2012

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Eric Schniter
Chapman University, schniter@chapman.edu

Timothy W. Shields
Chapman University, shields@chapman.edu

John Dickhaut
Chapman University

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Comments
Working Paper 12-26

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Eric Schniter [a*]
Timothy Shields [a]
John Dickhaut [a♀]

[a] Economic Science Institute, Chapman University
One University Drive, Orange, CA 92866, U.S.A.

November 12, 2012

Abstract
Discrimination based on age can affect same-aged and intergenerational interactions, presenting socially and economically undesirable phenomena. To investigate the effects of age stereotypes on cooperation, we presented older adults (over age 50) and younger adults (under age 25) with belief elicitation tasks (about anticipated interactions) and then a series of same, different, and unknown-aged group interactions in a Sender-Receiver game. Compared to the in-group (the age group they belong to) both younger and older participants stereotyped the out-group (the age group they did not belong to) as relatively different and more uncooperative than observed to be. We have only partial support for the notion that stereotypers behaved strategically: while younger stereotypers acted relatively uncooperatively and earned more, older stereotypers acted relatively cooperatively (despite out-group beliefs) and earned less. We discuss the implications of these findings for social identity theory, stereotype theory, and intergenerational interactions in an aging society.

Keywords: ageism, intergenerational interaction, stereotypes, discrimination, cooperation, economic experiment, social identity theory.

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* Corresponding authors (email): schniter@chapman.edu
♀ John Dickhaut is deceased (April, 2010) and included as co-author for his dedicated contribution to the study design during 2010. We thank Dave Porter and Jessica Hehman for comments and suggestions and commend Dale Brandenburg for his exceptional programming.

Introduction

Age, like gender, is a natural category used for social recognition and classification (Brewer, Dull, & Lui, 1981) and likely universal to all peoples. Infants as young as 5 months old have been shown to recognize people based on age (Fagot & Singer, 1979; Fagot & Leinbach, 1993), young adults have demonstrated the ability to extract and process age-dependent signals in sampled body odors so as to correctly identify older adults from younger adults (Mitro et al., 2012), and various studies with adults of varied ages using implicit age-association primes show stereotyping and behavioral effects based on age (e.g., see Greenwald, McGhee, & Schwartz, 1998; Gross & Hardin, 2007; Hess et al., 2004; Levy 1996; Levy et al., 2000; Perdue and Gurtman,1990).

Beliefs attributed to age-group membership have been shown to negatively affect interactions between adults (Bargh et al., 1996; McConnell & Leibold, 2001), interfering with the individual and mutual benefits possible and providing emotional (Levy, Ashman, & Dror, 1999-2000) or even physiological distress (Levy et al., 2000). In this study we investigate whether distinct beliefs about age groups cause an economic impact (either positive or negative) – an area of concern that has not yet been addressed experimentally.

We brought younger and older adults to the laboratory to participate in an incentivized experiment exploring the economic effects of age-based *stereotypes*[1] and strategies. While some individuals may derive economic gains from accurate age-based stereotypes, we focus our inquiry on *ageism*: behavior based on (young or old) age attributes that negatively impacts one's self, others, or cooperation[2].

This study has been designed to investigate a few main questions: "do people stereotype and discriminate based on age, and if so how?", and "who is economically harmed by ageist beliefs and strategies?" To address these questions, we used a set of incentive compatible belief elicitation tasks[3] that we refer to as the "guess game" (details of the guess game and its accompanying scoring rule are found in the methods section). Our guess game asked participants to make guesses (that would later be scored for accuracy) about the frequency of anticipated behaviors of senders and receivers in their same age group (the "in-group"), different age group (the "out-group"), and unknown-aged group (2x3) interactions in a Sender-Receiver game. Next the participants engaged in all these interactions. Guesses made in the guess game and their subsequent effects on behavior inform us of the economic consequences of revealed age-based stereotypes and *discrimination*[4] based on age.

To our knowledge, the particular "Bluff-Challenge" Sender-Receiver game which we used in this study has not been used before in laboratory experiments. The "Bluff-Challenge" game is a

[1] We define the term "stereotype" as an "exaggerated belief associate with a category" (Allport, 1935, p.287)
[2] This definition of ageism is broader than the more commonly used one (e.g. see Nelson, 2002): "stereotyping and prejudice against *older* persons".
[3] Incentive compatible belief elicitation tasks allow researchers to examine if people reveal accurate beliefs, if their beliefs deviate from equilibrium behavior, and if affected behaviors are consistent with beliefs (Rey-Biel 2009).
[4] We use the term "discrimination" in the sense of Cuddy & Fiske (2002) and Kite & Wagner (2002) who consider the phenomenon of ageism to involve three components: stereotypes (cognitive aspect), prejudice (affective aspect/feelings) and discrimination (behavioral aspect).

zero-sum sender-receiver game with asymmetric information that allows an informed sender to send a true message about the size of a resource state available for equal sharing, or (when a larger resource is available) to "bluff", by sending a false message that a smaller resource is available for equal sharing. Receivers, uninformed of the true size of resource in this game, can accept the sender's message at face value or else challenge message veracity. A receiver cannot audit message veracity without challenging, and only by challenging can a sender be prevented from cryptically embezzling the difference between the smaller and larger resource. A receiver who challenges a false message gains the entire resource that was available, which the sender misrepresented, while the sender forfeits it entirely. A receiver who challenges a true message forfeits the share of the resource that the sender offered for equal sharing, while the sender gains the resource entirely. Due to the nature of the game, the sender has economic incentives to deceive, and the receiver has economic incentives to avoid deception. Specific details about this game are described in the methods section below.

We chose the Bluff-Challenge game because it models the resource division opportunities found in unsupervised and working relationships that are subject to the uncertainty of nature, require voluntary and honest contributions to partnership, but allow risky and potentially lucrative opportunities to embezzle resources and challenge message veracity. We assume that the cooperation dilemma modeled by this game presented a recurrent selection pressure among ancestral humans and continues to be relevant today[5]. Outside of the laboratory, analogues to the game interactions are often encountered between younger and older coworkers or family members and invoke trust, suspicion, trustworthiness, and opportunism. Opportunities for bluffing modeled in the game arise 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.

Background

Humans construct social stereotypes and engage in social categorization to 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., Darley & Fazio, 1980; Cuddy & Fiske, 2002). One of these social challenges, relative to our study, is managing cooperation with unknown others and with others of different social groups in dyadic social dilemmas that provide incentive for non-cooperation. Perceivers recognize stereotypes of loosely structured constellations of traits to be variably true of individual members of a social category (Ashmore & Del Boca, 1981) like age. Stereotypes about other groups tend towards

[5] Cooperative (distributed) foraging with sharing is a hallmark of our species (Gurven, 2000). With this type of foraging and sharing, individuals run the risk of being exploited by "free-riding" partners who cheat by either not acquiring resources at the agreed rate (slacking, shirking), or else not pooling their acquired resources (as expected) by under-representing what they acquired (and embezzling the difference). Another important problem to contend with in these interactions is the risk involved with accusing a partner of cheating – if and when they are suspected. Cheater accusations and challenges directed at partners in a trust contract, when unfounded, could damage established trust and ruin the possibility of successful future dyadic interactions, thereby imposing high risks to the challenger. In modern society, cooperative labor and redistribution arrangements often present similar challenges. For example consider restaurant workers who agree to pool their tips: individual waiters 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.

polar extremes of a characteristic, such that opposites often emerge among the common stereotypes (Palmore, 1999). As such, stereotypes of others are salient social identifiers (useful for informing strategy selection) while also being time- and energy-savers (McGarty et al., 2002): they are simple and easier to understand than more detailed information (Tajfel, 1981), facilitate better recall (Macrae, Milne, Bodenhausen, 1994), and are thrifty in terms of cognitive demands (Macrae, Bodenhausen, & Milne, 1994).

Social identity theories (e.g., Tajfel and Turner 1979, 1986; Hog & Abrams 1993) suggest that people make a fundamental division of social groups into "us" (in-groups) and "them" (out-groups) so as to reduce uncertainty about expected behaviors and build concepts of themselves and others vis-à-vis group membership. A natural consequence of these social divisions is creation of belief in an inter-group contrast (Brewer & Brown, 1998) where stereotypes of the in-group are relatively different than stereotypes of the out-group. An extension of this hypothesized in- vs. out-group comparison argues that if in-groups, which people generally have more sampling experience with and have likely seen more variety among, are viewed as more heterogeneous and containing a mix of characteristics along a spectrum – a stereotype of the in-group will tend to be more moderate (i.e., some central tendency between polar extremes). Out-groups are perceived to be less variable than in-groups, a phenomenon called the "out-group homogeneity effect" (Park & Rothbart, 1982) which leads to common perceptual biases such as overestimating the number of people in out-groups (Boyer et al., 2012) and the "they're all the same" effect, where people from other race or ethnicities appear more similar and difficult to recognize as individuals than those from one's own race or ethnicity (Bothwell, Brigham, & Malpass, 1989; Meissner & Brigham, 2001). Biased views of different and homogeneous out-groups are more likely to lead to stereotypes of relatively different or more extreme out-group characteristics, accordingly informing beliefs about interaction risks, and the out-group propensity to cooperate.

Both younger and older adults hold ageist stereotypes about older adults (Palmore, 1999, Nelson, 2002) as well as younger adults (Zebrowitz & Montepare, 2000; Hehman & Bugental, 2012). For example, younger people tend to expect little variation in older adults' political affiliation and open-mindedness (Cuddy & Fiske, 2002). 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, & Miele (1991) found that older people were believed less likely to possess agentic (i.e., assertive, self-profiting) characteristics. Older adults also hold ageist stereotypes about younger adults and treat them discriminately (Zebrowitz & Montepare, 2000; Hehman & Bugental, 2012). Older adults tend to expect little variation in younger adults' discipline and thoughtfulness (Cuddy & Fiske, 2002). Young adults are typically viewed as being willing to take risks, something that is not socially desirable because the risks could harm others as well as themselves (Steinberg, 2008). Younger adults are also viewed as unable to meet societal expectations of older adults due to their perceived delinquency, self-absorption, and lack of self-control (Zebrowitz & Montepare, 2000).

Ageist stereotypes (Nelson, 2002) commonly center around notions that members of an age group are uncooperative, cooperative, exploitative, exploitable, willing to take risks (e.g. willing to challenge others), unwilling to take risks (e.g. not willing to challenge others and unconditionally accepting), feisty, and lacking an aggressive spirit. This stereotype content

responds to systematic principles by mapping onto multiple correlated dimensions to differentially produce "mixed stereotypes" (Fiske et al., 2002). Cuddy et al., (2004, 2005) suggest mixed stereotypes are cross-cultural phenomena, providing evidence of their consistency across 6 varied cultures. Peeters (1983, 1995) has argued for *self-profitable* (a.k.a "agentic", non-cooperative) and *other-profitable* (a.k.a. communal, cooperative) traits as fundamental organizational dimensions of stereotype content. Phalet & Poppe (1997) have also suggested *morality* as a major stereotype dimension. We consider *cooperativeness* as a stereotype dimension where cooperators do not bluff and do not challenge, and non-cooperators bluff and challenge.

Ageist beliefs about younger adults and older adults[6] may derive from social constructs (Levy, 2009) or adaptive responses (e.g., stigmatization (Kurzban & Leary, 2001) and xenophobia (Faulkner et al., 2004)) to associated weaknesses[7], costs[8], perceived challenges[9], and threats[10] anticipated from distinct age groups. Regardless of their ultimate origins, inaccurate age-based attributions can lead to under-valuation of older adults (Avolio & Barrett, 1987; Finkelstein, Burke, & Ragu, 1995), impose economic[11] and social costs (PIU, 2000; Palmore, 2005), and result in perceptions and experiences of discrimination against members of those age groups[12]. These hazards carry important implications for public policy (Bugental & Hehman, 2007) and, as we argue, economics.

Discrimination based on a personal characteristic unrelated to worker productivity (Arrow, 1973) can impose costs on the firm (Becker, 1971; Taylor & Walker, 1994). Age discrimination by employers, for example, may bring more costs than savings (Duncan, 2001) because, despite economic pressures to extend retirement age[13], employers show a reluctance to employ older workers (Kite et al., 2005; Lahey, 2005; Loretto & White, 2006).

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[6] O*lder adult*, and *younger adult* function as superordinate age categories which encompass several traits describing older and younger adults, respectively (Brewer et al., 1981; Hummert, 1990; Schmidt & Boland, 1986).

[7] Examples include incompetence of young (Zebrowitz & Montepare, 2000) and incompetence of older (Cuddy et al., 2005; Fiske et al., 2002; Hill et al., 1995).

[8] Costs include those of supporting older adults and seniority-based salaries (Butler, 1989; Bendick et al. 1999; Riach & Rich, 2006), and the costs of supporting young adults (March, 2012).

[9] Exposure to different age groups could prime comparisons of age-group stereotypes, leading to fear/anxiety of confirming the stereotypes and, in turn, performance deficits further reinforcing the prior stereotypes (Steele & Aronson, 1995)

[10] 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), and from physical disability (Park, Faulkner, & Schaller, 2003) and other visible features of aging often fallaciously perceived to correlate with increased vulnerability to infectious disease (Montepare & Zebrowitz, 2002; Duncan & Schaller, 2009).

[11] Medicare and special programs targeting older people amount to $300 billion in costs annually, employment discrimination against older workers amount to $60 billion in opportunity costs annually (Palmore, 2005).

[12] Younger and older adults report experiencing age discrimination (Gregory, 2001; Snape & Redman, 2003; OECD, 2006) and are more likely to report experiences with age discrimination than middle-aged adults (Garstka, Hummert, & Branscombe, 2005; Garstka, Schmitt, Branscombe, & Hummert, 2004).

[13] The 55 to 64 year age bracket is the quickest growing sector of the labor pool (AARP, 2000; Albright & Cluff, 2005; Callanan & Greenhaus, 2008; Calo, 2007; Toossi, 2004, Weiss & Maurer, 2004) and despite life expectancy increasing throughout the 20th and now 21st centuries retirement ages have decreased resulting in more people spending more time in retirement (NIA 2007).

The older-worker advantage (Shea & Haasen, 2006) and the potential added benefit of intergenerational interactions (Grund & Westergård-Nielsen, 2005, Pelled et al., 1999; Kilduff et al., 2000) represent economic and social opportunities too important to dismiss solely on the basis of potentially inaccurate beliefs about age.

Predictions

To address the questions "do people stereotype and discriminate based on age?" and "who is economically harmed by ageism?" we test the following predictions about ageist stereotypes and ageist interactions.

Guesses: age stereotypes. We predict that participants reveal age-based stereotypes, attributing either different or more polar extreme (i.e., always or never) characteristics to the out-group (as compared to unknown-aged groups or in-groups) in a systematically linked manner (i.e., where the tendency to bluff positively correlates with the tendency to challenge) tracking "cooperativeness"(**P1)**. Specifically we predict that when compared to the in-group or unknown-aged group, the out-group is stereotyped with attributions that are relatively different (**P1.1**), and relatively extreme (**P1.2**). We additionally predict that these age-based stereotypes will be systematically linked between both characteristics investigated (i.e., tendency to bluff and tendency to challenge) to form a single dimension of "cooperativeness": people's belief in an age group's tendency to bluff are positively correlated with belief in that age group's tendency to challenge (**P1.3**). Furthermore, we predict that these stereotypes are relatively inaccurate such that investment in one's own age-based beliefs (via guesses made in the guess game) is economically costly (**P2**). Specifically, we predict that relatively different stereotypes are inaccurate (**P2.1**) and costly (**P2.2**) for those in our sample who are *difference stereotypers*, and that relatively extreme stereotypes are inaccurate (**P2.3**) and costly (**P2.4**) for those who are *extreme stereotypers*.

Interactions: age discrimination and economic costs. We investigate how interaction behavior is strategically affected by age-group stereotypes and whether this strategic behavior is economically costly. The first set of predictions is that people attempt to maximize economic gains by strategically acting in accordance with stereotypes (**P3**).

Specifically we predict that *difference stereotypers'* noncooperation (based on bluffing and challenging) is relatively different with the out-group (compared to unknown-aged group or in-group) (**P3.1**). We also predict that *extreme stereotypers'* noncooperation is relatively extreme (more always or never bluffing and challenging) with the out-group (compared to unknown-aged group or in-group) (**P3.2**).

Our second set of predictions is that behavior with the out-group, strategically based on age group stereotypes, is economically costly to those age stereotypers acting on their ageism (**P4**). Specifically, *difference stereotypers'* behavior, in strategic response to anticipated behavior of the out-group, is economically costly (**P4.1**). Similarly, we predict that *extreme stereotypers*' behavior, in strategic response to anticipated behavior of the out-group, is economically costly (**P4.2**).

Methods

Sample

Others have compared the economic decision making behavior of healthy older adults and younger students in the laboratory, in some cases finding a large difference between age groups (Charness & Villeval, 1995; Fehr et al., 2002) and in other cases finding little or no difference (Kovalchik et al., 2005; Sutter & Kocher 2007). To our knowledge, however, no one has examined the economic impacts and effects of age-based stereotyping and discrimination (i.e. ageism), on both younger and older adults, interacting in the laboratory. The belief elicitation we used allows us to examine why cooperation might increase in one role, but decrease in another. Our participant group was drawn from two independently living healthy populations, one of older adults and one of younger adults. Older adults were recruited through local newspapers at two large independent living older adult communities, one in Seal Beach California, and one in Laguna Woods California. Younger adults were recruited from Chapman University's Economic Science Institute standard undergraduate subject pool.

20 younger adults (all under the age of 25) were sampled (9 female, 11 male) and 18 reported their age (ranging from 18 to 22; $M = 18.94$). 20 older adults (all over the age of 50) were sampled (13 female, 7 male), 19 reported their age (ranging from 51 to 84; $M = 70.11$). The average difference between a participant in younger vs. older age group is 51.17 years, roughly equivalent to the 50 year age difference of two standard American generations[14].

An objective test of matrix reasoning based on Raven's-like progressive matrices (both sets 1 and 2) does detect a significant negative age effect on performance ($\beta = -0.478$, $F(1,33) = 9.766$, $p = 0.004$, $R^2 = 0.228$), consistent with work reviewed by Salthouse (1992) showing a significant median correlation of -0.61 between age and Raven's score across studies with a wide range of ages, and later work showing a -0.57 correlation (Salthouse, 1993). The performance observed on these cognitive tasks supports the conclusion that these are all cognitively healthy adults. Comparing groups for each of the matrix sets (i.e. Set 1: 1-12; Set 2: 13-24) we find that there is no significant difference with matrix set 1 (items 1-12), but that there is a significant difference between groups for matrix set 2 ($F(8,27) = 3.305$, $p = 0.009$, $\eta = 0.703$). When comparing groups we find that there is no significant difference for self-reported socioeconomic status ($F(7,33) = 0.750$, $p = 0.632$, $\eta = 0.371$).

Procedure

Younger participants were led into one computer laboratory and older participants led into another adjacent computer laboratory. These laboratories were visually isolated from one another. Within each laboratory individual workstations were isolated by partitions. A progressive matrix task containing 24 matrices was administered. Next, prerecorded instructions with audio and video were presented. A quiz to ensure comprehension was administered, and the correct answers to the quiz were reviewed after the instructions. Questions were solicited and

[14] 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).

answered individually and privately before progressing with further tasks. All participants interacted with each other via a software interface using a computer network (see details describing interaction task in next section below). Font size as displayed on computer screens was optimized for older adults' usability (Bernard et al., 2001). Participants interacted in dyadic interactions, with one taking the role of "Sender" while the other takes the role of "Receiver". Personal identities of those involved in interactions were never revealed. Each participant was told, however, whether the person they were interacting with was of (1) an unknown-aged group, (2) the same age group as him or herself, or (3) a different age group. The interaction task was iterated 36 times, each time with a subject not previously interacted with in the same role. At the conclusion of these interactions, participants were informed about the computed accuracy of their guesses and results of their interactions. While participants waited for their payments to be computed, they were administered a brief questionnaire. It took subjects 120 minutes to complete the experiment[15]. A lottery was used to select a single guess and interaction for payment. After conclusion of the experiment, we paid-out participants in US currency.

Description of Guess Game

Our guess game asked participants to make guesses about how often senders with the available option sent false messages (on a scale ranging from never, 0% of the time, to always, 100% of the time) and how often receivers receiving potentially false messages challenged the message veracity (on a scale ranging from never, 0% of the time, to always, 100% of the time). Participants made guesses about the anticipated behaviors of interactions of senders and receivers from same, different, and unknown-aged groups participating in the experiment that day, 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 Sender-Receiver interactions (e.g. via the creation of hedging problems noted by Blanco et al., (2010)). To evaluate the relationship between guess accuracy and incentives we used a quadratic scoring rule which qualifies as a "proper scoring rule" (e.g. Aczel & Pfanzagl 1966, Savage 1971) or "strictly proper" scoring rule (Winkler & Murphy 1968) because the expected utility of a guess is uniquely maximized when the guessed behavior is equal to the true observed behavior. Subjects were told that they could earn money if their guess is within 1/6th (16.667%) - above or below, of the true observed behavior, else they will not be able to earn money with their guess. Our incentive compatible guess game was easy to understand and the graphical and numeric feedback of guess accuracy provided an easy to interpret form of contextualized information about the various types of interactions between age groups.

Description of Interaction Tasks

Each interaction begins with a computerized coin flip. Heads produces two units for the Sender and Receiver to share equally (to split); tails produces four units to split. Only senders view the result of the coin flip. After privately learning the result of the coin flip, the Sender will send one

[15] This experiment included a "second phase" which replicated and followed the "first phase" described in the procedure section. During our 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). We do not report results of the second phase.

of two messages about the result. A message of "Two to Split" tells the Receiver that the coin landed heads up, and there are two units to split. A message of "Four to split", tells the Receiver that the coin landed tails up, and there are four units to split. If the coin flip shows four the sender can either send a message of "two to split" (a *bluff*) that is inconsistent with the coin flip result or a message of "four to split" that is consistent with it. If the coin flip shows two, the sender can only send the message "two to split", which is consistent with the result of the coin flip. The payoffs to both players are contingent on (i) the result of the coin flip, (ii) the message sent by the Sender and (iii) the Receiver's decision to either accept or challenge the Senders' message (see also Figure 1 below where payoffs are reported).

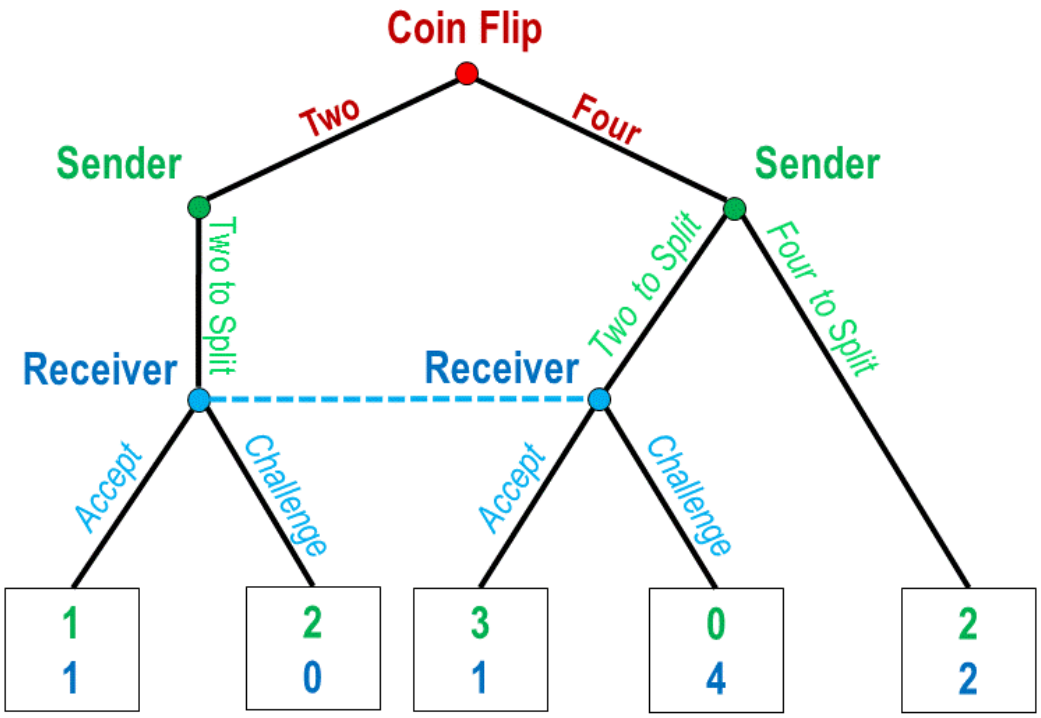

Figure 1. Game diagram of Sender-Receiver interaction.

Results

We examine whether ageism (behavior based on either relatively different or relatively extreme beliefs about others, based on their age group membership) exists and whether it leads to economic harm. The results below evaluate whether younger and older adults discriminate upon age groups, and whether the economic effects of these beliefs and belief-contingent interactions from the Sender-Receiver game are economically harmful.

To evaluate whether participants' hold relatively different beliefs about the out-group's behavior propensity (**P1.1**), we examine guesses at the individual level. For each participant, we compare guesses they made about the out-group's bluff and challenge propensity to guesses they made about these propensities in their in-group and in the unknown-aged group. The results are

reported in Table 1 panel (a). Using matched-pair tests[16], we observe that all cases of elicited beliefs about the out-group's noncooperation propensity are relatively different. Younger adults believed older adults would bluff 30.1% of the time possible, which was less than the 56.9% they expected of their own age group (Z = -3.735, $p < 0.001$) or the 46.0% they expected of the unknown-aged group (Z = -3.735, $p < 0.001$). Younger adults believed older adults would challenge 29.75% of the time possible, less than the 49.4% they expected of their own age group or the 42.3% they expected of the unknown-aged group (Z = -3.829 p<0.001, Z= -3.287 p = 0.001, respectively). Conversely, older adults believed younger adults would bluff 57.65% of the time possible, which was more than the 38.0% they expected of their own age group, or the 42.3% they expected of the unknown-aged group (Z = 2.726, $p < 0.01$; Z = 3.348, $p < 0.001$, respectively). Furthermore, older adults believed younger adults would challenge 58.8% of the time possible, more than the 35.8% they expected of their own age group or the 37.0% they expected of the unknown-aged group (Z = 2.991, $p < 0.01$: Z = 3.233, $p < 0.01$, respectively). Average guesses about target group (i.e. the in-group, the unknown-aged group, and the out-group) are plotted in Figure 2 for younger and older adults.

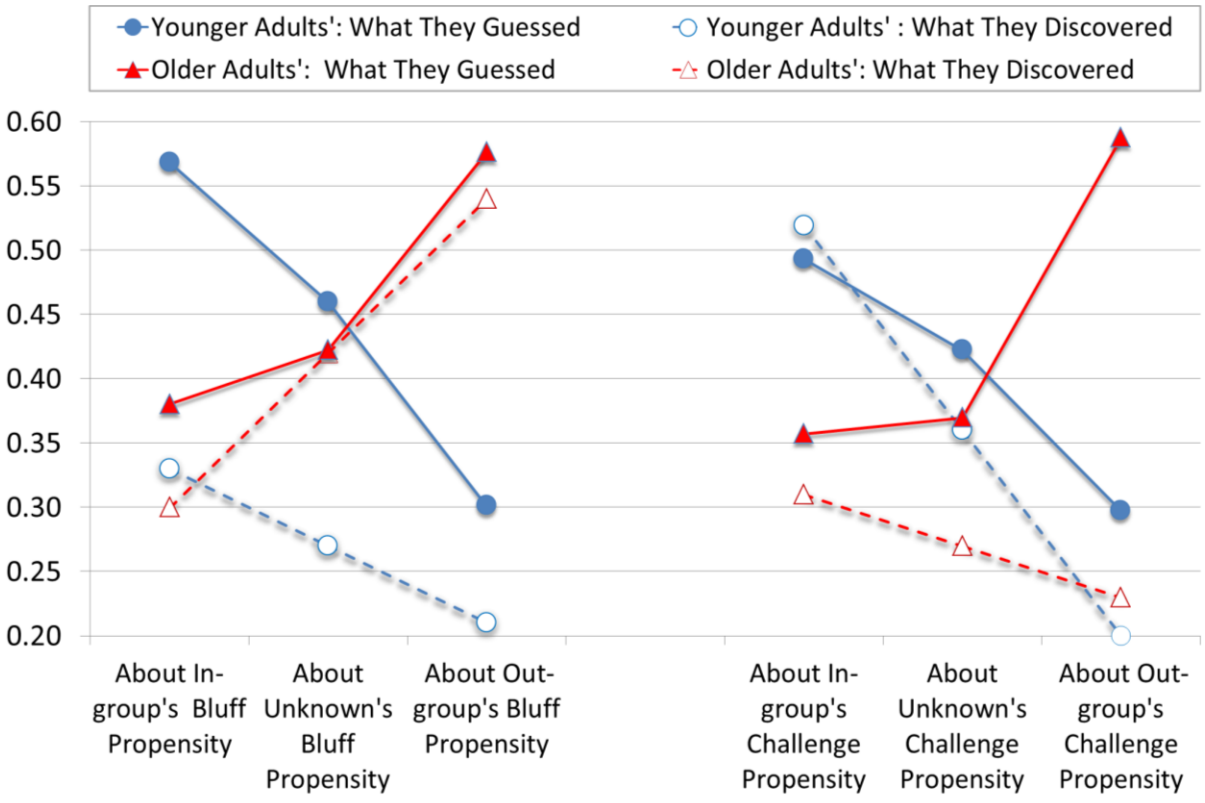

Figure 2. Behaviors guessed and discovered of target groups by younger and older adults.

To identify the individual younger and older adults that are driving the above *difference stereotype* effects (i.e., younger adults believing older adults to be *more* cooperative, and older adults believing younger adults to be *less* cooperative), we compare each individual's guesses (elicited beliefs) about their out-group with their guesses about their in-group. We also compare

[16] The results of Shapiro-Wilk tests reject the null hypothesis that the data is normally distributed and we report the results of Wilcoxon matched-pairs signed-rank test unless otherwise stated.

each individual's guesses about their out-group with their guesses about the unknown-aged group. We identify participants as holding these directional *difference stereotypes* (about bluff or challenge propensity) if significant differences are observed in the above comparisons using a one-tailed student-t test[17] with one degree of freedom at the five percent level. Comparing beliefs about in-group and out-group bluff propensity, we identify 14 individuals (8 younger adults and 6 older adults) as *difference stereotypers.* Comparing beliefs about in-group and out-group challenge propensity, we identify 15 individuals (10 younger adults and 5 older adults) as *difference stereotypers.* Most individuals with difference beliefs about out-group challenge behavior (relative to the in-group) are among those with difference beliefs about out-group bluff behavior (relative to the in-group) and vice versa. There are 10 individuals (6 younger adults and 4 older adults) who are among the 14 difference bluff stereotypers and 15 difference challenge stereotypers (identified by in-group out-group comparison). Overall, from in-group out-group comparisons, we observe a grand total of 19 individuals (12 younger adults and 7 older adults) with difference stereotypes of bluff and/or challenge propensity.

Comparing beliefs about unknown-aged group and out-group bluff propensity, we identify 13 individuals (6 younger adults and 7 older adults) as *difference stereotypers.* Comparing beliefs about in-group and out-group challenge propensity, we identify 10 individuals (5 younger adults and 5 older adults) as *difference stereotypers.* Most individuals with difference beliefs about out-group challenge behavior (relative to the unknown-aged group) are among those with difference beliefs about out-group bluff behavior (relative to the unknown-aged group) and vice versa. There are 8 individuals (3 younger adults and 5 older adults) who are among the 13 difference bluff stereotypers and 10 difference challenge stereotypers (identified by unknown-aged group out-group comparison). Overall, from unknown-aged group out-group comparisons, we observe a grand total of 15 individuals (8 younger adults and 7 older adults) with difference stereotypes of bluff and/or challenge propensity. We find most (13/19) of the set of difference stereotypers from the in-group out-group comparison among difference stereotypers identified by the unknown-aged group out-group comparison (8 younger adults and 5 older adults). Conversely, we find most (13/15) of the set of difference stereotypers from the unknown-aged group out-group comparison among difference stereotypers identified by the in-group out-group comparison. Of these 13 difference stereotypers revealed by both kinds of out-group comparisons, 8 are younger adults and 5 are older adults.

To evaluate whether participants' hold relatively extreme beliefs about the out-group's behavior propensity (**P1.2**), we examine guesses at the individual level: using matched-pair tests, the extremeness of beliefs about the out-group is compared to the extremeness of beliefs about the in-group and unknown-aged group beliefs. Specifically, we evaluated how close these guesses were to attributions of either "always" (100% of time) or "never" (0% of time) behavior propensity (e.g., bluffing, challenging). Thus we argue, the closer (smaller) the constructed metric is, the more extreme the stereotype. The results are reported in Table 1 panel (b). We observe that only younger adults held relatively extreme stereotypes about the out-group. Younger adults held more extreme beliefs about older adults' bluff propensity than of their own age group or the unknown-aged group ($Z = -3.328$, $p < 0.001$: $Z = -3.549$, $p < 0.001$, respectively), and more extreme beliefs of older adults' challenge propensity than of their own

[17] Shapiro-Wilk tests fail to reject the distribution of the difference measure is normal.

age group or the unknown-aged group (Z = -3.533, $p < 0.001$; Z = -3.736, $p < 0.001$, respectively).

To identify the individual younger adults that are driving the above *extreme stereotype* effect (where the out-group is viewed as *more* extreme than the comparison group), we compare each younger adult's guesses (elicited beliefs) about the out-group with their guesses about the in-group. We also compare each individual's guesses about their out-group with their guesses about the unknown-aged group. We identify participants as holding these extreme stereotypes (about bluff and challenge propensity) if significant differences are observed in the above comparisons using a one-tailed student-t test[18] with one degree of freedom at the five percent level. Comparing beliefs about in-group and out-group bluff propensity, we identify 8 individuals (7 younger adults, and 1 older adult) as *extreme stereotypers.* Comparing beliefs about in-group and out-group challenge propensity, we identify 9 individuals (8 younger adults, and 1 older adult) as *extreme stereotypers.* Most individuals with extreme beliefs about out-group challenge behavior (relative to the in-group) are among those with extreme beliefs about out-group bluff behavior (relative to the in-group) and vice versa. There are 5 individuals (4 younger adults and 1 older adult) who are among the 8 extreme bluff stereotypers and 9 extreme challenge stereotypers (identified by in-group out-group comparison). Overall, from in-group out-group comparisons, we observe a grand total of 12 individuals (11 younger adults and 1 older adult) with extreme stereotypes of bluff and/or challenge propensity.

Comparing beliefs about unknown-aged group and out-group bluff propensity, we identify 8 individuals (6 younger adults, and 2 older adults) as *extreme stereotypers.* Comparing beliefs about unknown-aged group and out-group challenge propensity, we identify 9 individuals (6 younger adults, and 3 older adults) as *extreme stereotypers.* No more than half of the individuals with extreme beliefs about out-group challenge behavior (relative to the unknown-aged group) are among those with extreme beliefs about out-group bluff behavior (relative to the unknown-aged group) and vice versa. There are 4 individuals (3 younger adults and 1 older adult) who are among the 8 extreme bluff stereotypers and 9 extreme challenge stereotypers (identified by in-group out-group comparison). Overall, from unknown-aged group out-group comparisons, we observe a grand total of 13 individuals (9 younger adults and 4 older adults) with extreme stereotypes of bluff and/or challenge propensity. We find most (9/12, composed of 8 younger adults and 1 older adult) of the set of extreme stereotypers from the in-group out-group comparison among extreme stereotypers from the unknown-aged group out-group comparison. Conversely, we find most (9/13, composed of 8 younger adults and 1 older adult) of the set of extreme stereotypers from the unknown-aged group out-group comparison among extreme stereotypers from the in-group out-group comparison.

Furthermore, we find most (11/12) of the extreme stereotypers from the in-group out-group comparison among difference stereotypers from the in-group out-group comparison (10 younger adults and 1 older adult). Conversely, we find most (11/19) of the difference stereotypers from the in-group out-group comparison among extreme stereotypers from the in-group out-group comparison. We also find most (11/13) of the extreme stereotypers from the unknown-aged group out-group comparison among difference stereotypers from the unknown-aged group out-group comparison (8 younger adults and 3 older adults). Conversely, we find most (11/15) of the

[18] *Ibid*

difference stereotypers from the unknown-aged group out-group comparison among extreme stereotypers from the unknown-aged out-group comparison.

To evaluate whether bluff and challenge stereotypes are systematically linked dimensions of cooperation (**P1.3**), we examine Spearman's rank correlation coefficients, evaluating evidence of positive correlation between guesses about bluff and challenge propensity in age-based in-groups and out-groups. Guesses about in-groups' bluff propensity are positively correlated with guesses about in-groups' challenge propensity ($\rho = 0.6144$, $p < 0.001$). When we examine younger and older adults separately, this correlation is not significant for younger adults ($\rho = 0.0970$, $p = 0.6842$) but is significant for older adults ($\rho = 0.8513$, $p < 0.001$). Guesses about out-groups' bluff propensity are positively correlated with guesses about out-groups' challenge propensity ($\rho = 0.8487$, $p < 0.001$). When we evaluate younger and older adults separately, this correlation is significant for both younger adults ($\rho = 0.7364$, $p < 0.001$) and older adults ($\rho = 0.6483$, $p = 0.002$). Additionally, we observe that guesses about unknown-aged groups' challenge propensity are positively correlated with guesses about their challenge propensity ($\rho = 0.6500$, $p < 0.001$). When we evaluate younger and older adults separately, this correlation is significant for both younger adults ($\rho = 0.5360$, $p = 0.0148$) and older adults ($\rho = 0.6925$, $p < 0.001$).

To evaluate whether stereotypes of different characteristics or polar extreme characteristics attributed to the out-group (via guesses made in the guess game) are relatively inaccurate (**P2.1, P2.3**), we first construct an error measure by subtracting each guess from the behavior subsequently observed for the target group guessed about. Errors of beliefs about anticipated interactions (i.e. accuracy of beliefs) are reported in Table 1 panel (c). To evaluate whether stereotypes of different characteristics or polar extreme characteristics attributed to the out-group (via guesses made in the guess game) are relatively costly (**P2.2, P2.4**), we measure the economic consequences of erroneous beliefs and report mean guess payoffs in Table 1 panel (d). The maximum payoff was \$10 and decreases to \$0 if the guess is more than 16.667% (1/6) from the actual.[19] Thus, the largest differences between guesses about bluff or challenge propensity and actual behavior correspond to the smallest game payoffs.

To test **P2.1 and P2.2** (that *difference stereotypes* are inaccurate and costly to believers) we compare *difference stereotypers* (revealed by in-group out-group comparisons) against all others (further evaluating younger and older adults separately). We find no significant differences in accuracy or earnings from guesses about out-group for younger and older adults combined, however we do find differences when age groups are examined separately. Young adult *difference stereotypers* are more accurate (than all other younger adults) when guessing about the out-group's bluff propensity ($Z = -2.56$, $p = 0.011$), however we do not observe significantly different payoffs from these scored guesses. Younger adult *difference stereotypers* are more accurate (than all other younger adults) when guessing about the out-group's challenge propensity ($Z = -2.73$, $p = 0.006$), however we do not observe significantly different payoffs from these scored guesses. Older adult *difference stereotypers* are less accurate (than all other older adults) when guessing about the out-group's bluff propensity ($Z = 2.73$, $p = 0.006$), however we do not observe significantly different payoffs from these scored guesses. Older adult *difference stereotypers* are less accurate (than all other older adults) when guessing about the

[19] Guess payoffs were paid according to the formula maximum{0, \$10(1 – 36(guess – actual)^2)}, where the guess and actual amounts are proportions on the unit interval.

out-group's challenge propensity ($Z = 2.84$, $p < 0.005$), however we do not observe significantly different payoffs from these scored guesses.

To test **P2.3 and P2.4** (that *extreme stereotypes* are inaccurate and costly to believers) we compare *extreme stereotypers* (revealed by in-group out-group comparisons) against all others (further evaluating younger and older adults separately). We find no significant differences in accuracy or earnings from guesses about out-group for younger and older adults combined, however we do find differences (among younger adults) when age groups are examined separately. Young adult *extreme stereotypers* are more accurate (than all other younger adults) when guessing about the out-group's bluff propensity ($Z = -3.226$, $p = 0.001$), however we do not observe significantly different payoffs from these scored guesses. Younger adult *extreme stereotypers* are more accurate (than all other younger adults) when guessing about the out-group's challenge propensity ($Z = -3.329$, $p = 0.001$), however we do not observe significantly different payoffs from these scored guesses.

To evaluate whether stereotypers' behavior in the Sender-Receiver game are affected by their stereotypes of the out-group (**P3**), we first compare, against all others, their bluff and challenge behaviors in interactions with the out-group. Next, to evaluate whether these stereotypers' behaviors with the outgroup is economically costly to those age stereotypers (**P4**), we construct metrics for game performance, which we label expected payoff, rather than relying upon the experimental profits. This allows us to attribute expected differences due to behaviors employed rather than stochastic realizations generated during the experiment.[20] The expected payoff is reported in Table 2 panel (b).[21]

To evaluate whether *difference stereotypers*' behaviors in the Sender-Receiver game are affected by their *difference stereotypes* of the out-group (**P3.1**), and whether these stereotypers receive relatively different payoffs in the Sender-Receiver game (informing **1.4.1**), we compare, against all others, their bluff and challenge behaviors in interactions with the out-group. Younger adult *difference stereotypers* do not exhibit significantly different challenge behavior and do not receive significantly different payoffs as receivers facing the out-group in the Sender-Receiver game (compared with all other younger adults). However, young adult *difference stereotypers* do exhibit significantly different bluff behavior (bluffing more often, $Z = -2.54$, $p = 0.011$) and do receive significantly different payoffs (earning more, $Z = -2.54$, $p = 0.011$) as senders facing the out-group in the Sender-Receiver game (compared with all other younger adults). Older adult *difference stereotypers* do not exhibit significantly different bluff behavior or receive significantly different payoffs as senders facing the out-group, but they do exhibit significantly different challenge behavior (challenging less often, $Z = 2.20$, $p = 0.028$) and do receive

[20] The same patterns gleaned from examining expected outcomes reveal themselves in realized game outcome: (i) senders fare better than receivers, (ii) younger adults earn the most as senders when facing older adults, and (iii) older adults earn the most as receivers when facing younger adults. However, the variances due to stochastic game realizations render any statistical comparison insignificant. Results are available from the authors upon request.

[21] Payoffs were calculated as follows. The expected payoff for a sender, who bluffs α percent of the time possible, facing group *A*, is $\frac{1}{2}[\ \beta_A\ 2 + (1-\beta_A)\ ] + \frac{1}{2}[\ \alpha\ (1-\beta_A)\ 4 + (1-\alpha)\ 2\ ]$ where β_A is the average percent of the time that receivers from group *A*, who are in a position to challenge, will challenge senders' messages. Conversely, the expected payoff for a receiver, who challenges β percent of the time possible, facing group *A*, is $\frac{1}{2}[\ (1-\beta)\ ] + \frac{1}{2}[\ \alpha_A\ \{\ \beta\ 4 + (1-\beta)\ \} + (1-\alpha_A)\ 2]$ where α_A is the average percent of the time senders form group A, who are in a position to bluff, will bluff when sending messages to receivers.

significantly different payoffs (earning less, $Z = 2.20$, $p = 0.028$) as receivers facing the out-group in the Sender-Receiver game (compared with all other older adults).

To evaluate whether *extreme stereotypers*' Sender-Receiver behaviors are affected by their *extreme stereotypes* of the out-group (**P3.2**), and whether these stereotypers receive relatively different payoffs in the Sender-Receiver game (informing **1.4.2**), we compare, against all others, the relatively extremeness of their behavior (more always or never bluffing and challenging) in interactions with the out-group. Younger adult *extreme stereotypers* exhibit marginally significant different challenge behavior (challenging less often, $Z = 1.838$, $p = 0.066$) and receive marginally significant different payoffs (earning more, $Z = -1.838$, $p = 0.066$) as receivers facing the out-group in the Sender-Receiver game (compared with all other younger adults). Likewise, young adult *extreme stereotypers* exhibit marginally significant different bluff behavior (bluffing more often, $Z = -1.912$, $p = 0.056$) and receive marginally significant different payoffs (earning more, $Z = -1.912$, $p = 0.056$) as senders facing the out-group in the Sender-Receiver game (compared with all other younger adults). Older adult *extreme stereotypers* do not exhibit significantly different bluff or challenge behaviors or receive significantly different payoffs as senders or receivers facing the out-group.

Discussion

The research presented in this paper examines whether younger and older adults reveal age-based stereotypes, discriminate based on those stereotypes, and suffer economic costs as a result. We find that younger and older participants reveal age-based stereotypes, attributing relatively different and more polar extreme (i.e., always or never) characteristics to the out-group (as compared to unknown-aged groups or in-groups) in a systematically linked manner (i.e., tendency to bluff positively correlates with tendency to challenge). While we find effects of these stereotypes on game behaviors, we do not find support for the prediction that stereotypes of different or extreme characteristics attributed to the out-group are relatively inaccurate and economically costly in terms of earnings derived from the incentivized guess game. When evaluated against observed behaviors, guesses that stereotype the out-group as relatively different or relatively extreme in their behavior propensities are more accurate for younger adults, but less accurate for older adults, and do not affect earnings.

Overall, both younger and older adults overestimated the out-group's bluff and challenge propensity. Younger adults overestimated older adults' bluff and challenge propensity by 9.15% and 9.75%, respectively. Older adults overestimated younger adults' bluff and challenge propensity by 3.65% and 35.8%, respectively. We find partial support for the prediction that stereotypes shape interaction strategy and affect cooperation: younger adults earn more by bluffing more in interactions with older adults (as a consequence of their difference stereotypes). However, older adults earn less by challenging less in interactions with younger adults (despite their difference stereotypes). We find marginally significant effects for younger adults earning more by challenging less and bluffing more in interactions with older adults as a consequence of their extreme stereotypes.

Both males and females in our study showed stereotyping behavior. While some have suggested a "male warrior hypothesis", that intergroup processes (specifically, negative attitudes,

discrimination, and increased competitiveness towards the out-group) will be more pronounced among males due to the long history of intergroup conflict involving male rival coalitions competing over resources relevant for survival and reproduction (Bugental and Beaulieu, 2009; Van Vugt et al., 2007), we saw no evidence for a sex effect[22]. We suspect that the presence of intersexual and intrasexual competition in a mixed sex environment, as well as other risks to male mating opportunities, may be necessary to trigger sex-specific facultative psychologies (e.g. see Klavina et al. 2011).

Our study provides support for the notion that people use age group membership to stereotype other's behavioral propensities and to discriminately adjust their own interaction styles with others. We find partial support for extensions of social identity theory and stereotype theory, namely that people make attributions about age groups where the "out-group" is believed to be different than the "in-group" (their own age group) and the out-group is believed to be more uncooperative than they actually are. However, we do not find clear support for a central assumption of in-group favoritism from social identity theory (Hewstone et al., 2002), namely that individuals hold a relatively favorable self-concept of themselves (and their in-group) derived from perceived group membership and a relatively unfavorable concept of those in the out-group. If we equate the concept of being "cooperative" with a favorable behavior propensity, and being "uncooperative" with an unfavorable behavioral propensity, we see that the fundamental inter-group bias premise of the social identity theory prediction (that individuals "strive for a positive self-concept"; Tajfel & Turner, 1979) does not hold up among our younger adults. In fact, of all possible target groups, younger adults as well as older adults view younger adults as the least cooperative. Furthermore, of all possible target groups, both younger and older adults perform worst predicting the behavior of younger adults than any other target group. However, the cooperative dimension of a "positive self-concept" may be transitory across the lifespan, with younger adults favoring a self-image of being non-cooperative whereas older adults favor a self-image of being cooperative. Further research is needed to evaluate this possibility.

Our results are most similar to Charness and Villeval (2009) who found older adults to be more cooperative than younger adults, and found that older adults act especially cooperative when knowingly interacting with younger adults. In our experiment, younger adults were relatively less cooperative with the older out-group (than their in-group) in the role of sender and believed the out-group to be relatively more cooperative (than their in-group). At the same time, younger adults were relatively more cooperative with the older out-group (than their in-group) in the role of receiver and believed the out-group to be relatively more cooperative as senders (than their in-group). This combination of beliefs and behavior is directionally consistent with the game theoretical response (see Appendix 1) intent on exploiting others. At the same time, older adults were relatively more cooperative with the younger out-group (than their in-group) in both sender and receiver roles, despite believing that younger adults were relatively less cooperative (than their in-group). This behavior is not consistent with the game theoretical response, but comparable to Charness and Villeval's result, which the authors interpret as older adults being "…interested in teaching the juniors the benefits of group cooperation…[because] experience taught them that cooperation pays off…" (p.974, 2009).

[22] Additionally, we examined whether –independent of stereotypes held—males are less cooperative, as suggested by some literature (e.g. Dreber & Johannesson, 2008). Again, we found no evidence of a sex effect.

The propensity to socially recognize and categorize others (e.g. based on sex, race, age) occurs implicitly and results in perceptual biases. Where inter-relationship between recognizable social groups might pose an economic threat, discrimination and even hostility can be aroused (Butz & Yogeeswaran, 2011; Hepworth & West, 1988; Hovland & Sears, 1940). Whereas previous work on ageism has focused on emotional and physiological impacts of ageist discrimination, we have investigated whether distinct beliefs about age groups cause an economic impact (either positive or negative) in strategic interactions – an area of concern that has not yet been addressed experimentally and which should have great impact on public policy and economic concerns.

This study reports an age-stereotype effect where both younger and older individuals alike make attributions about age groups where the "out-group" is believed to be different than the "in-group" (their own age group) and believed to be more uncooperative than they are observed to be. However, we do not find support for the claim that discriminating based on stereotypes will lead to economic costs. Though it may be considered a socially undesirable disease (Butler, 1989), the stereotyping we observe does not clearly come at an economic cost to those infected with it by: (1) losing money based on the inaccurate guesses they invest in, and (2) loosing money in the Sender-Receiver game by effect on contingent strategies. Though younger and older adults revealed stereotypes in the guess game, there were no significant economic effects on their scored guesses overall. Older adult difference stereotypers earned less as receivers in the Sender-Receiver game, but younger difference stereotypers earned more as senders. Younger adults holding extreme stereotypes of older adults also fared better in intergenerational interactions than when facing their own age group. In fact, cooperation is higher when subjects are aware that they are paired with members of the out-group (than when paired with in-group members), also consistent with Charness and Villeval's (2009) finding from the field that age-heterogeneous teams are more cooperative than age homogeneous teams.

Evidence of these stereotype propensities and economic effects should be taken note of, especially given the risk that the identified economic advantages may encourage further ageism. We should remain concerned that ageism can have many forms of great effect on interaction outcomes and on individuals involved. This is a source of grave concern given the growing older-adult population and its potential contribution to labor and other productive relationships.

Due to the unprecedented growth of older adult populations globally which will soon outnumber child populations (e.g. see Figure 3), and growing sources of intergenerational conflict, the prevalence of increased health risk, abuse, and neglect among elderly is quickly rising (Lachs & Pillemer, 2004). In order to address these issues we need to better understand if interpersonal interaction between generations and decisions affecting them are influenced by stereotype beliefs and if educational interventions and contextualized experiences within and between age groups can help overcome ageism.

As the older population grows larger, so do their demands for health care. As progressive chronic diseases are better controlled and other medical advances contribute to increased survival rates, allowing more life extension, an expansion in morbidity and disability is expected (Olshansky et al., 1991; Robine & Michel, 2003). With burgeoning old and disabled populations the negative impacts of ageism on health service provision (Grant, 1996; Hillerbrand & Shaw 1990) and

quality of communication about matters of health (Butler, 1975; Greene et al. 1989; Caporael & Culbertson 1986) will also become increasingly poignant.

The problem of harmful ageism is not unavoidable. We must recognize that there are many psychological and social reasons to expect ageism, and also recognize that ageists can be motivated to change their beliefs, so as to bring improvements to themselves and those they affect.

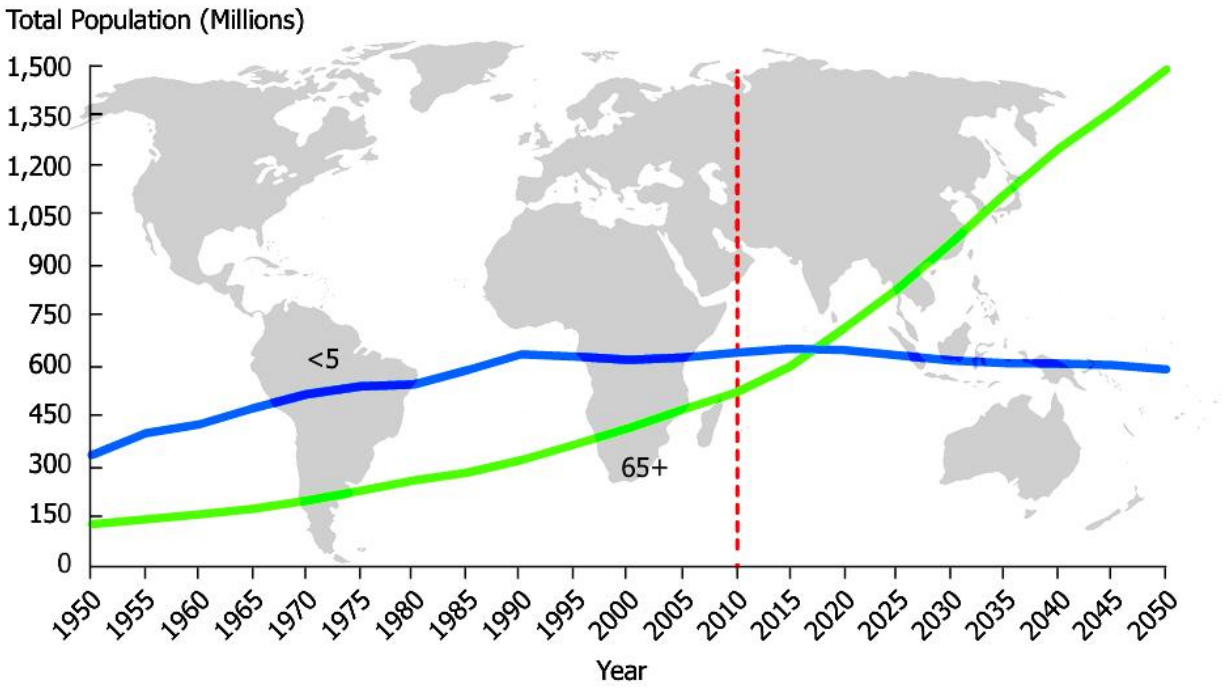

Figure 3. The changing ratio of adults 65 and over and children under age 5, globally and across time, based on historical data and demographic projections. (NIA 2012). Reproduced with permission of the Population Reference Bureau.

The literature on racism and sexism argues that these undesirable traits "can be erased" with decategorizing frames and counter-stereotype training processes, suggesting that similar results might be achieved for ageism. For example, the automatic (implicit) encoding of race after brief presentations is attenuated when racial identity is orthogonal to coalition membership (i.e., when it is no longer a proxy for in-group / out-group), suggesting that visual cues of race are processed as correlates of coalitional affiliation (Kurzban, Tooby, & Cosmides, 2001). "Decategorization" processes seek to eliminate categorization by not allowing differentiation based on social category, such as by making in-group members part of a non-differentiated group (Brewer,1999) or making out-group members part of a non-differentiated group. However, we do not find that when younger and older adults are facing an "unknown-aged group", which does not allow for age-based identification of the interacting participants, they hold less different or extreme beliefs, or act any more moderately, as compared to when facing known-aged groups.

Kawakami et al., (2005; 2011) provide evidence that "counter-stereotype training" can be successfully used to correct undesirable gender stereotypes and decrease intergroup bias in hiring decisions. A review of intervention programs designed to reduce gender-bias in hiring practices supports their effectiveness and concluded that there is much evidence that gender-equity can be effectively promoted (Isaac et al., 2009). We suspect that a similar approach countering undesirable age stereotypes holds much promise and should be pursued in an effort to improve intergenerational cooperation.

In 1968, Robert Butler coined the term "ageism", identifying a two-way problem that existed like a disease between young and old people (Butler, 1989). As an antidote, Butler proscribed interventions improving the afflicted parties' knowledge about the age-related problems at hand. Though our experiment allowed for ageism to occur and ageist stereotypers to profit from their age-based discrimination, it also provided adults, separated by two generations, novel opportunities to learn about intergenerational interactions in a controlled laboratory environment and, perhaps, to gain new information that counters their previous stereotypes. Future research is needed to replicate this experiment with a second stage (repeating the first stage after feedback about scored guesses and interaction outcomes), to evaluate whether stereotypers who suffer costs from inaccurate beliefs and poor strategy choice improve their beliefs and behaviors. We hope that interest in and continued activity with intergenerational research studies such as these will provide pathways towards developing greater intergenerational cooperation and overcoming harmful ageism.

References

Aczel, J. & Pfanzagl, J. (1966). Remarks on the measurement of subjective probability and information. *Metrika* 11:91-105.

Allport, G. (1935). Attitudes. In Murchison, C. *A Handbook of Social Psychology* Englewood Cliffs, NJ: Prentice-Hall.

Arrow, K.J. (1973). "The Theory of Discrimination." In Orley Ashenfelter and Albert Rees, *Discrimination in Labor Markets* (pp. 3-33) Princeton, N.J.: Princeton University Press.

Ashmore, R.D. & Del Boca, F.K. (1981). Conceptual approaches to stereotypes and stereotyping. In D.L. Hamilton, *Cognitive Processes in Stereotyping and Intergroup Behavior* (pp. 1-35) Hillsdale, NJ: Erlbaum.

Avolio, B.J., & Barrett, G.V. (1987). Effects of age stereotyping in a simulated interview. *Psychology and Aging,* 2(1):56-63.

Bailey, W.T. (1991). Knowledge, attitude, and psychosocial development of young and old adults. *Educational Gerontology,* 17:269-274.

Bargh, J.A., Chen, M., & Burrows, L. (1996). Automaticity of social behavior: Direct effects of trait construct and stereotype activation on action. *Journal of Personality and Social Psychology,* 71:230-244.

Baltes, P.B. 1987. Theoretical propositions of life-span developmental psychology: On the dynamics between growth and decline. *Developmental Psychology, 23*:611-626.

Becker, G. (1971). *The Economics of Discrimination.* Series: (ERS) Economic Research Studies.

Bendick, M., Brown, L.E., & Wall, K. (1999). No Foot in the Door: An Experimental Study of Employment Discrimination Against Older Workers. *Journal of Aging & Social Policy,* 10(1):5-23.

Berg, C.A., & Sternberg, R.J. (1992). Adults' conceptions of intelligence across the adult life span. *Psychology and Aging,* 7:221-231.

Bernard, M., Liao, C., & Mills, M. (2001) Determining the best online font for older adults. *Usability News* 3(1) http://www.surl.org/usabilitynews/31/fontSR.asp

Bhatt, M., & Camerer, C.F. (2005). Self-referential thinking and equilibrium as states of mind in games: fMRI evidence. *Games and Economic Behavior* 52(2):424-459.

Bird, C.P., & Fisher, T.D. (1986). Thirty years later: Attitudes toward the employment of older workers. *Journal of Applied Psychology,* 71(3):515-517.

Blanco, M., Engelmann, D., Koch, A.K., & Normann, H. (2010). Belief elicitation in experiments: is there a hedging problem? *Experimental Economics* 13(4):412-438.

Bothwell, R.K., Brigham, J.C., & Malpass, R.S. (1989). Cross-racial identification. *Personality and Social Psychology Bulletin, 15*(1):9-25.

Boyer, P., Lambert, A., & Christner, J. (2012). Why people see too many out-groups: Effects of coalitional threat appraisal on numerical estimation. *working paper.*

Brewer, M.B., Dull, V., & Lui, L. (1981). Perceptions of the elderly: stereotypes as prototypes. *Journal of Personality and Social Psychology.* 41(4):656-670.

Bugental, D.B., & Hehman, J.A. (2007). Ageism: A review of research and policy implications. *Social Issues and Policy Review.* 1:173-216.

Bugental, D.B., & Beaulieu, D.A. (2009). Sex differences in response to coalitional threat. *Evolution and Human Behavior*. 30:238-243.

Butler, R.N. (1975). Psychiatry and the elderly: An overview. *American Journal of Psychiatry.* 132:893-900.

Butler, R.N. (1989). Dispelling ageism: The cross-cutting intervention. *The Annals of the American Academy of the Political and Social Sciences*. 503:138-147.

Butz, D.A., & Yogeeswaran, K. (2011). A new threat in the air: macroeconomic threat increases prejudice against Asian Americans. *Journal of Experimental Social Psychology*. 47:22-27.

Callanan, G.A., & Greenhaus, J.H. (2008). The baby boom generation and career management: A call to action. *Advances in Developing Human Resources*. 10(1):70-85.

Campbell, D.T. (1960). Blind variation and selective retention in creative thought as in other knowledge processes. *Psychological Review.* 67:380-400

Caporael, L.R., & Culbertson, G.H. (1986). Verbal response modes of baby talk and other speech at institutions for the aged. *Language and Communication*. 6:99-112.

Caspi, A. (1984). Contact hypothesis and inter-age attitudes: A field study of cross-age contact. *Social Psychology Quarterly.* 47*:*74-80.

Charness, G., & Dufwenberg, M. (2010). Bare promises: an experiment. *Economic Letters.* 107(2):281-283

Charness, G., & Villeval, M. (2009). "Cooperation and Competition in Intergenerational Experiments in the Field and the Laboratory" *American Economic Review.* 99(3):956-78.

Costa-Gomes, M.A. & Weizsacker, G. (2007). Stated beliefs and play in normal form games. *Review of Economic Studies.* 75:729-762

Croson, R.T.A. (2000). Thinking like a game theorist: factors affecting the frequency of equilibrium play. *Journal of Economic Behavior and Organization*. 41:299-314.

Cuddy, A.J., & Fiske, S.T. (2002). Doddering but dear: Process, content, and function in stereotyping of older persons. In T.D. Nelson, *Ageism, Stereotyping and Prejudice Against Older Persons* (pp. 3-26). Cambridge, MA: The MIT Press.

Cuddy, A.J.C., Norton, M.I., & Fiske, S.T. (2005). This old stereotype: The pervasiveness and persistence of the elderly stereotype. *Journal of Social Issues.* 61:267-285.

Darley, J.M. & Fazio, R.H. (1980). Expectancy-confirmation processes arising in the social interaction sequence. *American Psychologist*. 35:867-881

Dennis, H. & Thomas, K. (2007). Ageism in the workplace. *Generations.* (Aging Society of America) Spring:84-89.

Deaux, K., & Major, B. (1987). Putting gender into context: An interactive model of gender-related behavior. *Psychological Review.* 94:369-389.

Dorris, M.C and Glimcher, P.W. (2004). Activity in posterior parietal cortex is correlated with the relative subjective desirability of action. *Neuron*. 44:365-378,

Dreber, A. & Johannesson, M. (2008). Gender differences in deception. *Economic Letters.* 99:197-199

Duncan, C. (2001). Ageism, early exit, and the rationality of age-based discrimination. In Glover, I. and Branine, M. (Eds.) *Ageism in Work and Employment* (pp. 3-21). Aldershot: Ashgate.

Duncan, L.A. & Schaller, M. (2009). Prejudicial attitudes toward older adults may be exaggerated when people feel vulnerable to infectious disease: evidence and implications. *Analysis of Social Issues and Public Policy* 9(1):97-115

Eagly, A.H. (1987). *Sex differences in social behavior: A social-role interpretation.* Hillsdale, NJ: Lawrence Eribaum Associates, Inc.

Eagly, A.H., Wood, W., & Diekman, A.B. (2000). Social role theory of sex differences and similarities: A current appraisal. In T. Eckes (Ed.), *The Developmental Social Psychology of Gender* (pp. 123-174). Mahwah, NJ: Erlbaum.

Einhorn, H.J. (1980). Learning from experience and suboptimal rules in decision making. In Thomas S. Wallsten *Cognitive Processes in Choice and Decision Behavior* (pp.1-20). Hillsdale, NJ: Earlbaum.

Erber, J.T., Etheart, M.E., & Szuchman, L.T. (1992). Age and forgetfulness: Perceivers' impressions of targets' capability. *Psychology and Aging. 7*:479-483.

Ericsson, K.A., Krampe, R.T., & Tesch-Romer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review.* 100:363-406.

Fagot, B.I. & Leinbach, M.D. (1993). Gender-role development in young children: from discrimination to labeling. *Developmental Review.* 13:205-224.

Fagot, B.I. & Singer, L.T. (1979). The role of simple feature differences in infant recognition of faces. *Infant Behavior and Development.* 2:39-46.

Fehr, E., Fischbacher, U., von Rosenbladt, B., Schupp, J., Wagner, G.G., (2002). A Nation-Wide Laboratory - Examining trust and trustworthiness by integrating behavioral experiments into representative surveys. *Schmollers Jahrbuch*, 122: 519-542.

Finkelstein, L.M., Burke, M.J., & Ragu, N.S. (1995). Age discrimination in simulated employment contexts: An integrative analysis. *Journal of Applied Psychology*. 80(6):652-663.

Fiske, S.T., Cuddy, A.J., Glick, P., & Xu, J. (2002). A model of (often mixed) stereotype content: Competence and warmth respectively follow from perceived status and competition. *Journal of Personality and Social Psychology.* 82(6):878-902.

Fiske, S.T., Lin, M., & Neuberg, S.L. (1999). The continuum model: Ten years later. In S. Chaiken & Y. Trope (Eds.), *Dual-process Models in Social Psychology* (pp. 231-254). New York: Guilford

Forte, C.S., & Hansvick, C.L. (1999). Applicant age as a subjective employability factor: A study of workers over and under age fifty. *Journal of Employment Counseling.* 36(1):24-35.

Fudenberg, D., & Tirole, J. (1994). *Game Theory*. Cambridge, MA: MIT Press.

Garstka, T.A., Hummert, M.L., & Branscombe, N.B. (2005). Perceiving age discrimination in response to intergenerational inequity. *Journal of Social Issues.* 61:321-342.

Garstka, T.A., Schmitt, M.T., Branscombe, N.R., & Hummert, M.L. (2004). How older and younger adults differ in their responses to perceived age discrimination. *Psychology and Aging.* 19(2):326-335.

Gordon, R.S. & Avery, R.D. (2004). Age bias in laboratory and field settings: A metaanalytic investigation. *Journal of Applied Social Psychology*, 34(3):468-492.

Grant, L. (1996). Effects of ageism on individual and health care providers' responses to healthy aging. *Health and Social Work.* 21:9-15.

Greene, M.G., Adelman, R.D., Charon, R., & Friedmann, R. (1989). Concordance between physicians and their older and younger patients in the primary care medical encounter. *Gerontologist.* 29:808-813.

Greenwald, A.G., McGhee, D.E., & Schwartz, J.L.K. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology*. 74:1464-1480

Gregory, R.F. (2001). *Age Discrimination in the American Workplace: Old At a Young Age.* New Brunswick, New Jersey: Rutgers University Press.

Gringart, E.H., Helmes, E., & Speelman, C.P. (2005). Exploring attitudes toward older workers among Australian employers: An empirical study. *Journal of Aging Social Policy*. 17(3):85-103.

Gross, E.F. & Hardin, C.D. (2007). Implicit and explicit stereotyping of adolescents. *Social Justice Research.* 20(2):140-160.

Grund, C., & Westergård-Nielsen, N. (2005). Age Structure of the Workforce and Firm Performance. *IZA Discussion Paper* 1816.

Harris, M.B., Page, P., & Begay, C. (1988). Attitudes toward aging in a Southwestern sample: Effects of ethnicity, age, and sex. *Psychological Reports*. 62:735-746.

Hassell, B.L., & Perrewe, P.L. (1995). An examination of beliefs about older workers: Do stereotypes still exist? *Journal of Organizational Behavior*. 16(5):457-468.

Hedge, J.W., Borman, W.C., & Lammlein, S.E. (2006). *The Aging Workforce: Realities, Myths, and Implications for Organizations.* Washington, D.C.: American Psychological Association.

Helton, W.S. (2008). Expertise acquisition as sustained learning in humans and other animals: commonalities across species. *Animal Cognition.* 11:99-107

Hehman, J. & Bugental, D. (2012). Life stage-specific cariations in performance in response to age stereotypes. forthcoming *Developmental Psychology*.

Hepworth, J., & West, S. (1988). Lynchings and the economy: A time-series reanalysis of Hovland and Sears (1940). *Journal of Personality and Social Psychology*. 55(2):239-247.

Hess, T.M., Hinson, J., & Statham, J. (2004). Explicit and implicit stereotype activation effects on memory: Do age and awareness moderate the impact of priming? *Psychology and Aging*. 19:495-505.

Hill, R.F., von Mering, O., & Guillette, E.A. (1995). Adolescence and old age: I. Terminal, problem cultures in American society. *Educational Gerontology*. 21:275-283.

Hillerbrand, E., & Shaw, D. (1990). Age bias in a general hospital: Is there ageism in psychiatric consultation? *Clinical Gerontologist.* 2:3-13

Hogg, M.A., & Abrams, D. (1993). Towards a single-process uncertainty-reduction model of social motivation in groups. In MA Hogg, D Abrams (eds.) *Group Motivation: Social Psychological Perspectives* (pp. 173-90). New York: Harvester Wheatsheaf

Hovland, C., & Sears, R. (1940). Minor studies in aggression: Correlation of lynchings with economic indices. *Journal of Psychology*. 9:301-310.

Hummert, M.L. (1990). Multiple stereotypes of elderly and young adults: A comparison of structure and evaluation. *Psychology and Aging.* 5:182-193

Hummert, M.L., Garstka, T.A., Shaner, J.L., & Strahm, S. (1994). *Journal of Gerontology.* 49(5):240-249

Isaac, C., Lee, B., & Carnes, M. (2009). Interventions that affect gender bias in hiring: a systematic review. *Academic Medicine.* 84(1):1440-1446

Jackson, L.A., & Sullivan, L.A. (1988). Age stereotype disconfirming information and evaluations of old people. *Journal of Social Psychology.* 128:721-729.

Johnson, R.W. (2007). Managerial attitudes toward older workers: A review of the evidence. *The Retirement Project Discussion Paper* 07-05. The Urban Institute, Washington, D.C.

Kawakami, K., Dovidio, J.F., & van Kamp, S. (2005). Kicking the habit: Effects of nonstereotypic association training and correction processes on hiring decisions. *Journal of Experimental Social Psychology*. 41:68-75.

Kawakami, K., Dovidio, J.F., & van Kamp, S. (2011). The impact of counterstereotypic training and related correction processes on the application of stereotypes. *Group Processes and Intergroup Relations.* 10(2):139-156

Kilduff, M., Angelmar, R. & Mehra, A. (2000). Top Management-Team Diversity and Firm Performance: Examining the Role of Cognitions. *Organization Science*, 11(1): 21-34.

Kreps, D.M. (1990). *A Course in Microeconomic Theory*. First Edition. Princeton, NJ: Princeton University Press.

Kite, M., Deaux, K., & Miele, M. (1991). Stereotypes of young and old: Does age outweigh gender? *Psychology and Aging.* 6:19-27.

Kite, M.E., & Johnson, B.T. (1988). Attitudes toward older and younger adults: A meta-analysis. *Psychology and Aging*. 3:233-244.

Kite, M.E., Stockdale, G.D., Whitley, Jr., B.E., & Johnson, B.T. (2005). Attitudes toward younger and older adults: An updated meta-analytic review. *Journal of Social Issues*. 61(2):241-266.

Kite, M.E., & Wagner. L.S. (2002). Attitudes toward older adults. In Nelson, T.D. (Ed.) *Ageism: Stereotyping and Prejudice Against Older Persons* (pp. 129-161). Cambridge, MA: The MIT Press.

Kovalchik, S., Camerer, C.F., Grether, D.M., Plott, C.R, & Allman, J.M. (2005). Aging and decision making: a comparison between neurologically healthy elder and young individuals. *Journal of Economic Behavior & Organization*. 58:79-94

Kramer, A.F. & Willis, S.L. (2002). Enhancing the cognitive vitality of older adults. *Current Directions in Psychological Science*. 11(5):173-177

Kurzban, R. & Leary, M.R. (2001). Evolutionary origins of stigmatization: the functions of social exclusion. *Psychological Bulletin.* 127(2):187-208.

Kurzban, R., Tooby, J., & Cosmides, L. (2001). Can race be erased? Coalitional computation and social categorization. *Proceedings of the National Academy of Sciences of the United States of America.* 98(26):15387-15392.

Lachs, M.S. & Pillemer, K. (2004). Elder abuse. *The Lancet.* 364: 1263-1272

Lahey, J.N. (2005). Do older workers face discrimination? An issue in Brief, *Center for Retirement Research at Boston College*. July 2005, Number 33.

Lahn, L.C. (2003). Competence and learning in late career. *European Education Research Journal*. 2(1):126-140.

Levy, B. (1996). Improving memory in old age through implicit self-stereotyping. *Journal of Personality and Social Psychology*. 71:1092-1107

Levy, B., Ashman, O., & Dror, I. (1999-2000). To be or not to be: The effects of aging stereotypes on the will to live. *Omega.* 40:409-420.

Levy, B., Hausdorff, J.M., Hencke, R., & Wei, J.Y. (2000). Reducing cardiovascular stress with positive self-stereotypes of aging. *Journal of Gerontology: Psychological Sciences.* 55B:205-213.

Lindle, R.S., Metter, E.J., Lynch, N.A., Fleg, J.L., Fozard, J.L., Tobin, J., Roy, T.A., & Hurley, B.F. (1997). Age and gender comparisons of muscle strength in 654 women and men aged 20-93 yr. *Journal of Applied Physiology*. 83:1581-1587.

Linville, P. (1982). The complexity-extremity effect and age-based stereotyping. *Journal of*

Personality and Social Psychology. 193-211.

Loretto, W., & White, P. (2006). Employers' attitudes, practices and policies towards older workers. *Human Resource Management Journal*. 16(3):313-330.

Macrae, C.N., Bodenhausen, G.V., & Milne, A.B. (1994). Stereotypes as energy-saving devices: A peek inside the cognitive toolbox. *Journal of Personality and Social Psychology*. 66:37-47

Marche, S. (2012). The war against youth. *Esquire* March 26, 2012. http://www.esquire.com/features/young-people-in-the-recession-0412 accessed May 31, 2012

Mathews T.J., & Hamilton B.E.. (2009). Delayed childbearing: More women are having their first child later in life. *NCHS Data Brief*, no 21. Hyattsville, MD: National Center for Health Statistics.

McConnell, A.R., & Leibold, J.M. (2001). Relations among the implicit association test, discriminatory behavior, and explicit measures of racial attitudes. *Journal of Experimental Social Psychology*. 37:435-442.

McEvoy, G.M., & Blahna, M.J. (2001). Engagement or disengagement? Older workers and the looming labor shortage. *Business Horizons*. September-October:46-52.

McGarty, C., Yzerbyt, V.Y., & Spears, R. (2002). Social, cultural and cognitive factors in stereotype formation. In C. McGarty, V. Y. Yzerbyt, & R. Spears (Eds.). Stereotypes as explanations: The formation of meaningful beliefs about social groups (pp. 1-15). Cambridge: Cambridge University Press.

Mermin, G.B.T. (2007). Are employers willing to hire and retain older workers? *The Retirement Project: Fact Sheets on Population Aging*.

Mermin, G.B.T., Johnson, R.W., & Toder, E.J. (2008). Will employers want aging boomers? *The Retirement Policy Program, Discussion Paper* 08-04, The Urban Institute, Washington, D.C.

Mitro, S., Gordon, A.R., Olsson, M.J., & Lundström, J.N. (2012). The Smell of Age: Perception and Discrimination of Body Odors of Different Ages. *PLoS ONE* 7(5):e38110. doi:10.1371/journal.pone.0038110

Montepare, J.M., & Zebrowitz, L.A. (2002). A social-developmental view of ageism. In T. D. Nelson (Ed.), *Ageism* (pp. 77-125). Cambridge, MA: MIT Press.

Munnell, A.H., Sass, S.A., & Soto, M. (2006). Employer attitudes towards older workers: Survey results. *Work Opportunities for Older Americans Series* 3 (July). Chestnut Hill, MA: Center for Retirement Research at Boston College.

Nash, J.F. (1950). Equilibrium points in *n*-person games. *Proceedings of the National Academy*

of Sciences. 36(1):48-49

Nash, J.F. (1951). Non-cooperative games. Annals of Mathematics and its use in planning movements. *Annual Review of Neuroscience.* 20(54) 286-295.

Nelson, T. D. (2002). *Ageism: Stereotyping and prejudice against older persons*. Cambridge, MA: MIT Press.

NIA (National Institute on Aging) (2007). Why population aging matters: a global perspective. *National Institute on Aging, National Institutes of Health Publication* No. 07-6134

NIA (National Institute on Aging) (2012). World Population Aging Clocks Illustrate Growth in Population Under Age 5 and Over Age 65**.** Retrieved July 19, 2012. From http://www.nia.nih.gov/research/dbsr/world-population-aging

Noonan, A.E. (2005). "At this point now": Older workers' reflection on their current employment experiences. *International Journal Aging and Human Development.* 61(3):211-241.

OECD. (2006). *Live Longer, Work Longer.* The Organization for Economic Co-operation and Development: OECD Publishing: Paris. ISBN**:** 9789264035874

Olshansky, S.J., Rudberg, M.A., Carnes, B.A., Cassel, C.K., & Brody, J.A. (1991). Trading Off Longer Life for Worsening Health The Expansion of Morbidity Hypothesis. *Journal of Aging and Health*. *3*(2):194-216.

Palmore, E.B. (1999). *Ageism: Negative and Positive* (2nd ed.). New York: Springer Publishing Company.

Palmore, E.B. (2005). Costs of ageism. In Palmore, E.B, Branch, L., Harris, D.K. (eds.) *Encyclopaedia of Ageism* (pp. 80-83). New York: Haworth Pastoral Press

Palfrey, T.R., & Wang, S.W. (2009). On eliciting beliefs in strategic games. *Journal of Economic Behavior and Organization*. 71(2):98-109

Park, J.H., Faulkner, J., & Schaller, M. (2003). Evolved disease-avoidance processes and contemporary anti-social behavior: prejudicial attitudes and avoidance of people with physical disabilities. *Journal of Nonverbal Behavior.* 27(2):65-87

Park, B., & Rothbart, M. (1982). Perception of out-group homogeneity and levels of social categorization: Memory for the subordinate attributes of in-group and out-group members. *Journal of Personality and Social Psychology, 42,* 1051-1068.

Peeters, G. (1995). What's negative about hatred and positive about love? On negation in cognition, affect, and behavior. In H. C. M. de Swart, L. J. M. Bergman (Eds.), *Perspectives on negation: Essays in honour of Johan J. de Iongh on his 80th birthday* (pp. 123-133). Tilburg, Netherlands: Tilburg University Press.

Peeters, G. (1983). Relational and informational patterns in social cognition. In W. Doise and S. Moscovici (Eds.), *Current issues in European social psychology*, 201-237. UK: Maison des Sciences de l'Homme and Cambridge University Press.

Pelled, L.H., Eisenhardt, K.M., & Xin, K.R. (1999). Exploring the Black Box: An Analysis of Work Group Diversity, Conflict, and Performance. *Administrative Science Quarterly*. 44(1):1-28

Perdue, C.W., & Gurtman, M.B. (1990). Evidence for the automaticity of ageism. *Journal of Experimental Social Psychology*. 26:199-216.

PIU (Performance and Innovation Unit) (2000). Winning the generation game: improving opportunities for people aged 50-65 in work and community activity. *Performance and Innovation Unit Report* (April) London: The Cabinet Office.

Peterson, S.J., & Spiker, B.K. (2005). Establishing the positive contributory value of older workers: A positive psychology perspective. *Organizational Dynamics*. 34(2):153-167.

Phalet, K., & Poppe, E. (1997). Competence and morality dimensions of national and ethnic stereotypes: A study in six eastern-European countries. *European Journal of Social Psychology*, 27:703-723.

Posthuma, R.A., & Campion, M.A. (2009). Age stereotypes in the workplace: Common stereotypes, moderators, and future research directions. *Journal of Management*. 35(1):158-188.

Rey-Biel, P. (2009). Equilibrium Play and Best Response to (Stated) Beliefs in Normal Form Games. *Games and Economic Behavior*. 65(2):572-585.

Riach, P.A., & Judith, R.. (2006). An Experimental Investigation of Age Discrimination in the French Labour Market. *IZA Discussion Paper* 2522, Bonn.

Rix, S.E. (2002). The labor market for older workers. *Generations*. Summer:25-30.

Robine, J.M., & Michel, J.P. (2004). Looking forward to a general theory on population aging. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences. 59*(6):M590-M597.

Salthouse, T.A. (1992) Reasoning and spatial abilities. in F.I.M. Craik & T.A. Salthouse (eds), *Handbook of Aging and Cognition.* Hillsdale, NJ: Earlbaum.

Salthouse, T.A. (1993). Influence of working memory on adult age differences in matrix reasoning. *British Journal of Psychology* 84:171-199.

Savage, L.J. (1971): Elicitation of Personal Probabilities and Expectations. *Journal of American Statistical Association* 66(336):783-801

Schmidt, D.F. & Boland, S.M. (1986). The structure of impressions of older adults: evidence of multiple stereotypes. *Psychology and Aging.* 1:255-260

Shea, G.F., & Haasen, A. (2006). *The Older Worker Advantage: Making the Most of Our Aging Workforce.* Westport, Connecticut: Praeger

Snape, E. & Redman, T. (2003). Too old or too young? The impact of perceived age discrimination. *Human Resource Management Journal* 13(1):78-89

Social Security Administration (2009). Normal Retirement Age. Page last reviewed or modified Thursday Nov 12, 2009 http://www.ssa.gov/OACT/ProgData/nra.html accessed May 30, 2012

Steele, C.M., Spencer, S J., & Aronson, J. (2002). Contending with group image: The psychology of stereotype and social identity threat. In M. P. Zanna (Ed.). *Advances in Experimental Social Psychology, Vol. 34,* (pp. 379-440). San Diego, CA: Academic Press, Inc.

Steinberg, L. (2008). A social neuroscience perspective on adolescent risk-taking. *Developmental Review.* 28(1):78-106

Sterns, J.L., & Miklos, S.M. (1995). The aging worker in a changing environment: Organizational and individual issues. *Journal of Vocational Behavior*. 47:248-268.

Stoney, C., & Roberts. M. (2002). The case for older workers at Tesco: An examination of attitudes, assumptions and attributes. *Working Paper* no. 53 School of Public Policy and Administration Carleton University, 1-27.

Sutter, M., Kocher, M.G. (2007) Trust and trustworthiness across different age groups. *Games and Economic Behavior.* 59(2):364-382

Tajfel, H. (1981). Social stereotypes and social groups. In J. C. Turner & H. Giles (Eds.). *Intergroup Behaviour* (pp. 144-167). Oxford: Blackwell

Tajfel, H., and Turner, J.C. (1979). An integrative theory of intergroup conflict. In W. G. Austin and S. Worchel (Eds.), *The Social Psychology of Intergroup Relations* (pp. 33-47). Monterey, CA: Brooks/Cole.

Tajfel, H., and Turner, J.C. (1986). The social identity theory of intergroup behavior. In S. Worchel and W. G. Austin (Eds.), *Psychology of Intergroup Relations* (pp. 7-24). Chicago: Nelson-Hall.

Taylor, P.E., & Walker, A. (1994). The ageing workforce: Employers' attitudes towards older people. *Work, Employment & Society*. 8(4):569-591.

UN (United Nations) (2005). United Nations Department of Economic and Social Affairs, Population Division. *World Population Prospects. The 2004 Revision*. New York: United Nations.

U.S. General Accounting Office. (2001). *Older Workers: Demographic Trends Pose Challenges for Employers and Workers.* Washington, D.C.

Van Vugt, M., De Cremer, D., & Janssen, D. (2007). Gender differences in competition and cooperation: the male warrior hypothesis. *Psychological Science.* 18:19–23.

Weiss, E.M., & Maurer, T.J. (2004). Age discrimination in personnel decisions: A reexamination. *Journal of Applied Social Psychology*. 34(8):1551-1562.

Winkler, R L. & Murphy, A.H. (1968) 'Good' Probability Assessors *Journal of Applied Meteorology.* 1:751-758.

Zebrowitz, L.A., & Montepare, J.M. (2000). Too young, too old: Stigmatizing adolescents and the elderly. In T. F. Heatherton, R. E. Kleck, J. G. Hull, & M. R. Hebl (Eds.), *The Social Psychology of Stigma.* (pp. 334-373). New York, NY: Guilford Publications.

Appendix 1. Proof of equilibrium strategy in Bluff-Challenge Strategic Information Transmission Game

The game theoretic best response behavior is solved below in our environment. The normative equilibrium is one of mixed strategies.

The sender discovers state is S or L (small value or large value) where each value has equal probability. The sender's action depends upon the value of the state:

1) If state is S, can only send true message that state is S to the receiver.
2) If state is L, then the sender can either:
   a. Send true message [T] to the receiver of L
   b. Bluff, sending a false message [F] to the receiver of S

The receiver receives a message of S or L (small value or large value) from the sender. The sender's action depends upon the message:

1) If message is L, the receiver has no choice but to accept. The payoffs for the sender and receiver are L/2.
2) If message is S, the receiver can accept or challenge, and the payoffs depend upon the state:
   a. Accept [A]:
   - If the message was true (i.e., the state was S), then payoffs for the sender and the receiver are S/2.
   - If the message was false (i.e., the state was L), then payoffs are L - S/2 for the sender and S/2 for the receiver.
   b. Challenge [C]:
   - If the message was true (i.e., the state was S), then payoffs are S for the sender and zero for the receiver.
   - If the message was false (i.e., the state was L), then payoffs are zero for the sender and L for the receiver.

The sender chooses what message to send when the state is L, and the receiver has a choice to accept or challenge when the message is S. Notice that if the sender was known to always send true messages, then the receiver would never challenge. However, if the receiver is known to never challenge, the sender can earn higher payoffs by sending false messages. Furthermore, if the sender always bluffs, a receiver who always challenges earns higher payoffs. But if the receiver always challenges, the sender can earn higher payoffs by always sending true messages. As such the use of pure strategies cannot result in equilibrium.

Instead, assume that the receiver chooses to challenge messages of S with probability β. Then the sender, seeing the state is L, must choose to send a true [T] message of L or a false [F] message of S. The sender's expected payoffs of taking each action are:

$E[T] \equiv E[\text{Payoff}|\text{state} = L, \beta] = L/2$

$E[F] \equiv E[\text{Payoff}|\text{state} = L, \beta] = (1 - \beta)(L - S/2)$

If the receiver challenges too often (i.e., β is relatively large), then the sender has a higher expected payoff by sending a true message, but if the receiver challenges too little, then the sender has an higher expected payoff sending a false message. So the best response depends

upon β. Given that L = 4 and S = 2, the expected payoffs to the sender are equal when $\beta = \frac{1}{3}$, and as such, the sender is indifferent to available actions.

Likewise assume the sender chooses to send false messages of S with probability α. The receiver, seeing the message is S, must choose to challenge [C] or accept [A]. The receiver's expected payoffs of taking each action are:

$$E[A] \equiv E[\text{Payoff} \mid \text{message} = S, \alpha] = S/2$$
$$E[C] \equiv E[\text{Payoff} \mid \text{message} = S, \alpha] = \alpha L/(1+\alpha)$$

If the sender sends false messages too often (i.e., α is relatively large), then the receiver has a higher expected payoff when challenging, but if the sender sends false message too seldom, then sender has a higher expected payoff when accepting. Given that L = 4 and S = 2, the expected payoffs to the sender are equal when $\alpha = \frac{1}{3}$.

In summary, a Nash equilibrium is to bluff, sending a false message 1/3 of the time possible, and to challenge 1/3 of the time possible.

Table 1: Difference, Extremeness, and Accuracy of Guesses

	About Bluff Propensity			About Challenge Propensity		
	In-group	Unknown	Out-group	In-group	Unknown	Out-group
(a) Relative Difference of Guesses						
Elicited from Younger	56.85*	46.00*	30.10	49.35*	42.25*	29.75
	(12.17)	(12.67)	(17.06)	(11.80)	(11.53)	(17.98)
Elicited from Older	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 Guesses						
Elicited from Younger	38.65*	40.00*	26.75	40.45*	39.55*	25.95
	(7.87)	(8.50)	(11.70)	(6.61)	(9.01)	(12.09)
Elicited from Older	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) Accuracy of Guesses						
Elicited from Younger	-25.64*#	-13.1*#	7.36#	-9.21*#	-2.67	0.88
	(12.67)	(12.45)	(16.48)	(12.59)	(12.14)	(19.02)
Elicited from Older	-6.75	-9.52*	-20.15#	5.69*	2.64*	-28.17#
	(18.85)	(18.50)	(21.77)	(23.40)	(15.20)	(23.52)
(d) Payoffs from Scored Guesses						
Earned by Younger	1.76*	5.56	5.04	6.28	6.30	5.40
	(3.23)	(3.43)	(4.07)	(3.54)	(3.08)	(4.14)
Earned by Older	3.26	4.27	4.05	3.90	5.86*	1.45
	(4.08)	(3.43)	(4.50)	(4.01)	(3.47)	(3.07)

Mean and standard deviation reported in parenthesis
* Significantly different from measure when facing the out-group at 5% percent level (Wilcoxon matched-pairs test)
# Significantly different from zero at 5% percent level (Wilcoxon sign test) reported only for accuracy of guesses.

Table 2: Sender-Receiver game Behavior and Sender-Receiver game (Expected) Payoffs

	In the role of Sender facing			In the role of Receiver facing		
	In-group	Unknown	Out-group	In-group	Unknown	Out-group
(a) Percentage of Time Bluff or Challenge						
Younger	32.50	43.25	53.75	51.92*	44.67*	23.08
	(33.59)	(40.63)	(40.69)	(30.79)	(34.85)	(36.74)
Older	30.17	32.00	21.17	30.50	33.33	20.08
	(28.56)	(35.10)	(24.18)	(29.74)	(32.30)	(18.30)
(b) Expected Payoffs						
Younger	1.75*	1.77*	1.90	1.33	1.35*	1.30
	(0.01)	(0.04)	(0.22)	(0.00)	(0.05)	(0.11)
Older	1.77	1.77*	1.73	1.33*	1.33*	1.36
	(0.11)	(0.12)	(0.14)	(0.01)	(0.01)	(0.03)

* Significantly different from measure when facing the out-group at 5% percent level (Wilcoxon matched-pairs test)

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