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Age-based discrimination is considered undesirable, yet we know little about age stereotypes and their effects on honesty and trust. To investigate this aspect of ageism, we presented older adults (over age 50) and younger adults (under age 25) with incentivized belief elicitation tasks about anticipated interaction behaviors and then a series of same, different, and unknown-aged group interactions in a strategic-communication game. All adults shared consensual stereotypes about uncooperative younger adults and cooperative older adults that demonstrated "wisdom of crowds". While the out-group was consistently stereotyped as relatively different and more dishonest and suspicious than observed to be, the in-group was neither consistently stereotyped more accurately nor treated with more honesty and trust. Younger adults earned more by acting dishonestly with older adults and older adults earned less by trusting younger adults (despite stereotyping them as dishonest). We discuss how ageism is relevant to intergenerational cooperation in an aging society.

Keywords: ageism, intergenerational interaction, stereotype, discrimination, honesty, trust
JEL codes: A13, D03, J14

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1. Introduction

Age is a natural category used for social recognition and informing the choice of behavior. Both implicit and explicit age-associated cues automatically prime younger and older adults' ageist stereotyping and behaviors (Meisner, 2012). While stereotyping[1] and discrimination based on age have been portrayed as mostly problematic, the link between beliefs and behaviors has not been well explored. We consider whether ageist stereotypes and behaviors might economically help or harm people and evaluate expectations from the literature. Our experimental approach used incentivized belief elicitation tasks and strategic-communication games that identified interaction partners according to age group membership. This allowed us to measure the relative accuracy of age stereotypes held by younger and older adults and evaluate the economic impact of those stereotypes and their discriminant effects on behavior.

Stereotypes about age-groups have been shown to negatively affect interactions between adults (Bargh, Chen, & Burrows, 1996; McConnell & Leibold, 2001), providing emotional (Levy, Ashman, & Dror, 1999-2000) and physiological distress (Levy et al., 2000). Age-based attributions have been associated with under-valuation of older adults applying for jobs (Finkelstein, Burke, & Ragu, 1995; Bendick, Brown, & Wall 1999), and result in perceptions and experiences of hiring and workplace discrimination against members of those age groups (Gregory, 2001; Snape & Redman, 2003). These practices and experiences impose costs on society and firms: Medicare and special programs targeting older people amount to approximately $300 billion in costs annually while opportunity costs and litigation costs associated with older worker employment discrimination total over $60 billion annually (PIU, 2000; Palmore, 2005).

[1] We define stereotypes as "beliefs about the personal attributes of a social group" (Ashmore & Del Boca, 1981).

While it has been implied that age stereotypes are harmful because they are unjustified or inaccurate, Jussim's (2012) comprehensive review of the stereotype literature notes (p.282) that most stereotype studies have provided "virtually no evidence demonstrating accuracy (see review by Brigham, 1971, Mackie, 1973; Ryan, 2002)". Though age discrimination has been a topic of research for experimental economists (Holm & Nystedt, 2005; Charness & Villeval, 2009), the accuracy and impact of age stereotypes and their link to discrimination has not yet been directly addressed in economic experiments. To address this understudied topic, we invited younger and older adults to the laboratory to participate in an incentivized experiment exploring the accuracy and economic effects of *ageism*: behavior affected by age stereotypes.[2]

To study age stereotypes we used a set of incentive compatible belief elicitation tasks that we refer to as the "Guess game". Our Guess game asked participants to make guesses (that would later be scored and paid for accuracy) about behavior in a strategic-communication game. Specifically, we asked participants to predict the frequency of anticipated sender and receiver behaviors in same age group (the "in-group"), other age group (the "out-group"), and unknown-aged group interactions of the "Bluff-Challenge" game. These six guesses (2x3) informed us of *consensual* and *personal stereotypes*. Consensual stereotypes are the aggregate beliefs about a particular group (or beliefs about differences between groups). Consensual stereotypes are measured by averaging what all (younger and older) perceivers state they believe about a particular group's behavior propensity (e.g. what all perceivers think about younger adult bluffing or older adult challenging). Below, set A predictions about "wisdom of crowds" concern the relative accuracy of these consensual stereotypes. Consensual stereotypes receive considerable attention among lay people and in the social science literature (e.g. Allport, 1979;

[2] This definition of ageism is broader than the more commonly used one about discrimination directed at older adults; as in the title of Nelson's (2002) book, *Ageism: Stereotyping and Prejudice Against Older Persons*.

Jost & Banji, 1994; Pickering, 2001) because they represent the beliefs that are most widely shared. Personal stereotypes are beliefs about groups held by individuals. This is the level of analysis used to test predictions in sets A- D below.

Subsequent behaviors and monetary earnings in the Bluff-Challenge game informed us of age-based discrimination, economic consequences, and whether individuals acted consistently with their personal beliefs. The accuracy of beliefs and their correspondence to discriminant behavior informs us whether individuals practiced "statistical discrimination" (Phelps, 1972; Arrow, 1973) based on empirically informed beliefs (maximizing-money with a best response) or taste-based discriminated (Becker, 1957).

1.1. Social Categorization and Stereotyping

Humans engage in social categorization and construct social stereotypes around constellations of traits believed to be true of individual members of a social category (Ashmore & Del Boca, 1981) like age. Stereotypes help people cope with social challenges, such as identifying, encoding, and recalling members of other groups, making sense of what qualifies a social group, and informing decisions of how to deal with them (e.g., Tajfel, 1981; Cuddy & Fiske, 2002). One of these social challenges, relative to our study, is managing communication and trust with members of different age groups in dyadic social dilemmas that provide incentive for non-cooperation.

"Mixed stereotypes" are sets of correlated stereotypes attributed to people based on their social category (Fiske et al., 2002) that have been verified cross-culturally (Cuddy, Norton, & Fiske, 2005). We consider stereotypes about *cooperativeness* in a strategic-communication setting to involve mixed stereotypes such that cooperators are honest and trusting, and non-cooperators are dishonest (by bluffing) and suspicious (by challenging). Mixed stereotypes about

social groups may be transmitted via popular cultural sources[3] and provide individuals salient and reliable benchmarks to anchor their beliefs on. Indeed, consensual stereotypes often demonstrate what Surowiecki (2004) dubbed "wisdom of crowds": the average of individuals' estimations tends to balance out over- and under-estimation errors of individuals and thus corresponds to actual behaviors of the targets better than the majority of individuals' stereotypes (Jussim, 2012; Chan et al., 2012). Where "wise" consensual stereotypes are available, individuals from both within and outside of a group may prefer to stereotype it in the same way based on "shared beliefs" derived from consensual stereotypes, rather than from their less accurate personal beliefs.

1.2. Intergroup Bias

Social identity theories (e.g., Tajfel, 1981; Hogg & Abrams, 1993) suggest that people make a fundamental division of social groups into "us" (in-groups) and "them" (out-groups) so as to build concepts of themselves and others vis-à-vis group membership and reduce uncertainty about expected behaviors. A natural consequence of these social divisions is creation of belief in an inter-group contrast (Brewer & Brown, 1998) where stereotypes about the in-group are relatively different than stereotypes about the out-group.

Extreme stereotyping can occur between groups because it magnifies inter-group differences making them more identifiable. In the absence of exposure to individuating information about group members, out-groups are perceived to be less variable than in-groups, a phenomenon called the "out-group homogeneity effect" (Park & Rothbart, 1982) or the "they're all the same" effect (Bothwell, Brigham, & Malpass, 1989; Meissner & Brigham, 2001). On the

[3] Discussions of how ageism is transmitted via advertising, children's literature, cartoons, greeting cards, popular songs, literature, TV and movies are found in Palmore, Branch, and Harris (2005).

other hand, people typically have relatively more experience sampling their in-groups and thus tend to view the in-group as more heterogeneous and containing a mix of characteristics along a spectrum. This leads to relatively moderate stereotypes about the in-group. While these tendencies may lead younger adults to hold relatively extreme stereotypes about older adults, the greater sampling experience of longer-lived older adults (who were once young) makes them unlikely to hold relatively extreme stereotypes about younger adults.

1.3. Age-based Stereotyping and Discrimination

Adults of all ages hold distinct ageist stereotypes about both older and younger adults (Palmore, 1999; Zebrowitz & Montepare, 2000). When young adult college students were given the task of describing a group of older adults, they used more simple and extreme descriptions than they did when describing other young adults (Linville, 1982). Kite, Deaux, and Miele (1991) found that older people were believed less likely to possess agentic (i.e., assertive, competent, self-profiting) characteristics. On the other hand, young adults are typically viewed as delinquent, self-absorbed, and lacking self-control (Zebrowitz & Montepare, 2000). These and other ageist beliefs about "younger adults" and "older adults" may derive from social constructs (Levy, 2009), or adaptive responses (Kurzban & Leary, 2001) to associated weaknesses,[4] costs,[5] perceived challenges, and threats[6] anticipated from age groups. While the literature tends to suggest that age stereotyping is quite common and that ageism is costly, it is unclear whether age

[4] Younger (Zebrowitz & Montepare, 2000) and older (Cuddy et al., 2005) adults are viewed as incompetent.
[5] It may be costly to support older adults and seniority-based salaries (Butler, 1989), and it may be costly to support young adults (Marche, 2012).
[6] Age-group threats may be perceived to derive from the risky behaviors youth engage in that could harm self and others (Gross & Hardin, 2007; Steinberg, 2008), from physical disability (Park, Faulkner, & Schaller, 2003) and from other visible features of aging often fallaciously perceived to correlate with increased vulnerability to infectious disease (Faulkner et al., 2004; Duncan & Schaller, 2009).

stereotypes necessarily affect age-discriminant cooperative behaviors, and if so, who is harmed in the process.

2. Experimental Games and Hypotheses

2.1. Guess game.

Our incentivized Guess game elicited age stereotypes by asking participants to make guesses about how often target groups of senders (e.g. younger or older) sent false messages and how often target groups of receivers challenged message veracity when targets were knowingly engaged in interactions with members of the perceiver's group. Participants additionally made guesses about senders and receivers of an unknown-aged group who would be knowingly engaged in interactions with members of an unknown-aged group.

Guesses about both bluff and challenge propensity were made on a scale ranging from never, 0% of the time, to always, 100% of the time. Participants made guesses about the anticipated interaction behaviors of senders and receivers from same, different, and unknown-aged groups participating in the experiment, but who would not interact with the guess makers directly - thereby precluding the possibility that guesses would have reason to directly influence the behaviors subsequently chosen in Bluff-Challenge game interactions. To incentive guesses we used a quadratic scoring rule[7] that qualifies as a "proper scoring rule" (e.g., Aczel & Pfanzagl, 1966; Savage, 1971) or "strictly proper" scoring rule (Winkler & Murphy, 1968). Participants were told that they could earn money if their guess is within 1/6th (16.667%) - above or below, of the observed behavior, else they would not be able to earn money with their guess. Our incentive compatible Guess game was easy to understand and the graphical and

[7] Guess payoffs were paid according to the formula: maximum{0, $10(1 – 36(guess – actual)^2)}, where guess and actual are contained within the unit interval.

numeric feedback of guess accuracy provided an easy-to-interpret form of contextualized information about the various types of interactions between age groups.

2.2. Bluff-Challenge game.

The Bluff-Challenge game belongs to a class of strategic-communication games with asymmetric information called "Bluffing games" (Holm, 2010). In the game (see Figure 1), the sender (S) witnesses a computerized coin flip in which nature (N) first selects the state $\in \{2,4\}$ with equal probability. The state determines the resources that are available to the sender and receiver. The sender observes the state and sends a message $\in$ {"two to split", "four to split"} to the receiver (R). If the state is 2, the true message "two to split" is sent, but if the state is 4, the sender can either send the true message "four to split" or else bluff by sending the false message "two to split". Upon seeing the message "two to split" the receiver must take action $\in$ {Accept (A), Challenge (C)}, accepting or challenging the message veracity. If a receiver sees the message "four to split" then the receiver can only accept. When accepting a message, the receiver's payoff does not strictly depend upon the state, but also upon the message: the receiver's payoff is 2 when the message is "four to split" and 1 when the message is "two to split". The receiver's payoff is 0 when challenging a true message, but is 4 when challenging a false message. The sender's payoff is the state minus the receiver's payoff. By this design the sender has economic incentives to send dishonest messages and the receiver has economic incentives to challenge dishonest messages.

While the Bluff-Challenge game bears some similarities to strategic-communication games of Gneezy (2005) and Sanchez-Pages and Vorsatz (2007), it differs by offering a single unique mixed equilibrium prediction that is interior (more than never but less than always): the sender bluffs a third of the time when the state is 4 and the receiver challenges a third of the time

when the message is "two to split". These strategies result in expected payoffs of 5/3 for a sender and 4/3 for a receiver.

We chose the Bluff-Challenge game because it models the resource division opportunities found in relationships with unsupervised work that are subject to the uncertainty of nature, require voluntary and honest contributions to partnership, but also offer incentive for dishonesty and suspicion. We assume that the cooperation dilemma modeled by this strategic-communication game presented a recurrent selection pressure among ancestral humans and continues to be relevant today.[8] Outside of the laboratory, analogues to the game interactions are often encountered between younger and older coworkers or family members and invoke honesty, deception, trust, and suspicion.[9] Unlike the aforementioned strategic-communication games, where senders always have bluffing opportunities, the opportunities for bluffing modeled in the Bluff-Challenge game arise occasionally by chance, are not affected by age-dependent performance, and are equally available in same, different, or unknown-aged group interactions – providing conditions for identifying when and how ageist beliefs and discrimination occur. At the same time, receivers do not always have opportunity to challenge, but can always elect an option that gives a certain payoff.

[8] Cooperative distributed foraging with voluntary sharing is a hallmark of our species (Gurven, Hill, Kaplan, Hurtado, & Lyles, 2000) and has been generated in the laboratory (Kaplan et al., 2012).

[9] In modern society, cooperative labor and contribution pooling with redistribution arrangements are common, especially among work and family relations. Consider restaurant workers who agree to pool their tips: individual waiters privately earn their tips from restaurant patrons and contribute all their earnings to a central place (e.g. a tip jar) to be divided equally with co-workers at the end of a shift. Family members sharing use of a car might agree to individually filling the gas tank when they drive it and find that it gets to "empty". In these examples exploitation by "free-riding" coworkers and family members occurs when individuals choose to embezzle their resources and under-contribute what was to be shared (as expected). In uncertain situations like these it is risky to accuse a suspected coworker or family member of cheating. When unfounded, cheater accusations, challenges, and audit demands directed at partners could damage established trust and ruin the possibility of successful future interactions, thereby imposing high risks to the challenger.

2.3. Hypotheses

To address questions concerning stereotyping, stereotype accuracy, the link between stereotypes and behaviors, and the economic effects of ageism we tested predictions derived from several literatures. We consider (**A**) "wisdom of crowds", (**B**) "mixed stereotypes", (**C**) "social identity theory", and (**D**) "costs of ageism" perspectives informing the following predictions about age-based stereotypes and interactions.

A. 1. Consensual stereotypes about age groups should be more accurate than personal stereotypes for the majority of individuals.

2. Younger and older adults' personal stereotypes about an age group should not differ.

B. 1. Participants' stereotyping should systematically link between both characteristics investigated (i.e., where bluff propensity positively correlates with challenge propensity) to form a single dimension of "(non)cooperativeness".

C. 1. Compared to the in-group, the out-group should be stereotyped with attributions that are relatively different.

2. Compared to how they stereotype themselves, younger adults should stereotype older-adults with relatively extreme attributions, however, older adults should not stereotype younger-adults with relatively extreme attributions.

D. 1. Relatively different stereotypes about the out-group should be inaccurate and costly.

2. Individuals with relatively different stereotypes about the out-group show relatively different behavior with the out-group that is costly.

3. Method

3.1. Participant samples

Our participant samples were non-randomly drawn from independently living healthy populations in Orange County California. Using print and electronic advertisements circulated in their communities, we recruited older adults (with minimum required participation age of 50) from communities in Seal Beach and Laguna Woods and younger adults (with maximum required participation age of 25) from a standard undergraduate subject pool at Chapman University. Advertisements and instructions explained to participants that they would engage in a laboratory activity that involved using computers, making decisions, and interacting over a computer network. We assured participants that they would not be deceived by the experimenters and would have the opportunity to earn money based on their decisions and the decisions of others. Interested participants contacted the experimenters and made arrangements to be contacted at a later time in an attempt to coordinate a time and date for participation in the experiment. Given that the laboratory and computer network used for this study was not capable of running the experiment with more than 40 people (20 from each group), we scheduled our experiment upon recruiting a sufficient number of interested participants.

Twenty younger adults were sampled (9 female, 11 male) and 19 reported their age (ranging from 18 to 22; $M = 18.89$, $SD = 1.10$). Twenty older adults were sampled (13 female, 7 male) and 19 reported their age (ranging from 51 to 84; $M = 70.11$, $SD = 10.05$). The average difference between participants in the younger vs. older age group was 51.22 years, roughly

equivalent to the 50-year age difference of two standard American generations.[10] All participants participated simultaneously in a single session.

3.2. Control variables: progressive matrices and subjective socio-economic status ladder.

To verify whether participants were cognitively healthy adults (despite expected age-related declines), we administered an objective test of matrix reasoning based on Raven's-like progressive matrices. For this test we developed two sets of 12 progressive matrices using the Sandia National Laboratory (2012) Generated Matrix tool (see Appendix B). By systematically manipulating shape, shading, orientation, size, and number of relations in a matrix problem, we replicated the manipulations identified in Raven's *C* and *D* sets of the Standard Progressive Matrices (Raven, Court, & Raven, 1998) by Matzen et al. (2010). Thus, our progressive matrices mimicked sets *C* and *D* of Raven's Progressive Matrices and other similar matrix problems that have been used for decades to study analytical intelligence (Carpenter, Just, & Shell, 1990) and fluid intelligence (Cattell, 1963). Demonstration of expected adult levels of analytical and fluid intelligence is of interest to this study because evidence of significantly lower than expected levels raises concern that individuals were unable to evaluate the games and select goal pursuant strategies.

Works with a wide range of ages reviewed by Salthouse (1992) showing a -.61 median correlation between age and Raven's score, and later work showing a -.57 correlation (Salthouse, 1993) have indicated that normal cognitive decline is associated with healthy aging. Performance scores from the matrix reasoning test were regressed on age using OLS regression. A normal rate of cognitive decline associated with age predicted the age effect on performance that we

[10] As of 2008, the average generation length in the United States was 25 years, up 3.6 years since 1970 (Mathews & Hamilton, 2009). The standard American career-span is 49 years, starting at the beginning of legal adulthood (18) and ending around the "normal retirement age" of 67 (Social Security Administration, 2009).

observed (β = -.488, R^2 = 0.238, $F(1, 34) = 10.641$, p = .003), supporting the conclusion that our participants where all cognitively healthy adults that should have been capable of evaluating and playing the games. Additionally, we failed to find correlation between performance scores and (i) accuracy of guesses, (ii) payoffs from guesses, or (iii) payoffs from interactions.

To verify whether our younger and older adult samples differed in socio-economic status (SES) we administered a subjective scale of socio-economic status based on similar instruments used by Adler et al. (2000), and Piff et al. (2010), where participants are presented with a figure of a ladder containing 10 rungs representing people from their society with different levels of education and income (see Appendix B). To use the instrument for self-report, participants first read instructions, inducing an anchoring effect based on subjective perceptions of relatively high or low social-class rank, then selected the rung that represented where they perceived they stood relative to others.

Younger adults reported a mean SES position of 5.84 (SD =1.57) and older adults a mean SES position of 7.11 (SD = 1.37) on the ten point subjective socioeconomic status ladder. We failed to find correlation between the reported SES and (i) accuracy of guesses, (ii) payoffs from guesses, or (iii) payoffs from interactions. We observed that between groups variances did not differ and there was no significant difference[11] for self-reported socioeconomic status (D = 0.3316, p = .186), supporting the conclusion that our younger and older participant groups did not differ in socioeconomic status.

[11] We used the Kolmogorov-Smirnov test for independent samples because the test is based on ranks and our subjective socioeconomic status ladder asks participants to rank their position on the ladder's rungs, creating ordinal (though not necessarily interval) data for which a comparison of means is not necessarily appropriate.

3.3. Procedure

Younger and older participants were seated in visually isolated individual workstations separated by partitions in a computer laboratory. Prerecorded instructions with audio and video were presented (see Appendix B). A quiz to ensure comprehension was administered, and the correct answers to the quiz were reviewed after the instructions.[12] Questions were solicited and answered individually and privately before progressing with further tasks. All participants interacted with each other via a software interface using a computer network. Font size as displayed on computer screens was optimized for older adults' usability (Bernard, Liao, & Mills, 2001). Screenshots of the Guess game, feedback for the Guess game, and the Bluff-Challenge game are available in Appendix A. Participants were aware that there were two age groups present and that they would be interacting with members of these age groups in the experiment. Participants made guesses (which we refer to throughout as "stereotypes") about the bluffing and challenging behaviors of sets of others in the experiment of unknown age, the same age group, or the other age group. Thereafter, participants interacted in a series of dyadic strategic-communication interactions, all taking the role of "Sender" for eighteen interactions and thereafter taking the role of "Receiver" for eighteen interactions. The computerized software queued and distributed sender messages to appropriate receivers such that all participants took sender and receiver roles in the same order. Personal identities of those involved in interactions were never revealed. Each participant was told whether they were a sender or receiver and whether the person they were interacting with was of (1) unknown age (2) the same age group, or (3) the other age group. With six different interactions per group pairing per role ($2\times3\times6$), the interaction task was iterated a total of 36 times (with no feedback provided in between

[12] Quiz scores were not recorded and remained confidential.

interactions), each time with a participant not previously interacted with in the same role. This allowed us to evaluate whether participants were using mixed or pure bluffing and challenging strategies. At the conclusion of all 36 of these interactions, participants were informed about the computed accuracy of their stereotypes and results of their interactions. While participants waited for their payments to be computed, they completed a progressive matrix task containing 24 matrices and the subjective socio-economic ladder. It took participants approximately 60 minutes to complete the procedure reported in this paper.[13] A lottery was used to select a single guess and interaction from each game for payment at a rate of two US dollars to every one experimental unit. Participants were paid at the conclusion of the experiment and earned an average of $37.3 (*SD* = 9.52).

4. Results

The results below evaluate how younger and older adults stereotyped, and whether stereotypes were shared, accurate, and affected behaviors. Finally we evaluated whether the economic effects of these stereotypes in the Guess game and correlated interaction behaviors from the Bluff-Challenge game (a zero sum game) were economically harmful to stereotypers or to the groups they interacted with. Reported stereotypes are grouped by target and reported game behavior is constructed by averaging all decisions by a participant for each interaction group. All reported statistical tests consider a participant to be a single observation.

4.1. Consensual and Personal Age-based Stereotypes

Consensual and personal stereotypes about targets' non-cooperative behaviors are reported in Table 1 along with targets' actual (observed) behaviors and stereotype discrepancies

[13] Our experiment also was designed to include a "second phase" which repeated the tasks in the "first phase". During the unreported second phase a participant chose to terminate participation and leave the laboratory, invalidating intended experimental procedures for participants in the second phase (but not the first phase).

from actual behaviors. We used a benchmark criteria established by Jussim (2012, p.319) to qualify stereotypes as "accurate" (where their discrepancies are within 10% of actual behavior) and as "near misses" (where their discrepancies are greater than 10% but less than or equal to 20% off from actual behavior).

Consensual stereotypes about younger adults' were "near misses" and consensual stereotypes about older adults were "accurate" while the consensual stereotypes about targets from known-aged groups were "near misses". Consistent with (**A.1**), consensual stereotypes about age groups corresponded to actual behaviors better than did most individuals' personal stereotypes: while only 50% of personal stereotypes about younger adults' uncooperativeness (specifically 28% of individual bluff stereotypes, 72% of individual challenge stereotypes, N = 40) were inferior, 68% of personal stereotypes about older adults' uncooperativeness (specifically 55% of individual bluff stereotypes, 80% of individual challenge stereotypes, N = 40) were inferior. The distribution of stereotypes is illustrated in Figure 2.

We observed a difference between consensual stereotypes about younger adults' uncooperativeness and consensual stereotypes about older adults' uncooperativeness. Specifically, differences between consensual stereotypes about younger and older adults' bluff propensity ($M_{\text{diff}} = .265$, $SD = .195$) and differences between consensual stereotypes about their challenge propensity ($M_{\text{diff}} = .236$, $SD = .192$) were both significant ($Z = 5.493$, $p < .001$). Both younger and older adults' stereotypes about age-groups were based on "shared beliefs", as evidenced by their stereotyping of younger adults as less cooperative than older adults (see Table 1). Consistent with **A.2**, we failed to find significant differences in stereotypes about age groups between perceivers' age groups.

To evaluate whether the bluff and challenge stereotypes made of a target group were correlated, we examined Spearman's rank correlation coefficients. Stereotypes about the in-groups' bluff propensity were positively correlated with stereotypes about their challenge propensity ($\rho = .6144$, $p < .001$). Stereotypes about out-groups' bluff propensity were positively correlated with stereotypes about out-groups' challenge propensity ($\rho = .8487$, $p < .001$). Additionally, stereotypes about unknown-aged groups' bluff propensity were positively correlated with stereotypes about their challenge propensity ($\rho = .6500$, $p < .001$). These correlations support the prediction (**B.1**) that bluff and challenge stereotypes are systematically linked to broader attributions of (non)cooperativeness.

A two-way repeated measures analysis of variance was conducted that examined the personal stereotype discrepancies of perceivers according to perceiver age group and age group of target. The interaction term in this ANOVA captures intergroup (in-group out-group) effects. We ran this test twice, once for bluff stereotype discrepancies and once for challenge stereotype discrepancies. For bluff stereotype discrepancies, the main effect of target group was insignificant ($F(1,38) = 1.79$, $p = .189$, $\eta^2=.022$). The main effect of perceiver group was significant ($F(1,38) = 6.42$, $p = .016$, $\eta^2=.080$) as was the interaction (in-group out-group) effect ($F(1,38) = 6.76$, $p = .013$, $\eta^2=.064$). These results stem from the fact that younger adults' stereotypes about younger adults' bluff propensity were significantly less accurate than their stereotypes about older adults' bluff propensity, while older adults' stereotype accuracy did not significantly differ across targets (see Table 2 c). For challenge stereotype discrepancies, the main effect of target group was marginally significant ($F(1,38) = 3.11$, $p = .086$, $\eta^2=.036$). The main effect of perceiver group was significant ($F(1,38) = 10.71$, $p = .002$, $\eta^2=.125$) as was the interaction (in-group, out-group) effect ($F(1,24) = 37.68$, $p < .001$, $\eta^2=.198$). These results are

due to (i) both younger and older adult stereotypers' significantly less accurate stereotypes about the out-group relative to the in-group and (ii) older adults inaccuracy in stereotyping younger-adults' challenge propensity (see Table 2 c). For the first ANOVA, the significant interaction term is due to in-group inaccuracy, but for the second ANOVA, it is due to out-group inaccuracy.

4.2. Different and Extreme Stereotypes about the Out-group

To evaluate whether participants' held relatively different stereotypes about the out-group's behavior propensity (**C.1**), we compared individuals' stereotypes made about their out-group's bluff and challenge propensities to stereotypes they made about their in-group's propensities.[14] Means of these results are reported for younger and older adult perceivers in Table 2 panel (a). Using matched-pair tests,[15] we observed that younger and older adult perceivers' hold relatively different stereotypes about their out-group.

To evaluate whether younger adults held relatively extreme stereotypes about the out-group's behavior propensity (**C.2**), we examined individuals' stereotypes: using matched-pair tests, extremeness of stereotype about the out-group was compared to extremeness of stereotype about the in-group. Specifically, we measured extremeness of a stereotype by evaluating how close it was to either "always" (100% of time) or "never" (0% of time) attributions. Means of these results are reported for younger and older adult groups in Table 2 panel (b). We observed that only younger adults held relatively extreme stereotypes about the out-group.

[14] We do not report results of unknown-aged group out-group contrasts which generally revealed similar patterns to those found with in-group out-group contrasts, albeit smaller differences and effects.
[15] A Shapiro-Wilk test rejects the null hypothesis that stereotypes are normally distributed and thus we report the results of the Wilcoxon matched-pairs signed-rank test unless otherwise stated.

4.3. Accuracy of and Payoffs from Stereotypes

We evaluated how the extent of *difference stereotyping* and *extreme stereotyping* from in-group out-group contrasts affected stereotype accuracy and payoffs (based on scored stereotypes). To assess "accuracy" we evaluated the absolute value of the discrepancy measure that we created by subtracting from the stereotype the actual behavior subsequently observed for the target group. Stereotype "discrepancy" is reported in Table 2 panel (c). Overall, both younger and older adults overestimated the out-group's bluff and challenge propensity. We also report the mean payoffs (determined by the quadratic scoring rule) of elicited stereotypes in Table 2 panel (d).

To test whether relatively different stereotypes about the out-group were inaccurate (**D.1)** we evaluated the relationships between *difference stereotyping* and stereotype accuracy. We found no evidence that relatively different stereotypes were inaccurate. *Difference stereotyping* of the out-group's bluff propensity was correlated with greater accuracy for younger adults (β = -.222, R^2 = .215, $F(1,18) = 4.942$, p = .039) but not for older adults. *Difference stereotyping* of the out-group's challenge propensity was correlated with greater accuracy for both younger and older adults (β = -.589, R^2 = .347, $F(1,18) = 9.552$, p = .006 and β = -.627, R^2 = .393, $F(1,18)$ = 11.643, p = .003, respectively).

To test whether relatively extreme stereotypes about the out-group were inaccurate (**D.1)** we evaluated the relationships between *extreme stereotyping* and stereotype accuracy. We found limited evidence of relatively extreme stereotypes being inaccurate. *Extreme stereotyping* of the out-group's bluff propensity was correlated with greater accuracy for older adults (β = -.970, R^2 = .941, $F(1,18) = 284.724$, $p < .001$), but not for younger adults. *Extreme stereotyping* of the out-group's challenge propensity was correlated with less accuracy for younger adults (β = .509, R^2 = .259, $F(1,18) = 6.291$, p = .022) while older adults' more extreme stereotypes of their out-

group's challenge propensity were more accurate (β = -.523 R^2 = .273, F(1,18) = 6.773, p = .002).

To test whether relatively different and extreme stereotypes about the out-group were costly (**D.2, D.3)** we evaluated the relationships between *difference stereotyping* and payoffs from those scored stereotypes, and between *extreme stereotyping* and payoffs from those scored stereotypes. *Difference stereotyping* of the out-group's bluff propensity had no significant relationship with payoffs for either younger adults or older adults. *Difference stereotyping* of the out-group's challenge propensity was significantly correlated with higher earnings for younger adults (β = .451, R^2 = .203, F(1,18) = 4.599, p = .046) but not for older adults.

Extreme stereotyping of the out-group's bluff propensity was correlated with higher payoffs for older adults (β = .891, R^2 = .794, F(1,18) = 69.168, p < .001), but not for younger adults. *Extreme stereotyping* of the out-group's challenge propensity was significantly correlated with cost for younger adults (β = -.481, R^2 = .231, F(1,18) = 5.420, p = .032) but not for older adults.

4.4. Differences in Group-discriminant Behavior

We found that participants demonstrated different behaviors when interacting with younger versus older adults (see Table 1). While the Wilcox signed-rank test indicated no significant difference in bluff behavior directed at the in-group as compared to the out-group for either younger adults (Z = -1.538, p = .124) or older adults (Z = 1.456, p = .1453), there were differences in challenge behavior. Younger adults challenged their in-group significantly more than the out-group (Z = 3.451, p < .001). Older adults' relatively greater challenging of their in-group was marginally significant (Z = 1.706, p = .088).

4.5. Ageism and Its Economic Consequences

To evaluate whether behaviors against the out-group (compared to the in-group) were relatively different or extreme (**D.2, D.3**), we measured between group differences in behavior propensity and in behavior extremeness with in-group out-group contrasts. To evaluate whether the relative difference or extremeness of stereotypers' behaviors against the out-group was economically costly (**D.2, D.3**), we constructed and evaluated an "expected payoff" metric for game performance (rather than relying upon actual profits). This allowed us to attribute expected payoff differences to stereotypers' chosen behaviors better than from the stochastic realizations generated during the experiment.[16] Expected payoffs for the sender exceeded those for the receiver (reported in Table 3).[17]

Difference stereotyping of the out-group's bluff propensity was positively correlated with relatively different challenge behavior against the out-group (N=40, $\rho = .4382$, $p = .005$). However, correlations were not significant when evaluated separately for younger and older stereotypers. *Difference stereotyping* of the out-group's challenge propensity was negatively correlated with relatively different bluffing behavior against the out-group (N=40, $\rho = -.3278$ $p = .039$). However, correlations were not significant when evaluated separately for younger and older stereotypers.

[16] Never the less, the same patterns of results seen from expected outcomes revealed themselves in actual realized game outcomes: (i) senders fared better than receivers, (ii) younger adults earned most as senders interacting with older adults, and (iii) older adults earned the most as receivers interacting with younger adults. However, variances due to stochastic game realizations rendered statistical comparisons based on them insignificant.

[17] Payoffs were calculated as follows. The expected payoff for a sender, who bluffs α percent of the time possible, facing group *A*, is $\frac{1}{2}[\ \lambda_A\ 2 + (1-\lambda_A)\ ] + \frac{1}{2}[\ \alpha\ (1-\lambda_A)\ 4 + (1-\alpha)\ 2\ ]$ where λ_A is the average percent of the time that receivers from group *A* (the applicable unknown, same, or other age group), who are in a position to challenge, will challenge senders' messages. Conversely, the expected payoff for a receiver, who challenges λ percent of the time possible, facing group *A*, is $\frac{1}{2}[\ (1-\lambda)\ ] + \frac{1}{2}[\ \alpha_A\ \{\ \lambda\ 4 + (1-\lambda)\ \} + (1-\alpha_A)\ 2]$ where α_A is the average percent of the time senders from group *A*, who are in a position to bluff, will bluff when sending messages to receivers. Both λ_A and α_A do not include the participant's own strategy when the participant belongs to that age group.

Difference stereotyping about out-group bluff propensity was correlated with profitable challenge behavior against the out-group for older adults (β = .461, R^2 = .213, $F(1,18) = 4.869$, p = .041), but not younger adults. *Difference stereotypes* about out-group challenge propensity was correlated with profitable bluff behavior against the out-group for both younger and older adults (β = .585, R^2 = .342, $F(1,18) = 9.361$, p = .007 and β = .509 R^2 = .259 $F(1,18) = 6.286$, p = .022, respectively).

Finally, *extreme stereotypes* about out-group bluff propensity did not correlate with relatively extreme challenge behavior against the out-group for either younger or older adults. *Extreme stereotypes* about out-group challenge propensity did not correlate with relatively extreme bluff behavior w/out-group for either younger or older adults. Additionally for both younger and older adults, *extreme stereotypes* about out-group bluffing had no correlation with costly challenge behavior against the out-group and e*xtreme stereotypes* about out-group challenging also had no correlation with costly bluff behavior against the out-group.

5. Discussion

The economic behavior of younger and older adults has been investigated in the laboratory, in some cases finding differences between age groups (Charness & Villeval, 1995; Fehr et al., 2002; Qin, Shen, & Meng, 2011) and in other cases finding little or no difference (Kovalchik et al., 2005; Sutter & Kocher 2007). Missing from this experimental literature on age is evidence of the link between ageist stereotypes and age discriminant behaviors. We have reported results demonstrating ageism in the laboratory and below discuss the link between ageist beliefs and behaviors and its economic impact on both younger and older adults.

First, stereotypes about age groups' bluff propensities were positively correlated with stereotypes about those age groups' challenge propensities indicating that the stereotyping we

observed within and between age groups more broadly formed a latent stereotype dimension of (un)cooperativeness. Both younger and older participants stereotyped the "other" age group (the out-group) as relatively different in terms of their uncooperativeness. Younger adults also held relatively extreme stereotypes about older adults' cooperativeness. Older adults, however, did not hold relatively extreme stereotypes about younger adults, likely because of their greater experience sampling younger age groups. Both age groups shared stereotypes about relatively uncooperative younger adults and relatively cooperative older adults. We find it reasonable to conjecture that these shared stereotypes may have been modeled after consensual stereotypes previously encountered outside the laboratory that could demonstrate "wisdom of the crowds". Indeed, the consensual stereotypes about age groups generated in our study tended to be superior to most individuals' personal stereotypes about age groups.

Though ageism has been considered a "socially undesirable disease" (Butler, 1989), the symptomatic age stereotyping and age discrimination we observed did not clearly come at an economic cost to those infected with it. Due to their accuracy, payouts from relatively different age stereotypes made in the Guess game were not costly, but profitable. Likewise, relatively extreme age stereotypes were profitable for the older adults who held them. We found no support for the predictions that relatively different and extreme stereotypes would strategically affect intergenerational cooperation (producing relatively different and extreme behavior), and impose costs on the ageist discriminators. Rather, relatively different stereotypes were profitable for ageist discriminators. As stereotypes were fairly accurate, it should be no surprise that discriminant behaviors strategically based on stereotypes were profitable.

Compared to the messages they sent their own age group, younger adults bluffed more when sending messages to the older adults they correctly believed to be trusting. Younger adults

also challenged less when receiving uncertain messages from older adults they believed to be honest. For younger adults, this combination of beliefs and behavior was directionally consistent with a best response. Older adults were relatively more cooperative with younger adults in both sender and receiver roles, despite believing that younger adults were relatively less cooperative (than their own group). Given the accuracy of older adults' stereotypes about younger adult bluffing, their trusting behavior is not consistent with statistical discrimination, but instead with taste based discrimination.

We find it noteworthy that overall cooperation (based on honesty and trust) was higher in intergenerational interactions than in intragenerational interactions, also consistent with Charness and Villeval's (2009) finding that age-heterogeneous teams were more cooperative than age homogeneous teams. Charness and Villeval interpreted older adults' greater cooperativeness with younger adults as their being "…interested in teaching the juniors the benefits of group cooperation …[because] experience taught them that cooperation pays off…" (2009, p. 974). We agree with this interpretation and find it reasonable to suppose that traits predisposing older adults to be role models for younger generations may have been selected for because they functioned to improve fitness of descendant kin (Gurven & Schniter, 2010). For example, the demonstration of moral and cooperative behavior by older adults in the context of intergenerational interaction may have served fitness goals in ancestral environments where older adults were often surround by extended kin networks. However, once such an other-regarding adaptation was selected for, "it could be applied outside the rearing context and play a role in the wider network of social relationships" (de Waal, 2008 p. 282). We suspect that older adults' beneficent behavior towards younger adults in our experiment is a legacy of this human evolutionary history.

We consider our findings valuable when viewed in light of other laboratory and field experiments that have considered economic consequences of age on intergenerational interactions. We have confirmed that there are no obvious issues with cognitive ability or social status among our younger and older adult samples which might detract from its relevance. Never the less, when extrapolating results beyond our nonrandom sample, we caution readers that our sample should not be considered representative of broader populations (e.g. adults seeking employment) that are experiencing problems of ageism.

Given the burgeoning economic challenges brought on by the demographic transition, society is facing increasing demands for older worker employment. However, despite the economic pressures to extend retirement age, employers avoid employing older workers (Ahmed, Andersson, & Hammarstedt, 2012; Albert, Escot, & Fernandez-Cornejo, 2001; Riach & Rich 2006, 2007a, 2007b), a form of discrimination that brings more costs than savings (Taylor & Walker, 1994). Our research suggests an attractive virtue of older adults for youngsters who might avoid them: older adults appear likely to engage in a benevolent form of taste-based discrimination when interacting with younger adults, acting honestly and trusting with them *despite* accurate beliefs that younger adults behave dishonestly and distrustfully. Coupled with the older-worker advantage (Shea & Haasen, 2006), evidence of cooperativeness of older adults in intergenerational interactions (see also Pelled, Eisenhardt, & Xin, 1999) may help foster greater intergenerational cooperation in our graying society.

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Table 1. ***Consensual and Personal Stereotypes about Targets' Non-cooperative (Bluff and Challenge) Propensities, Targets' Actual (Observed) Behaviors, and Consensual and Personal Stereotype Discrepancies***

All perceivers (*N*=40)	Targets' age group	Consensual stereotypes about targets' propensities			Targets' actual behaviors			Consensual stereotype discrepancies		
		% Bluff (RSD)	% Challenge (RSD)	% Non-cooperation (RSD)	% Bluff (RSD)	% Challenge (RSD)	% Non-cooperation (RSD)	% Bluff	% Challenge	% Non-cooperation
	Younger	57.3 (18.1)	54.1 (19.1)	55.7 (16.1)	43.1 (29.2)	37.5 (30.9)	40.3 (22.2)	14.2*	16.6*	15.4*
	Older	34.1 (18.1)	32.8 (20.6)	33.4 (18.5)	25.7 (23.0)	25.3 (19.5)	25.5 (18.3)	8.4**	7.5**	7.9**
	Unknown	44.1 (15.8)	39.6 (13.3)	41.9 (13.3)	37.6 (37.9)	39 (33.7)	38.3 (24.1)	6.5**	0.6**	3.6**
Age group (perceivers)	Targets' age group	Personal stereotypes about targets' propensities			Actual behaviors of targets interacting with perceivers			Personal stereotype discrepancies		
		% Bluff (RSD)	% Challenge (RSD)	% Non-cooperation (RSD)	% Bluff (RSD)	% Challenge (RSD)	% Non-cooperation (RSD)	% Bluff	% Challenge	% Non-cooperation
Younger (*N*=20)	Younger	56.9 (12.2)	49.4 (11.8)	53.1 (8.5)	32.5 (33.6)	51.9 (30.8)	42.2 (23.8)	24.4	-2.6**	10.9*
Older (*N*=20)	Younger	57.7 (22.2)	58.8 (23.7)	58.2 (21.1)	53.8 (40.7)	23.1 (36.7)	38.4 (24.7)	3.9**	35.7	19.8*
Younger (*N*=20)	Older	30.1 (17.1)	29.8 (18.0)	30.0 (17.0)	21.2 (24.2)	20.1 (18.3)	20.6 (17.2)	8.9**	9.7**	9.3**
Older (*N*=20)	Older	38.0 (18.6)	35.8 (23.1)	36.9 (19.7)	30.2 (28. 6)	30.5 (29.7)	30.3 (23.7)	7.8**	5.3**	6.5**
Younger (*N*=20)	Unknown	46.0 (12. 7)	42.3 (11.5)	44.1 (12.1)	37.6 (37.9)	39.8 (33.6)	38.7 (24.1)	8.4**	2.5**	5.4**
Older (*N*=20)	Unknown	42.3 (18.5)	37.0 (14.8)	39.6 (16.6)	37.6 (37.9)	39.8 (33.6)	38.7 (24.1)	4.6**	-2.8**	0.9**

Note: We report mean percent for stereotypes and behaviors, and difference of means for discrepancies. "Non-cooperation" stereotypes were constructed from both bluff and challenge stereotypes. Stereotypes about targets of Relative standard deviation (RSD) is expressed in percent and is obtained by multiplying the standard deviation by 100. ** indicates an "accurate" stereotype discrepancy less than or equal to 10% off from actual behavior. * indicates a "near miss" stereotype discrepancy less than or equal to 20% off and greater than 10% off from actual behavior. Stereotype discrepancy greater than 20% off from actual behavior is considered inaccurate.

Table 2. ***Relative Difference, Relative Extremeness, Discrepancies, and Payoffs for Younger and Older Adults' Stereotypes***

	About bluff propensity of			About challenge propensity of		
	In-group	Unknown	Out-group	In-group	Unknown	Out-group
(a) % Relative difference of stereotypes (RSD)						
from younger perceivers	56.85***	46.00***	30.10	49.35***	42.25**	29.75
	(12.17)	(12.67)	(17.06)	(11.80)	(11.53)	(17.98)
from older perceivers	38.0*	42.25***	57.65	35.75*	37.00*	58.80
	(18.59)	(18.48)	(22.18)	(23.05)	(14.75)	(23.68)
(b) % Relative extremeness of stereotypes (RSD)						
from younger perceivers	38.65***	40.00***	26.75	40.45***	39.55***	25.95
	(7.87)	(8.50)	(11.70)	(6.61)	(9.01)	(12.09)
from older perceivers	33.55	36.95	32.25	27.95	36.80	30.70
	(14.53)	(15.02)	(14.90)	(15.27)	(14.56)	(15.82)
(c) % Stereotype discrepancies from actual behavior (RSD)						
from younger perceivers	24.35**#	8.38#	8.98#	-2.57**	3.25*	9.67
	(12.17)	(12.67)	(17.06)	(11.80)	(11.53)	(17.98)
from older perceivers	7.88	4.62	3.90	5.25**	-2.00***	35.72#
	(18.59)	(18.48)	(22.18)	(23.05)	(14.75)	(23.68)
(d) Payoffs from scored stereotypes (SD)						
from younger perceivers	1.76**	5.56	5.04	6.28	6.30	5.40
	(3.23)	(3.43)	(4.07)	(3.54)	(3.08)	(4.14)
from older perceivers	3.26	4.27	4.05	3.90	5.86**	1.45
	(4.08)	(3.43)	(4.50)	(4.01)	(3.47)	(3.07)

Note: Means reported. All cells N=20. When compared to zero, # indicates $p \leq .05$, Wilcoxon sign test. When compared to the out-group measure, * indicates $p \leq .05$, ** indicates $p \leq .01$, *** indicates $p \leq .001$, Wilcoxon matched-pairs tests.

Table 3. ***Expected Bluff-Challenge Game Payoffs for Younger and Older Adults***

	Senders interacting with			Receivers interacting with		
	In-group	Unknown	Out-group	In-group	Unknown	Out-group
Expected payoffs (SD)						
by younger	1.75*	1.77*	1.90	1.33	1.34	1.35
	(0.01)	(0.09)	(0.24)	(0.00)	(0.02)	(0.07)
by older	1.75	1.77*	1.73	1.33*	1.33**	1.29
	(0.01)	(0.08)	(0.13)	(0.00)	(0.02)	(0.06)

Note: Means reported. All cells N=20. When compared to the out-group measure * indicates $p \leq .05$, ** indicates $p \leq .01$, *** indicates $p \leq .001$, Wilcoxon matched-pairs tests.

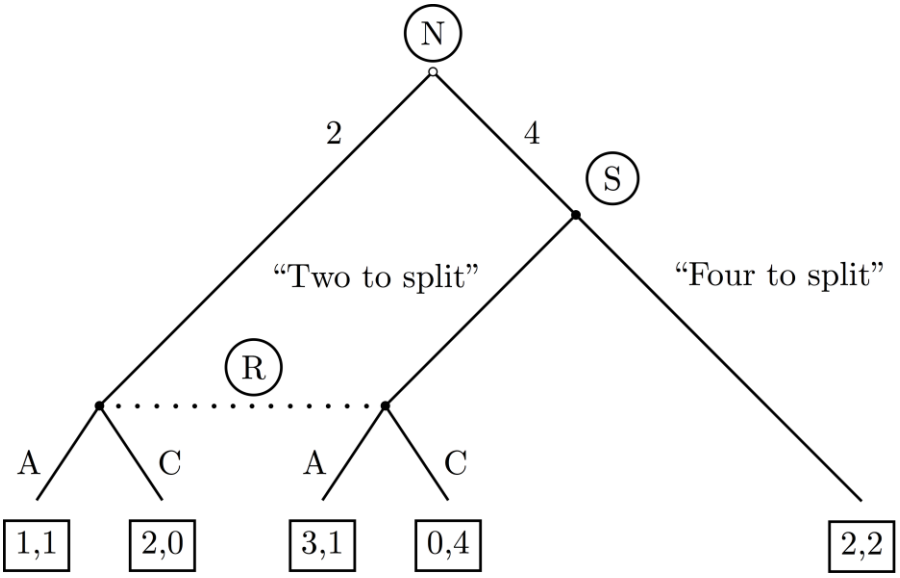

Figure 1. Game-tree for the Bluff-Challenge game.

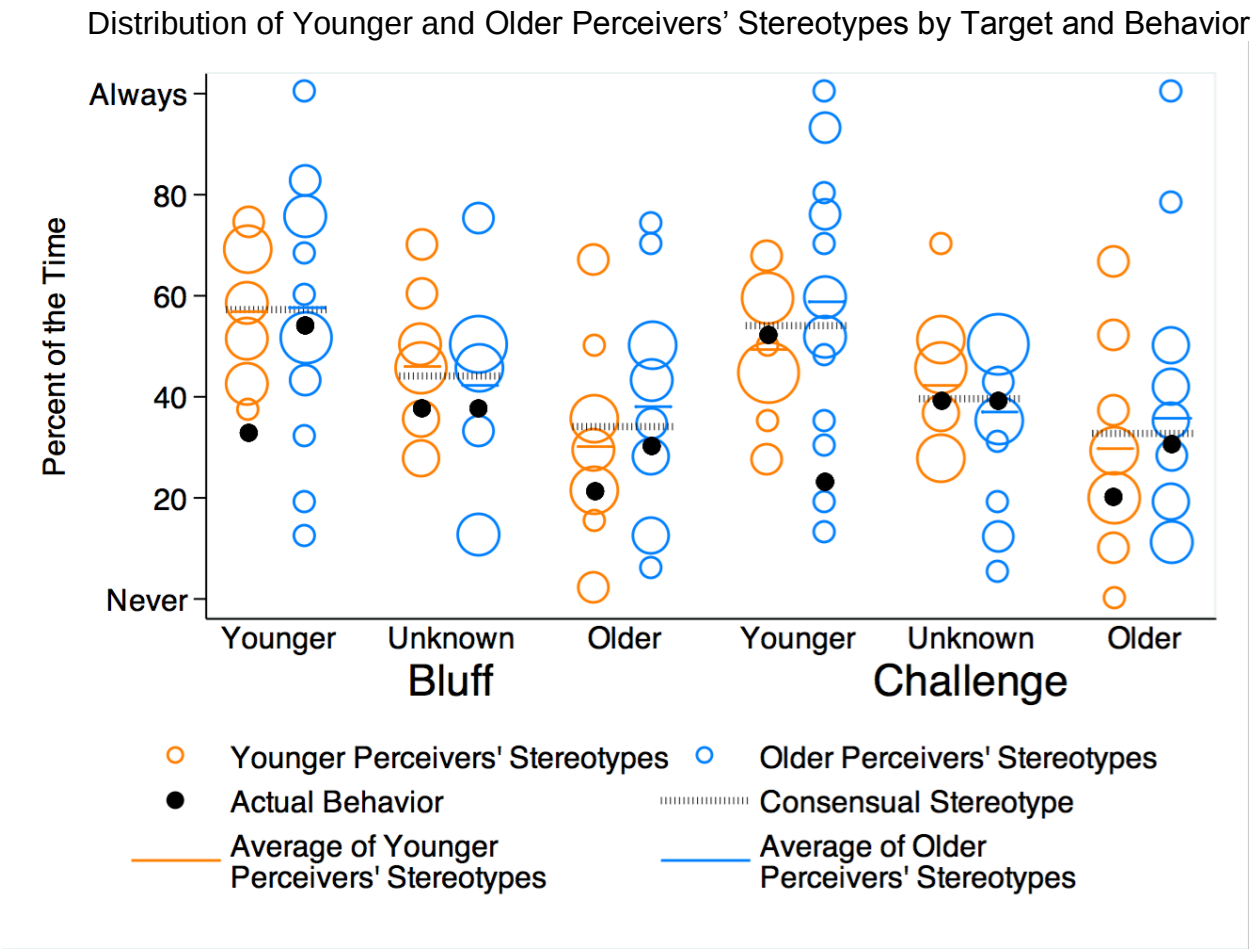

Figure 2. Bubble plot showing younger and older perceivers' personal stereotypes about age-specific target groups, averages of younger and older perceiver's stereotypes, consensual stereotypes, and age-specific target groups' actual behaviors. The largest bubble represents eight perceivers; the smallest bubble represents one perceiver.