree."

Figure 1: Example of the Distribution of Cosine Similarity (CS) Scores



Note: Figure reports the distribution of cosine similarity scores for all trigrams from the job ads with the communication skills stereotype. The higher the cosine similarity score, the more related the trigram is to "communication skills."

Figure 2: Job Ad Examples

Administrative Assistants Template 1 (Admin Assistant)

Psychiatric office is in need of a full or part time Administrative Assistant to assist in front/back office general clerical duties. This individual will work on a several tasks and stay on course at all times. The Administrative Assistant we hire will be trained in various duties that cover the entire office.

This individual MUST possess the following:

-Exceptional customer service background to greet and register patients, answer phones, schedule appointments.
-Can multitask.
-High School diploma or GED.
-Professional attitude.
-***Communication Skill Requirement***.
-***Technology Requirement***
-***Physical Requirement***
-Available for flexible hours.
(Schedule hours and days will alternate every other week)

Please email us a CV or resume and put "full-time" or "part-time" in the subject line.

Retail Sales Associate Template 1 (Retail Sales Job)

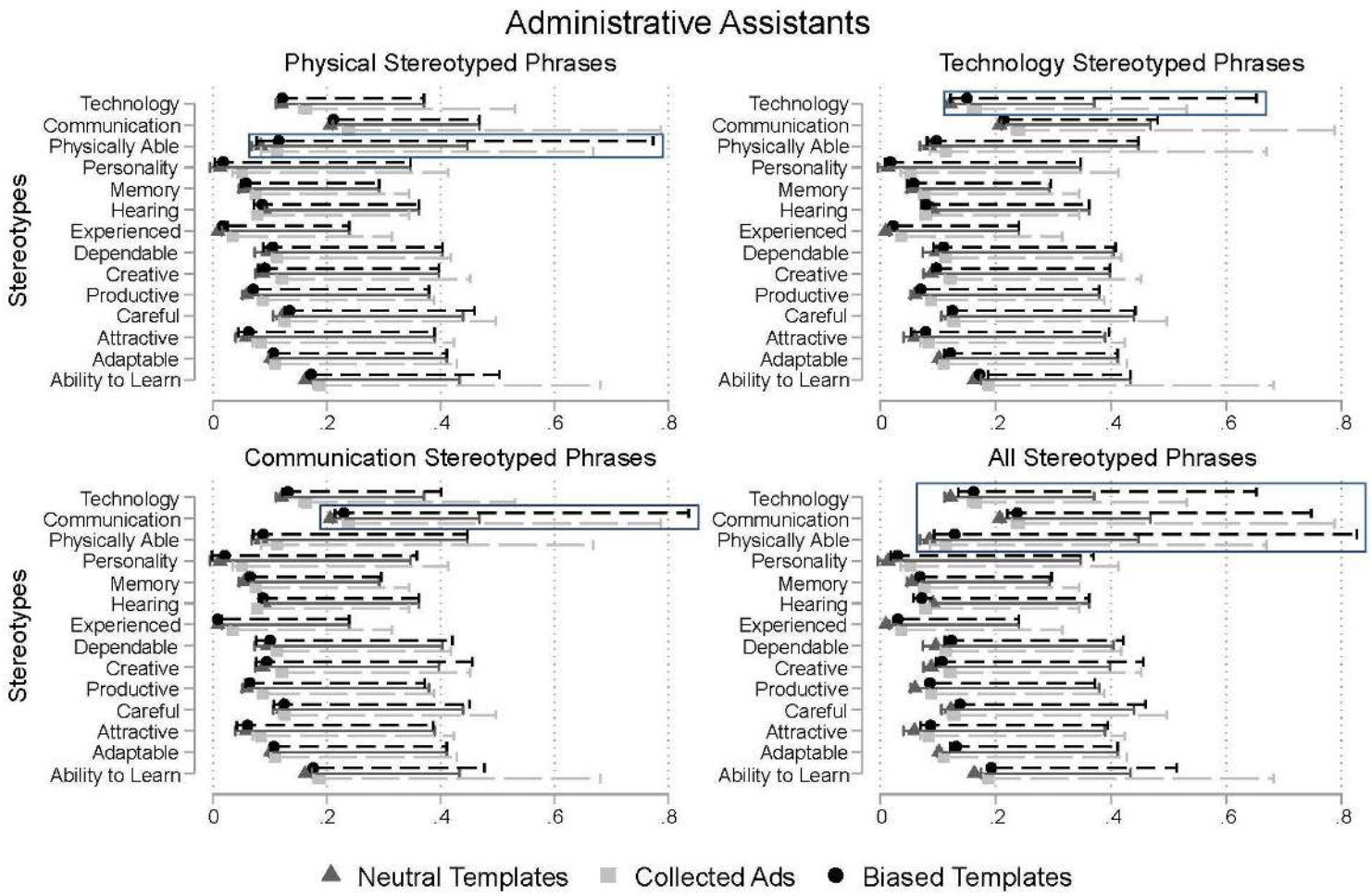
Our women's clothing store in ***City*** is looking for a sales associate to help us out weekday afternoons. We are pretty busy store and you must ***Physical Requirement*.** We are looking for someone with open to working in retail, who ***Communication Skill Requirement*.** We need you to ***Technology Requirement***. So if this sounds like you, send us your resume and your earliest possible starting date and we will be in touch.

Security Guard Template 1 (HIRING UNARMED SECURITY GUARDS)

We currently have a position for a full-time or part-time security officer available. Training and uniforms will provided. We offer flexible working hours and have shifts any day of the week. Our pay scale is competitive. Email your resume and potential work hours to apply.

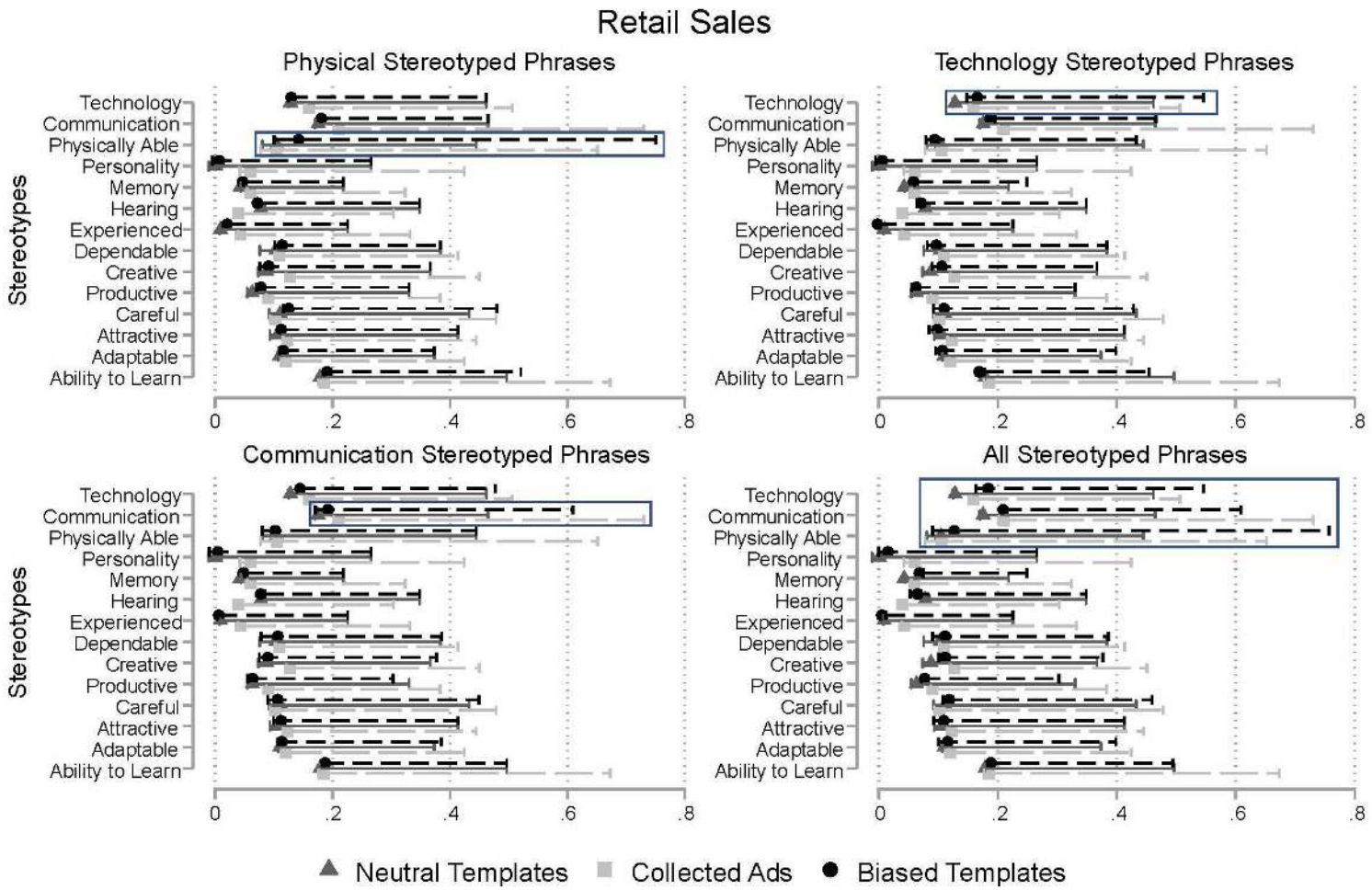
Requirements
-Professional appearance & attitude
-Detail oriented
-*Communication Skill Requirement*
-*Physical Requirement*
-*Technology Requirement*
-At least 18 years of age
-Access to transportation

Figure 3: Cosine Similarity Score of Administrative Assistant Templates



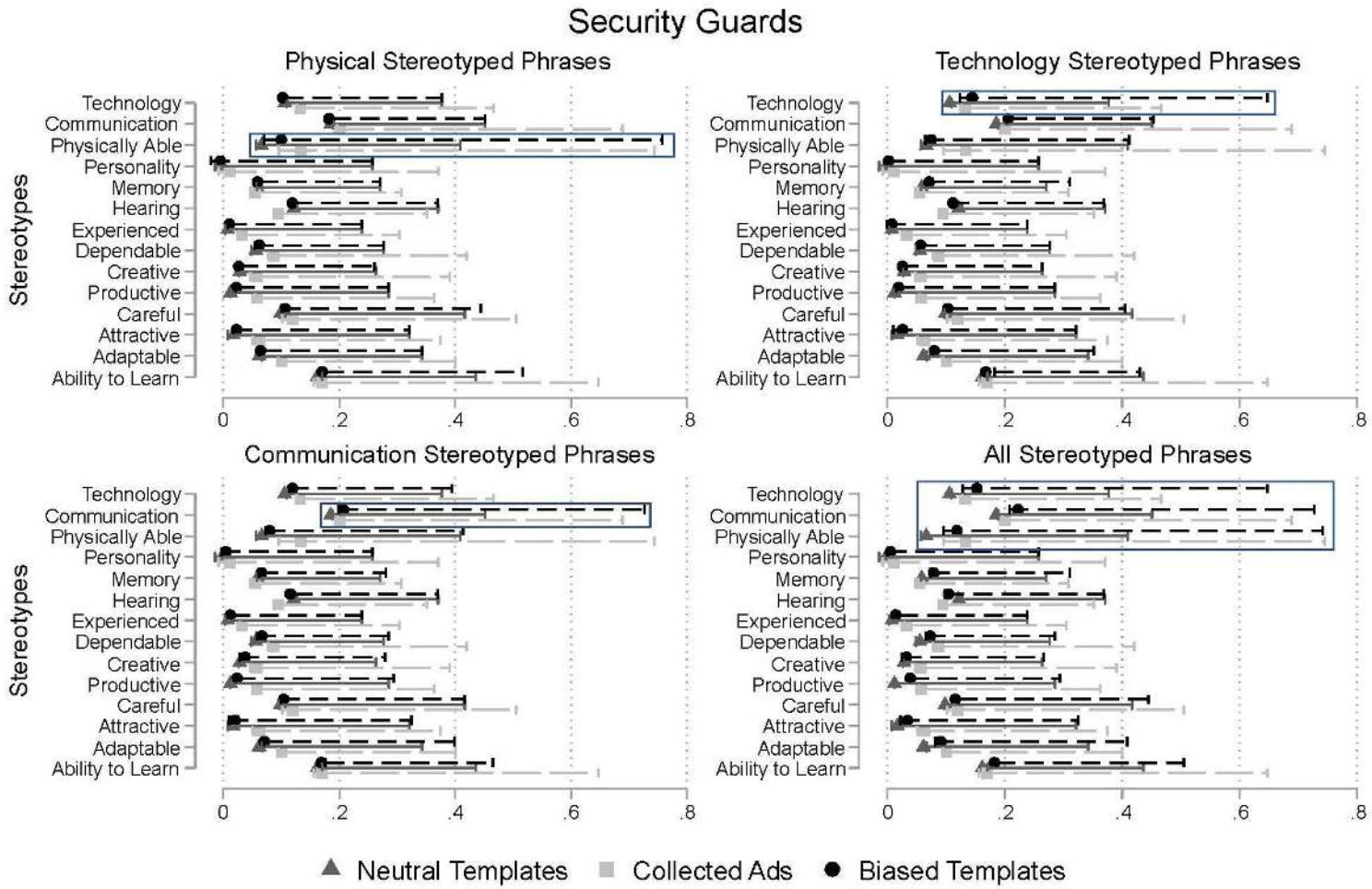
Note: Graphs display median to 99th percentile range of trigram semantic similarity scores for each stereotype for Administrative Assistant ads. The average trigram semantic similarity score for each stereotype is represented by the respective shape for each template. Control ("neutral") templates contain trigrams from the created ad templates with only non-stereotyped phrases included. Collected ads comprise trigrams from all Administrative Assistant job ads. Treatment templates contain trigrams from the created ad templates with the respective stereotyped phrase or phrases included.

Figure 4: Cosine Similarity Score of Retail Sales Templates



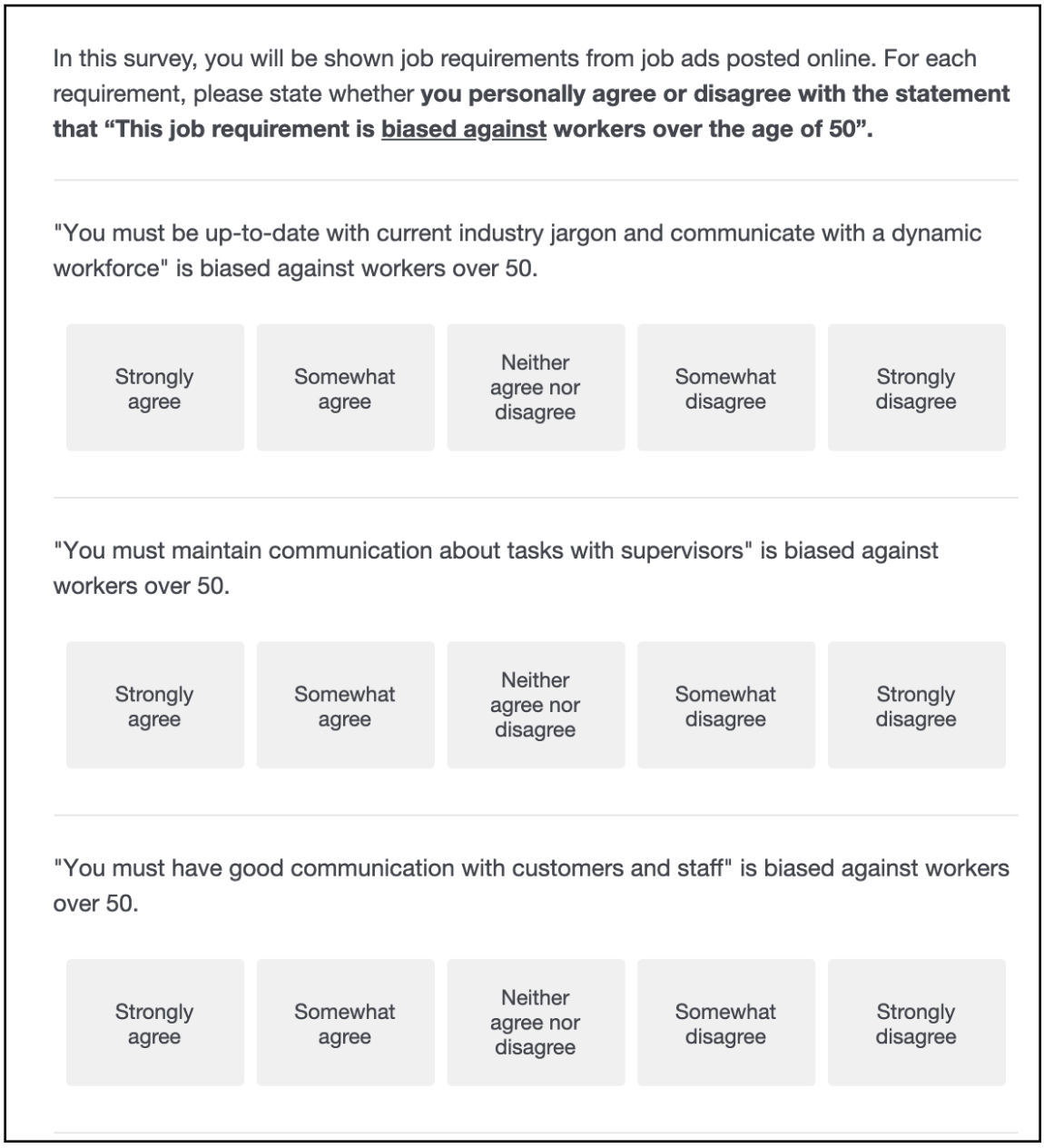
Note: Graphs display median to 99th percentile range of trigram semantic similarity scores for each stereotype for Retail Sales ads. The average trigram semantic similarity score for each stereotype is represented by the respective shape for each template. Control ("neutral") templates contain trigrams from the created ad templates with only non-stereotyped phrases included. Collected ads comprise trigrams from all Retail Sales job ads. Treatment templates contain trigrams from the created ad templates with the respective stereotyped phrase or phrases included.

Figure 5: Cosine Similarity Score of Security Guard Templates



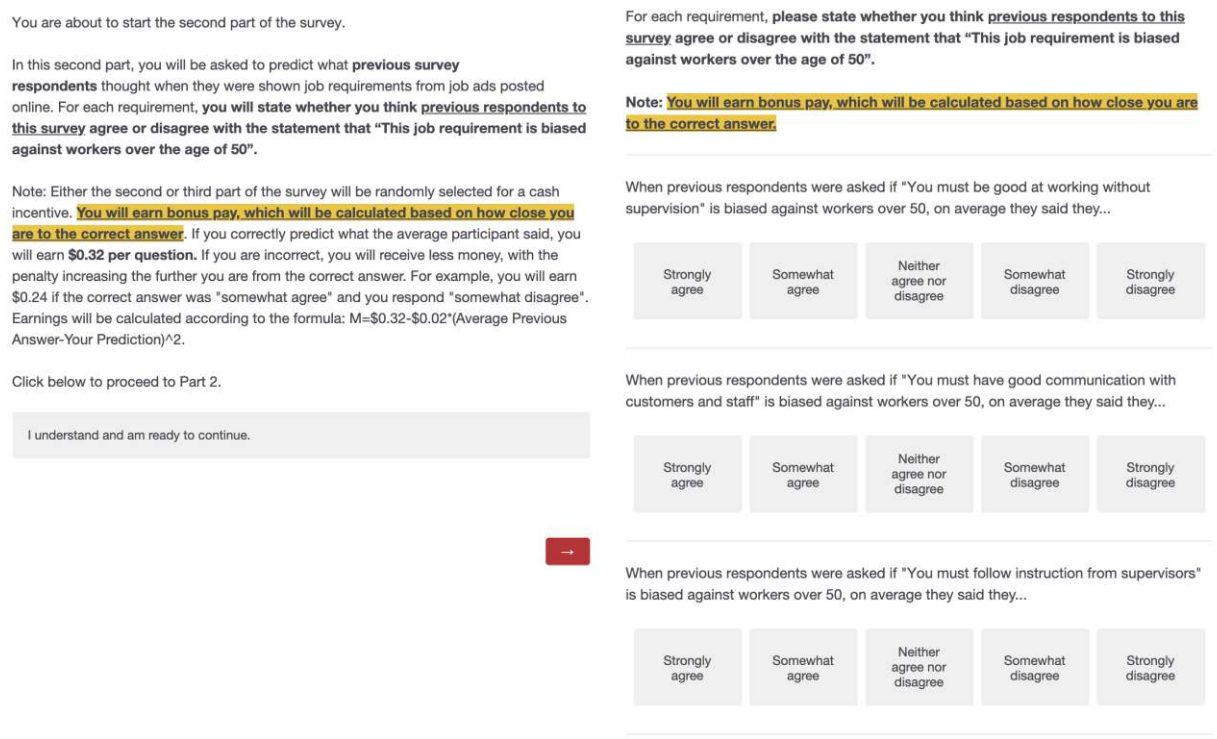
Note: Graphs display median to 99th percentile range of trigram semantic similarity scores for each stereotype for Security Guard ads. The average trigram semantic similarity score for each stereotype is represented by the respective shape for each template. Control ("neutral") templates contain trigrams from the created ad templates with only non-stereotyped phrases included. Collected ads comprise trigrams from all Security Guard job ads. Treatment templates contain trigrams from the created ad templates with the respective stereotyped phrase or phrases included.

Figure 6: Block 1 Example (Exists in Survey 1 and Survey 2)



Note: Respondents were asked about their opinions for all of the treatment and control phrases within a given age-related stereotype. The treatment and control phrases within the communication, physical, and technology categories were shown on three separate pages, and the Qualtrics software disallowed skipping or going back between sections. The order of phrases was randomized for each participant, and they were required to provide an answer in order to proceed to the next section of the survey. In this example, the first three phrases for the communication category are shown.

Figure 7: Block 2 Landing Page and Example



Note: After survey participants completed the block soliciting their personal opinions on whether certain phrases were age-biased, they were directed to the landing page pictured on the left-hand side of the figure. The landing page stressed the incentivized nature of the subsequent section and that bonus pay would be based on how accurately they could identify what the average respondent to the baseline survey said. The questions in the section reflected the new prompt and a highlighted portion at the top of each page reminded MTURK participants that their answers were incentivized based on accuracy.

Figure 8: Block 3 Landing Page and Example (Exists only Survey 2)

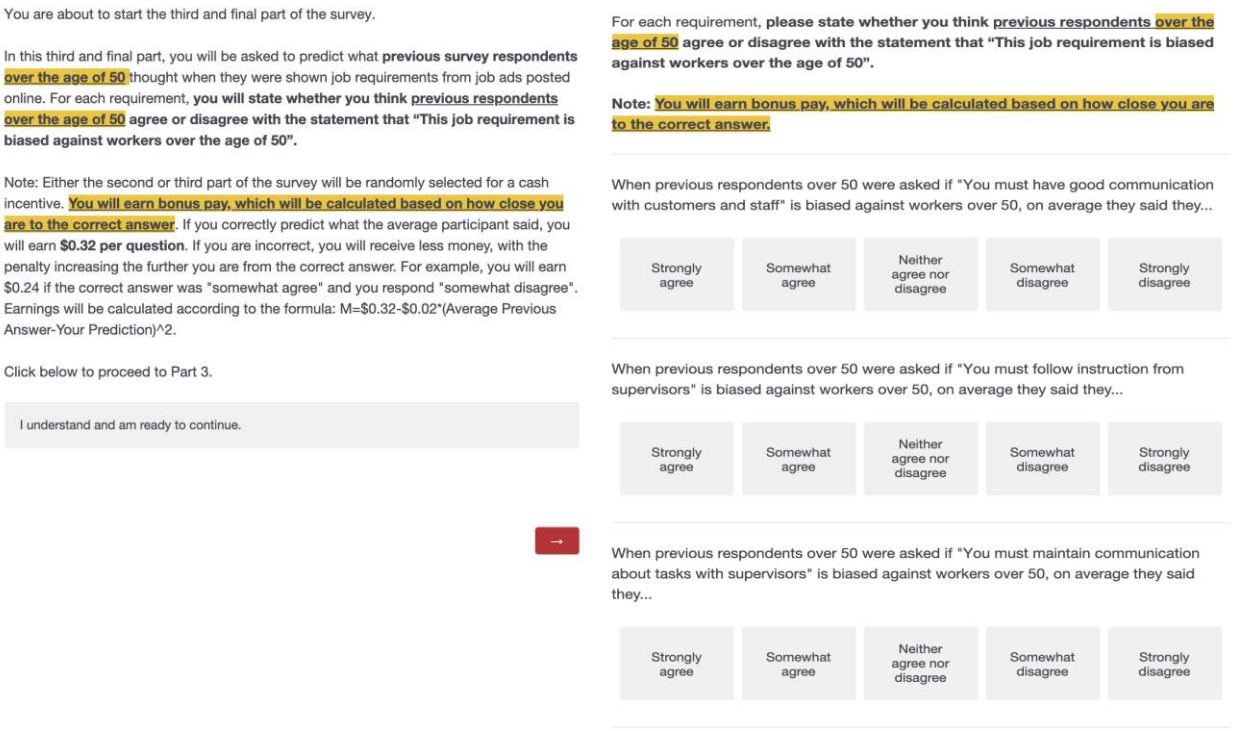
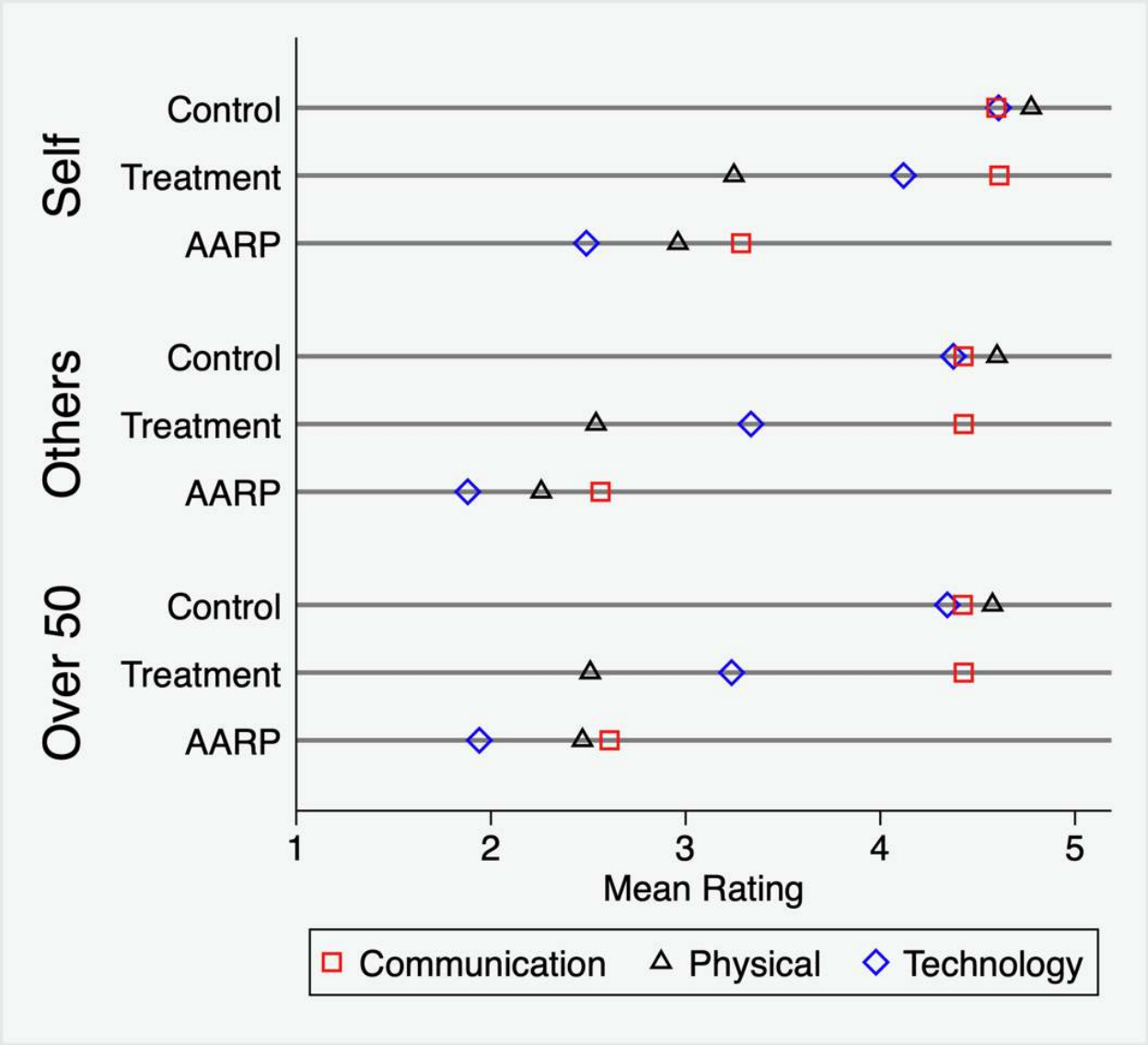
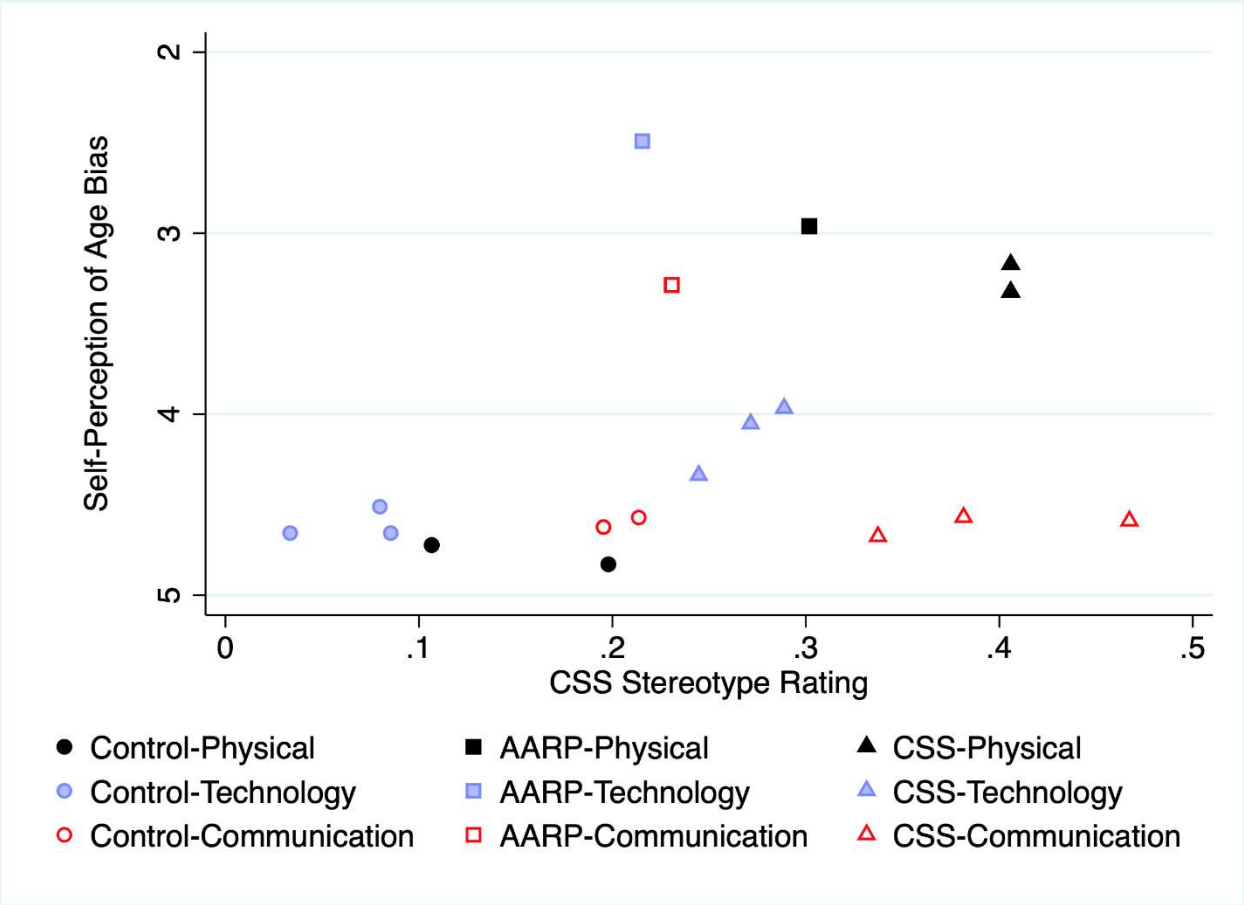


Figure 9: Survey Results



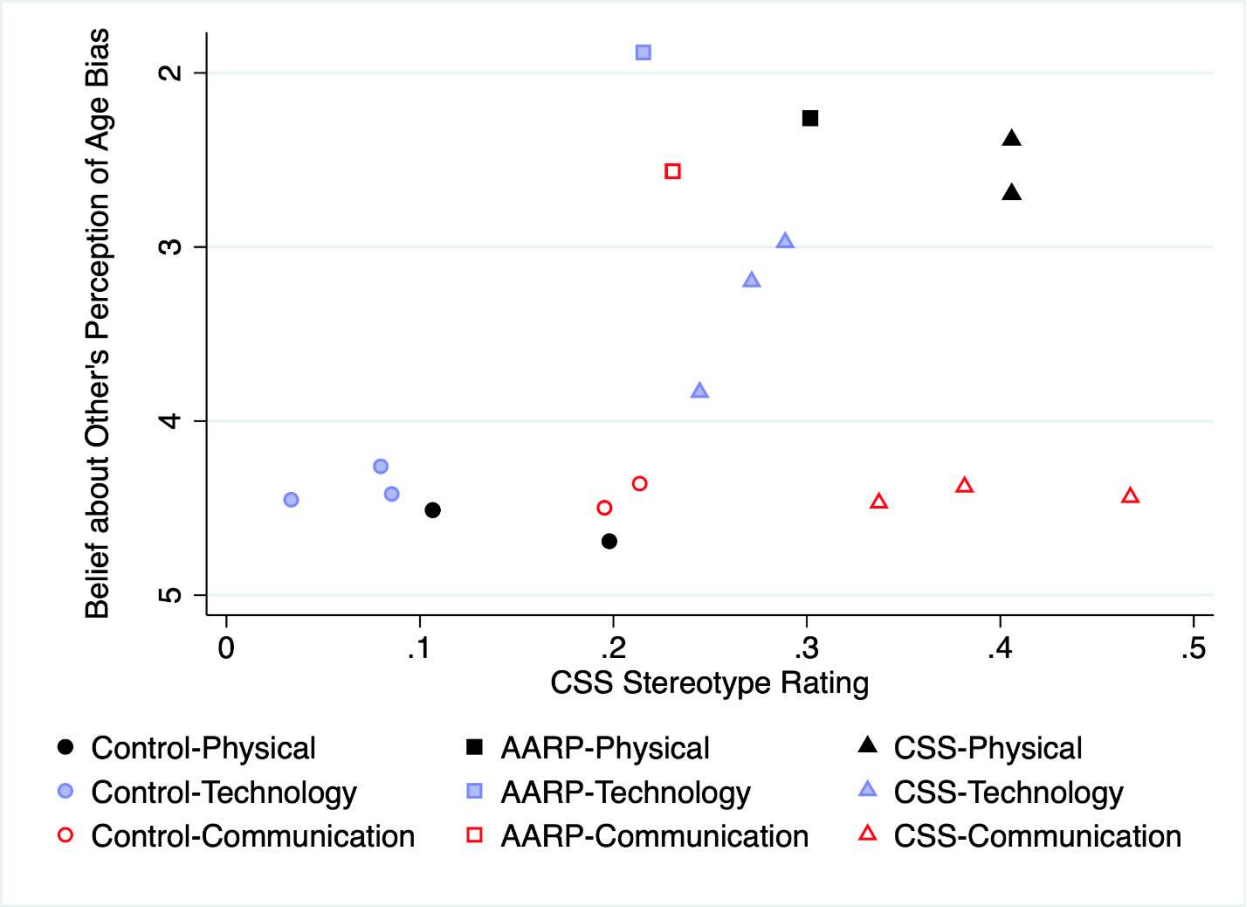
Note: These numerical ratings reflect the degree to which survey respondents rated phrases as age-biased or not age-biased, with lower numbers indicating a greater bias against older workers. Likert Scale ratings were translated to a numerical value such that "Strongly Agree" mapped to 1, "Somewhat Agree" mapped to 2, "Neither agree nor disagree" mapped to 3, "Somewhat Disagree" mapped to 4, and "Strongly Disagree" mapped to 5. The three categories: "Self," "Others," and "Over 50," refer to which group's opinions the MTURK respondents were asked to provide or predict in a given survey block. The average bias rating was collapsed on the treatment status of phrases (control, treatment, and AARP) as well as the category of the stereotype (communication, physical, or technology). Hence, each point in the figure above reflects the average bias rating MTURK respondents gave to a given treatment status for a specific stereotype from the perspective of a given group of people. For example, the triangle in the first row of the above figure indicates that when respondents were asked for their self-assessment of whether or not the physical stereotype control phrases were age-biased, they, on average, stated that they strongly disagreed.

Figure 10: Scatter of Self-Beliefs of Age Bias and Cosine Similarity (CS) Scores



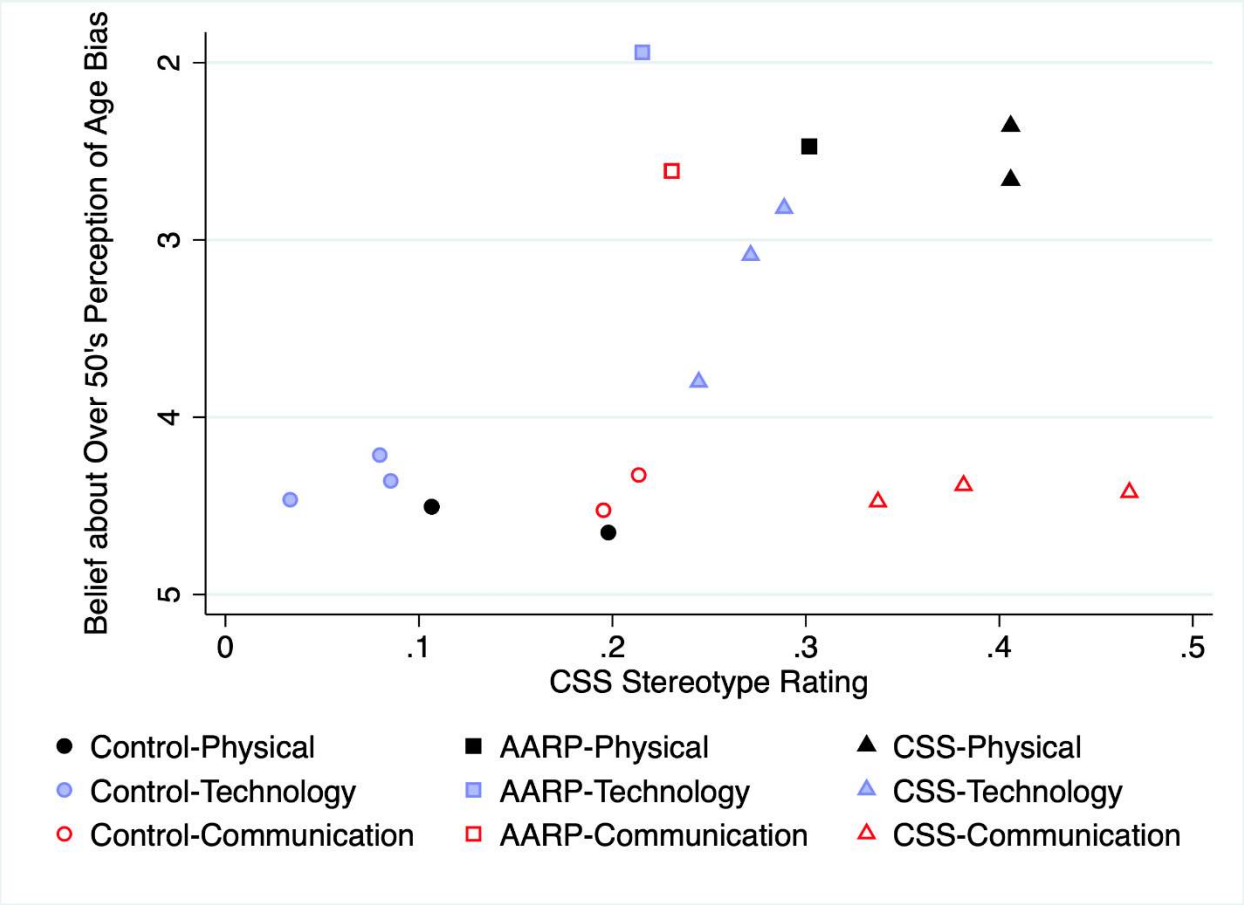
Note: CSS = "cosine similarity score." Figure plots MTURK respondents' average self-perception of age bias against CSS stereotype ratings from Table 2. Lower numbers on the y-axis indicate higher levels of perceived age bias. Higher CSS scores on the x-axis indicate higher average levels of semantic similarity of a phrase with its respective stereotype. Circular, triangular, and square markers represent control phrases, CSS treatment phrases, and AARP treatment phrases, respectively. Black (solid), blue (shaded), and red (unshaded) markers represent physical, technology, and communication phrases, respectively.

Figure 11: Scatter of Belief of Others' Perceptions of Age Bias and Cosine Similarity (CS) Scores



Note: CSS = "cosine similarity score." Figure plots MTURK respondents' average belief about the perception of other's age bias against CSS stereotype ratings from Table 2. Lower numbers on the y-axis indicate higher levels of perceived age bias. Higher CSS scores on the x-axis indicate higher average levels of semantic similarity of a phrase with its respective stereotype. Circular, triangular, and square markers represent control phrases, CSS treatment phrases, and AARP treatment phrases, respectively. Black (solid), blue (shaded), and red (unshaded) markers represent physical, technology, and communication phrases, respectively.

Figure 12: Scatter of Belief of Others over 50s' Perceptions of Age Bias and Cosine Similarity (CS) Scores



Note: CSS = "cosine similarity score." Figure plots MTURK respondents' average belief about respondents over 50s' perception of age bias against CSS stereotype ratings from Table 2. Lower numbers on the y-axis indicate higher levels of perceived age bias. Higher CSS scores on the x-axis indicate higher average levels of semantic similarity of a phrase with its respective stereotype. Circular, triangular, and square markers represent control phrases, CSS treatment phrases, and AARP treatment phrases, respectively. Black (solid), blue (shaded), and red (unshaded) markers represent physical, technology, and communication phrases, respectively.

Online Appendices

Machine Learning and Perceived Age Stereotypes in Job Ads: Evidence from an Experiment

Appendix A (online): Job Ad Templates

Administrative Assistants

Administrative Assistants Template 1 (Admin Assistant)

Psychiatric office is in need of a full or part time Administrative Assistant to assist in front/back office general clerical duties. This individual will work on a several tasks and stay on course at all times. The Administrative Assistant we hire will be trained in various duties that cover the entire office.

This individual MUST possess the following:

-Exceptional customer service background to greet and register patients, answer phones, schedule appointments.
-Can multitask.
-High School diploma or GED.
-Professional attitude.
-***Communication Skill Requirement***.
-***Technology Requirement****
-***Physical Requirement****
-Available for flexible hours.
(Schedule hours and days will alternate every other week)

Please email us a CV or resume and put "full-time" or "part-time" in the subject line.

Administrative Assistants Template 2 (Administrative Job)

About the Employer: We are a well-established but growing law office looking for a Full-Time Receptionist/Administrative Assistant. We have a team of dedicated attorneys who work with a range of independent and corporate clients. Prior background is preferred, but not required.

Responsibilities include:
-Answering up to 6 phone lines
-Coordinating mail in and out of the office
-Filing and basic paperwork

The ideal candidate will possess the following qualifications:
-Can multitask
-***Physical Requirement****
-Organized and detail-oriented
-***Communication Skill Requirement***
-Maintain a professional attitude at all times
-High School diploma or equivalent
-Be a team player
-***Technology Requirement****
-Can work in a fast paced environment!

If you meet these requirements, please send a resume and some interview hours to the provided email.

Administrative Assistants Template 3 (Office Assistant)
About: Growing company, over 30 years history, family owned and operated.

About the position: Office Assistant
* will train, prior background preferred;
* fast paced environment;
* answer 6 phone lines;
* record daily records;

Qualifications:
* can multitask;
****Physical Requirement*;**
****Technology Requirement*;**
* organized;
* ***Communication Skill Requirement**;
* a team player, the company is run by the team.

Please email your resume and availability for more information.

Administrative Assistants Template 4 (HIRING ADMIN ASSISTANT)
Job Description: Administrative Assistant position open now. Email resumes with a start date in the header!

We are a Commercial Roofing company. All applicants need the judgement to make independent decisions when circumstances warrant. Excellent time management and strong organization are required. This position requires you to work under pressure, be self-directed with good business judgment and handle confidential information appropriately.

In this position you will be responsible for:
-Answering a multi-line phone system.
-Greeting incoming guests.
-Filing incoming faxes.
-Light data entry.
-Filing and other basic clerical duties.
-Help co-workers as needed

To qualify for this position, you must have:
-***Communication Skill Requirement**.
-***Physical Requirement***
-***Technology Requirement***
-Can multitask
-Detail oriented

Administrative Assistants Template 5 (Looking for Admin Assistant)
A well-established service company is currently seeking an Administrative Assistant.

Qualified candidates will possess the following:

Proficiency in answering, screening, or forwarding calls, providing information, taking messages, or scheduling appointments.
Maintain a professional presence at all times.
Communication Skill Requirement.
Be self-motivated.
Pay attention to detail and multitask.
***Physical Requirement*.**
Possess strong organizational and critical thinking
Technology Requirement
Please submit your resume via email. Put "Re: Administrative Assistant Position" in the subject line.

Administrative Assistants Template 6 (ADMINISTRATIVE ASSISTANT)
Our accounting firm is seeking an administrative assistant to work in account receivable.

Minimum Qualifications:
H.S. Graduate or GED (higher education is a plus)
Administrative background useful
Technology Requirement
Communication Skill Requirement
Other assorted office duties

Responsibilities include, but are not limited to:
Managing contracts, certificates, releases, etc.
Handling invoices, collections, liens, etc.
Physical Requirement

Email resumes to us at: * email address*. Be sure to let us know when your earliest possible start date is!

Administrative Assistants Template 7 (Administrative Assistant)
Our family-run business is looking for an Administrative Assistant in *City*. We would like someone who is detail oriented, has a solid work ethic, and ***Communication Skill Requirement***. If you fit this description, then please submit your resume by email and preferred work hours!

Duties include client interaction, filing paperwork and testing, ***Physical Requirement*, *Technology Requirement*,** answering phone calls and emails, and scheduling.

Administrative Assistants Template 8 (Office Admin Assistant)
We are searching for an administrative assistant for our office manager. Our work hours are fast paced. Your main tasks would be to greet clients, answer the phone, schedule appointments also organize tax returns, filing, light cleaning and other office jobs as needed.

The following are absolute must haves:
Communication Skill Requirement
Technology Requirement
Physical Requirement
High School Diploma (equivalents also acceptable)

Please send resume via email with the heading "Administrative Opening".

Administrative Assistants Template 9 (Office Assistant Wanted)
We are a furniture store in need of a part or full time administrative assistant in downtown *City*. Candidate must be highly organized and reliable. Job duties include but are not limited to:

- ***Communication Skill Requirement***

- Making appointments for project managers and clients

- Making calls and greeting clients as the enter the store.

- ***Technology Requirement***

- ***Physical Requirement***

Simply reply to this posting by email with "part time" or "full time" and attach your resume.

Administrative Assistants Template 10 (Admin Position)

We are looking for an administrative assistant that can operate in a team environment. Candidates will assist visitors to the company and handle office tasks. Ideal candidates can provide professional assistance via phone, mail, and email.

Job Responsibilities:

- ***Physical Requirement*.**
- Greet and assist visitors.

Communication Skill Requirement

- Handle tasks, like filing paperwork, setting up for meetings, and reordering supplies.

Requirements:

- Good time management and organization.
- ***Technology Requirement***

Attention to detail.

If you're interested in this position, email us your resume and let us know the earliest you begin working. We can discuss details of the position in an interview.

Administrative Assistants Template 11 (Admin Job)

Are you interested in an administrative assistant position in a growing business? We are hiring qualified candidates in *City*! Apply with your resume and your preferred work hours. Submissions accepted via email.

Duties include but are not limited to; greeting and checking-in guests, sending and receiving packages via Fedex/UPS/USPS, as well as admin support to management.

Qualifications:

• Relevant background or high school diploma (or equivalent) required
• ***Technology Requirement***
• ***Communication Skill Requirement***
• Organized and great follow through on tasks

Additional Responsibilities:

• ***Physical Requirement***
• Assist in greeting and escorting high profile guests.
• Assisting with various administrative duties as needed.
• Provide executive assistance as required.

Administrative Assistants Template 12 (Administrative Assistant Wanted)

Our firm is seeking an Office Administrative Assistant committed to providing premier client service and working well in a team environment. The best candidate ***Communication Skill Requirement***, ***Physical Requirement*,** and maintain and organized work environment. General duties include managing space reservations and serving as a contact for facilities related issues.

Responsibilities and Qualifications:
-***Technology Requirement***
-Work with team with individuals at all levels
-Follow-up and address issues in a timely and prompt manner.
-Strong attention to detail, commitment to producing accurate work
-Manage and maintain inventory of kitchen and office supplies, including printer paper and toner supplies
-High School Diploma/GED required
-Place catering orders, including set up for office meeting meals
-Provide administrative support to the administrative team
-Assist in other projects and responsibilities as assigned

Please contact us if you are interested. We accept resumes or curricula vitae at * email address*. Put "Office Assistant Position" in the first line of your email. Thanks!

Retail Sales Associate

Retail Sales Associate Template 1 (Retail Sales Job)

Our women's clothing store in ***City*** is looking for a sales associate to help us out weekday afternoons. We are pretty busy store and you must ***Physical Requirement*.** We are looking for someone with open to working in retail, who ***Communication Skill Requirement*.** We need you to ***Technology Requirement***. So if this sounds like you, send us your resume and your earliest possible starting date and we will be in touch.

Retail Sales Associate Template 2 (SALES ASSOCIATE WANTED)

Seeking a sales associate for our hardware store in ***City*.** We have flexible hours available during the week. You ***Physical Requirement*.** Previous retail background is a plus, and our ideal candidate has a proven ***Communication Skill Requirement*. *Technology Requirement***. Email a resume and specify your ideal work hours.

Retail Sales Associate Template 3 (Sales Associate)

Position: Retail Sales Associate (Retail Store)

Requirements and duties:

- Greet retail customers
- Answering phones/email
- Receive inventory
- Stock merchandise
- ***Communication Skill Requirement***
- ***Technology Requirement***
- ***Physical Requirement***
- High school diploma or college degree
- Access to transportation

Full Time and Part Time Available + Competitive Wages

If you meet the above mentioned qualifications, please reply with resume (put full or part-time in the subject line). We look forward to your application!

Retail Sales Associate Template 4 (Entry-Level Retail Sales Associate)
Entry-level sales position. Please read all requirements and apply if you are looking for a long-term position. This can be either full-time or part-time position.

Requirements:
- ***Communication Skill Requirement***
- Work in sales preferred but not required
-***Technology Requirement***
- Can multitask and work as a team
- GED or High School Diploma
- ***Physical Requirement***

More information will be discussed during the interview. Please email resumes and list your schedule availability.

Retail Sales Associate Template 5 (RETAIL SALES ASSOCIATE)
Seeking enthusiastic, part time or full time Retail Associate for our store.

Responsibilities Include
- Customer Service: greeting customers, assisting them as they shop, answering their questions
- Over The Counter Sales: manage the cash register, handle product returns
- Packing & Shipping Online Orders

Qualifications
- Applicants must have good attendance and punctuality, access to transportation
- Applicants must be 18 years old or older
- Applicants must have at least a high school diploma
- Applicants must ***Communication Skill Requirement***
- Applicants must ***Physical Requirement***
- Applicants must ***Technology Requirement***

Email us a resume and indicate part-time or full-time if you are interested.

Retail Sales Associate Template 6 (Hiring Sales Associate)
We are a shoe store hoping to hire a new sales associate in *City*!

Our ideal candidate can:
- ***Physical Requirement***
- ***Technology Requirement***
- Assist customers with in-store purchases.
- Has a High School diploma or equivalent
- Confirm labels match the correct products.
- Inspect for damaged deliveries and merchandise.
- Finalize work orders and ***Communication Skill Requirement***

If you're interested please reply to this ad with your résumé! (List your hours.)

Retail Sales Associate Template 7 (Family Owned Store: Retail Sales Position)
Be a part of our family owned, fabric wholesaler! We are searching for a part or full time sales assistant in our *City* location. Our business is committed to quality design and excellent service. As an employee you will work with staff, handle transactions, schedule deliveries, and ***Technology Requirement***.

Qualifications:

-Qualified applicants will have a welcoming presentation.
-We are looking for candidates with a High School diploma or equivalent GED, having a retail background is a plus.
-Excellent customer service, ***Communication Skill Requirement***.
-***Physical Requirement*.**
-Complete our pre-employment background screening.

Please send in your preferred schedule and resume to apply.

Retail Sales Associate Template 8 (Furniture Showroom Sales Associate)
Seeking a sales associate for a furniture showroom who has solid design training for a part time position (full time is available as well) in a fast-moving environment. Candidate must have the following qualifications:

* Strong interest in retail.
* High School Diploma/GED.
* Interest or background in interior design.
* ***Physical Requirement*.**
* ***Technology Requirement*.**
* Passion for interior design.
* ***Communication Skill Requirement***.

Email us your resume/cv for consideration. Let us know if you are looking for part-time or full-time work in the header of email.

Retail Sales Associate Template 9 (Pawnshop Job)
We're running a small pawnshop in *City* and are looking for a new team member. Qualified applicants will:
· Be a team player.
· ***Physical Requirement***
· Have familiarity with retail environment
· *__Technology Requirement__*

Your duties will include but are not limited to organizing paperwork, selling watches and other items, evaluating new items, write loans, *__Communication Skill Requirement__* and all general store duties. Email us a resume and list of available work hours if interested.

Retail Sales Associate Template 10 (Floral Design Sales Associate)
We are searching for a full or part-time sales associate to join our small business in floral design. We offer flexible work hours with competitive pay. You will have to *__Communication Skill Requirement__*. You need to ***Physical Requirement*, *Technology Requirement*,** and be organized**.** Please send a resume and potential in-person interview hours. Thank you!

Retail Sales Associate Template 11 (Novelty Products Shop Opening)
We are a local retail shop in the novelty products business looking for sale associate. We are looking for someone with strong sales techniques and with good customer service.

We require:
__Communication Skill Requirement__
Technology Requirement
Physical Requirement
flexible work hours

To apply for a position:
Please email your resume.
Please indicate your M-F availability in the email.

Retail Sales Associate Template 12 (Retail Job Opening)
We are an upscale business working with select clients and are looking for a talented sales associate. This can be a part time or full time position and the number hours will vary, but the schedule will be posted far in advance. We prefer candidates with a track record in sales. Our business is growing and we are looking for someone to continue to grow with our team.

Qualified candidate should:
* ***Technology Requirement***
* Be available to work on weekends
* *__Communication Skill Requirement__*
* ***Physical Requirement***
* Work well in a team environment

This position pays competitive wages. To apply, email your resume or curricula vitae and let us know many hours per week you prefer.

Security Guard

Security Guard Template 1 (HIRING UNARMED SECURITY GUARDS)
We currently have a position for a full-time or part-time security officer available. Training and uniforms will provided. We offer flexible working hours and have shifts any day of the week. Our pay scale is competitive. Email your resume and potential work hours to apply.

Requirements
-Professional appearance & attitude
-Detail oriented
-*Communication Skill Requirement*
-*Physical Requirement*
-*Technology Requirement*
-At least 18 years of age
-Access to transportation

Security Guard Template 2 (Security Guard)
Responsibilities
* Monitor and report flow of people on client property.
* Monitor and inform any illegal or incorrect activity.
* Give protection for individuals and property.
* Take control of emergency conditions and inform to authorities as appropriate.

Job requirements
* Proficient in English.
* Respond to emergency conditions fast and appropriately.
Technology Requirement
Physical Requirement
* Can work flexibly and/or late night hours as needed.
* Meet requirements for professional conduct and ethics.
Communication Skill Requirement

Send resumes and propose interview time/dates via email.

Security Guard Template 3 (Security Officer)
We're looking for security guards for a local office park.

Duties:
* Report suspicious things and look out for felony acts or law infractions at or near assigned post that may be a danger to the property, client or workers at the site
* Report all incidents as required

Requirements:
Communication Skill Requirement.
* Capability to perform important tasks of the position.
****Technology Requirement****
****Physical Requirement*.**
* Capacity to maintain satisfactory attendance standard

If you're interested in this posting send us your resume and list a few hours for a sit-down interview. We will correspond by email.

Security Guard Template 4 (HIRING UNARMED SECURITY GUARDS)
Hiring UNARMED SECURITY GUARDS for a construction site!

Overview:
We are looking for guards to keep materials, tools, and trailers secured in *city*. You are expected to patrol the site and prevent vandalism and theft while on duty. Guards must ***Technology Requirement**** each day and report suspicious or criminal activity.

Requirements:
- High level of integrity
- ***Communication Skill Requirement****
- ***Physical Requirement****

Reply to this ad with your resume plus your earliest start date and a member of our team will contact you.

Security Guard Template 5 (Event Security)
We are seeking qualified applicants for UNARMED security officers to staff local events.

MEET THE FOLLOWING QUALIFICATIONS:
-***Physical Requirement***
-Bring and own a flashlight and a pair of boots
-Carry and use a pair of handcuffs
-High School Diploma are equivalent
-***Communication Skill Requirement***
-***Technology Requirement***

Note: Veterans/reservist background is a plus

EMAIL YOUR RESUME AND TYPICAL WEEKLY SCHEDULE FOR CONSIDERATION

Security Guard Template 6 (Hiring Security Guards)
HIRING *UNARMED* SECURITY GUARDS FOR A CLUB.
PAID IN CASH WEEKLY.

We are looking for security officers that can:
- Check guest I.D.s upon entry
- ***Physical Requirement***
- Frisk/pat down guests for weapons

Job Description:
- ***Technology Requirement***
- ***Communication Skill Requirement***
- Report unusual or suspicious activity to managers
- Must be 18 years of age

If you are qualified to this position contact us soon with your workday preferences.
PLEASE EMAIL RESUMES FOR A RESPONSE

Security Guard Template 7 (Unarmed Security)
Our golf club is searching for security professionals in *City*

JOB: Unarmed Security Guard

QUALIFICATIONS:

- ***Technology Requirement***
- Minimum age of 18 years old,
- High School Diploma or Equivalent
- ***Communication Skill Requirement***
- ***Physical Requirement***

-Duties include…
Enforce parking rules and regulations
Report incidents and suspicious activity
Look and monitor doors and gates

PLEASE EMAIL ALL RESUMES AND SPECIFY FULL OR PART-TIME

Security Guard Template 8 (UNARMED GAURDS)
Join our team if you're a security professional seeking a full-time or part-time position! We are a local warehouse and delivery company operating in *City*.

REQUIREMENTS:
• Must be at least 18 years of age.
• ***Physical Requirement*.**
• Must meet, follow, and maintain company policy at all times.
• Must pass a background check.
• ***Communication Skill Requirement*.**
• Must have a High School Diploma or GED.
• ***Technology Requirement*.**

Join our team today! Tell us how many hours you'd like to sign up for! Submit resumes by email!

Security Guard Template 9 (SECURITY GUARD JOBS)
FULL OR PART TIME SECURITY GUARD OPENING
Location: *City*

We are hiring security guards for corporate offices in *city*. You are expected to patrol entry points and verify I.D.s upon entry. Work may involve contacting emergency services, responding to fire alarms, or interviewing suspicious people.

DAILY FUNCTIONS:
- Office patrols to deter criminal activity.
- ***Technology Requirement*.**
- Activity reporting to investigate and record suspicious persons.

MINIMUM QUALIFICATIONS:
- Must be at least 18 years of age.
- ***Physical Requirement*.**
- ***Communication Skill Requirement*.**
- Must have a High School Diploma or GED.

Interested in these positions? Send us an email with your resume and a few possible dates for an interview.

Security Guard Template 10 (Retirement Community Residential Security)
Security officers wanted for part-time and full-time work at a retirement community in *City*. Email resumes and say part-time/full-time to express interest.

Position Summary: This role involves responding to emergencies, offering assistance, as well as monitoring the security to ensure resident safety.
Qualifications:
- ***Physical Requirement***
- ***Technology Requirement***
- Detail-oriented, and can multitask
- ***Communication Skill Requirement***

Duties:
- Record information on units, keys, and deliveries
- Monitor security of the buildings
- Maintain resident roster: Use and maintain current resident information
- Enforce policies such as parking policies and amenity reservations

Security Guard Template 11 (Security Officers Wanted)
We are a security company looking for new guards that can join our ranks. Our business contracts locally in *City* and has several upcoming openings.

We want our team members to have the following:

*Knowledge of security service, defense, etc.
*High school diploma or GED
*Attention to detail
* ***Physical Requirement***
* ***Technology Requirement***
* ***Communication Skill Requirement***

Please email your resume or summary of experience and suggested work hours for review.

Security Guard Template 12 (Unarmed Security Officer)
NEW OPENINGS for Security Guards in *City* *State*. Contact us by email with your resume and start date.

Professional duties:

*Conducting patrols and security checks.
*Maintain consistent attendance.
*Responding to alarms as needed.
* ***Technology Requirement***
*Monitor, address, and report fire & safety hazards.
*Maintain security of a complex, building and/or premises.

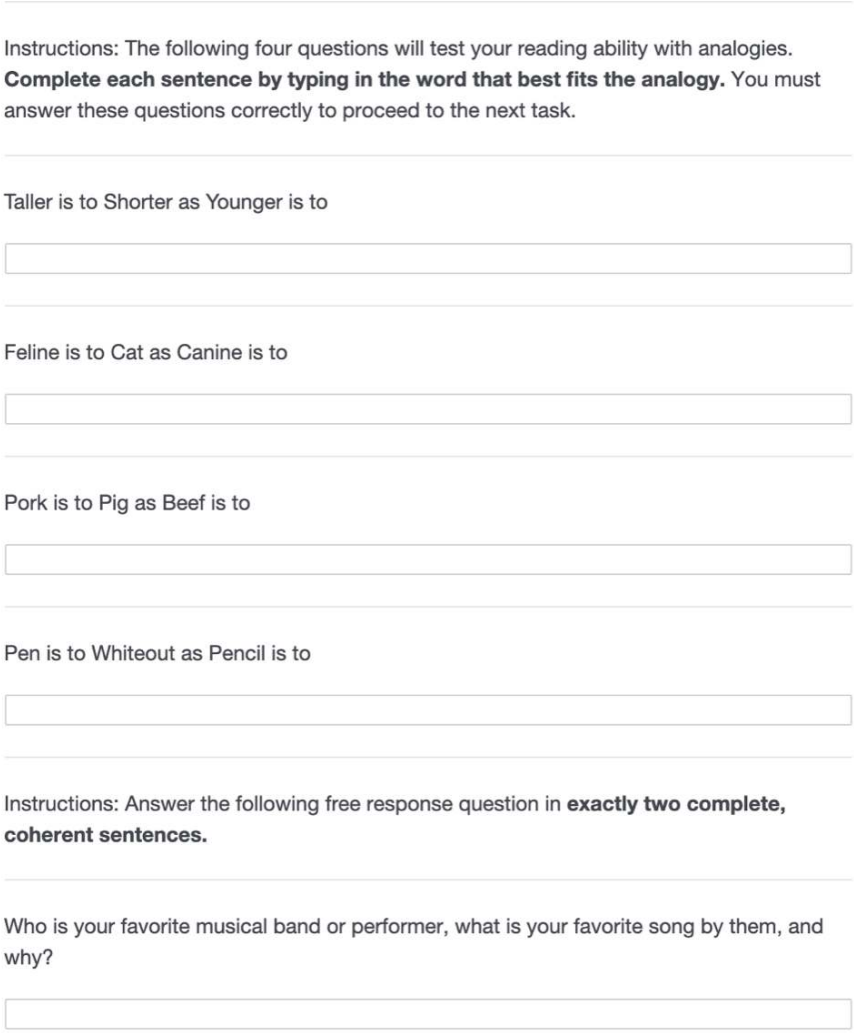
Requirements:

*Must be at least 18 years of age.
*Must have High School diploma or GED equivalent.
* ***Communication skill Requirement*.**
* ***Physical Requirement*.**

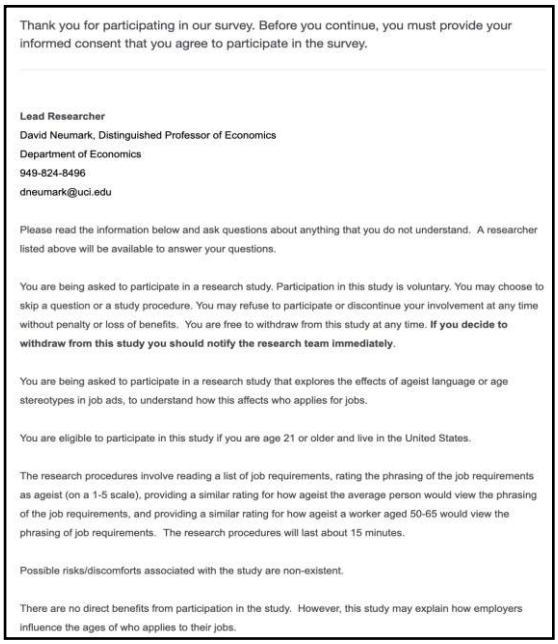
Veterans encouraged to apply but previous service is NOT required!

Appendix B (online)

Appendix Figure B1: Manipulation Checks



Appendix Figure B2: Informed Consent



Thank you for participating in our survey. Before you continue, you must provide your informed consent that you agree to participate in the survey.

Lead Researcher
David Neumark, Distinguished Professor of Economics
Department of Economics
949-824-8496
dneumark@uci.edu

Please read the information below and ask questions about anything that you do not understand. A researcher listed above will be available to answer your questions.

You are being asked to participate in a research study. Participation in this study is voluntary. You may choose to skip a question or a study procedure. You may refuse to participate or discontinue your involvement at any time without penalty or loss of benefits. You are free to withdraw from this study at any time. **If you decide to withdraw from this study you should notify the research team immediately.**

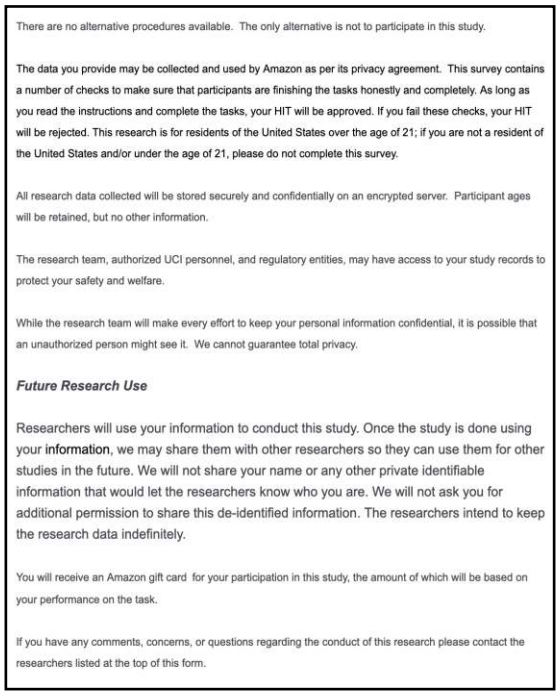
You are being asked to participate in a research study that explores the effects of ageist language or age stereotypes in job ads, to understand how this affects who applies for jobs.

You are eligible to participate in this study if you are age 21 or older and live in the United States.

The research procedures involve reading a list of job requirements, rating the phrasing of the job requirements as ageist (on a 1-5 scale), providing a similar rating for how ageist the average person would view the phrasing of the job requirements, and providing a similar rating for how ageist a worker aged 50-65 would view the phrasing of job requirements. The research procedures will last about 15 minutes.

Possible risks/discomforts associated with the study are non-existent.

There are no direct benefits from participation in the study. However, this study may explain how employers influence the ages of who applies to their jobs.



There are no alternative procedures available. The only alternative is not to participate in this study.

The data you provide may be collected and used by Amazon as per its privacy agreement. This survey contains a number of checks to make sure that participants are finishing the tasks honestly and completely. As long as you read the instructions and complete the tasks, your HIT will be approved. If you fail these checks, your HIT will be rejected. This research is for residents of the United States over the age of 21; if you are not a resident of the United States and/or under the age of 21, please do not complete this survey.

All research data collected will be stored securely and confidentially on an encrypted server. Participant ages will be retained, but no other information.

The research team, authorized UCI personnel, and regulatory entities, may have access to your study records to protect your safety and welfare.

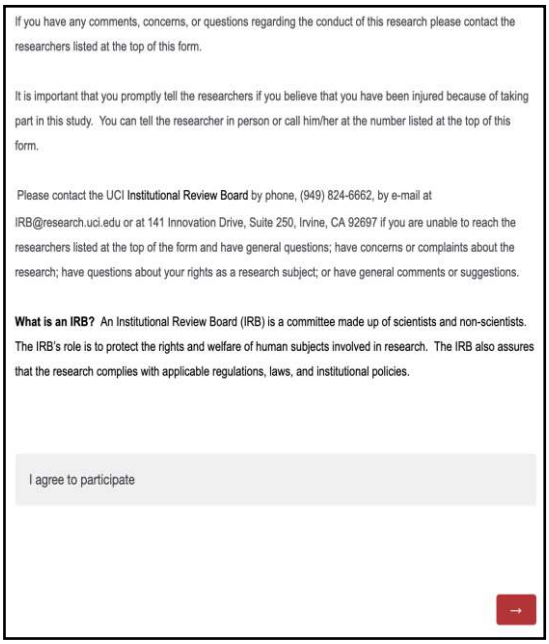
While the research team will make every effort to keep your personal information confidential, it is possible that an unauthorized person might see it. We cannot guarantee total privacy.

Future Research Use

Researchers will use your information to conduct this study. Once the study is done using your information, we may share them with other researchers so they can use them for other studies in the future. We will not share your name or any other private identifiable information that would let the researchers know who you are. We will not ask you for additional permission to share this de-identified information. The researchers intend to keep the research data indefinitely.

You will receive an Amazon gift card for your participation in this study, the amount of which will be based on your performance on the task.

If you have any comments, concerns, or questions regarding the conduct of this research please contact the researchers listed at the top of this form.



If you have any comments, concerns, or questions regarding the conduct of this research please contact the researchers listed at the top of this form.

It is important that you promptly tell the researchers if you believe that you have been injured because of taking part in this study. You can tell the researcher in person or call him/her at the number listed at the top of this form.

Please contact the UCI **Institutional Review Board** by phone, (949) 824-6662, by e-mail at IRB@research.uci.edu or at 141 Innovation Drive, Suite 250, Irvine, CA 92697 if you are unable to reach the researchers listed at the top of the form and have general questions; have concerns or complaints about the research; have questions about your rights as a research subject; or have general comments or suggestions.

What is an IRB? An Institutional Review Board (IRB) is a committee made up of scientists and non-scientists. The IRB's role is to protect the rights and welfare of human subjects involved in research. The IRB also assures that the research complies with applicable regulations, laws, and institutional policies.

I agree to participate

→

Appendix Figure B3: Demographic Questions