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Prejudicial Attitudes Toward Older Adults May Be Exaggerated When People Feel Vulnerable to Infectious Disease: Evidence and Implications

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Prejudice against elderly people ("ageism") is an issue of increasing social concern, but the psychological roots of ageism are only partially understood. Recent theorizing suggests that ageism may result, in part, from fallible cue-based disease-avoidance mechanisms. The perception of subjectively atypical physical features (including features associated with aging) may implicitly activate aversive semantic concepts (implicit ageism), and this implicit ageism is likely to emerge among perceivers who are especially worried about the transmission of infectious diseases. We report an experiment ($N = 88$) that provides the first empirical test of this hypothesis. Results revealed that implicit ageism is predicted by the interactive effects of chronic perceptions of vulnerability to infectious disease and by the temporary salience of disease-causing pathogens. Moreover, these effects are moderated by perceivers' cultural background. Implications for public policy are discussed.

The human population is aging. In 2001, 795,000 people per month entered the "over 65" age category (a number expected to increase to 847,000 per month by 2010); and, in many countries, the oldest old (80 and above) are the fastest-growing component of the population (Kinsella & Velkoff, 2001). This aging population produces many challenges, some of the most obvious of which lie in the realms of health care and economics. Perhaps less obviously, the aging population produces a larger pool of people who are the target of age-based prejudices and acts of discrimination (or "ageism" for short). Ageism manifests in many forms, and has many implications for the well-being of older adults, and for public policy (see Bugental & Hehman, 2007 for a review). To effectively combat ageism, one must

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understand its psychological causes. By doing so, one can identify circumstances that are especially likely to trigger ageist responses, and also specify interventions and policy initiatives that may inhibit age-based discrimination.

Multiple, conceptually independent psychological processes contribute to ageism (Bugental & Hehman, 2007). Here, we identify an additional psychological mechanism that may play a role in ageism—a mechanism that produces implicit (and often erroneous) cue-based inferences about infectious disease. This mechanism implies specific circumstances under which ageist responses to older adults may be especially pronounced. In this article, we report the first empirical evidence linking this mechanism to ageist attitudes, and we discuss the implications for public policy.

Background: Antecedents of Ageism

Prejudice and discrimination against older adults takes many forms, across many different domains of social life. In the workplace, for example, older adults are often less likely than younger applicants to secure interviews (Finkelstein & Burke, 1998; McMullin & Marshall, 2001). In the home, elderly people are in the highest-risk category for being subjected to abuse and neglect by caregivers (Choi & Mayer, 2000; Lachs, Williams, O'Brien, Hurst, & Horwitz, 1997; O'Keeffe et al., 2007). Older adults also suffer from a variety of forms of segregation and social exclusion (Bugental & Hehman, 2007; Hagestad & Uhlenberg, 2005).

These negative responses occur despite the fact that beliefs about older adults are often substantially positive. While common stereotypes of older adults include negative traits such as *incompetent*, *dependent*, and *sickly*, they also contain positive traits, such as *warm*, *nurturing*, and *wise* (Cuddy & Fiske, 2002; Cuddy, Norton, & Fiske, 2005; Kite & Wagner, 2002; Levy & Langer, 1994). Negative attitudes toward the elderly coexist with a variety of positive attitudes and values, such as those promoting filial piety (e.g., McCann, Ota, Giles, & Caraker, 2003). Indeed, cross-cultural evidence reveals that negative attitudes toward the elderly are, if anything, especially pronounced within countries (such those in East and Southeast Asia) that have strong traditions of filial piety (McCann et al., 2003; Sharps, Price-Sharps, & Hanson, 1998).

These apparent contradictions can be understood within the context of a dual-process model of stigma and prejudice (Pryor, Reeder, Yeadon, & Hesson-McInnis, 2004; Reeder & Pryor, 2008). According to this model, responses to stigmatized individuals include an immediate reflexive response (based on associative mechanisms) to perceptual cues displayed by those individuals, as well as a more deliberative (and slower) response that incorporates additional, rule-based considerations. Whereas positive attitudes toward older adults may result from the deliberative rule-based process, aversive reactions are likely to result from the cue-based associative process. Consistent with this analysis is evidence

from studies that have used reaction-time methodologies to assess the extent to which older adults (compared to younger adults) are implicitly associated with negative (vs. positive) semantic information. The results are clear: At an implicit level of analysis, older adults are associated with negative concepts (Dasgupta & Greenwald, 2001; Karpinski & Hilton, 2001; Nosek, Banaji, & Greenwald, 2002). Implicit cognitive associations of this sort can have powerful effects on actual behavior (e.g., Bargh, Chen, & Burrows, 1996; McConnell & Leibold, 2001). Therefore, despite the presence of explicit attitudes that imply more-positive responses, deleterious acts of prejudice and discrimination against older adults may result substantially from the implicit activation of aversive affective and cognitive responses.

What exactly are the psychological mechanisms that might produce such aversive responses? Multiple mechanisms have been identified (Bugental & Hehman, 2007), and there is some empirical evidence bearing on each. One explanatory perspective focuses on the fact that compared to younger adults, older adults are characterized by decreased levels of cognitive flexibility and physical ability (Kite & Wagner, 2002; Levy & Langer, 1994), potentially causing them to be implicitly perceived as suffering from deficits in valued characteristics (Butler, 1989). Ageist attitudes may result from a process in which elderly people are judged to have limited potential in the important realm of social exchange relationships (Kurzban & Leary, 2001; Cosmides & Tooby, 2005). Also, it has been suggested that older adults remind perceivers of their own mortality—an affectively aversive experience with implications for prejudice (Greenberg, Schimel, & Martens, 2002; Martens, Goldenberg, & Greenberg, 2005).

It is clear, then, that multiple mechanisms may contribute to implicit aversive responses to older adults. In addition, there is reason to speculate that implicit ageism might occur as a result of the operation of cue-based stimulus-response mechanisms designed to inhibit contact with infectious diseases.

Disease Avoidance Mechanisms

Infectious diseases have long posed a threat to human life. The immune system provides one sophisticated means of defending against this threat. In addition, there appears to be a sort of "behavioral immune system" too—a suite of psychological mechanisms that facilitates the detection and behavioral avoidance of other individuals who might be infected with disease-causing pathogens (Schaller & Duncan, 2007).

Because most pathogens are microscopic and not directly perceptible, people must typically rely on superficial morphological or behavioral cues (e.g., skin lesions, coughing spasms) to detect their presence. The perception of disease-connoting cues typically triggers disgust (Curtis, Aunger, & Rabie, 2004) and also triggers the activation of aversive cognitions into working memory, both of which

have the functional consequence of motivating behavioral avoidance (Kurzban & Leary, 2001; Schaller & Duncan, 2007).

The correspondence between superficial cues and the presence of pathogens is imperfect, and this gives rise to a signal-detection problem. Because the costs of a false negative error (failing to avoid a truly infectious individual) are typically much graver than the costs of a false positive error (avoidance of an individual who is actually healthy), the behavioral immune system—like other psychological defense systems (Haselton & Nettle, 2006; Nesse, 2005)—is predictably biased toward minimizing false negatives. Perceivers therefore tend to be biased toward inferring that healthy people are diseased, rather than the reverse. This inferential bias manifests in a tendency to implicitly associate risk of infection with a broad range of superficial cues: Any gross deviation from species-typical morphological norms may be implicitly interpreted as evidence of possible parasitic infection, and thus may trigger an aversive response (Kurzban & Leary, 2001). Consistent with this analysis, people respond aversively not only to individuals who truly are diseased, but also to healthy individuals who are morphologically anomalous in some way—including individuals who are disfigured, disabled, or obese (Park, Faulkner, & Schaller, 2003; Park, Schaller, & Crandall, 2007; Schaller & Duncan, 2007).

Hyper-vigilant and over-inclusive disease-avoidance mechanisms provide some functional benefits (reduced contact with infectious pathogens), but they involve some costs as well (e.g., reduced contact with entirely healthy individuals who might be potential friends and benefactors). As a means of maximizing the benefits, while minimizing the costs, it appears that these mechanisms are engaged somewhat flexibly, contingent upon the presence of additional information indicating the extent to which infectious diseases should be considered a cause for concern. Perceivers respond especially aversively to morphologically anomalous individuals under circumstances in which they (the perceivers) feel especially vulnerable to infectious disease. For instance, while people in general respond aversively to the perception of physically disabled individuals, this aversive response is exaggerated among perceivers who generally feel vulnerable to disease transmission, or who are especially prone to experience disgust (Park et al., 2003). Similarly, while people respond negatively to the sight of obese individuals, this aversive response is especially pronounced among individuals who perceive themselves to be especially vulnerable to disease transmission, or for whom the threat posed by disease-causing pathogens has been made temporarily salient (Park et al., 2007).

Cultural background may also have an influence on the operation of these mechanisms. Infectious diseases have historically been more prevalent in some geographical regions than in others, an ecological difference that has both cultural and psychological implications (e.g., Schaller & Murray, 2008). In addition, there exist cultural differences in lay theories of epidemiology and disease

transmission (Pachuta, 1996). For example, Western European beliefs regarding disease transmission center on germ theory and external causes of disease, whereas the tenets of traditional Chinese medicine are more holistic and attentive to internal causes. The implication of these differences is that contextual cues that connote vulnerability in one culture may be interpreted somewhat differently within another. Empirical results consistent with this speculation are reported by Park et al. (2003), who manipulated the temporary salience of threats posed by infectious pathogens (such as Hepatitis A) and examined the impact of this manipulation on implicit antipathy toward physically disabled persons. Their results showed an effect of this manipulation among participants of European cultural heritage, but not among participants of East Asian heritage.

Implications for Ageism

Just as disease-avoidance mechanisms are one cause of prejudices against the physically disabled and obese, so too they seem likely to contribute to ageism. The process of aging is associated with many physical changes. There are myriad changes in facial appearance, including a loss of fat tissue, qualitative and quantitative increases in wrinkles and bags, and changes in hair distribution and color (Gonzalez-Ulloa & Stevens-Flores, 1965; Guthrie, 1976). Facial proportions also change as a result of the growth of ear and nose cartilage throughout life, such that in advanced age the nose becomes longer and broader, and the ears increase in length (Smith, 1978). Older adults are also more likely to display skin discoloration (Gilchrest, 1996) than their younger counterparts. Thus, as people age, their physical appearance increasingly deviates from the species-typical prototype. Consequently, given the manner in which the behavioral immune system operates, the mere visual perception of older adults may trigger an implicit aversive response. Furthermore, to the extent that perceivers are aware that aging is associated with decreased immunocompetence, perceivers may learn to associate the social category of older adults with the semantic concept of disease. This learned cognitive association may also contribute to the implicit aversive response.

Importantly, however, the magnitude of this implicit aversive response to older adults is expected to vary depending upon the extent to which perceivers are worried about the threat posed by infectious diseases. Implicit ageism is likely to be greatest among those who feel especially vulnerable to disease transmission; ageism may be attenuated among perceivers who feel less vulnerable. This logical deduction not only provides a means of empirically testing the disease-avoidance perspective on ageism but it also has additional implications for policies and other interventions that might be used to combat ageism.

In addition, because there are likely to be cultural differences in the specific contexts and cues that connote vulnerability to disease, it is important to consider the possibility that cultural differences may emerge in any empirical test of this

hypothesis. Moreover, if cultural differences do emerge, this too has implications for the implementation of interventions employed to combat ageism.

The Present Study

Although previous authors have speculated about a possible link between disease-avoidance mechanisms and ageism (Bugental & Hehman, 2007), no prior research has empirically tested this proposed link. The present study provides the first empirical test.

The central hypothesis is that implicit ageist attitudes are amplified among individuals who are especially worried about disease transmission, and attenuated among those who are not. Therefore, we assessed individual differences in perceived vulnerability to disease and also introduced an experimental manipulation designed to make disease-causing pathogens especially salient to a subset of participants. Following the manipulation, participants completed two computer-based reaction time tasks. The design of these tasks allowed the assessment of the extent to which participants were likely to implicitly associate older adults—relative to younger adults—with (1) aversive semantic concepts in general and (2) disease-connoting concepts more specifically.

Our participant sample was drawn from a multi-ethnic university population that included substantial numbers of individuals with East Asian (primarily Chinese) cultural backgrounds, as well as substantial numbers with European cultural backgrounds. Thus, in analyzing results, we were sensitive to the possibility that cultural background might directly influence implicit ageism, and also to the possibility that cultural background might moderate effects of the primary variables (perceived vulnerability to disease and temporary pathogen salience) on implicit ageism.

Methods

Participants

Participants were 88 undergraduate students at the University of British Columbia. Within the sample, 55 participants reported an East Asian ethnic heritage, and 33 reported a European heritage. (Seven additional participants reported neither East Asian nor European heritage; their data were not included in analyses.)

Individual Differences in Perceived Vulnerability to Disease

Participants completed several questionnaires at the outset of the study, one of which was designed to assess individual differences in Perceived Vulnerability

to Disease (PVD; Duncan, Schaller, & Park, 2009). The 15-item PVD questionnaire has two subscales. An 8-item "Germ Aversion" subscale (Cronbach's $\alpha = .61$) measures the extent to which individuals experience discomfort in situations that imply a high likelihood of pathogen transmission (e.g., "I don't like to write with a pencil someone else has obviously chewed on"). A 7-item "Perceived Infectability" subscale (Cronbach's $\alpha = .85$) measures the extent to which individuals subjectively believe that they are susceptible to contracting infectious diseases (e.g., "I am more likely than the people around me to catch an infectious disease"). These subscales were moderately correlated (in the present sample, $r(86) = .21, p = .049$), and previous research reveals that they may predict different outcomes (Duncan et al., 2009; Park et al., 2003, 2007).

Experimental Manipulation of Pathogen Salience

Participants were randomly assigned to view one of two slide-show presentations, each containing 10 slides. In one experimental condition ("Pathogens Salient"), each of the 10 slides was designed to temporarily heighten the salience of pathogens and/or the infectious diseases they cause (e.g., one slide depicted germs and bacteria lurking on kitchen sponges and countertops). In the other experimental condition ("Accidents Salient"—a control condition), each of the 10 slides was designed to temporarily heighten the salience of other, equally dangerous but disease-irrelevant threats to physical well-being (e.g., one slide depicted the risk of electrocution from home appliances).

Manipulation Check

After viewing the slide show, participants rated how effective the slide show was in raising awareness of the pertinent threat. Responses were recorded on a 7-point scale (1 = not at all effective; 7 = very effective). In both experimental conditions, the slide show was rated as reasonably effective, and effectiveness ratings did not differ between experimental conditions (M's = 4.60 and 4.80 in the Pathogens Salient and Accidents Salient conditions, respectively; $p = .44$).

Reaction-Time Measures of Implicit Ageism

Participants then performed two variations of a computer-based reaction-time task designed to assess the extent to which older adults (relative to younger adults) were especially likely to be implicitly associated with aversive semantic information. One task assessed associations with negative semantic concepts in general. The other assessed associations specifically with concepts connoting disease. (The order in which participants completed these two tasks was counterbalanced.) Both tasks were versions of the Implicit Association Test (IAT; Greenwald, Nosek, &

Banaji, 2003), which has been used successfully in previous research assessing implicit ageism (Dasgupta & Greenwald, 2001; Nosek, Banaji, & Greenwald, 2002), and also previous research assessing the effects of temporary threats on implicit social cognition (Park et al., 2003, 2007; Schaller, Park, & Mueller, 2003). For one IAT task, participants categorized positively or negatively valued stimulus words (e.g., *smart*, *nasty*) as either "Pleasant" or "Unpleasant" by pressing specified response keys on a computer keyboard; they also categorized a set of target faces as either "Young" or "Old," using the same set of response keys. Target faces were photos of six young men and women, and of six elderly men and women.[1] Within the task, there were two critical blocks of trials (the order of these critical blocks was counterbalanced across participants). For one critical block of trials, the response categories "Old" and "Unpleasant" shared a response key; for the other critical block, "Old" and "Pleasant" shared a response key. The difference in mean reaction times across these two blocks of trials indicates an implicit cognitive association: Relatively shorter reaction times on trials in which "Old" and "Unpleasant" share a response key indicate an implicit cognitive association linking older adults (compared to younger adults) with unpleasant semantic concepts. The other IAT task followed an identical template, except that on the word-categorization trials, participants categorized health- or disease-relevant words (e.g., *strong*, *contagious*) as connoting either "Health" or "Disease." For this IAT task, relatively shorter reaction times on trials in which "Old" and "Disease" share a response key indicates an implicit cognitive association linking older adults (compared to younger adults) with the semantic concept of disease. For each IAT task, an IAT effect size score (analogous to Cohen's *d*) was computed for each participant, following computational guidelines described by Greenwald et al. (2003). These scores were computed such that positive values indicated implicit ageism (i.e., implicit cognitive associations linking "Old" people with "Unpleasant" and with "Disease"); more strongly positive values indicated more extreme levels of implicit ageism.

Results

Preliminary analyses revealed that compared to European participants, East Asians scored more highly on the Germ Aversion subscale of Perceived Vulnerability to Disease questionnaire (East Asian $M = 4.17$, European $M = 3.70$, $t(86) = 2.45$, $p = .01$). There was a similar mean difference on the Perceived Infectability (PVD) subscale, but this difference was nonsignificant (East Asian $M = 3.70$,

[1] Target faces were identical to those used in previous work on implicit ageism (Nosek et al., 2002). To assess the perceived age of these faces, we asked a separate sample of 21 participants to estimate the age of the target individuals. The mean perceived age of the six young faces was 23.8 years ($SD = 4.23$). The mean perceived age of the six elderly faces was 66.3 years ($SD = 13.53$).

European = 3.42; $t(86) = 1.16$, $p = .25$). There were no statistically significant gender differences on either PVD subscale.

On both the Unpleasant and Disease IATs, the mean effect size score was significantly more positive than zero: Unpleasant IAT mean = 0.46, $t(87) = 11.10$, $p < .001$; Disease IAT mean = 0.43, $t(87) = 11.58$, $p < .001$. These results reveal that, relative to younger adults, elderly individuals were especially likely to be implicitly associated with negative semantic concepts in general, and with disease-connoting concepts in particular.

Mean scores on the Unpleasant IAT were greater among East Asians ($M = 0.54$) than among Europeans ($M = 0.31$), $t(68) = 2.85$, $p = .005$. No such difference was found on Disease IAT scores (East Asian $M = 0.40$, European $M = 0.47$; $t(86) = 0.92$, $p = .36$). There were no statistically significant gender differences on either IAT.

These findings are consistent with previous work showing that elderly targets are implicitly associated with more aversive concepts than younger targets, and also indicate some cultural differences in these implicit associations; but these preliminary analyses do not address whether implicit ageism varied depending upon the extent to which perceivers were worried about the threat posed by infectious diseases. Three variables were particularly pertinent to the perception of disease threat: Chronic concerns with infectious diseases as measured by the Germ Aversion and Perceived Infectability subscales of the PVD questionnaire; and temporary salience of infectious diseases as created by the Slide Show manipulation (Pathogens Salient vs. Accidents Salient). To assess the impact of these variables, we conducted two separate regression analyses (one with the Unpleasant IAT score as the dependent variable, and the other with the Disease IAT score as the dependent variable) to assess the main and interactive effects of these key predictor variables, along with ethnicity (European, East Asian) as an additional predictor variable. (Continuous predictor variables were centered prior to computing interaction terms.)

The regression analysis of Unpleasant IAT scores produced two statistically significant effects. There was a main effect of ethnicity, $\beta = -.29$, $t(75) = 2.57$, $p = .01$, such that East Asian participants associated elderly targets more strongly with unpleasant concepts. This effect was qualified by a three-way interaction between ethnicity, Perceived Infectability, and the Slide Show manipulation, $\beta = .30$, $t(75) = 2.44$, $p = .02$.

The analysis of Disease IAT scores also produced two statistically significant effects. One was a two-way interaction between ethnicity and the slide show manipulation, $\beta = .27$, $t(75) = 2.27$, $p = .03$. The other (just as with Unpleasant IAT scores) was a three-way interaction between ethnicity, Perceived Infectability, and the Slide Show manipulation, $\beta = .24$, $t(75) = 1.99$, $p = .05$.

To better illuminate the nature of these three-way interactions, we conducted additional regression analyses on both the Unpleasant and Disease IAT scores,

separately for Europeans and East Asians. Each analysis included the Perceived Infectability subscale and Slide Show manipulation as predictor variables, along with the interaction of Perceived Infectability with the slide show manipulation. Of particular interest was the two-way interaction between Perceived Infectability and the Slide Show manipulation. Among European participants, this two-way interaction emerged both on Unpleasant IAT scores and on Disease IAT scores (Unpleasant IAT: $\beta = .34$, $t(29) = 1.94$, $p = .06$; Disease IAT: $\beta = .37$, $t(29) = 2.27$, $p = .03$). No such effects emerged among East Asian participants (Unpleasant IAT: $\beta = -.13$, $t(51) = 0.93$, $p = .36$; Disease IAT: $\beta = -.14$, $t(51) = 1.05$, $p = .30$). Thus, among perceivers of European cultural background (but not among perceivers of East Asian background), implicit ageism was an interactive product of both chronic concern with disease transmission and the temporary salience of infectious pathogens.

Additional regression analyses (following methods prescribed by Baron & Kenny, 1986) were conducted to investigate the possibility that, among European participants, the effect of the two-way interaction on Unpleasant IAT scores was mediated by its effect on Disease IAT scores. Results indicated no compelling evidence of any such mediation.

Although the Disease IAT and Unpleasant IAT scores were only moderately correlated ($r = .29$), given that the three-way interaction was essentially identical across both IAT tasks, the graphical representation of this interaction can be simplified by combining scores on both IATs into a single index of implicit ageism. Therefore, for each participant, we computed the mean of the two IAT scores to create a composite score. Using this composite IAT index as the criterion, we conducted separate regression analyses (identical to those described above) on the implicit ageism scores of European and East Asian participants. Among participants of European heritage, the Perceived Infectability by Slide Show interaction was significant, $\beta = .43$, $t(29) = 2.69$, $p = .01$. No such effect emerged among participants of East Asian heritage, $\beta = -.165$, $t(51) = 1.20$, $p = .23$. Further tests indicated that the Slide Show manipulation produced significant differences in implicit ageism among European heritage participants with chronically high levels of Perceived Infectability (1 *SD* above the mean; $\beta = .68$, $t(29) = 2.95$, $p = .006$) but not among those with low levels of Perceived Infectability (1 *SD* below the mean; $\beta = -.21$, $t(29) = 0.91$, $p = .37$). The results are depicted graphically in Figure 1 (following the methods prescribed by Aiken & West, 1991).

In sum, among European participants, the highest levels of implicit ageism were found among individuals who were dispositionally inclined to worry about their own vulnerability to infectious diseases and for whom the threat of pathogens was also temporarily salient. In contrast, the effects of Perceived Infectability and the Slide Show manipulation were negligible among participants of East Asian heritage.

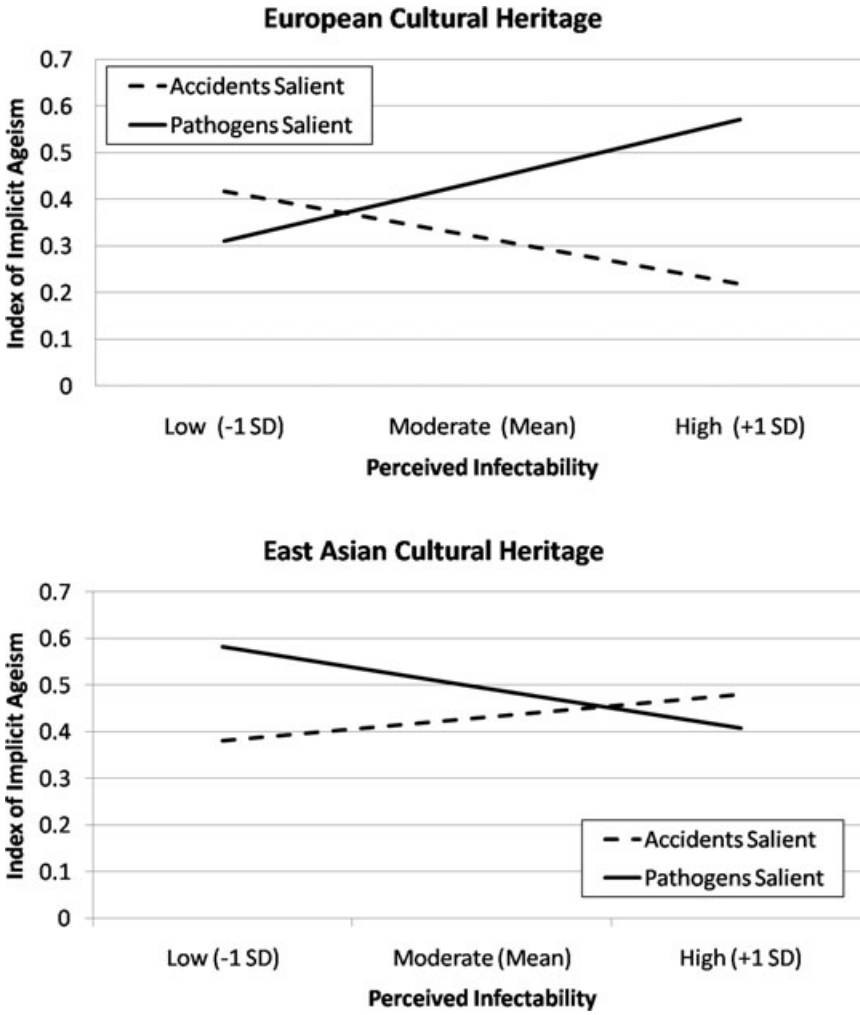

Fig. 1. Among participants of European heritage, implicit ageism was predicted by the interactive effect of individual differences in Perceived Infectability and the temporary salience of pathogens. This interaction did not emerge among participants of East Asian heritage.

Discussion

These results provide the first evidence indicating that implicit prejudices against older adults may result, in part, from the operation of disease-avoidance mechanisms. Moreover, because these mechanisms are engaged flexibly, these

aversive responses may sometimes be amplified in contexts connoting high levels of vulnerability. This is exactly the pattern observed here within the sample of participants with a European cultural heritage. Compared to circumstances in which disease-irrelevant threats were salient, implicit ageism was greater under circumstances in which the threat of pathogen transmission was temporarily salient, and this effect occurred primarily among individuals who chronically perceived themselves to be vulnerable to pathogenic infection.

This pattern of results (among participants of European heritage) is conceptually similar to previous findings documenting the role of disease-avoidance mechanisms as contributors to other forms of prejudice based on other kinds of morphological anomalies (Park et al., 2003, 2007; Schaller & Duncan, 2007). More broadly, these findings are conceptually analogous to findings in the psychological literature on perceived threats and prejudices. In several studies, it has been found that danger-relevant stereotypes of African Americans (i.e., the stereotypical tendency to associate African Americans with aggression, criminality, and other danger-connoting traits) are most strongly activated into working memory when perceivers find themselves in contexts that imply vulnerability to harm (e.g., in the dark), and this activation occurs primarily among individuals who chronically perceive the world to be a dangerous place (Schaller et al., 2003). Findings such as these have useful implications for the development of interventions aimed at ameliorating racial and ethnic prejudices (e.g., Neuberg & Cottrell, 2006; Schaller & Abeysinghe, 2006; Schaller & Neuberg, 2008). Similarly, the present findings have implications for the development of interventions that might ameliorate age-based discrimination. We discuss these possibilities more fully below.

Before doing so, however, we must comment further on two aspects of these empirical results: (1) the fact that virtually identical responses emerged across the two different IAT tasks, and (2) the fact that the effects failed to emerge among participants of East Asian heritage.

Responses on the two IAT tasks (one of which assesses implicit associations with the specific semantic concept "disease" and the other of which assesses implicit associations with a broad and diffuse set of "unpleasant" concepts) were only modestly correlated with one another, and so there is no statistically necessary reason why the same pattern of results should emerge across both. (Indeed, in research on implicit prejudice against obese individuals, rather different patterns of results have been found to emerge across these two different kinds of IAT tasks; Park et al., 2007). Nor was there any evidence that responses on the more semantically specific Disease IAT task were mediated by responses on the Unpleasant IAT task. So why were the results so similar on the two tasks? One possibility is that the two tasks were picking up on two somewhat distinct associative mechanisms. One mechanism may be sensitive to the visual perception of morphological anomalies of all kinds (including, but not limited to, the morphological anomalies associated

with aging), and may trigger a relatively crude and semantically diffuse aversive response. The other mechanism may reflect a more specific learned association, informed by the rational awareness of decreased immunocompetence that links elderly people to the specific semantic concept of disease. Both mechanisms would be expected to produce stronger aversive responses under conditions in which perceivers feel more vulnerable to disease transmission, but these effects may be conceptually—and empirically—distinct.

Finally, let us consider closely the fact that there was a relation between disease-threat and implicit ageism among participants of European heritage, but there is no such relation among participants of East Asian heritage. The lack of effects among East Asians clearly cannot be attributed to a lack of ageism among East Asians. (If anything, implicit ageism was higher among East Asians than among Europeans.) These results are conceptually similar to cultural differences reported previously by Park et al. (2003), who focused not on ageism but instead on implicit prejudice against physically disabled individuals. What might account for these cultural differences? We suspect that an answer may lie in the tendency for pathogen transmission to be differentially emphasized in the epidemiological belief systems traditionally associated with different cultural populations. The traditional tenets of Chinese medicine, for instance, emphasize internal rather than external factors in the etiology of disease (Ohnuki-Tierney, 1984; Pachuta, 1996; Wang, 1991; Wilson & Ryan, 1990). Consequently, in terms of creating a sense of vulnerability, the pathogen salience manipulation may have had less meaningful impact on East Asians than on Europeans. To test the veracity of this speculation, it might be informative for future research to actually measure the extent to which participants support Eastern and Western health philosophies and the frequency with which they rely on each of the practices. In addition, it might be useful to draw on the tenets of Chinese medicine in order to create a rather different disease-salience manipulation that might be expected to affect feelings of vulnerability primarily among people who ascribe to those traditional epidemiological beliefs. This manipulation would therefore be expected to influence implicit ageism primarily among people of East Asian heritage, but not among those of European heritage.

Implications for Public Life and Public Policy

Although often nonconscious, implicit forms of prejudice can have substantial effects on behavioral interactions with the targets of those prejudices (McConnell & Leibold, 2001). This is troubling, especially given that implicit attitudes are often resistant to the variables and interventions that affect more conscious and deliberative beliefs (McConnell, Rydell, Strain, & Mackie, 2008). But this does not mean that implicit prejudices—such as implicit ageism—are inevitable and unchangeable. It simply means that we must often look in different (and sometimes nonobvious) places to find the variables that do moderate these implicit

prejudices. Along with many other results bearing on the relation between threats and prejudices (e.g., Schaller & Neuberg, 2008), the results reported above suggest that when a specific implicit prejudice results in part from some specific form of threat, the magnitude of that implicit prejudice may be moderated by any variable that influences the extent to which people are (or merely perceive themselves to be) vulnerable to that particular threat. This insight has implications for identifying many real-life variables that may affect the degree to which older adults are the target of prejudice and discrimination.

For instance, given that infectious pathogens are more prevalent in some geographical regions than in others, ageism might also be expected to vary geographically. Observed cultural differences in ageism (e.g., higher levels of ageism in Southeast Asia compared to North America; McCann et al., 2003; Sharps et al., 1998) correspond to well-documented regional differences in pathogen prevalence (Epstein, 1999; Guernier, Hochberg, & Guégan, 2004). In addition, travelers (who may have a heightened susceptibility to infectious diseases in the first place) may feel especially susceptible, and therefore may be prone to implicit ageism, when traveling to parts of the planet with a high prevalence of pathogens.

Other forms of naturally occurring susceptibility may also temporarily dispose individuals toward ageist attitudes. One intriguing example emerges from recent research on pregnancy. Neurochemical changes occurring in the first trimester of pregnancy suppress the body's immune response, with the implication that women in the early stages of pregnancy have a temporarily heightened vulnerability to infectious diseases. This has important psychological consequences, including a heightened sensitivity to disgust and increased ethnocentrism (Fessler, Eng, & Navarrete, 2005; Navarrete, Fessler, & Eng, 2007). It follows that women in the first trimester of pregnancy may also be more prone to implicit ageism. Other immunosuppressing events or circumstances might exert similar effects on ageism.

Other potentially relevant contextual variables pertain to the different social or institutional environments within which individuals might find themselves in the course of ordinary life. Consider the fact that workplaces may vary profoundly in the extent to which they inspire sensitivity to infectious diseases. In some workplace settings (e.g., banks and financial offices), the threat of disease is unlikely to be salient. In other settings, the salience of this threat is much higher. These include hospitals, doctors' offices, and other workplaces within the health care industry. Thus, ironically, it is in exactly those situations where older adults might logically be expected to be treated with the greatest courtesy, that they might also be especially prone to suffer the discriminatory consequences—aversion, avoidance, exclusion—of ageism. There is abundant evidence of age-based discrimination within the health care system (Robb, Chen, & Haley, 2002; Ward, 2000) and numerous studies have found that medical, dental, and nursing students show little desire to actually work with elderly patients (see Weir, 2004, for a review).

Moreover, evidence of actual physical illness dramatically increases elder neglect (Choi & Mayer, 2000; Lachs et al., 1997).

Contexts involving the preparation and ingestion of food are also likely to trigger a heightened sensitivity to the potential threat of infectious diseases. Consequently, one might expect age-based prejudices and acts of discrimination (e.g., employment discrimination) to be especially pronounced within the food service industry. More broadly, just as other prejudices vary across different workplace settings (see Neuberg, Smith, & Asher, 2000, for an analogous example involving antigay employment discrimination), ageism is likely to vary depending on the extent to which the specific setting implies vulnerability to infectious diseases.

Perceived vulnerability is not only influenced by actual vulnerability but may also be influenced by anything that makes disease perceptually salient. Media coverage of health-relevant news can have a substantial impact on the extent to which people worry about disease transmission and, as a consequence, may have an impact on disease-relevant prejudices such as ageism. Thus, to the extent that news media creates an exaggerated perception of the threat posed by infectious diseases (e.g., coverage of the SARS outbreak in 2003), there may be obvious consequences on health-relevant behaviors as well as more subtle, but no less pernicious, consequences for ageism and other related prejudices.

Of course, news media outlets rarely act alone in exaggerating public fears of infectious diseases. Governments, nongovernmental organizations, and other watchdogs of public health can also have a substantial impact on the extent to which people feel fearful of infectious diseases (Glassner, 1999). As a consequence, they may have an unintended impact on ageism (and related prejudices) as well. This impact may be deleterious (caused, for example, by hyperbolic political pronouncements about the threat of bioterrorism, or by incautiously worded warnings about diseases that pose, in reality, only a very limited threat). But the impact these groups have may be positive as well. Governments and other organizations are in a position to enact health care policies that actually erect buffers against the spread of infectious diseases.

The useful implication is that legislation and public policy in the domain of health care may not only have the intended benefits for health care, they may also have the additional benefit of ameliorating ageism and related prejudices. Indeed, because implicit prejudices (such as ageism) may be relatively resistant to interventions based on overt rule-based injunctions, nonobvious forms of intervention (which address the actual psychological roots of these prejudices) may be more effective. Ageism might ultimately be reduced by policies that promote hygiene and thus inhibit the actual transmission of infectious diseases. Ageism might also be reduced by interventions that either increase public access to health care or increase the caliber of that health care. Access to high-quality health care not only has salutary epidemiological benefits (e.g., epidemic outbreaks of infectious diseases are less likely to occur), it also has the important psychological benefit that

individuals are less likely to be fearful of infectious diseases. And, as our findings suggest, this perception (at least among people of European cultural heritage) has implications for ageism.

In a world in which age-based prejudices pose substantial problems to an ever-growing number of older adults, it is increasingly important to uncover the subtle causes of ageist attitudes, so as to design interventions accordingly. Our findings offer the first empirical evidence that the implicit psychology of disease avoidance may be a causal agent. And because of this, ageism may be triggered by variables affecting the extent to which individuals worry about the threat posed by disease transmission. This new empirical knowledge is potentially very useful. As Robert Butler (1989, p. 138) wrote, "Concerning the treatment of ageism as a disease, I find that knowledge is the most basic intervention, serving as antidote to numerous erroneous but widely held beliefs."

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