

Construct Validity of Implicit Age Attitudes

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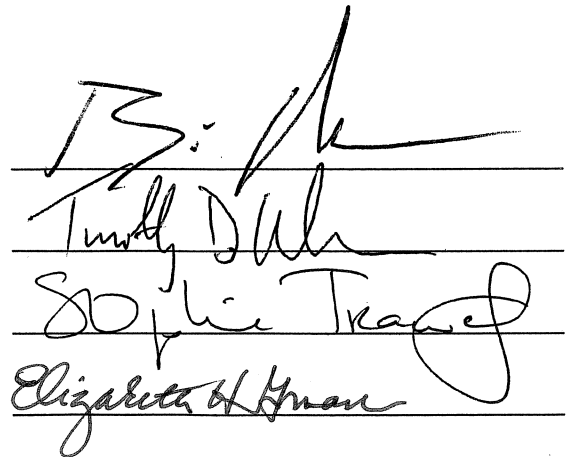
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## Abstract

The research described here focused on the construct validation of implicit age attitudes. In Study 1, I illustrated how implicit age attitudes failed to demonstrate the relationships that construct validation of implicit attitudes more generally would anticipate, highlighting the need to investigate the construct validity of implicit age attitudes. Specifically, implicit age attitudes were dissociated from individuals' explicit age attitudes and age identity. Studies 2 through 5 pursued the construct validation of implicit age attitudes. Study 2 examined whether asking different questions or using alternative implicit measures would reveal stronger implicit-explicit relations. Instead, implicit age attitudes, as assessed by 4 distinct measures, remain substantially dissociated from anything individuals self-reported, including multiple measures of self-reported age preferences, intergroup contact, age identity, perceived competence and likability, expectations about one's own aging process, and mortality concerns. In Studies 3 and 4, I examined the measurement of implicit age attitudes, varying the age groups targeted in implicit measurement. As assessed with two separate measures, implicit age attitudes were consistently pro-young, but sensitive to which age groups represented *younger* and *older*, and implicit attitudes toward middle-aged adults were moderated by individuals' own age. Study 5 contrasted several hypotheses for how age attitudes could vary across nations, such as nations' collectivism, socioeconomic modernization, or the percentage of older adults in the population. Culture is thought to influence the environment in which an attitude is learned; I found that despite the dissociation in *individuals'* implicit and explicit age attitudes, there was evidence at the *national* level for their predictive validity. National indicators of population aging predicted national levels of negative implicit and

explicit attitudes toward older adults, suggesting that cultural contexts present different messages about old people and aging and that these messages are one source of negative associations with older adults. The persistent dissociation between individuals' implicit age attitudes and all self-report constructs remains a puzzle for their construct validity. But as a whole, the present research represents significant progress in accumulating evidence for the nomological net supporting the construct of implicit age attitudes.

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## **Introduction**

Age, like gender and race, is one of the “basic” or “primitive” social categories with which people automatically categorize others (Fiske, 1998; Kinzler, Shutts, & Correll, 2010; Nelson, 2002). Despite this and in contrast to social psychology’s focus on race and gender attitudes, age attitudes have received comparatively little empirical attention (Chasteen, 2005; Nelson, 2002; Richeson & Shelton, 2006). This lack of social cognitive research on aging is particularly surprising given the impermanence of a young age identity—aging is inevitable and most people hope to live long enough to become an “older adult”—and the increased population of older adults projected for the United States (He, Sengupta, Velkoff, & DeBaros, 2005).

One potential explanation for the lack of attention to age attitudes is that age attitudes, both implicitly (Greenwald et al., 2002; Levy & Banaji, 2002; Nosek, Smyth, et al., 2007) and explicitly (Chasteen, 2005; Garstka, Schmitt, Branscombe, & Hummert, 2004; Richeson & Shelton, 2006), often fail to demonstrate the relationships that construct validation of implicit attitudes more generally would anticipate. Thus, this dissertation examines the construct validity of implicit age attitudes, by developing “nomological net of facts, relationships, and validity evidence that clarifies the identity and utility of the construct” (Nosek & Smyth, 2007, p. 15)

### **Background Research: Age Biases and Discrimination**

Like sexism and racism, ageism or age bias is defined as the attitudes, stereotypes, and discriminatory behavior directed at older adults (Butler, 1969; Palmore, 2003). Stereotypes of older adults contain both negative and positive aspects, but negative stereotypes predominate among young, middle-aged, and older adults (Hummert,



Garstka, Shaner, & Strahm, 1994). Meta-analytic research also indicates that self-reported *attitudes* toward older adults are primarily negative among young and older adults (Kite, Stockdale, Whitley, & Johnson, 2005) and that there is evidence of *age discrimination* in a variety of contexts, including employment (Gordon & Arvey, 2004).

Research has also found that age bias differs from other social group biases like race and gender (Chasteen, 2005; Garstka et al., 2004; Greenwald et al., 2002; Levy & Banaji, 2002; Richeson & Shelton, 2006), in that older adults may continue to prefer the young, rather than preferring their own age group—old people. Thus, research has had difficulty generalizing to age bias from models developed to understand racism and sexism. Currently, research on age bias and discrimination is limited by a lack of understanding of the contexts and evaluations in which age bias is strongest (Gordon & Arvey, 2004; Kite et al., 2005), of why and when older adults self-identify as old (Greenwald et al., 2002, Hummert, Garstka, O'Brien, Greenwald, & Mellott, 2002), and of interventions that effectively reduce age bias (National Research Council, 2006; Packer & Chasteen, 2006).

In a review of the literature on age biases, stereotyping, and discrimination, Richeson and Shelton (2006) note that although raw performance (especially cognitive speed) does decline with age, cognitive-aging research that takes a more ecologically-valid approach “suggests that stereotypes of cognitive functioning in older age are more severe than most actual deficits and, furthermore, that the stereotypes largely mask age-related cognitive performance gains” (Richeson & Shelton, 2006, p. 177). Indeed, it is clear that the young anticipate a much poorer quality of life in old age than older adults experience. More than 92% of college students overestimated the actual percentage (5%)

of older adults living in long-stay institutions and more than 65% underestimated the actual percentage (75%) of older adults who were able to engage in their normal activities (Harris, Changas, & Palmore, 1996, p. 578).

### **Implicit Age Attitudes**

Most research on age bias has focused on individuals' self-reported thoughts and feelings for older adults (for exceptions, see Hummert et al., 2002; Levy & Banaji, 2002). The present investigation draws upon research on implicit social cognition. *Implicit social cognition* finds that group prejudice need not be intentional, endorsed, or even introspectively available for it to influence behavior, but may simply be automatically elicited. Expanding prejudice research's traditional reliance on self-reported or *explicit* attitudes, a variety of *implicit* measures have been developed, including the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998). These measures assess attitudes without requiring introspection and under conditions that decrease controllability of responses (Greenwald & Banaji, 1995; Nosek, Greenwald, & Banaji, 2007). Because individuals need not endorse or even be aware of their implicit responses, implicit measures can reveal evaluations that are quite distinct from self-report.

Even though early research in implicit social cognition emphasized the divergence between implicit and explicit attitude constructs, evidence for the construct validity of implicit attitudes for a variety of social groups has accumulated, finding that (a) implicit and explicit attitudes represent distinct but related constructs (Nosek & Smyth, 2007); (b) the strength of the relationship between implicit and explicit attitudes varies based on features of the attitude, such as the degree to which it elicits self-presentation concerns and how well-elaborated it is (Nosek, 2005); (c) both implicit and explicit attitudes

predict a variety of social behaviors (Greenwald, Poehlman, Uhlmann, & Banaji, 2009); and (d) group membership moderates the strength of implicit group preferences (Jost, Banaji, & Nosek, 2004). Researchers interested in understanding age bias and discrimination have also suggested that implicit age attitudes could be critical for understanding why negative stereotypes tend to win out over positive stereotypes and the factors that trigger the activation of negative rather than positive age stereotypes, resulting in age discrimination (Hummert, 1999, p. 183).

Despite this interest in implicit age attitudes, age attitudes and identity fail to conform to predictions derived from the construct validation of implicit attitudes in general. Specifically, *age attitudes* reflected one of the weakest associations between implicit and self-reported attitudes in an investigation of 95 social concepts (Nosek & Hansen, 2008) and age-group membership has consistently failed to moderate the strength of implicit age attitudes favoring the young (Levy & Banaji, 2002; Nosek, Smyth, et al., 2007). The existing research on age attitudes is ambiguous as to whether implicit age attitudes are simply distinct from other implicit social cognitions or whether either the construct itself or the way that it is measured has weak validity. The research described here begins by characterizing how implicit age attitudes and age identity diverge from those for other social groups and then accumulates evidence for the construct validity of implicit age attitudes. These findings also contribute to the understanding of how implicit attitudes and identity operate in social groups where the group boundaries are permeable and where individuals' group identity may change.

### **Overview of Dissertation**

In the research described here, I focus on the construct validation of implicit age

attitudes. In Study 1, I draw from a large web-based sample, finding that implicit age attitudes strongly favor the young and are dissociated from both explicit age attitudes and individuals' age identity. These findings emphasize how age attitudes and identity diverge from other social group attitudes and make the case for investigating the construct validity of implicit age attitudes, which I investigated in Studies 2 through 5. In Study 2, I focused on the dissociation between implicit and explicit age attitudes, by testing whether asking different questions or using alternative implicit measures revealed stronger implicit-explicit relations. I found that implicit age attitudes, as assessed by four distinct measures, remain substantially dissociated from anything individuals self-reported. In Studies 3 and 4, I investigated whether implicit age attitudes were construct-valid, despite their dissociation from what individuals self-report. Using two different measures of implicit age attitudes, I found that implicit age attitudes are sensitive to which age groups represent *younger people* and *older people*. And critically, I found that as social-identity theories would predict, participants' own age moderates their implicit age attitudes only when middle-aged adults represent *younger people* or *older people*. In Study 5, I investigated whether implicit age attitudes demonstrated predictive validity by varying meaningfully across nations; I hypothesized that the cumulative cultural associations between older adults and negativity would be stronger in nations with larger older populations, because of greater discussion of national concerns about the elderly and aging. I found that national averages of implicit and explicit age attitudes favored young more strongly for nations with larger older populations, and this relationship persisted when accounting for nations' socioeconomic development and their collectivist orientation. Taken together, these findings accumulate evidence for the construct validity

of implicit age attitudes, although the persistent dissociation between implicit and explicit age attitudes remains a puzzle.

**Study 1 – Implicit & explicit age attitudes:  
Relationships with one another and with individuals' age**

In the present study, I describe how age attitudes diverge from other social group attitudes, in order to guide the construct validation of implicit age attitudes that I pursue in subsequent studies. One important way that age attitudes diverge from other social attitudes is that age-group identity fails to moderate age-group preferences. Social identity theories anticipate that individuals derive self-esteem from identifying with social groups, even low-status groups. As a consequence, they are motivated to prefer their ingroup (Greenwald et al., 2002; Tajfel & Turner, 1986). This expectation is typically borne out in *self-reported attitudes* for a variety of social groups—those belonging to socially-stigmatized groups typically report favoring their ingroup relative to the socially-dominant outgroup.

However, *system justification theory* (Jost et al., 2004) has qualified this finding by marshaling evidence that members of stigmatized groups demonstrate weaker preferences for their ingroup than members of socially-dominant groups do. This is particularly evident in implicit or automatic group preferences—members of stigmatized groups are more likely to demonstrate implicit attitudes favoring the socially-dominant outgroup than are members of socially-dominant groups, who typically demonstrate implicit attitudes favoring their ingroup. Previous comparisons of implicit group preferences for several socially-stigmatized groups have observed that implicit age

preferences demonstrate particularly small effects of group membership (Greenwald et al., 2002; Jost et al., 2004; Nosek, Smyth, et al., 2007).

Here, I describe my own investigation of implicit and explicit age attitudes, highlighting both their consistency across the age span and their surprising disassociation. I examine these correlational results among data collected through the Project Implicit infrastructure, and in Study 5, I describe further analysis of these data to understand how implicit and explicit age attitudes vary across cultures.

## **Method**

### **Source of Data**

Project Implicit operates a research and education Virtual Laboratory, where individuals can complete implicit and explicit measures of attitudes for a variety of social groups (<http://implicit.harvard.edu>). More than 12 million study sessions have been completed since the site's launch in 1998, and Project Implicit has expanded with parallel international sites that administer studies of implicit social cognition in 22 languages. Visitors to the Project Implicit websites can select from a list of topics measuring implicit and explicit attitudes toward old and young people, among others. These samples are not intended or expected to be representative of the general population; selection biases influence whether individuals learn about the website, choose to visit it, select one or more attitude tasks, and complete the attitude measures. Even so, the sample's size and demographic heterogeneity (especially for age, compared to psychology participant pools) allow me to correlationally examine age attitudes across the age span.

### **Participants**

Participants chose the age task while visiting one of three publicly available

websites (see Footnote 1, Nosek, Smyth, et al., 2007) between the dates of July 12, 2000 and May 12, 2010. Some results from the data collected through May 12, 2006 have been summarized elsewhere (Nosek, Smyth, et al., 2007). Demographic information is reported for participants ( $M_{\text{age}} = 27.0$ ,  $SD = 12.2$ , range = 7 – 90+) who responded to at least one of the implicit or explicit measures. Women (66%) made up the majority of the sample (34% men), and 82% reported being US citizens. Most (61%) participants aged 25 or older reported having attained at least a bachelor's degree. Participants reported their racial background as follows: 0.9% American Indian, 6.6% Asian or Asian American, 5.9% Black (not of Hispanic origin), 6.4% Hispanic or Hispanic American, 73.2% White (not of Hispanic origin), 3.7% multi-racial, and 3.3% other/unknown.

### **Design & Procedure**

The Project Implicit age task always included an age IAT; at varying points in data collection, participants were asked to self-report their age preferences in different ways. The order in which the self-report measures and the IAT task were presented has always been counterbalanced between-participants. Beginning in September 2006, demographics were collected separately from self-reported attitudes, and the demographic task's order was also counterbalanced between participants. The age task on the Project Implicit website closes with debriefing and feedback on IAT performance.

### **Measures**

**Age evaluation Implicit Association Test (IAT).** Like most other implicit measures, the IAT *infers* individuals' preferences from how quickly individuals can categorize concepts (such *young people* and *old people*) with evaluations (such as *good* and *bad* or *positive* and *negative*). The basic principle behind these implicit measures is

that when evaluations are associated in memory with concepts, they can be categorized together more quickly when they require the same response rather than opposing responses (see Nosek, Greenwald, et al., 2007 for a review). The age IAT compares individuals' average speed of responding when sorting evaluations and concepts in two different phases – one in which they sort *young* and *good* stimuli with one response key while simultaneously sorting *old* and *bad* stimuli with another response key. In the other phase, individuals sort *old* and *good* stimuli with one response key while simultaneously sorting *young* and *bad* stimuli with the other response key. Most adults (80%) can sort *young* with *good* (and *old* with *bad*) more quickly than the reverse (Nosek, Smyth, et al., 2007). Implicit age attitudes were assessed using an IAT (Greenwald et al., 1998), that paired the evaluative attributes of *good* (e.g., delightful, excellent) and *bad* (e.g., detest, grief) and category faces of 3 female and 3 male *Young* and *Old* adults (available at <http://www.projectimplicit.net/stimuli.php>). It consisted of seven trial blocks (Nosek, Greenwald, et al., 2007), and order in which participants paired group categories and evaluative attributes (i.e., *young people-good* and *old people-bad* versus *young people-bad* and *old people-good*) was randomized between participants.

IAT scores were calculated using the *D* scoring algorithm (Greenwald, Nosek, & Banaji, 2003), such that response latencies <400 ms and >10,000ms were excluded in calculating the mean response latencies, trial latencies were calculated by adding a 600-ms penalty for error trials, and scores represent the difference between the mean response latencies of the critical blocks, divided by the inclusive standard deviation of latencies in those blocks. Missing data, either because of participant dropout or database-transfer errors, prevented the calculation of valid IAT scores for 8% of participants. Additionally,



previously-established speed and accuracy thresholds (Nosek, Smyth, et al., 2007) were applied to exclude IAT scores for participants with *too many fast responses* (responses <300 ms; either >10% fast responses averaged across all critical blocks, >24% fast responses in one critical block, or >34% fast responses in one practice block) or *too many categorization errors* (as either >30% error rate averaged across all critical blocks, >39% error rate in one critical block or across all practice blocks, or >49% error rate in one practice block). Age IAT scores are scaled so that positive values indicate an attitude favoring young people relative to old people (Cronbach's  $\alpha = .71$ ).

**Explicit age preferences.** Participants self-reported how warm (10 = *Warmest feelings*) or cold (0 = *Coldest feelings*) they felt toward *old people* and *young people*; the warmth-difference score represents the relative difference in warmth, with positive scores indicating warmer self-reported feelings for young people than for old people.

Participants also reported their *relative age preferences* using a 7-point item<sup>1</sup> that parallels the IAT, with positive values indicating attitudes favoring the young; it assesses preferences for young adults *relative* to older adults, on a response scale ranging from -3 (“I strongly prefer *old people* to *young people*”) to 3 (“I strongly prefer *young people* to *old people*”; 0 reflected equal liking for both groups).

**Explicit attitudes toward the aging process.** A subset of participants ( $N \approx 44,414$ ) also reported their attitudes toward the aging process, by rating how *warm* (10) or *cold* (0) they felt toward *being old* and *being young*. The difference score between

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<sup>1</sup> Other self-report measures (e.g., internal and external motivations to respond without age bias, subjective age identity) have been assessed at various time points in data collection, but are not described in this report. Because they are reported elsewhere (Nosek, Smyth, et al., 2007), similar self-reported relative preference items (with 5 or 9 response options) are presented in Table 1-1 for comparison purposes but are not described further.

these ratings was calculated so that positive values represent greater relative warmth for *being* young rather than *being* old.

### Analysis Strategy

The large sample for this study permits an emphasis on effect size and confidence intervals because of high statistical power. All statistical analyses and overall models were statistically significant at  $p \leq .001$  unless stated otherwise.

## Results

### Implicit and Explicit Age Attitudes

Table 1-1. *Descriptive Statistics for Implicit and Explicit Attitudes from Project Implicit*

Variable	Descriptive Statistics			Correlations with		Dates Administered	
	<i>N</i>	<i>M</i>	( <i>SD</i> )	IAT	Age	Start	End
IAT ( <i>D</i> )	617,565	0.46	(0.39)	—	.02	07-17-2000	05-12-2010
Relative preferences (5-pt)	370,178	0.39	(0.78)	.13	-.21	07-17-2000	09-15-2006
Relative preferences (7-pt)	236,063	0.58	(1.17)	.13	-.20	09-16-2006	05-12-2010
Relative preferences (9-pt)	45,770	0.62	(1.65)	.14	-.18	03-23-2001	04-30-2004
Warmth differential: People	640,196	0.40	(2.23)	.12	-.15	11-29-2000	05-12-2010
Young People	640,799	7.07	(1.94)	.03	-.11		
Old People	640,872	6.67	(1.96)	-.10	.07		
Warmth differential: Aging	44,414	3.26	(3.34)	.13	-.16	03-23-2001	04-30-2004
Being Young	44,546	7.61	(2.14)	.07	-.22		
Being Old	44,527	4.35	(2.36)	-.11	.03		

*Note.* All correlations are significant at  $p < .0001$ .

Table 1-1 displays descriptive statistics for the various measures of age attitudes, their correlations with participants' age and implicit age attitudes, and the time span during which each item was assessed. Implicit and explicit age attitudes were weakly but positively correlated, *Mean correlation* ( $r$ ) = .13. Previous research (Nosek, Smyth, et al., 2007) reported that for nine social preference IATs (e.g., race, skin tone, sexual orientation, weight), the age IAT demonstrated the strongest preference for the dominant

group. The current results indicate that implicit attitudes strongly favoring young relative to old people on average, *Cohen's d* = 1.19. In fact, 80.1% of adults exhibited reliably pro-young implicit attitudes ( $D > .15$ ), 13.7% demonstrated equal implicit liking for young and old people, while only 6.2% demonstrated stronger implicit attitudes favoring old people relative to young people.

Participants also self-reported preferring young people more than old people. This effect was consistent when self-reported preferences were assessed either as the difference score in self-reported warmth toward *young people* compared to *old people* ( $d = 0.18$ ) or as single item assessing self-reported preferences for young *relative* to old people ( $d = 0.49$ ). In contrast to the proportion of adults demonstrating *implicit* attitudes that favored the young, participants' self-reported *relative preferences* were more egalitarian. Many (41.4%) reported liking young people and old people equally, although 44.6% reported attitudes favoring young relative to old people and only 14.0% reported favoring old relative to young people.

**Age span differences: Older adults prefer young implicitly, and prefer both old and young explicitly.** Preference for the social group to which one belongs over others is an essential component of social identity theory (Tajfel & Turner, 1986). But as others have observed (Greenwald et al., 2002; Jost et al., 2004; Levy & Banaji, 2002; Nosek, Smyth, et al., 2007), implicit age attitudes were consistently pro-young among participants of different ages<sup>2</sup>. Implicit age attitudes consistently favored the young

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<sup>2</sup> It is plausible that age attitudes could fail to show the expected group membership effects because older adults subjectively identify as young and prefer the young age group, regardless of their chronological age. We (Lindner & Nosek, 2010) examined how subjective age, how old individuals *feel*, differed from their actual or *chronological age*. Subjective age increased around half as slowly as

among adults of all ages; implicit age preferences even increased slightly with age,  $r = .02$ . Further examination of the average level of implicit age attitudes across age groups (grouped here and elsewhere as ages 10-17, 18-24, 25-34, 35-44, 45-54, 55-64, or 65-89) emphasizes the consistency of implicit attitudes favoring the young across the age span ( $M_s$  range = 0.47 – 0.50). The single exception was those aged 10-17.

I used contrast coding to compare these adolescents to adults aged 18 and older, and estimated the mean difference in age preferences between adolescents and adults. Relative to adults, adolescents demonstrated significantly (all  $p_s < .0001$ ) weaker implicit age preferences,  $B = -.064$ ,  $SE_B = .002$ ,  $\eta_p^2 = .002$ , though they self-reported greater warmth for young people relative to old people,  $B = 0.938$ ,  $SE_B = .009$ ,  $\eta_p^2 = .016$ . By way of comparison, adults aged 65 and older (relative to adults aged 18-64), demonstrated slightly *stronger* implicit preferences favoring the young,  $B = .027$ ,  $SE_B = .006$ ,  $t(448322) = 4.39$ ,  $p < .0001$ ,  $\eta_p^2 < .00001$ .

This lack of age-group differences in implicit age attitudes is an important divergence from other social groups, including African Americans, women, and gay men/lesbians, all of whom, *relative to* members of the socially-dominant group, demonstrate greater liking for their own group despite its stigmatization (Jost et al., 2004). Social identity theory (Tajfel & Turner, 1986) would predict that older adults' failure to prefer their age group and identify as old prevents their age identity from buffering their self-esteem when confronted with age discrimination, which they are likely to experience (Palmore, 2001).

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individuals' chronological age. But when predicting implicit age attitudes among older adults (aged 50-89), subjective age and its interaction with chronological age did not account for any meaningful variation in their age attitudes ( $R^2 = .002$ ).

Variation in explicit preferences across the age span reveals a different pattern—the negative correlations between self-reported age attitudes and participants’ age indicate that older participants reported greater liking for old people, relative to younger participants. The separate ratings of warmth towards young people and old people indicate that these age-span changes were driven by simultaneous cooling warmth toward young people,  $r_{age} = -.11$ , and increasing warmth toward old people,  $r_{age} = .07$ . But follow-up analysis indicated that older adults (aged 65–89) did not self-report greater liking for their own age group than for young people, such that adults aged 65 and older reported feeling slightly warmer to young people ( $M = 6.9$ ) than to old people ( $M = 6.6$ ), *paired*  $t(5265) = 5.80, p < .0001, d = 0.08$ ; older adults also self-reported relative preferences that slightly favored their age *outgroup*. In their self-reported warmth toward old and young people, college-aged adults (ages 18–24) reported feelingly warmer to young people ( $M = 7.2$ ) than toward old people ( $M = 6.7$ ), *paired*  $t(265593) = 133.41, p < .0001, d = 0.26$ . Although older adults reported feeling slightly warmer toward young people than toward old people, this effect size demonstrates that this outgroup preference was very slight. Regardless, it is striking that older adults failed to report greater liking for their own age group.

### **Do Implicit Age Biases Reflect Attitudes toward Aging, rather than toward Older Adults?**

Some have suggested that age attitudes do not reflect negativity toward older adults as a group but toward the category itself, such as declines in health or cognitive abilities and fears of encroaching death (Martens, Goldenberg, & Greenberg, 2005; Martens, Greenberg, Schimel, & Landau, 2004). Participants’ self-reported feelings

toward *being old* or *being young* provide one way of evaluating whether this explanation accounts for the relative strength of implicit age attitudes. Overall, adult participants ( $N = 31608$  for those who rated their warmth toward all four concepts) reported viewing *old people* ( $M = 6.4$ ) much more positively than they viewed *being old* ( $M = 4.4$ ). Compared to their feelings toward *old people*, they reported viewing *young people* slightly more positively ( $M = 6.8$ ) and viewed *being young* even more positively ( $M = 7.5$ ). Attitudes toward the aging process differed among participants of different ages, such participants' own age correlated positively with warmth toward *being old*,  $r = .03$ , and negatively with warmth toward *being young*,  $r = -.22$ .

However, the critical test of this hypothesis is whether attitudes toward the aging process predict implicit age attitudes better than attitudes toward *old people* themselves. Compared to a model that predicted implicit age attitudes from non-college-aged adults' (aged 25-89,  $N = 9932$ ) difference in warmth toward *young people* relative to *old people* ( $R^2 = .028$ ), implicit age attitudes were significantly, but not substantially better predicted ( $\Delta R^2 = .009$ ) by adding warmer feelings for *being young*,  $\beta = .057$ ,  $p < .0001$ , and colder feelings for *being old*,  $\beta = -.075$ ,  $p < .0001$ , to the model. No significant higher-order interactions among these self-reports or with participants' own age qualified these results. This is preliminary evidence that despite its low correlation with self-reported age attitudes, the age IAT is not substantially predicted by individuals' self-reported negativity toward *aging*. This idea was examined further in Study 2.

## Discussion

The results for explicit attitudes indicate that although age-group membership predicted *relative* differences in *explicit* age attitudes—in that participants' age was

associated with increasing self-reported warmth for old people and cooling warmth for young people—older adults did not self-report greater liking for their own age group. These findings highlight how age group identity and preferences diverge from other social groups. Research on subjective age identity (as the age that one *feels* rather than one's *chronological age*) suggests one explanation for the attenuated effects of age group-membership in self-reported age attitudes. This research finds that older adults avoid identifying as old by reporting that they *feel* younger than they are, with adults over 40 reporting that they feel 20% younger than their chronological age (Rubin & Berntsen, 2006). This would suggest that even retirement-age adults may fail to identify as an “old person;” this failure to identify as old could explain why older adults failed to self-report preferring the age-group to which others perceive them as belonging.

The results for implicit age attitudes suggest that the strong *implicit* attitudes favoring young relative to old people were also consistently strong across the sample's age span—older adults demonstrate implicit age attitudes that are just as strong as those of young adults. It also appears that despite the relative dissociation between implicit and explicit age attitudes, implicit age attitudes were not substantively predicted by self-reported attitudes toward the aging process, after accounting for individuals' self-reported attitudes toward *old people*.

## **Study 2 – Structure of Implicit and Explicit Age Attitudes**

The results from Study 1 emphasize both the strength of implicit age attitudes favoring the young and the dissociation between explicit and implicit age attitudes, as

assessed by the IAT (*Mean r* = .13). Across topics, implicit and explicit measures reveal some degree of dissociation from one another, but age attitudes reflect one of the weakest associations between implicit and self-reported attitudes among 95 social concepts examined (see Figure 5, Nosek & Hansen, 2008). This could mean (a) that the measures are invalid, (b) that implicit and explicit age attitudes are valid measures, just largely dissociated, or (c) that asking different questions or using alternative implicit measures would reveal stronger relations. Possibility (c) is not mutually exclusive of either (a) or (b), but it is the most obvious, and tractable, option to examine next.

For Study 2, I tested the relations among a variety of implicit and explicit age measures to see if any measures would elicit stronger implicit-explicit correspondence. In this study, a sample of young adults completed self-report measures assessing age preferences, attitudes toward the aging process, and both negative and positive stereotypes of old age. These measures represented a variety of other previously-unstudied constructs, such as intergroup contact, expectations about one's own aging process, and concerns about mortality and ill-health. Implicit age attitudes were assessed with four different implicit attitude measures: the Implicit Association Test (IAT; Greenwald et al., 1998), the Brief IAT (BIAT; Sriram & Greenwald, 2009); the Sorting Paired-Features Task (SPF; Bar-Anan, Nosek, & Vianello, 2009), and the Affect Misattribution Procedure (AMP; Payne, Cheng, Govorun, & Stewart, 2005). This was intended to address the possibility of (a) above, that one implicit measure might have particularly weak validity, while others reflect stronger convergent validity with self-reports. I examine the correlations among and between implicit and self-report measures, to examine whether any of the variety of self-reported attitudes about old age and aging



predict meaningful variation in implicit age attitudes.

My selection of the explicit measures related to old age and aging was guided by existing hypotheses for why attitudes toward older adults are so negative. As discussed in Study 1, mortality-salience theorists have suggested that age attitudes may not necessarily reflect negativity toward older adults themselves. Instead, age attitudes may reflect negativity toward old age as a category, as represented by declines in health or cognitive abilities and fears of encroaching death (e.g., Martens et al., 2005). This would suggest that anxiety about aging or negative old-age stereotypes about cognitive functioning, health, and proximity to death would be more closely related to implicit age attitudes than self-reported attitudes about older adults themselves. Another potential explanation for the dissociation between implicit and explicit age attitudes comes from the *stereotype-content model* (Cuddy, Fiske, & Glick, 2007; Fiske, Cuddy, & Glick, 2002). This research finds that compared to young adults, older adults are seen as warmer but less competent, suggesting that older adults' perceived incompetence, rather than their perceived warmth, is driving implicit age attitudes favoring the young.

## **Method**

### **Participants**

Participants ( $N = 229$ ) completed the study in return for partial course credit in an introductory psychology course. Participants ( $M_{\text{age}} = 19.0$ ,  $SD = 1.3$ , range = 17 – 26) consisted of 87 men and 113 women (29 failed to report demographics, collected separately). Participants reported their racial background as follows: 131 as White (57%); 50 as Asian, Native Hawaiian, or Pacific Islander (22%), 5 as multiracial (2%), 2 as Black (1%), and 12 reported that their race did not fall into any of these categories. 10

participants who had reported their racial background also reported a Hispanic ethnic background. Because of computer error, AMP data were not collected for 6 participants, and SPF and IAT data were not collected for 1 participant.

### **Design and Procedure**

After providing consent, participants provided their university ID to link their responses with the demographics information they provided when registering with the Department participant pool at the beginning of that academic semester. Once participants understood the general instructions for the tasks, they proceeded through the study at their own pace. The instructions for each explicit task indicated the number of items it included, and the instructions for each implicit measure estimated the amount of time required to complete the task. The study itself presented four implicit measures (IAT, BIAT, SPF, and AMP) and four explicit measures (the *images of old age* scale, the *anxiety about aging* scale, participants' gut and actual feelings toward young people and old people, and a sequence of items concerning the warmth and competence of old and young people and participants' relative age preferences and relative age identity). The study alternated between implicit and explicit measures, and the order in which they were presented was counterbalanced using a Latin-Square design. After completing the AMP, participants were asked to report their familiarity with the *pinyin* pictographs they had just seen, and during debriefing, participants were given the opportunity to identify as many of the task's *pinyin* pictographs as they could. The study closed with debriefing.

### **Measures**

**Explicit measures.** The explicit measures consisted of self-report items assessing a variety of constructs. Participants' *positive expectations about aging* were assessed with

nine items (*Cronbach's*  $\alpha = .76$ ) from the *anxiety about aging scale* (Lasher & Faulkender, 1993). These items assessed: (a) *group contact with older adults* (“I enjoy being around old people”; “I feel very comfortable when I am around an old person”; “I enjoy talking with old people”); (b) *positive expectations about one's own psychological well-being* (“I fear it will be very hard for me to find contentment in old age”, reverse-coded; “I will have plenty to occupy my time when I am old”); (c) *lack of concern about age-related physical changes* (“I have never dreaded looking old”; “It doesn't bother me to imagine myself as being old”); and (d) *positive expectations about age-related losses* (“I fear when I am old all my friends will be gone”, reverse-coded; “I worry that people will ignore me when I am old”, reverse-coded). Participants responded to the items using a 6-point agree-disagree scale, which was then centered to range from -2.5 (*Strongly Disagree*) to 2.5 (*Strongly Agree*).

Participants also reported how accurately old people in general were described by *stereotypes of old age* (Levy, Kasl, & Gill, 2004), using a 7-point scale that ranged from 0 (*Furthest from what you think*) to 6 (*Closest to what you think*). The scale consisted of stereotypes in 9 domains that were either *positive* (well-groomed, active, wise, full of life, capable, positive outlook, healthy, family-oriented, will to live;  $\alpha = .66$ ) or *negative* (walk slowly, wrinkled, senile, dying, helpless, grumpy, sick, lonely, given up;  $\alpha = .72$ ).

In one sequence of self-report items, participants completed two bipolar items assessing *relative age preferences* and *relative age-group identity*. The response scale ranged from 1 to 7, and was then centered so that scores range from -3 (*I strongly prefer old people to young people; I strongly identify as being old*) to 3 (*I strongly prefer young people to old people; I strongly identify as being young*). Before continuing to the next

implicit task in the study, participants also evaluated the *warmth* (0 = *Very cold* to 10 = *Very warm*) and *competence* (0 = *Very incompetent* to 10 = *Very competent*) of the average young person and the average old person. Competence and warmth difference scores were calculated to represent the relative age-group difference, such that positive scores indicate that young people were perceived as being more competent or warmer than old people.

In another sequence of self-report items, participants reported both their gut and actual feelings toward young and old people. The instructions introduced this idea by stating: “*People’s gut reactions about a topic can be different from their feelings after they have had time to think about it. For example, someone who is trying to quit smoking might have a very positive gut reaction, but negative actual feelings toward smoking.*” Participants then rated their gut feelings and actual feelings for both old people and young people using a scale ranging from 0 (*Coldest feelings*) to 10 (*Warmest feelings*). Gut and actual feeling difference scores were calculated to reflect relative age-group differences, such that positive scores indicate greater self-reported positivity toward young people relative to old people.

**Implicit measures.** The implicit measures assessed implicit attitudes for young people and old people, and consisted of the Implicit Association Test (IAT; Greenwald et al., 1998), the Brief IAT (BIAT; Sriram & Greenwald, 2009); the Sorting Paired-Features Task (SPF; Bar-Anan, Nosek, & Vianello, 2009), and the Affect Misattribution Procedure (AMP; Payne, Cheng, Govorun, & Stewart, 2005).

**Common features of the implicit measures.** The design and scoring procedure for the IAT, SPF, and Brief IAT had several common features. First, the evaluative stimuli

were randomly selected from a common set of *good* (brilliant, cheerful, delight, enjoy, excellent, friend, funny, glee, glorious, great, happy, joy, laugh, love, lucky, marvelous, peace, pleasant, pleasure, smile, splendid, success, sunshine, superb, triumph, wonderful) and *bad* (abuse, agony, angry, brutal, crash, destroy, dirty, disaster, enemy, evil, failure, frown, gross, horrible, humiliate, nasty, noxious, poison, pollution, rotten, stink, terrible, tragic, unpleasant, vomit, yucky) words. Second, the face stimuli for *young* and *old* adults were randomly selected from a common pool of images chosen from a diverse aging-faces database (Minear & Park, 2004). An equal number of male and female faces represented the *young* and *old* group category in each implicit task (see Appendix 1 for all stimuli). Third, if participants made an error in categorizing a stimulus, a red “X” appeared below the stimulus (or stimuli-pair for the SPF) and persisted until participants corrected their response. Current recommendations for scoring the IAT (Greenwald et al., 2003) and BIAT (Sriram & Greenwald, 2009) were followed, such that: (a) response latencies < 400 milliseconds (ms) and >10,000 ms were excluded in calculating the mean response latencies, (b) trial latencies were calculated from the beginning of the trial until the time of a correct response, so that error trials include the time required to correct the initial response, and (c) scores represent the difference between the mean response latencies of the critical blocks, divided by the inclusive standard deviation of latencies in those blocks.

**IAT.** The IAT assessed the relative strength of participants’ associations between *good* and *bad* evaluative attributes and faces representing the *young* and *old* group categories (Nosek, Smyth, et al., 2007). Its design is consistent with the age IAT described in Study 1, and scores are scaled so that positive values indicate an attitude

favoring young people relative to old people (*Cronbach's*  $\alpha$  for 4 15-trial parcels = .82). As a necessary consequence of its design, the age IAT score represents the *relative strength* of individuals' associations between *good* or *bad* and *young* or *old*. It is not possible to discern whether a strongly pro-young IAT score is driven by strong associations between *young* and *good* or between *old* and *bad*. IAT scores were excluded from analysis for 3 participants who had too many error trials or too many fast trials (see Study 1 for exclusion criteria).

**Brief IAT.** As its name suggests, the Brief IAT (Sriram & Greenwald, 2009) retains some of the IAT's procedural features, but shortens measurement time by roughly one-half. An important procedural distinction to the IAT is that the Brief IAT directs participants to focus on two of the task's four categories. Participants are directed to sort young faces and good stimuli with a focal response key and categorize everything else (i.e., old faces and bad stimuli) with another "nonfocal" key. The "everything else" items and stimuli are not named or labeled. For the purposes of performing the task, the participant need only recognize that they are not the focal categories - young faces and good words. The Brief IAT consisted of four 28-trial blocks in which the focal categories were good and young, good and old, bad and young, or bad and old. The order in which these blocks appeared was randomized across participants. Each block began by briefly repeating the instructions and directing participants to the focal category labels, which were located in the top-center of the screen throughout the task. This study was conducted in 2006, which was early in the process of validating the Brief IAT and establishing its design. Later validation of the Brief IAT (Sriram & Greenwald, 2009) found that the *good*-focal, but not the *bad*-focal, Brief IAT has satisfactory internal

consistency, test-retest correlation, and correlations with explicit attitudes. Because of this, Brief IAT scores are only calculated and reported for the *good*-focal blocks, which focused on *good* and *young* or *old* ( $\alpha = .77$ ). Scores are scaled so that positive values indicate stronger relative associations between *good* and *young* rather than *old*. Brief IAT scores were excluded for 14 participants who had too many fast responses ( $<300$  ms, either  $>10\%$  for the entire task or  $>24\%$  in at least one block) or had greater than 39% error responses in at least one block.

**SPF.** The Sorting Paired Features (SPF) task (Bar-Anan et al., 2009) consists of a single task with four response alternatives (*young people-good*, *young people-bad*, *old people-good*, *old people-bad*). In the SPF, labels for the four category-evaluation pairs (*young people-good*, *young people-bad*, *old people-good*, *old people-bad*) are presented in the four corners of the computer screen, with their spatial location being counterbalanced across participants, and are represented with a distinct response key ('q', 'p', 'c', and 'm'). In each trial, one of the four category-evaluation pairs appeared in the center of the computer screen. In the SPF's three identical blocks, participants used the response keys to sort the category-evaluation stimulus pairs into the appropriate corner as quickly as possible. The first four of each block's forty trials presented one of each of the four category-evaluation pairs to familiarize participants with the task. The remaining trials were randomized so that each of the four category-evaluation pairs was presented an equal number of times. SPF scores were calculated to parallel the IAT and BIAT *D* scores, such that scores represent the difference between the mean response latency of sorting a particular category-evaluation pair (e.g., *old-good*) and the overall mean of response latencies for all trials, as scaled by the overall standard deviation of latencies for

all trials. The four component SPF scores are algebraically dependent, but represent the relative strength of associations with *old-bad* (Cronbach's  $\alpha = .19$ ), *old-good* ( $\alpha = .35$ ), *young-bad* ( $\alpha = .07$ ), and *young-good* ( $\alpha = .42$ ). Because of these scores' low reliability, I also calculated two scores, representing the relative strength of stereotypic *young* ( $\alpha = .37$ ) and *old* ( $\alpha = .38$ ) associations<sup>3</sup>. These SPF scores are scaled so that positive scores represent stronger stereotypic associations, with positive SPF-Young scores representing stronger associations for *young-good* than for *young-bad*, and SPF-Old scores representing stronger associations with *old-bad* than with *old-good*. SPF scores were excluded from analysis for 5 participants who had a below-chance accuracy rate (< 25%) in sorting the group-evaluation pairs or who had more than 1/6 trials outside of the analyzed latency range (400-10000 ms).

**AMP.** The AMP is distinct from the other implicit measures described here. The other reaction-time measures infer individuals' age preferences from their response speed when sorting *young* or *old* faces with evaluative categories like *good* and *bad*. The AMP infers individuals' preferences from the extent to which their feelings toward primed old or young faces influence evaluation of novel target stimuli. In the AMP, participants evaluate Chinese *pinyin* pictographs (see Appendix 2 for all *pinyin* characters) as either more positive or more negative than the average pictograph. Participants were instructed to use their gut feelings to make their evaluations quickly and told that a face would appear before each pictograph, but that it was important to ignore the face and evaluate only the pictograph. To familiarize participants with the pictographs and how quickly

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<sup>3</sup> Analysis examining how the individual SPF component scores related to the other implicit and self-report measures was conducted and revealed the same pattern of results—except that the individual SPF scores were more strongly correlated (*Mean*  $|r| = .33$ ), as is expected for interdependent scores.



they would flash on the screen, participants began with a 5-trial practice block in which only the Chinese pictographs were presented. The AMP's critical block consisted of 72 trials throughout which the evaluative categories (*Less Pleasant* and *More Pleasant*) appeared in the upper-left and upper-right corners. In each trial of the critical block, a randomly-selected stimulus (old face, young face, or a neutral grey square) was primed for 75 ms, after which a blank screen was presented for 125 ms, then a Chinese pictograph was presented for 100 ms before being replaced with an image of white noise until participants evaluated the pictograph. The next trial began as soon as participants evaluated the preceding pictograph. The *pinyin* pictographs were randomly selected from a pool of 200 (from <http://www.unc.edu/~bkpayne/materials.html>). Because participants differ in how likely they are to respond *pleasant*, old and young AMP scores represent participants' likelihood of responding *pleasant* after an old prime relative to the neutral grey square. As in previous research (Payne et al., 2005, Experiments 5 & 6), the overall AMP score was calculated as the difference between the proportion of pleasant responses after old relative to young primes; positive values indicate greater positivity toward young people ( $\alpha$  for 24 pairs = .61). AMP scores were excluded from analysis for 28 participants because they were native speakers or students of a language using *pinyin* pictographs and for 7 participants who had more than 40% trials faster than 400 ms.

## Results

Table 2-1 summarizes descriptive statistics for the implicit and explicit measures and their intercorrelations. Descriptive statistics are reported for subscales of self-reported attitudes toward aging and old-age stereotypes. I first describe the relationships among the implicit measures and among the explicit measures. I then examine the

structure of the self-report measures and whether any of these age-related attitudes correlate with implicit age attitudes.

### **Relationships among Implicit Measures**

Overall, implicit age attitudes significantly differed from the zero-point, which indicates no preference. The age IAT demonstrated a strong effect size favoring *young* compared to *old people*,  $d = 1.27$ ,  $t(224) = 19.11$ ,  $p \leq .001$ , while the Brief IAT,  $d = 0.29$ ,  $t(215) = 2.79$ ,  $p = .006$ , and the AMP,  $d = 0.20$ ,  $t(195) = 4.26$ ,  $p \leq .001$ , demonstrated a small effect size of attitudes favoring *young* compared to *old people*. Similarly, the SPF-Old demonstrated a small effect size for stronger *old-bad* associations than *old-good* associations,  $d = 0.24$ ,  $t(222) = 3.56$ ,  $p < .001$ , and the SPF-Young demonstrated moderately stronger *young-good* associations than *young-bad* associations,  $d = 0.66$ ,  $t(222) = 9.86$ ,  $p \leq .001$ . Thus, implicit attitudes favoring young compared to old people appear to be much stronger for the IAT than for the other implicit measures.

As has been observed with other topics (e.g., self-esteem: Bosson, Swann, & Pennebaker, 2000), reaction-time-based measures of implicit age attitudes were weakly intercorrelated ( $Mean r = .19$ ; range =  $.07 - .28$ ) in the anticipated positive direction. The AMP score, indicating the proportion of pleasant responses after old relative to young faces, correlated marginally or nonsignificantly with the other implicit measures,  $Mean r = .10^4$ . Given the low intercorrelations among the implicit measures, it is reasonable to anticipate that at least some implicit measures will be dissociated from self-reported

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<sup>4</sup> This could suggest that the AMP failed to represent *implicit* attitudes, as suggested by Bar-Anan and Nosek (2011), who found that roughly half of participants retrospectively reported rating the primes (e.g., the young and old faces), which they were instructed to ignore, rather than the targets. Excluding those who ignored the instructions greatly reduced the AMP's internal consistency and relationships with other criterion variables, which (if participants' retrospective self-reports are accurate rather than post-hoc inferences), threatens its validity as a measure of *implicit* attitudes.

attitudes, while one or more could relate to self-reported age attitudes. However, the low correlation between the IAT and Brief IAT is surprising because participants are behaviorally doing the same thing in both tasks—this suggests that directing participants to focus their attention on *good* rather than on *bad* has important consequences for how strongly participants implicitly favor young compared to old people.

### **Correlations among Explicit Measures**

Among the explicit measures, correlations varied widely (range =  $-.31 - .57$ ) but in anticipated directions. For example, the explicit measures of age preferences (as *relative age preferences* and age-group difference scores of perceived *competence*, perceived *warmth*, *gut feelings*, or *actual feelings*) positively correlated with one another, *Mean r = .27*.

Table 2-1. *Descriptive Statistics and Correlation Matrix for Implicit and Self-Report Measures among Young Adults*

	Correlation Matrix																		
	Descriptives																		
	<i>M</i>	<i>(SD)</i>	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
<b>Implicit age preferences</b>	1. IAT ( <i>D</i> )	0.43 (0.33)	.09	<u><b>.27</b></u>	.17	<u><b>.24</b></u>	.03	-.09	.03	-.00	-.08	.01	.10	-.07	.07	.02	.09	-.01	
	2. AMP difference	0.04 (0.22)	.12	.12	.05	.02	-.02	-.03	.03	.07	-.06	-.06	<b>.16</b>	-.05	.10	<b>.16</b>	.08	-.05	
	3. Good BIAT	0.14 (0.48)		<u><b>.28</b></u>	.07	.03	.02	.02	-.01	-.03	.09	.13	-.09	<u><b>.28</b></u>	<u><b>.18</b></u>	<u><b>.18</b></u>	.13	.03	
	4. SPF: Old	0.06 (0.27)			.11	-.06	-.02	-.03	-.02	-.02	.03	.12	-.03	.13	.07	.10	.10	.01	
	5. SPF: Young	0.20 (0.30)				.05	.00	-.05	.00	-.01	<b>.16</b>	.01	-.01	.00	.05	.03	.02		
<b>Positive expectations about aging</b>	6. Group contact	0.36 (1.14)					<u><b>.39</b></u>	<u><b>.22</b></u>	<u><b>.13</b></u>	<u><b>.50</b></u>	<u><b>.19</b></u>	<u><b>.21</b></u>	-.07	<u><b>.20</b></u>	<u><b>-.13</b></u>	<u><b>.24</b></u>	<u><b>-.12</b></u>		
	7. Well-being	0.40 (1.16)						<u><b>.25</b></u>	<u><b>.28</b></u>	<u><b>.40</b></u>	-.10	-.11	.05	.01	.02	-.05	.03		
	8. Physical changes	-0.10 (1.25)							<u><b>.24</b></u>	<u><b>.17</b></u>	<u><b>.24</b></u>	.04	.08	-.03	-.08	-.10	-.04		
	9. Losses	-0.13 (1.18)								.02	<u><b>.21</b></u>	-.13	-.02	<u><b>.17</b></u>	<u><b>-.14</b></u>	-.05	-.01		
<b>Images of old age</b>	10. Positive	3.29 (0.69)									<u><b>.23</b></u>	<u><b>.31</b></u>	-.10	<u><b>.18</b></u>	<u><b>-.14</b></u>	<u><b>.12</b></u>	<u><b>.19</b></u>	<u><b>.14</b></u>	
	11. Negative	3.37 (0.82)										.06	.09	<u><b>.18</b></u>	.12	<u><b>.19</b></u>	<u><b>.14</b></u>		
<b>Explicit preferences: Young-Old difference</b>	12. Warmth	-0.29 (2.41)											<b>.13</b>	<u><b>.31</b></u>	<u><b>.35</b></u>	.08	-.01		
	13. Competence	0.55 (2.63)												<u><b>.32</b></u>	<u><b>.22</b></u>	<u><b>.11</b></u>	.08		
	14. Gut feelings	0.39 (2.65)													<u><b>.57</b></u>	<u><b>.30</b></u>	<u><b>.22</b></u>		
	15. Actual feelings	-0.02 (2.06)														<u><b>.27</b></u>	<u><b>.17</b></u>		
<b>Relative explicit</b>	16. Preferences	1.43 (1.10)																	<u><b>.37</b></u>
	17. Identity	2.06 (1.24)																	

Note. IAT = Implicit Association Test, BIAT = Brief IAT, SPF = Sorting Paired-Features Task, AMP = Affect Misattribution Procedure. IAT correlations with: AMP,  $N = 192$ ; with BIAT,  $N = 212$ ; with SPFs,  $N = 221$ , with explicit measures  $N = 225$ . AMP score correlations: with BIAT,  $N = 182$ ; with SPFs,  $N = 190$ ; with explicit measures,  $N = 195$ . BIAT correlations: with SPFs,  $N = 212$ , with explicit measures,  $N = 215$ . All other SPF score correlations,  $N = 223$ . Intercorrelations among explicit measures,  $N = 229$ .

*Italic*  $p \leq .10$ . **Bold**  $p \leq .05$ . Underline  $p \leq .01$ . **Double-underline**  $p \leq .001$

### **Relationships between Implicit and Explicit Measures**

I had previously proposed to use structural equation modeling to understand the underlying structure of implicit and explicit age attitudes and how they related to other age-related constructs. I conducted preliminary analysis using structural equation modeling to represent implicit and explicit constructs. But the weak communalities among the variables appear to have restricted the model fit, making it impossible to evaluate whether the mediocre model fit when representing an implicit construct and its relationship with various self-report constructs was due to incorrect model specification or was simply restricted by the tiny relationships among the implicit and explicit measures.

I then conducted an exploratory factor analysis of the 32 explicit items, excluding age identity. I found that it was possible to represent the self-report items as six correlated ( $M |r| = .21$ ,  $r_s$  range =  $-.47 - .37$ ) factors, representing negative attitudes toward older adults, group contact, mild but ambivalent old-age stereotypes, positive expectations about one's own aging, positive expectations about physical changes, death and loss concerns. However, less than half (42%) of the variance in self-reported attitudes represented common variance that could be considered in factor analysis. More importantly, the purpose of using such a large range of self-report constructs was to evaluate whether implicit and explicit age attitudes were simply measuring different constructs, such that individuals could self-report feelings toward aging and old-age that do predict meaningful variation in implicit age attitudes. Thus, the analyses reported below focus on the direct relationships between implicit and explicit measures and whether any self-reported constructs can predict meaningful variation in any measure of

implicit age attitudes.

**Bivariate correlation between implicit attitudes and explicit constructs.** I first examined how the implicit measures of age preferences correlated either with self-reported age preferences (5 items) or self-reported feelings toward aging and old age (27 items). To do so, measures were scored so that higher scores reflect greater negativity toward old people or aging; thus, negative correlations are in the opposite of the anticipated direction. These bivariate correlations are summarized in Table 2-2.

Table 2-2. *Summary of Correlations of Implicit Measures with Explicit Constructs*

Implicit Measures	Correlations with Explicit Age Preferences		Correlations with Explicit Attitudes to Aging & Old Age			
	<i>Mean</i>	<i>Max</i>	<i>25 %ile</i>	<i>Mean</i>	<i>75 %ile</i>	<i>Max</i>
IAT	.04	.10	-.01	.02	.05	.11
Brief IAT	.13	.28	-.04	.02	.08	.14
SPF-Old	.08	.13	-.01	.02	.05	.11
SPF-Young	.02	.05	-.03	.03	.09	.16
AMP Difference	.09	.16	-.07	-.02	.02	.07

*Note.*  $p \leq .05$  for  $|r| \geq .13$ .

The IAT, SPF-Young, SPF-Old, and AMP were largely disassociated from self-reported attitudes toward older adults (all *Mean rs*  $\leq .09$ ; all *rs*  $\leq .16$ ). The Brief IAT exhibited its strongest correlation with age-group differences in gut feelings ( $r = .28$ ), but its correlations with the self-reported age preferences (*Mean r* = .13) were not significantly stronger than those for the other implicit measures. Of the implicit-explicit correlations for age preferences, all implicit-explicit correlations were in the anticipated direction; the sole exception was perceived competence, which correlated in the opposite

of the expected direction with the implicit measures (*Mean r* = -.05). All implicit measures were essentially unrelated to attitudes about aging and old age.

**Hierarchical regressions testing whether any self-reported attitudes predict implicit age preferences.** To test the critical research question for the study, I next conducted a series of hierarchical linear regressions predicting each of implicit measures from the self-report measures; the self-report measures were scored so that higher values indicate greater negativity toward older adults. The results for these regressions are summarized in Table 2-3. I first predicted implicit preferences from self-reported age-group preferences. Step 2 added the 9 items assessing aging anxiety, and Step 3 added the 18 items assessing positive and negative stereotypes of old age.

Table 2-3. *Hierarchical Regressions Predicting Implicit Measures from Self-Report*

Predicting	Step 1.	Step 2.	Step 3.	Total	
	Explicit age preferences	Aging anxiety	Old-age stereotypes	$R^2$	Adj- $R^2$
IAT	.03	.04	.07	.14	<.01
Brief IAT	.12	.03	.10	.25	.12
SPF-Old	.04	.03	.07	.14	<.01
SPF-Young	.003	.02	.15	.17	.03
AMP Difference	.05	.02	.10	.17	.01

Ignoring the cost of including so many individual predictors (i.e., focusing on the  $R^2$  rather than on the adjusted- $R^2$ ), the results indicate that self-reported age-group preferences predict some variation in implicit age attitudes, particularly on the Brief IAT. In Step 2, aging anxiety predicts very little additional variation in implicit age attitudes. And old-age stereotypes predict some additional differences in implicit age attitudes, but

contrary to expectations, this is most apparent for the SPF-Young score, representing negative and positive associations with *Young People*. Collectively, these self-report measures accounted for between 17% and 25% of the total variation in implicit age attitudes. Accounting for 25% of the variance is equivalent to a cumulative  $r$  of .40 to .50. At first glance, this seems impressive, suggesting that implicit age attitudes are not strongly correlated with any single self-report measure about old age. Instead, it appears at first to be a cumulative relationship with small contributions by many different aspects of age-relevant attitudes, stereotypes, and anxiety.

However, outside of the Brief IAT,  $F(32, 182) = 1.89, p = .005$ , the overall  $F$ -tests of those relationships were nonsignificant ( $F_s \leq 1.2, p_s \geq .22$ ), and the adjusted- $R^2$  near zero. This suggests that these sizable aggregate relationships between self-report measures and implicit age attitudes reflect cumulative “apparent” meaningfulness of random variation. To show that it is actually meaningful variation, this pattern would need to be replicated with very large samples that will be more resistant to showing sizable, cumulative effects of random variability.

### **Discussion**

This study examined whether several measures of implicit age attitudes were associated with any of a diverse range of self-report measures concerning age preferences, aging anxiety, and old-age stereotypes. Instead, I failed to find any strong implicit-explicit associations. This is despite the weak intercorrelations among the four diverse measures of implicit age attitudes, which previously led me to anticipate that even if some implicit measures would be dissociated from self-reported attitudes, one or more would relate to self-reported age attitudes. Thus, the implications discussed here are



tentative because they are based on my failure to reject several null hypotheses. However, the miniscule correlations reported here suggest that several potential explanations for the strength and relative dissociation of implicit age attitudes fail to account for any meaningful variation in implicit age attitudes.

### **Failure to Support Various Explanations for Implicit Age Attitudes**

**Age attitudes as concerns about mortality.** As discussed in Study 1, some have suggested that age attitudes reflect negativity toward old age as a category, as represented by declines in health or cognitive abilities and fears of encroaching death (e.g., Martens et al., 2005), rather than negativity toward older adults themselves. But stereotypes about old age, which included concepts like *senile*, *dying*, *helpless*, and *given up*, failed to predict any meaningful variation in implicit age attitudes.

**Attitudes toward the aging process.** Similarly, some have found that attitudes toward one's own aging process are correlated with negative attitudes toward older adults (Allan & Johnson, 2009). But collectively, aging anxiety (Lasher & Faulkender, 1993) in the form of concerns about changes in one's own well-being, physical changes, and losses due to aging, predicted minimal variation in implicit age preferences. These concerns were also only weakly correlated with self-reported age attitudes.

**Competence vs. likability.** The *stereotype-content model* compares individuals' perceptions of *societal* attitudes towards a variety of social groups (Cuddy et al., 2007; Fiske et al., 2002), finding that group attitudes are composed of two fundamental dimensions—likability and competence, rather than a single dimension of positivity. This research finds that relative to young adults, older adults are seen as more likable but much less competent. This would suggest that older adults' perceived competence drives

negative attitudes toward them. Instead, competence was minimally correlated with the various measures of implicit age attitudes. It also exhibited the lowest communality (squared multiple correlation = .25) with the various self-report measures, which included negative stereotypes about old age and expectations about the aging process. As measured in the present study, perceptions of older adults' competence, relative to that of young adults, was minimally related to both implicit and explicit attitudes toward older adults. The potential relationship of competence and likability with implicit age attitudes will be explored further in Study 3.

### **Conclusion**

The present research examined whether a diverse range of self-report measures could predict meaningful variation in implicit age attitudes. As in other research (Study 1 of this dissertation; Nosek et al., 2002; Nosek, Smyth, et al., 2007), self-reported attitudes toward older adults as a group and age-group identification were substantially uncorrelated with implicit age attitudes. And neither perceptions of older adults' competence and likability, nor anxiety about the aging process, nor negative and positive stereotypes of old age were substantively and associated with implicit age attitudes. They did so only in aggregate, which suggests that these self-report measures were merely predicting random variation in the implicit measures.

This study examined whether asking different questions or using alternative implicit measures would reveal stronger implicit-explicit relations. But at present, implicit age attitudes remain substantially dissociated from anything individuals have self-reported. Left unanswered is the question of *what* is being measured as implicit age attitudes. The possibility remains that either the implicit measures are invalid or that

implicit and explicit age attitudes are valid measures, but are largely dissociated. I turn to this second possibility in Studies 3 and 4, by directly manipulating which age groups represent *Young* and *Old* in measures of implicit age attitudes, to examine whether implicit age attitudes vary in theoretically meaningful ways, even as they fail to relate to self-reports of age-relevant constructs.

### **Study 3 – Construct Validity of Implicit Age-Group Attitudes**

In Study 3, I took a different approach to establish the construct validity of implicit age attitudes. It is possible that implicit age attitudes are construct valid and yet are largely unrelated to either explicit age attitudes and beliefs or individuals' own age-group identity. To pursue this possibility, I examined the implicit measurement of age attitudes directly by varying the age groups targeted in implicit measurement.

A review of available research on the IAT (Nosek, Greenwald, et al., 2007) found that category labels (e.g., *young people* and *old people*) are critical in defining the dimension on which stimuli should be categorized, but that the stimuli that represent those labels also affect how the category is construed. For example, the strength of implicit gay–straight attitudes was altered by manipulating whether some of the *gay people* stimuli were represented by gay men versus lesbians (Supplement 1; Nosek, Greenwald, & Banaji, 2005).

Because a limited range of facial stimuli have represented the constructs *young people* and *old people*, attributes specific to these stimuli could be a source for the strength of implicit pro-young preferences or the dissociation between implicit and self-

reported age preferences. Previous research on implicit age attitudes (Nosek, Banaji, & Greenwald, 2002) reported that implicit attitudes favored *young* more weakly when *young people* and *old people* are represented by faces rather than first names<sup>5</sup> (Cohen's *ds* = 0.99 and 1.42, respectively). But existing research on implicit age attitudes has typically relied on a single stimuli set of faces representing *young people* and *old people*—as 12 black-and-white photos of faces that are cropped above and outside the eyebrows and just above the lips (see Appendix 3). In Study 2 of this dissertation, a large pool of young and old faces represented *young people* and *old people* in the implicit attitude measures (see Appendix 1); but these faces were not equated for their facial expressions or attractiveness—attributes that could plausibly influence the cognitive representations that are evoked by *young people* and *old people*. And in all cases, the *young people* and *old people* stimuli represented the extreme ends of the age spectrum, as very young and very old adults.

To evaluate the construct validity of implicit age attitudes, I developed the age-groups IATs (Study 3) and Brief IAT (Study 4). The IAT assessed individuals' implicit attitudes toward *younger people* relative to *older people*, as represented by children, young adults, middle-aged adults, or old adults. I also examined how implicit age attitudes varied depending on which two age-groups were compared. Specifically, I examined (a) whether implicit attitudes favoring the young are an artifact of the stimuli used to represent *younger people* and *older people*, (b) whether implicit preferences for various age groups consistently favor *younger*, and (c) which age-group comparisons

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<sup>5</sup> Young names were Tiffany, Michelle, Cindy, Kristy, Brad, Eric, Joey, and Billy; and old names were Ethel, Bernice, Gertrude, Agnes, Cecil, Wilbert, Mortimer, and Edgar (Nosek et al., 2002).

elicit the strongest preferences for the younger age-group, either across different experimental conditions (Studies 3-A and 3-B) or within individuals (Study 4).

### **Hypotheses**

Based on previous hypotheses for why implicit attitudes favor young people relative to old people so strongly, I anticipated that implicit age-group attitudes would vary—depending on which age-groups were compared—in one or more of the following ways. In evaluating the support for each hypothesis, I expect that more than one of the following hypotheses could jointly account for how implicit attitudes for different age-group comparisons vary.

In anticipating how implicit age-group attitudes would vary, one possibility is that individuals would prefer the age group that is closest to the “prime of life” – where health, vitality, fertility, cognitive functioning, and competence are maximized (cf. Huang & Bargh, 2008). In this case, individuals would implicitly prefer young adults to all other age groups, regardless of whether they were represented as “younger” or “older”.

A second possibility is that implicit evaluations are driven by a universal *younger is better* association. In that case, no matter what the age groups, participants would implicitly prefer the younger group on average. A potential moderating influence of this hypothesis is that the strength of pro-younger implicit attitudes could increase as the gap between the age groups increases. I call this corollary the *extremity-of-comparison* hypothesis. Implicit attitudes for *children* compared to *old adults* would demonstrate the strongest pro-younger effect size, and individuals would demonstrate relatively weaker implicit pro-younger attitudes for the *children–Young adult*, *young–Middle-aged adult*,

and *middle-aged–Old adult* comparisons.

One final possibility is that implicit evaluations for the age groups would depend on the relationship between individuals' own age and the age groups that represent *younger people* or *older people*. When considering the construct validity of age attitudes, one way in which age attitudes depart from predictions derived from social-identity theories is that implicit age attitudes are dissociated from individuals' own age (see Study 1). By manipulating whether *younger people* and *older people* were represented by the extreme ends of the adult age spectrum (as in previous measures of implicit age attitudes) or by other age groups, I examined how implicit age-group attitudes varied across the sample's agespan. If implicit age-group attitudes vary depending on their relationship with individuals' own age, then this would support the construct validity of implicit age attitudes.

Because social identity theories predict that group preferences vary based on group membership, then discriminant validity would be demonstrated if variation occurs only for age-group identities that change within the sample's age span. I anticipate that participants' own age is most likely to influence implicit age-group attitudes when one of the comparison groups is *young adults* or *middle-aged adults*. This expectation is based on the age (in analysis of the data described in Study 1) at which Project Implicit volunteers identify as the transition between middle-aged adult and older adult (median age = 65) or between young adult and adult (median age = 21). But given how system justification theory has qualified social identity theories, it is likely that on average, implicit age-group attitudes would shift toward the age-group to which participants belong, but would still implicitly prefer the dominant group of *younger people*.

## Study 3-A Method

### Participants

10575 participants began the study, 10008 consented to participate, and 8221 of those contributed usable data on the IAT or a self-report measure. These contributors ( $M_{age} = 31.5$ ,  $SD = 13.9$ , range = 12 – 94;  $N = 7613$ ), were predominantly women (63.0%; 29.8% men, 7.1% missing data), US citizens (79.1%), and educated (82.9% reported having at least some college education). They reported racial background as follows: 0.8% American Indian, 7.2% Asian or Pacific Islander, 9.4% Black or African descent, 71.0% White or European descent, 6.7% Multiracial, and 4.9% Other or unknown; 7.9% reported a Hispanic ethnic background.

### Materials

**Age group stimuli.** After developing a pool of age group stimuli to represent children, young adults, middle-aged adults, and old adults of White descent, pretesters ( $N = 13$ ) rated the apparent age of the stimuli. I selected the 3 male and 3 female stimuli that best represented each age group, and the stimuli originate from the following sources. Stimuli representing children (pretesting:  $M_{age} = 11.1$ ,  $SD = 1.9$ ) were selected from the Radboud Face Database (Langner et al., 2010). Matched pairs of young adult faces (pretesting:  $M_{age} = 21.0$ ,  $SD = 2.8$ ) and old adult faces (pretesting:  $M_{age} = 72.0$ ,  $SD = 7.9$ ) were selected from a subset of faces from the CAL/PAL Face Database (Minear & Park, 2004) that were rated (Ebner, 2008) on several dimensions<sup>6</sup>, including attractiveness,

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<sup>6</sup> Female young and old stimuli were matched on attractiveness (young- $M = 2.2$ , old- $M = 1.9$ ), mood (young as 7.0% sad, 48.3% neutral, and 35.0% happy; old as 6.3% sad, 44.0% neutral, and 49.3% happy), and likability (young- $M = 2.3$ ; old- $M = 2.2$ ). Male young and old stimuli were matched on attractiveness (young- $M = 1.7$ ; old- $M = 1.6$ ), mood (young as 13.3% sad, 51.3% neutral, and 35.0% happy);

likability, mood, and age in decades. Stimuli representing middle-aged adults (pretesting:  $M_{age} = 47.0$ ,  $SD = 6.0$ ) were either selected directly from the CAL/PAL Face Database (Minear & Park, 2004) or were created (middle-aged males 1, 2, and 3 and female 2) by morphing two faces from this database using FantaMorph 5.0 ([www.fantamorph.com](http://www.fantamorph.com)). All faces had neutral expressions. Peripheral details were neutralized, such as the background color (to off-white), and the shape and color (to off-black) of their clothing. Photos were cropped to the same 3:4 ratio and resized to the same dimensions (see Appendix 3 for all stimuli).

**Age-groups IATs.** As in previous studies, implicit age attitudes were assessed using IATs (Greenwald et al., 1998), that paired the evaluative attributes of *Good* (*glorious, happy, joy, laughter, love, peace, pleasure, wonderful*) and *Bad* (*agony, awful, evil, failure, horrible, hurt, nasty, terrible*) with age category faces of 3 female and 3 male faces representing *Younger People* and *Older People*. The category labels of *Younger People* and *Older People* were represented by stimuli for one of seven possible age-group comparisons: children–Young adults, children–Middle-aged adults, children–Old adults, young adults–Middle-aged adults, young adults–Old adults, middle-aged adults–Old adults, or the standard age IAT stimuli of young people and old people. The IATs consisted of seven trial blocks following the standard format (Nosek, Greenwald, et al., 2007), and the order in which participants paired age group categories and evaluative attributes (i.e., *younger people-good* and *older people-bad* versus *younger people-bad* and *older people-good*) was randomized between participants.

**Scoring.** Current recommendations for scoring the age-groups IATs were used, as and old as 15.7% sad, 60.3% neutral, and 24.0% happy), and likability (young- $M = 1.9$ ; old- $M = 1.9$ ).



described in Study 2. Missing data, either from participant dropout or database-transfer errors, prevented the calculation of valid age-group IAT scores for 2.7% of participants. Standard speed and accuracy thresholds (Nosek, Smyth, et al., 2007) were applied to exclude IAT scores for participants with *too many fast responses* (<300ms; 0.1%;) or *too many categorization errors* (2.4 %; see Study 1 for details of the thresholds)<sup>7</sup>. Age-group IAT scores ( $N = 6916$ ) are scaled so that positive values indicate an implicit preference for younger relative to older people.

**Demographics.** Participants reported their gender, age (responses options from 10-99), race and ethnicity, country of citizenship and current zipcode, highest educational attainment, and political identities regarding social issues and economic issues. If participants reported having completed at least some college, they reported the field of study for their highest degree.

**Self-report.** Participants responded to two sets of self-report items in randomized order. One self-report measure presented the faces that were used in the age-groups IAT with the instructions, “*Consider the groups ‘younger people’ and ‘older people’ to be people in the age groups represented by the images below*”. Participants then reported their relative age-group preferences (*With these age groups in mind, which statement best describes you?*) on a 7-point scale anchored on -3 (*I strongly prefer older people to younger people*) and 3 (*I strongly prefer younger people to older people*; 0: *I like younger people and older people equally*).

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<sup>7</sup> The percentage of IAT scores that met inclusion criteria rather than being excluded either because of fast responses or categorization errors did not differ based on which 1 of 7 stimuli sets represented *Younger People* and *Older People* and the stereotype-incongruent vs. -congruent pairing order,  $\chi^2(12, 7096) = 18.52, p = .101, \phi = .05$ .

Participants also separately rated each of the four age groups in terms of likability and competence (Instructions: *Please rate how likable [/competent] or unlikable [/incompetent] you find people in the age range represented by each set of faces*). Ratings were reported using an 8-point scale that was then centered to range from -3.5 (*Extremely unlikable/incompetent*) to 3.5 (*Extremely likable/competent*). The order of these traits was counterbalanced between participants and the presentation order for four age groups was fixed as children, young adults, middle-aged adults, and old adults.

### **Design & Procedure**

At the Project Implicit front page (<https://implicit.harvard.edu>), visitors can begin a *feature task* or navigate to the demonstration site, research site, or one of 33 country-specific sites. The age-groups task was featured between the dates of February 19, 2011 and April 7, 2011. Participants who selected the age-groups task were randomly assigned to one of the seven age-group pairings: children–Young adults, children–Middle-aged adults, children–Old adults, young adults–Middle-aged adults, young adults–Old adults, middle-aged adults–Old adults, or standard age stimuli of young people and old people (see Appendix 3 for all stimuli). Participants reported their relative age-group preferences for the same age-group pairing as the IAT and rated likability and warmth for all four age groups. The order in which the self-report measures, demographics items, and the IAT were presented was randomized between participants. The study closed with debriefing and feedback on IAT performance.

### **Study 3-A Results**

Table 3-1. *Implicit (as IAT) and Explicit Age-Group Attitudes*

<i>Younger and Older</i> represented by:	Implicit Attitudes					Explicit Attitudes				Implicit- explicit <i>r</i>
	<i>N</i>	<i>M</i>	( <i>SD</i> )	<i>d</i>	$\alpha$	<i>N</i>	<i>M</i>	( <i>SD</i> )	<i>d</i>	
Standard	987	0.39 <sup>A</sup>	(0.39)	1.01	.68	963	0.69 <sup>A</sup>	(1.33)	0.52	.16
Child–Young	924	0.19 <sup>D</sup>	(0.43)	0.44	.74	892	-0.32 <sup>D</sup>	(1.42)	-0.23	.21
Child–Middle-aged	1033	0.32 <sup>B,C</sup>	(0.40)	0.79	.70	991	-0.05 <sup>C</sup>	(1.32)	-0.04	.13
Child–Old	970	0.30 <sup>C</sup>	(0.39)	0.76	.68	942	0.25 <sup>B</sup>	(1.26)	0.20	.06, <i>ns</i>
Young–Middle-aged	986	0.39 <sup>A</sup>	(0.39)	1.01	.70	955	0.29 <sup>B</sup>	(1.31)	0.22	.15
Young–Old	1024	0.39 <sup>A,B</sup>	(0.39)	0.94	.68	999	0.62 <sup>A</sup>	(1.32)	0.47	.17
Middle-aged–Old	990	0.41 <sup>A</sup>	(0.40)	1.04	.71	955	0.60 <sup>A</sup>	(1.29)	0.46	.13

*Note.* Implicit-explicit correlation for the children-old adults comparison,  $p = .086$ , all other correlations,  $p < .001$ . For implicit or explicit attitudes, means that do not share a superscript letter differ significantly from each other, at  $p \leq .05$ , with Bonferroni correction.

Table 3-1 summarizes the descriptive statistics for the implicit and self-reported relative age-group attitudes for the six age-group comparisons and the standard *young* and *old adults* stimuli. It also summarizes the reliability (as Cronbach's  $\alpha$ ) for the four 15-trial blocks of the IATs and the correlation between implicit and self-reported age-group attitudes. Implicit age-group attitudes demonstrated similar reliabilities ( $\alpha$  range = .68 – .74).

### **Implicit Age-Group Attitudes**

The results indicated that no matter which age group represented *younger people*, individuals implicitly preferred, on average, *younger* relative to *older people* (IAT *ds* range = 0.44 – 1.01). As shown in Table 3-1, posthoc comparisons of the strength of implicit preferences for the various age-groups, using Bonferroni adjustment for the multiple comparisons, indicated that implicit attitudes favoring *younger* were equally strong for the *middle-aged–Old adult*, *young–Old adult*, *young–Middle-aged adult*, and the standard *young–Old people* comparisons. Compared to those attitudes (except for the *young–Old adult* comparison), implicit attitudes favoring *children* compared to *middle-*

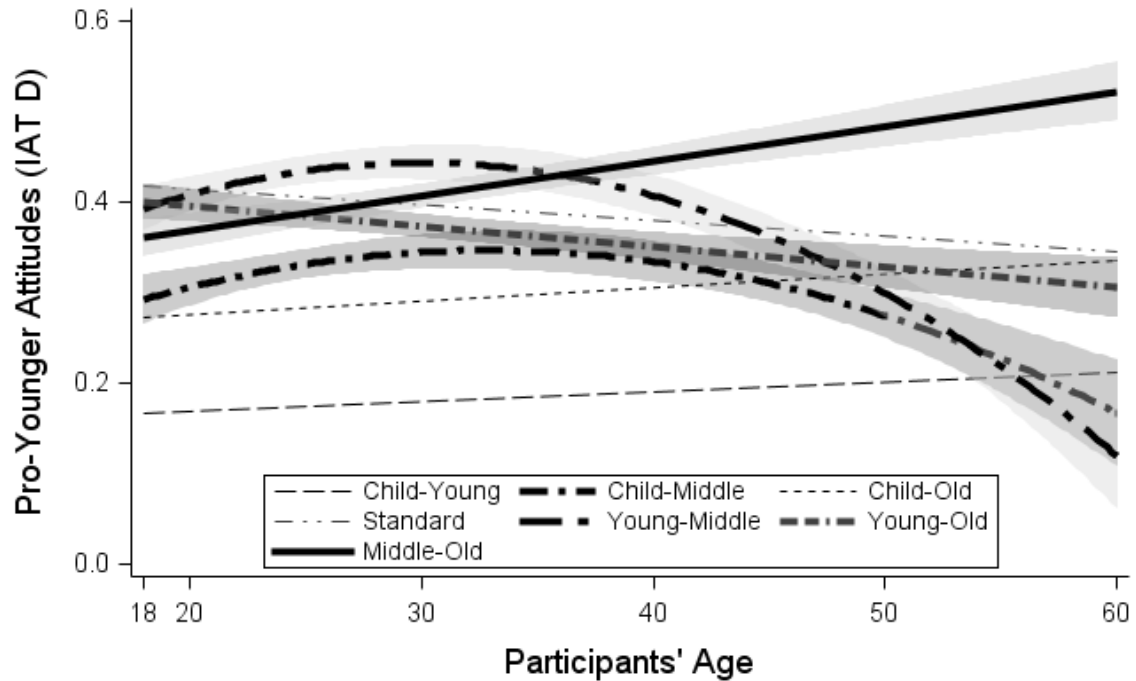
*aged adults* were significantly weaker. And implicit attitudes favoring *children* compared to *old adults* were significantly weaker than any of the strongest implicit pro-younger attitudes. On average, implicit attitudes for *children* compared to *young adults* demonstrated the weakest effects favoring *Younger*.

**Age-span changes in implicit age-group attitudes.** In Study 1, I found that in contrast to what social identity theories would anticipate, participants' age was unrelated to their implicit pro-young attitudes, as assessed by standard *young-old people* stimuli. In the current study I found that overall, individuals implicitly preferred *Younger People* relative to *Older People*, regardless of whether the relative category of *Younger People* was represented by children or middle-aged adults. However, those implicit attitudes for some age-group comparisons did differ based on participants' age. Overall ( $R^2 = .040$ )<sup>8</sup>, participants' implicit pro-younger attitudes varied depending on the age-groups comparison,  $F(6, 5995) = 11.50, p < .001, \eta_p^2 = .0114$ , and participants' age interacted with which age-group they compared,  $F(6, 5995) = 5.69, p < .001, \eta_p^2 = .0056$ , while participants' age did not exert a significant main effect on implicit attitudes,  $F(1, 5995) = 1.03, p = .311, \eta_p^2 = .0002$ . To decompose this interaction, I examined the linear and quadratic effects of participants' age for implicit attitudes toward each age-group comparison. The results are presented graphically in Figure 3-1 (participants' age did not exert cubic effects on implicit age-group attitudes, all  $F$ s < 1.30).

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<sup>8</sup> I examined the effects of participants' own age among participants aged 18 to 60 ( $n$ s range = 816 – 901) because of the small number of older participants aged 61 to 98 ( $n$ s range = 31 – 51).

Figure 3-1. The linear or quadratic relationship between participants' own age (for age 18-60) and implicit age-group attitudes. 68% confidence limits surround statistically significant slopes, so that non-overlapping limits reflect points that are significantly different at  $p \leq .05$ .



Participants' own age was unrelated to implicit age-group attitudes for the *children–Young adult* ( $R^2 = .001$ ) and *children–Old adult* ( $R^2 = .002$ ) comparisons. Participants' own age was linearly related to implicit *middle-aged–Old adult* attitudes,  $R^2 = .015$ ,  $\beta = .12$ ,  $t(856) = 3.57$ ,  $p < .001$ ; implicit *young–Old adult* attitudes,  $R^2 = .005$ ,  $\beta = -.07$ ,  $t(894) = 2.10$ ,  $p = .036$ ; and nonsignificantly but in the same direction to implicit age attitudes with the standard *young–old people* stimuli,  $R^2 = .003$ ,  $\beta = -.06$ ,  $t(853) = 1.65$ ,  $p = .100$ . Participants' own age was related to implicit *children–Middle-aged adults* attitudes ( $R^2 = .007$ ), with simultaneous linear,  $\beta = .47$ ,  $t(898) = 2.01$ ,  $p = .044$ , and quadratic,  $\beta = -.51$ ,  $t(898) = 2.21$ ,  $p = .027$ , effects. Likewise, participants' own age was related to implicit *young–middle-aged adults* attitudes ( $R^2 = .028$ ), with simultaneous

linear,  $\beta = .64$ ,  $t(841) = 2.82$ ,  $p = .005$ , and quadratic,  $\beta = -.77$ ,  $t(898) = 3.38$ ,  $p < .001$ , effects.

Put simply, these results suggest that when one of the comparison groups is *middle-aged adults*, individuals' implicit age preferences shift across the age span as social identity theories would predict—becoming relatively positive toward middle-aged adults, whether middle-aged adults represent either *younger people* or *older people*. Focusing on the three age-group IATs with significant changes across the agespan, then across the sample's age span, pro-younger implicit attitudes become increasingly favorable toward *middle-aged adults* relative to *old adults*. The other two age-group IATs both demonstrated similar relationships with participants' own age, such that participants between the ages of roughly 18 and 40 demonstrated implicit pro-younger preferences, for either the *children–Middle-aged adult* or *young adults–Middle-aged adults* comparisons. And among young participants, as social identity theories would predict, implicit *young–Middle-aged adult* attitudes were significantly stronger than implicit *children–Middle-aged adult* attitudes. But relative to young adults, participants between the ages of 40 and 60 became relatively less pro-young for both the *children–Middle-aged adult* and *young–Middle-aged adult* comparisons. As system justification theory would anticipate, participants aged 40 to 60 continued to demonstrate implicit attitudes favoring younger people, but these pro-younger preferences were weaker than those of young participants.

### **Self-reported Age-Group Attitudes**

On average, individuals self-reported age-group preferences that slightly preferred *Younger People*. As shown in Table 3-1, posthoc comparisons of individuals' self-

reported age-group preferences indicates that individuals self-reported the strongest pro-younger preferences for the *middle-aged–Old adult*, *young–Old adult*, and the standard *young people–Old people* comparisons; these attitudes' strength did not differ significantly from one other, using Bonferroni adjustment. Participants reported significantly weaker but still pro-younger attitudes favoring *children* compared to *old adults* and *young adults* compared to *middle-aged adults*. Participants reported equal liking of *children* compared to *middle-aged adults*, which differed significantly from all other self-reported age-group preferences. And on average, participants self-reported preferring *young adults* compared to *children*, the opposite of their implicit attitudes toward these ages groups. This is the only case in all of the reported studies in which the full sample self-reported a preference for the older group compared to a younger group.

Comparison of the effect sizes for implicit and explicit age attitudes indicates that individuals self-reported weaker age-group preferences than they demonstrated implicitly and even self-reported equal liking or pro-older preferences for some age-group comparisons. However, comparing across conditions between implicit and explicit attitudes, the magnitude of participants' preferences can be ranked in approximately the same order.

### **Implicit-Explicit Correlations**

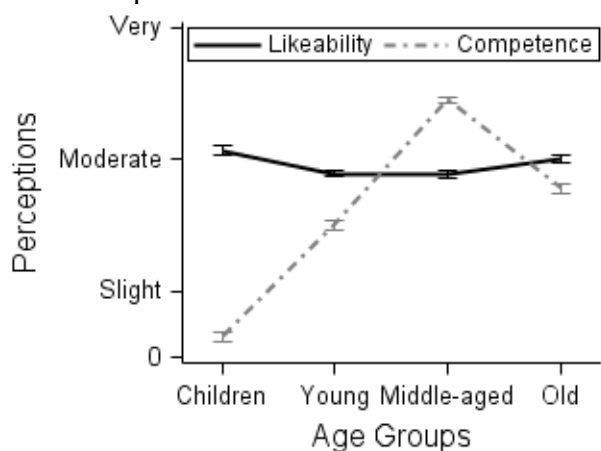
As shown in Table 3-1, except for *children* relative to *old adults* ( $r = .06$ ,  $p = .086$ ) implicit and self-reported preferences toward the age groups were weakly but significantly correlated in a positive direction ( $r$ s range = .13 – .21). These magnitudes are strikingly similar to those reported elsewhere in this dissertation. Implicit and explicit attitudes toward specific age-groups were remarkably dissociated, despite a design that

maximized the similarity between the implicit and explicit measures. Participants self-reported their attitudes toward people in the younger age group relative to the older age group, and those age groups were represented by the same faces that were evaluated in the implicit measure.

### Perceived Competence and Likability

Participants also rated the perceived competence and likability of people in the age range represented by arrays of the face stimuli for the four age groups. Figure 3-2 presents the age groups' perceived likability and

*Figure 3-2.* Perceived likability and competence for children, young adults, middle-aged adults, and old adults. Error bars represent 95% confidence



competence. There were minimal differences in how likable the four age groups were perceived to be (Cohen's *ds* range = -.09 – .13). The perceived competence of the age groups varied more widely, such that children were perceived as slightly competent, while young adults were seen as slightly to moderately competent, old adults were rated as being closer to moderately competent than young adults, and middle-aged adults were perceived as moderately to very competent.

### Convergent and discriminant validity: Correlations with implicit attitudes.

Given the weak correlations between implicit and explicit age-group attitudes, I examined whether the correlations between implicit age-group attitudes and self-reports of the age-groups' perceived likability and competence demonstrated convergent or



discriminant validity. Because participants evaluated all four age groups, then convergent validity would result in strong implicit-explicit correlations for the two age groups that participants evaluated in the IAT, and discriminant validity would result in weaker implicit-explicit correlations for the two age groups that were not evaluated. The results are presented in Table 3-2.

Table 3-2. *Correlations of Implicit Age-Group Attitudes with Competence and Likability*

<i>Younger and Older</i> represented by:	Age-Groups' Likability				Age-Groups' Competence			
	Child	Young	Middle- Aged	Old	Child	Young	Middle- Aged	Old
Standard	.02	.04	-.03	<b>-.08*</b>	-.02	.03	-.02	<b>-.10**</b>
Child–Young	<b>.15***</b>	-.05	.01	.02	<b>.14***</b>	.01	.03	.05
Child–Middle-aged	<b>.14***</b>	-.01	<b>-.09**</b>	-.04	.03	-.02	-.05	-.04
Child–Old	.02	.01	-.01	<b>-.10**</b>	-.03	.03	.01	-.05
Young–Middle-aged	-.01	-.00	-.05	-.06	-.03	.03	-.02	-.04
Young–Old	-.00	.05	-.05	<b>-.10**</b>	<b>-.06*</b>	.01	.01	<b>-.09**</b>
Middle-aged–Old	-.00	<b>.10**</b>	<b>.07*</b>	-.02	-.04	<b>.06*</b>	.03	.02

Note. \* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ . All  $ns \geq 901$ .

However, the overall magnitude of these relationships failed to demonstrate discriminant and convergent validity. For the seven age group comparisons, the relationships between implicit age-group attitudes and perceived likability for the two age groups that participants evaluated in the implicit measure were similar in magnitude (*median*  $|r| = .06$ ) to those for the two age groups that were not evaluated (*median*  $|r| = .03$ ). The same was true for the relationships between implicit age-group attitudes and perceived competence for the two evaluated age groups (*median*  $|r| = .04$ ) and the two unevaluated age groups (*median*  $|r| = .03$ ). Thus, although research (Cuddy et al., 2007; Fiske et al., 2002) has identified bi-dimensional ambivalence in attitudes toward older adults—such that older adults are seen as more likable but much less competent than

young adults—perceptions of the age-groups’ likability and competence were not associated with implicit attitudes toward those age groups.

### **Study 3-A Discussion**

The present research manipulated which age groups represented the superordinate categories of *Younger People* and *Older People* to examine the construct validity of implicit age attitudes. Overall, individuals implicitly preferred *Younger People* relative to *Older People*, regardless of whether the relative category of *Younger People* was represented by children or middle-aged adults. Thus, implicit age attitudes continued to favor younger people when using multiple stimuli sets to represent *Younger People*. And regardless of whether attitudes for *young adults* compared to *old adults* were assessed with either the newly-developed face stimuli or with the standard stimuli, both demonstrated similar effects across all analyses.

### **Evaluating Hypotheses for Differences in Implicit Attitudes toward Age Groups**

In evaluating my hypotheses for how implicit age-group attitudes would vary based on which age groups were being compared, the clearest finding is that as a whole, implicit evaluations were influenced by a universal *younger is better* association. In all seven of the age-group comparisons, individuals preferred *Younger People* relative to *Older People* on average, whether *Younger People* was represented by children or middle-aged adults.

However, there was both supporting and contradictory evidence for a *prime-of-life* hypothesis. Implicit attitudes for the *young–Middle-aged adult* comparison were stronger than the *children–Middle-aged adult* comparison, just as the *young–Old adult* comparison was stronger than the *children–Old adult* comparison. This suggests that

individuals have stronger pro-younger associations when the young comparison group is young adults, who are in their prime of life, rather than even younger but still maturing children. But contrary to what a *prime-of-life* hypothesis would predict, implicit attitudes for the *children–Young adult* comparison favored children. This could be evidence that a *younger is better* association dominated any preferences for individuals in the prime of life. The lack of transitivity in these implicit age-group attitudes also emphasizes the relative nature of the IAT and most other implicit measures—implicit preferences for a group are necessarily relative to the comparison group.

No evidence supported an *extremity-of-comparison* hypothesis. Although the *children–Young adult* comparison yielded the weakest effect favoring younger, the *middle-aged–Old adult* comparison demonstrated the strongest pro-younger effect. And as discussed previously, when the older comparison group was either middle-aged adults or old adults, pro-younger preferences were stronger when compared to *young adults* than to *children*. As a whole, implicit attitudes toward different age-group comparisons varied meaningfully, which supports the construct validity of implicit age-group attitudes.

### **Implicit and Explicit Age Attitudes Remain Dissociated**

Replicating the results reported in Study 1, approximately one-third of participants self-reported liking *Younger People* and *Older People* equally. In contrast, between 57 and 79 percent of participants demonstrated implicit attitudes favoring *Younger People*. And consistent with the results reported in Studies 1 and 2, implicit and explicit age attitudes were only weakly correlated. Notably, they remained dissociated even though self-reported preferences paralleled the implicit measure as closely as possible. That is, the age groups were represented by the same faces that were evaluated

in the implicit measure, and participants self-reported their age-group preferences toward people in the younger age group relative to the older age group.

### **Construct Validity: Participants' Age Moderates Implicit Age-group Attitudes**

In previous research, I (Study 1 of this dissertation; Nosek, Smyth, et al., 2007) and others (Hummert, Garstka, O'Brien, Greenwald, & Mellott, 2002) found that among participants of all ages, implicit age attitudes were equally pro-young in both young and older adults. This stood in sharp contrast to what social-identity theories would predict—group preferences should vary based on individuals' group membership. In Study 3-A, I identified a clear relationship between participants' own age and implicit attitudes toward middle-aged adults. When middle-aged adults were specifically represented in the measure, then individuals' implicit age preferences became relatively more positive toward middle-aged adults across the sample's age span, as social identity theories would predict. Across the sample's age span, implicit attitudes for the *children–Middle-aged adult* and *young–Middle-aged adult* comparisons became less pro-young and implicit attitudes for *middle-aged adults* relative to *old adults* became more pro-young. Implicit attitudes for the *young–Old adult* and *children–Young adult* comparisons were not moderated by participants' own age. In Study 4, I sought to replicate this evidence for social-identity influences in implicit age attitudes.

### **Study 3-B**

But first, in understanding the results of Study 3-A, it is possible that the pattern of effects was influenced by the choice of labels, which were the same for all age-group comparisons, as *younger people* and *older people*. Because the category labels for the IAT are critical in framing the categories, these relative labels could have exaggerated the

implicit pro-younger preferences that individuals demonstrated. One alternate approach would be to use the *specific* or qualitative labels for each age group – children, young adults, middle-aged adults, and old adults. In Study 3-B, I tested whether using specific age-group labels altered how participants construed the implicit attitudes task. I manipulated the age group labels as *relative* or *specific* for the 7 age-group IATs from Study 3-A, while counterbalancing the presentation order of stereotype-congruent and stereotype-incongruent pairings. The descriptive statistics and *t*-test comparisons for the relative vs. specific category labels are presented in Table 3-3, collapsing across the presentation order of stereotype-congruent or -incongruent pairings.

Table 3-3. *Implicit Age-group Attitudes with Relative vs. Specific Category Labels*

Age groups compared:	Relative: <i>Younger</i> vs. <i>Older</i>				Specific: Age Group Labels				Label Diff.	
	<i>N</i>	<i>M</i>	( <i>SD</i> )	$\alpha$	<i>N</i>	<i>M</i>	( <i>SD</i> )	$\alpha$	<i>t</i>	<i>p</i>
Standard	193	0.39	(0.34)	.61	187	0.45	(0.37)	.66	1.50	.136
Child–Young	162	0.23	(0.40)	.65	190	0.10	(0.42)	.70	-2.84	.005
Child–Middle-aged	172	0.34	(0.40)	.68	175	0.29	(0.40)	.71	-1.11	.268
Child–Old	209	0.33	(0.37)	.66	203	0.31	(0.39)	.69	-0.51	.612
Young–Middle-aged	195	0.38	(0.38)	.67	177	0.38	(0.34)	.54	0.08	.940
Young–Old	168	0.33	(0.42)	.69	195	0.39	(0.36)	.66	1.45	.148
Middle-aged–Old	190	0.43	(0.41)	.72	182	0.33	(0.36)	.63	-2.53	.012

Replicating the exact study design but changing the category labels indicated that even with large sample sizes, using specific rather than relative age-group labels had small and primarily nonsignificant effects on implicit attitudes. Of the 7 age-group IATs, using specific or qualitative age-group labels rather relative labels significantly reduced the strength of implicit age-group attitudes only for the *children–Young adult* and *middle-aged–Old adult* comparisons. And when examining the effect of category labels within

each presentation order of stereotype-congruent or -incongruent pairings, the average difference in implicit attitudes was close to zero ( $N = 14$ ; *M-diff*: average = -0.02, range = -0.16 – 0.13). Specifically, significant differences were present for only 3 of the 14 conditions, for either the *children–Young adult*,  $t(178) = 2.74$ ,  $p = .007$ , *young–Old adult*,  $t(162) = 2.04$ ,  $p = .043$ , or *middle-aged–Old adult* comparisons,  $t(181) = 2.05$ ,  $p = .042$ , only when participants first categorized stimuli in stereotype-congruent ways.

Additionally, the reliabilities (as Cronbach's  $\alpha$ ) for the relative and specific age-group labels were similar. Thus, although there were small and occasionally significant differences in implicit age-group attitudes—based on whether the age groups were categorized with the relative labels of *younger people* and *older people* compared to the specific age-group labels of *children*, *young adults*, *middle-aged adults*, or *old adults*—implicit age-group attitudes remained consistently pro-younger and demonstrated similar reliabilities.

#### **Study 4 – Comparing Individuals' Implicit Attitudes toward Different Age Groups**

Study 3 demonstrated that implicit age attitudes were sensitive to which specific age groups represented *younger people* and *older people*. I was only able to compare how implicit age attitudes varied based on an experimental manipulation of which age groups were compared in an implicit measure. But the variation in implicit attitudes toward different age-group comparisons suggests that it would be useful to estimate individual patterns of age evaluations across the age span. Recent measurement innovation, in the form of the Brief IAT (Sriram & Greenwald, 2009), makes this possible. Because of its

efficient procedure, the Brief IAT can be adapted to assess individuals' relative implicit preferences for more than two groups. This adaptation was recently used to examine individuals' implicit preferences for four primary candidates relative to one another in the 2008 Presidential primary in the United States. In Study 4, implicit preferences for the six age-group comparisons that were examined between-subjects in Studies 3-A and 3-B were assessed within-subjects. And in Study 4, I specifically evaluate whether implicit age attitudes favor specific age groups or whether individuals simply prefer the younger age group in a given comparison.

## Method

### Participants

4705 participants began the study, 4465 consented to participate, and 3537 of those contributed usable data on an implicit or self-report measure. These contributors ( $M_{\text{age}} = 31.3$ ,  $SD = 13.9$ , range = 11 – 88;  $N = 3179$ ), were predominantly women (59.9%; 30.1% men, 10.0% missing data), US citizens (80.7%), and educated (80.6% reported having at least some college education). They reported racial background as follows: 1.2% American Indian, 6.2% Asian or Pacific Islander, 8.6% Black or African descent, 71.5% White or European descent, 8.0% Multiracial, and 4.4% Other or unknown; 9.1% reported a Hispanic ethnic background.

### Materials

**Brief IAT.** Compared to the IAT, the Brief IAT (Sriram & Greenwald, 2009) directs participants to focus on two of the task's four categories. Because the Brief IAT retains some of the IAT's procedural features but shortens measurement time, it can efficiently measure individuals' strength of associations toward four distinct groups,

comparing each age group to the others in turn. From participants' perspective, the Brief IAT differs from the IAT only in the categories on which participants are instructed to focus. Participants sort one set of faces (e.g., *children*) and *good* stimuli with a focal response key (*i*) and categorize all other stimuli (e.g., *bad* stimuli and either *young*, *middle-aged*, or *old* faces) with another "nonfocal" response key (*e*).

The Brief IAT consisted of 14 20-trial blocks; the first two trials of each block served as practice trials and presented stimuli from the focal and nonfocal age categories. The first block served as practice sorting the *good* focal and *bad* nonfocal evaluations. The second block was identical to the third block, and provided practice with the task procedure for the critical blocks (blocks 3-12). In blocks 2-14, the focal evaluation was *good*, the nonfocal evaluation was *bad*, and the focal and nonfocal group categories compared each age group to the three others in turn. That is, the focal category in a given block was *children*, *young adults*, *middle-aged adults*, or *old adults*. The nonfocal category represented one of the other age groups. For example, *children* represented the focal age category in 4 of the 12 critical blocks, and *young adults*, *middle-aged adults*, and *old adults* represented the nonfocal age category in turn.

If participants made an error in categorizing a stimulus, a red "X" appeared below the stimulus and persisted until participants corrected their response. The order in which critical blocks appeared was counterbalanced across participants, and an age group was never nonfocal if it had been focal in the preceding block.

Each block began by briefly repeating the instructions, presenting the stimuli representing each focal category, and directing participants to the focal category labels, which were located in the top-center of the screen throughout the task. Because the



stimuli used to represent the focal categories were presented before each block (e.g., an array of the age-group faces and the *good* words), the evaluative stimuli comprised a subset of the *Good* (*love, pleasant, great, wonderful*) and *Bad* (*hate, unpleasant, awful, terrible*) words from Study 3-A. The face stimuli representing children, young adults, middle-aged adults, and old adults remained the same (see Appendix 3).

**Scoring.** Like the IAT, each of the 6 age-group Brief IAT scores represent, for example, participants' average speed of responding when *young people* and *good* are focal and *old people* and *bad* are nonfocal, compared to their speed of responding when *old people* and *good* are focal and *young people* and *bad* are nonfocal. Current BIAT scoring recommendations (Sriram & Greenwald, 2009; personal communication, N. Sriram, May 7, 2011) as an IAT *D*-type measure were followed, such that: (a) response latencies <300 ms (1.7% of all trials) and >3,000 ms (1.8% of all trials) were truncated before calculating the response latencies' mean and standard deviation, (b) trial latencies were calculated from the beginning of a trial until the time of a correct response, so that error trials include the time required to correct the initial response, and (c) each of the six age-group BIAT scores represents the difference between the mean response latencies of the two critical blocks, divided by the inclusive standard deviation of those latencies.

Like the IAT, speed and accuracy thresholds were applied to exclude BIAT scores for participants with *too many fast responses* (responses <300 ms; >10% fast responses averaged across all critical blocks, 3.1%), *too many slow responses* (responses >3,000 ms; >10% slow responses averaged across all critical blocks, 1.0%), or *too many categorization errors* (as either >30% error rate averaged across all critical blocks or >39% error rate in one critical block, 3.4%). Similar to the implicit measures in previous

studies, scores are scaled so that positive values reflect stronger relative associations between *good* and the younger age group rather than between *good* and the older age group. Internal consistencies, as Cronbach's  $\alpha$ , were computed by partitioning the critical trials in each of the two blocks into two parallel subsets. One subset consisted of trials {1, 2, 3, 7, 8, 9, 13, 14, 15} and the other subset consisted of the remaining 9 trials. I calculated D for each subset as the difference between subset mean latencies in the two blocks, divided by the inclusive standard deviation of the subset latencies. Internal consistency represents the correlation between these split halves.

**Self-report.** As before, participants reported two sets of self-report measures in randomized order. The procedure with which participants rated the four age groups on likability and competence remained the same. In Study 4, participants indicated their self-reported age-group attitudes by rating the warmth of their feeling toward each age group. Participants were instructed to “*consider how you feel toward the age groups of children, young adults, middle-aged adults, and old adults, as represented by each set of faces. Below, please rate how warm or cold you feel toward each age group relative to each another*”. Participants then reported the warmth of their feelings toward each age group, using an 11-point scale anchored on 0 (*Very Cold*) and 10 (*Very Warm*; 5: *Neutral*). The order in which the four age groups were presented was fixed as children, young adults, middle-aged adults, and old adults. Relative age-group preferences for the six age-group comparisons were calculated as a difference score, such that positive scores indicate that participants reported greater warmth of feelings toward the younger age group than toward the older age group.

## **Design & Procedure**

The procedure, design, and demographics were the same as Study 3. The age-groups task was featured between the dates of April 21, 2011 and May 16, 2011.

## Results

Table 4-1 summarizes the descriptive statistics for the implicit and self-reported relative age-group attitudes for the six age-group comparisons. Overall, implicit and self-reported preferences for the six age-group comparisons were weakly but significantly and positively correlated ( $r$ s range = .11 – .13). These effects replicate the results from Study 3, except that attitudes for the *children–Old adult* comparison were also significantly correlated. The magnitude of these correlations replicates those reported elsewhere in this dissertation, emphasizing the consistent dissociation of implicit and explicit age attitudes.

Table 4-1. *Implicit (Brief IAT) and Explicit Age-Group Attitudes*

Age-groups Comparison	Implicit (BIAT)					Explicit				Implicit-explicit	
	<i>N</i>	<i>M</i>	( <i>SD</i> )	<i>d</i>	$\alpha$	<i>N</i>	<i>M</i>	( <i>SD</i> )	<i>d</i>	<i>N</i>	<i>r</i>
Child–Young	2731	0.13 <sup>D</sup>	(0.46)	0.29	0.52	3331	0.64 <sup>A</sup>	(2.36)	0.27	2639	.13
Child–Middle-aged	2742	0.26 <sup>A</sup>	(0.48)	0.56	0.56	3331	0.69 <sup>A</sup>	(2.48)	0.28	2652	.12
Child–Old	2729	0.27 <sup>A</sup>	(0.50)	0.55	0.62	3330	0.18 <sup>B</sup>	(2.48)	0.07	2640	.13
Young–Middle-aged	2733	0.23 <sup>B</sup>	(0.47)	0.49	0.58	3332	0.04 <sup>C</sup>	(1.98)	0.02	2650	.11
Young–Old	2741	0.17 <sup>C</sup>	(0.50)	0.35	0.60	3331	-0.46 <sup>D</sup>	(2.65)	-0.17	2650	.12
Middle-aged–Old	2734	0.12 <sup>D</sup>	(0.46)	0.27	0.52	3331	-0.51 <sup>D</sup>	(2.11)	-0.24	2646	.11

*Note.* All implicit-explicit correlations are significant,  $p \leq .001$ . For implicit or explicit attitudes, means that do not share a superscript letter differ significantly from each other, at  $p \leq .05$ , with Bonferroni correction.

### Self-reported Age-Group Attitudes

In Study 4, perceptions of the four age groups' likability and competence demonstrated the identical pattern of effects that was reported in Study 3-A (i.e., Figure 3-2) and are not discussed further<sup>9</sup>. On average, individuals self-reported age-group

<sup>9</sup> As before, I examined whether the correlations between implicit attitudes and perceived

attitudes that either slightly preferred an age group or reflected equal liking for both age groups. As shown in Table 4-1, paired *t*-tests with Bonferroni adjustments of individuals' self-reported age-group preferences indicates that individuals self-reported the strongest pro-younger preferences for the *child–Young adult* and *child–Middle-aged adult* comparisons, but the effect sizes were small in magnitude. Participants reported significantly weaker but still slightly pro-young attitudes favoring *children* compared to *old adults*, but despite its tiny effect size, these preferences differed significantly from equal liking,  $t(3329) = 4.23, p < .001$ . Participants reported equal liking of *young* compared to *middle-aged adults*, which differed significantly from all other self-reported age-group preferences. And on average, participants self-reported pro-older preferences for the *young–Old adults* and *middle-aged–Old adult* comparisons, which did not differ from each other.

### **Implicit Age-Group Attitudes**

The results indicated that no matter the age group comparison, individuals implicitly preferred, on average, the younger age group relative to the older age group (BIAT *ds* range = 0.27 – 0.50). All Brief IAT scores significantly differed from 0, indicating relative pro-younger implicit preferences,  $ts \geq 13.96, p < .001$ . As shown in Table 4-1, paired *t*-test comparisons of the strength of implicit attitudes toward the various age-groups, using Bonferroni adjustment for the 15 comparisons, indicated that implicit attitudes favoring *younger* were equally strong for the *young–Middle-aged adult*

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likability or competence demonstrated convergent or discriminant validity. Like Study 3, correlations between implicit age-group attitudes and perceived *likability* or *competence* for the two age groups implicitly evaluated were similar in magnitude (*median*  $|r|$ s = .05, .04, respectively) to those for the two unevaluated age groups (*median*  $|r|$ s both = .02)

and *children–Old adult* comparisons. Relative to those age-group combinations, implicit attitudes favoring *young adults* compared to *middle-aged adults* were slightly but significantly weaker. Implicit attitudes favoring *young adults* compared to *old adults* were significantly weaker still. And on average, implicit attitudes for the *children–Young adult* and *middle-aged–Old adult* comparisons both demonstrated the weakest effects favoring *Younger* and did not differ from one another.

### Implicit Age-Group Attitudes: Intercorrelations and Changes across the Agespan

As presented in Table 4-2, implicit attitudes for the various age-group comparisons were weakly but positively intercorrelated ( $r$ s range =  $-.02$  –  $.23$ , median  $r = .11$ ). Because part of the intercorrelations among the Brief IAT scores should reflect their common measurement method (Nosek & Smyth, 2007), it is somewhat surprising that they are so weakly correlated.

Table 4-2. *Correlations among Brief IAT Scores and with Participants' Age*

	Correlation with Brief IAT age-group comparison					
	1	2	3	4	5	6
Participants' age (18-60)						
Linear	.00	-.03	.01	-.09***	-.04	.04*
Quadratic (partialing)	-.04	-.05*	-.03	-.02	-.02	.03
BIAT comparing:						
1. Child–Young		.11***	.09***	.00	-.02	-.00
2. Child–Middle-aged			.19***	.16***	.18***	.02
3. Child–Old				.23***	.21***	.09***
4. Young–Middle-aged					.15***	.06**
5. Young–Old						.15***
6. Middle-aged–Old						

Note. \* $p \leq .05$ . \*\* $p \leq .01$ . \*\*\* $p \leq .001$ . All BIAT  $n$ s  $\geq 2661$ , all age effect  $n$ s  $\geq 2341$ .

Figure 4-1. The linear or quadratic relationship between participants' own age (for age 18-60) and implicit age-group attitudes. 68% confidence limits surround statistically significant slopes, so that non-overlapping limits reflect points that are significantly different at  $p \leq .05$ .

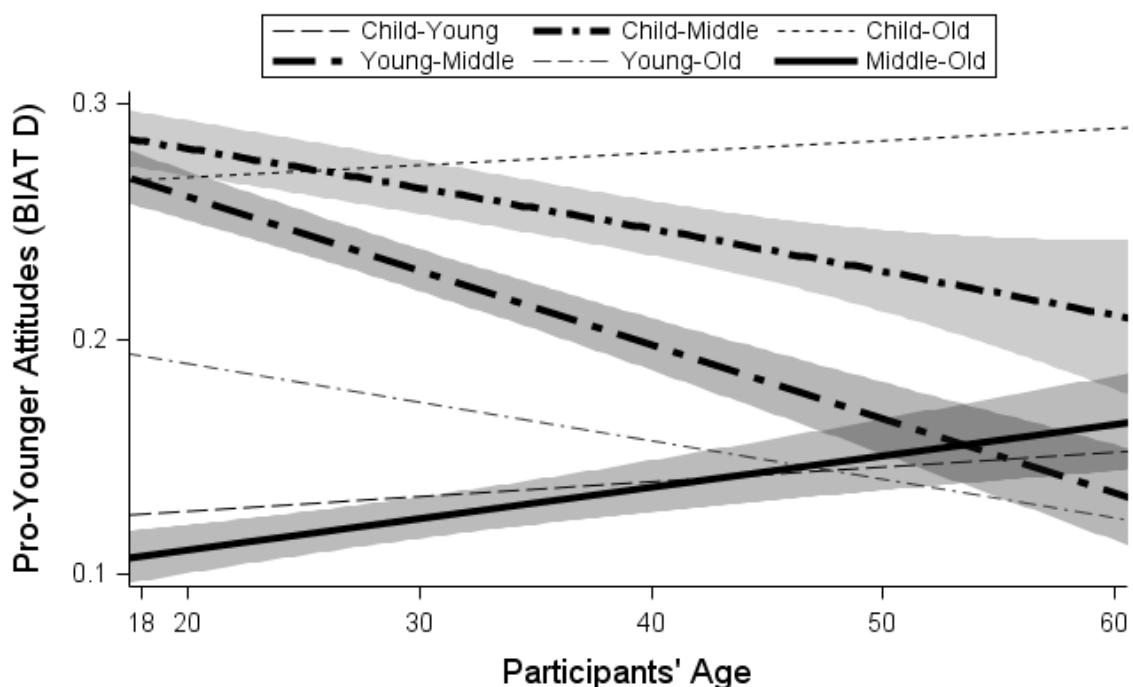


Table 4-2 also summarizes whether participants' own age<sup>10</sup> moderated implicit attitudes for each age-group comparison. Linear effects reflect the direct correlation between participants' age and implicit attitudes, and quadratic effects reflect the curvilinear effect of participants' age, after partialing for any linear effects of participants' age. Replicating the results in Study 3-A, participants' own age moderated implicit age-group attitudes only when middle-aged adults were one of the comparison groups. As social identity theories would predict, as participants' age increased, participants demonstrated stronger implicit attitudes favoring *middle-aged adults* relative to *old adults*,  $F(1, 2344) = 4.25, p = .039, R^2 = .002$ . And across the sample's age span,

<sup>10</sup> As in Study 3, age effects were examined among participants aged 18 to 60 ( $n_s \geq 2341$ ), because only 83 participants aged older than 60 provided usable data for at least one implicit age-group attitude.

participants' own age predicted weaker implicit attitudes favoring either *children* relative to *middle-aged adults*,  $F(2, 2342) = 3.88, p = .021, R^2$  (quadratic) = .003, or *young adults* relative to *middle-aged adults*,  $F(1, 2342) = 19.05, p < .001, R^2 = .008$ . Figure 4-1 displays these significant relationships, along with the nonsignificant relationships between participants' age and implicit age-group attitudes, for the *children–Young adult*, *children–Old adult*, and *young–Old adult* comparisons.

## Discussion

### Evaluating Hypotheses for Differences in Implicit Attitudes toward Age Groups

Replicating the results of Study 3-A, there was support for a *younger is better* hypothesis, at least implicitly. In contrast to individuals' self-reported attitudes, individuals implicitly preferred the younger age group relative to the older age group for all six age-group comparisons, whether younger was represented by children or middle-aged adults.

But in contrast to Study 3-A, there was no evidence in support of a *prime-of-life hypothesis* and some evidence for an *extremity-of-evaluation hypothesis*. In support of the extremity hypothesis, the *children–Young adult* and *middle-aged–Old adult* comparisons demonstrated the weakest pro-younger effects. Also, the *children–Middle-aged adult* and *children–Old adult* comparisons demonstrated the strongest pro-younger effects, but their equal magnitude fails to support an extremity hypothesis. And as further evidence against this explanation, the *young–Middle-aged adult* comparison demonstrated the second strongest pro-younger effect size. And relative to this comparison, the *young–Old adult* comparison was significantly weaker, despite the greater extremity between the comparison age groups. In contrast to Study 3-A and as evidence against the *prime-of-life*

hypothesis, implicit age-group attitudes in Study 3 were significantly more strongly pro-young when comparing either middle-aged or old adults to young adults rather than to children.

### **Differences in Effects for Studies 3 and 4 in Implicit Age-Group Attitudes**

Compared to Study 3, implicit age-group attitudes, as assessed by the Brief IAT rather than the IAT, demonstrated weaker, although still significant, attitudes favoring the younger age group. However, comparing the ranked order of implicit age-group attitudes across Studies 3 and 4 indicates notable differences in their relative ranking. In both studies, the *children–Young adult* comparison demonstrated the weakest pro-younger effect size. But in Study 4, the *middle-aged–Old adult* comparison demonstrated an equally weakest effect size, while in Study 3 it demonstrated the strongest pro-younger effect size. And in Study 4, the *children–Middle-aged adult* comparison was more strongly pro-young than the *young–Middle-aged adult* comparison, and the *children–Old adult* comparison was stronger than the *young–Old adult* comparison. In contrast, implicit age-group attitudes in Study 3 were significantly more strongly pro-young when comparing either middle-aged or old adults to *young adults* rather than to *children*.

These differences could be influenced by the IAT and BIAT's differential reliabilities. The Brief IAT reliabilities in Study 4 were weaker than the IAT reliabilities reported in Studies 3-A (see Tables 3-1 and 4-1). This is likely a result of the smaller number of trials in the Brief IAT (18 trials) for each pairing condition, relative to the IAT (60 trials). This difference could also have been partially influenced by using specific labels for the age groups. But as reported in Study 3-B, using specific (e.g., *children*, *young adults*) rather than relative (*Younger* vs. *Older*) labels significantly altered implicit



age-group IAT scores only for the *children–Young adult* comparison, which demonstrated similar ranking in Studies 3-A and 4, and the *middle-aged–Old adult* comparison, which demonstrated opposite rankings in Study 3-A compared to Study 4.

And in comparing the results between Studies 3-A and 4, one sharp distinction is the difference in effect sizes for the *young–Old adult* IAT and Brief IAT. Although this could be driven by the Brief IAT's lower reliability, relative to the IAT, this replicates the effects described in Study 2. In Study 2, I found that for implicit attitudes for young people relative to old people, the IAT had a large effect size ( $d = 1.27$ ), and the Brief IAT had a similarly small effect size ( $d = 0.29$ ); the Brief IAT implemented an earlier design, with no practice trials and an increased number of critical trials (28 vs. 18). But until investigations examine the underlying structure of the IAT and Brief IAT in multiple domains (e.g., Nosek & Smyth, 2007), it is impossible to determine from these data whether differences in the relative ranking of implicit age-group attitudes reflects different processes underlying the BIAT and IAT or the weaker measurement properties of the Brief IAT's design (e.g., its lower reliability). At the same time, the Brief IAT's reduced number of trials and elimination of blocks that allowed participants to practice each of the 14 age-group pairing blocks was a necessary trade-off to measure each individual's implicit associations for all of the age-group comparisons.

### **Study 5 – Implicit and Explicit Age Attitudes as National Indicators of Age Burden**

In Study 5, I evaluate the construct validity of implicit age attitudes by examining predictive validity; that is, whether age attitudes vary across cultures and whether that

variation is predicted by cultural factors. Attitudes, particularly implicit attitudes, are thought to develop from both direct and indirect experiences with attitude objects (Nosek & Hansen, 2008). Those experiences can include exposure to messages in the surrounding environment, such as one's culture (Banaji, 2001). I hypothesize that cultural messages about older adults and aging would be more negative in nations with larger older populations, because of greater discussion of national concerns about the aging population.

Conversely, some have suggested that old age would be viewed more positively in Asian or collectivist cultures because collectivism stresses family interdependence (Levy & Langer, 1994; Yoon, Hasher, Feinberg, Rahhal, & Winocur, 2000) or in less economically-developed societies because economic modernization was assumed to decrease older adults' social status (Cowgill, 1974; Palmore & Manton, 1974; but see Aboderin, 2004). Recent research found that societies' perceived negativity or positivity toward old age varied across 26 nations; individuals living in nations where older adults made up a larger proportion of the population reported that their society viewed old age more negatively (Löckenhoff et al., 2009). In the present research, I extend this finding to examine the *age burden hypothesis*—whether national levels of implicit or explicit age attitudes correlate with the proportion of older adults in the citizenry. I evaluate whether the age burden hypothesis or alternative explanations best describe how implicit and explicit age attitudes vary across cultures and nations.

### **Accounts of Cross-Cultural Differences in Attitudes toward Aging and the Aged**

Previous research has posited multiple mechanisms by which attitudes and stereotypes toward older adults would vary across cultures. One explanation posits that

age biases and stereotypes would be less apparent in collectivist cultures than in individualist ones (Levy & Langer, 1994; Yoon et al., 2000). This is because collectivism is thought to emphasize interdependence among all group members, including older adults. Collectivism is “defined as a social pattern of closely linked individuals who define themselves as interdependent members of a collective (e.g., family, coworkers), whereas individualism as a cultural pattern stresses individual autonomy and independence of the self” (Vandello & Cohen, 1999, p. 279). At the cultural level, individualism and collectivism are seen as the endpoints of a single dimension; this dimension been used to explain cultural differences in many psychological processes (Heine, 2010). This research characterizes the United States and countries in Western Europe as individualist and Asian countries as collectivistic, although there is considerable within-country variation as well (e.g., Vandello & Cohen, 1999). In contrast to this prediction, most research has found no evidence that older adults are viewed more positively in collectivist or Asian countries than in individualist or Western countries (Boduroglu, Yoon, Luo, & Park, 2006; Cuddy, Norton, & Fiske, 2005; Giles et al., 2000; Harwood et al., 1996; Ryan, Jin, Anas, & Luh, 2004), although most research has focused on pairwise country comparisons (for an 11-nation comparison, see Giles et al., 2000).

Alternatively, *modernization theory* (Cowgill, 1974) posited that societal modernization, which introduces modern technology in health, economics, urbanization, and increasing education levels, reduces older adults’ social status. But this theory has been criticized on several points, such as its lack of empirical evidence for declines in older adults’ social status or received familial support (Aboderin, 2004) and its “romanticized or naive portrayal of eldership in pre-industrial societies” (Bengtson,

Dowd, Smith, & Inkeles, 1975, p. 689).

Recent cross-cultural research in 26 nations suggests another way in which age attitudes could vary meaningfully across cultures. In examining cross-cultural variations in expected age-related changes in personal characteristics, Löckenhoff and colleagues also examined college students' perceptions of whether their society viewed *old age* negatively or positively (2009). They found that (a) culture accounted for 14% of the total variance in individuals' perceptions of societal views of old age and (b) the percentage of cultures' populations aged 65 and older accounted for 24% of this variation in attitudes toward old age across cultures. They also found that Asian-Western differences in perceived societal positivity towards old age became nonsignificant after accounting for the countries' population percentage of older adults (p. 949). In the research proposed here, I will examine whether this finding can generalize from perceived societal negativity to explain cultural differences in attitudes toward older adults.

### **Cultural Influences on Attitudes**

Attitudes can be understood as associations in memory between a concept (e.g., older adults) and an evaluation (e.g., positive or negative; Fazio, 1990). These associations are thought to develop from “experience, direct and indirect, with attitude objects” (Nosek & Hansen, 2008, p. 588). For example, attitudes about aging and the aged could develop from personal experiences with aging, interpersonal experiences with members of different age groups, and community or cultural exposure to political and social issues related to aging. If cultural contexts present different messages about old people and aging, then variation in age attitudes across cultures may occur. Theory has

focused on how culture affects *implicit* attitudes because of the possibility that implicit attitudes are formed by environmental exposure regardless of whether the person believes or agree with the learned associations (Banaji, 2001; Nosek & Hansen, 2008). In contrast, explicit attitudes are deliberately endorsed, so that they may reflect both associations that exist in memory and deliberate decisions about what a person believes to be true or false (Gawronski & Bodenhausen, 2006; Nosek & Hansen, 2008). However, culture could plausibly play a role in shaping those associations that individuals use to construct their self-reported, explicit attitudes toward older adults. After all, people from different cultures self-report differences in their societies' perceived negativity to old age (Löckenhoff et al., 2009).

### **Cultural Discussions about Aging and Older Adults**

How might cultures differ in the types of associations that they imprint on their citizenry about aging and older adults? I anticipate that cumulative cultural associations between older adults and negativity will be stronger in nations with larger older populations, because of greater discussion of national concerns about the elderly and aging, such as aging-related costs of pensions (e.g., Silverstein, Angelelli, & Parrott, 2001), labor challenges in having a relatively small young population (e.g., Börsch-Supan, 2003), and discussion of aging-related health issues such as Medicare and Alzheimer's disease (e.g., Schneider & Guralnik, 1990). However, others have predicted the reverse. Gire posits that cultures with a larger proportion of older adults would view old age more positively, either (a) because younger adults would have greater familiarity with older adults or (b) because a larger older population would increase their peer support network, allowing older adults to retain engagement with the community (2011,

p. 113).

Instead, I anticipate that this will not be the case because intergroup contact would reduce age biases *only* if young and older adults view each other as mutually dependent and pursuing common goals (Pettigrew & Tropp, 2005). Consistent with my hypothesis, public opinion researchers have noted that media coverage in the United States during the 1980s and '90s “reflected—as well as stirred—public fears concerning the anticipated demands placed on the retirement system by aging baby boomers” (Silverstein et al., 2001, p. S36). This research examined changes in Americans’ attitudes toward government programs supporting older adults during the '80s and '90s. They found that societal shifts in opinion toward reduced benefits were driven by the youngest age cohort; this age cohort was substantially more skeptical of older adults’ *deservingness* (but not the program costs, p. S42) than previous young cohorts.

Based on previous research, I predicted the *age burden hypothesis*—cross-national variations in the proportion of the total population aged 60 and older would positively relate to the explicit and implicit age attitudes of individual citizens within those nations. And as in previous research (Löckenhoff et al., 2009), I anticipated that this relationship would persist after accounting for cultural differences in socioeconomic development and cultural values, in the form of collectivism. I examined the age burden hypothesis using data from the English-language age task on the Project Implicit Demonstration website, which is described in Study 1. These country samples represent convenience samples, as Project Implicit visitors are volunteers and do not represent a definable population (Nosek, Smyth, et al., 2007).

## **Method**

### **Sources of Data, Measures, and Design**

This analysis comprises a subset of the dataset described in Study 1. Thus, the procedure, design, and measures, including the exclusion criteria for the IAT, are identical. Implicit age attitudes were assessed by the age attitudes Implicit Association Test (IAT; Greenwald et al., 1998), with positive values indicating attitudes favoring young compared to old people. Explicit age attitudes were assessed as an age-group difference score in self-reported warmth of feelings toward young people and old people, scaled so that positive values reflect greater self-reported warmth toward young compared to old people. The analyzed subset consists of participants who visited the English-language websites (see Study 1) and reported citizenship in one of 99 nations for which the size of their older population and other national-level covariates were available and at least 40 citizens had contributed usable data on the implicit or explicit measures.

### **Participants**

A total of 488,021 participants from 99 nations were included in the dataset. For sessions where participants reported demographics, the overall sample consisted of 66% women and 34% men, with an average age of 29.2 ( $SD = 12.2$ , range = 18 – 89). For participants aged 25 and older, 62% had attained at least a bachelor's degree in education.

### **Results**

In preliminary analysis, I examined my research question using multi-level modeling (see Appendix 4). Because this study was intended to compare different explanations for how implicit and explicit age attitudes would vary across cultures, I then used regression analysis to examine these cross-cultural differences, after aggregating implicit and explicit age attitudes at the national level (e.g., citizen scores; P. B. Smith,

Bond, & Kağıtçıbaşı, 2006, p. 50).

Table 5-1 (at the end of this study) presents the descriptive statistics for implicit and explicit age attitudes favoring the young for the 99 nations used in these analyses. Nations are organized by the nation-level average of implicit attitudes favoring the young, from strongest to weakest. The table also presents the representation of older adults (aged 60 and older) in each nation's total population. Despite the weak correlation between *individuals'* implicit and self-reported age attitudes, national levels of implicit and explicit age attitudes were positively correlated,  $r(99) = .43, p < .001$ . National sample sizes for implicit and explicit age attitudes, respectively, varied dramatically (Median  $ns = 221, 271$ ;  $mins = 41, 58$  for Azerbaijan;  $maxs = 340749, 395086$  for United States). Thus, I weighted the regression analyses following the procedure from Nosek and colleagues (2009), so that nations with larger samples and more reliable estimates carried greater weight in the regression analysis than nations with small samples<sup>11</sup>; I then log-transformed these weights to attenuate the leverage of the United States sample. For the regression analyses reported below, I examined both weighted and unweighted results, and the pattern of effects was consistent for both.

**Sample covariates.** To account for sample differences in individual demographic characteristics are known to influence implicit or explicit age attitudes, I computed sample covariates separately for implicit and explicit age attitudes. They represent the proportion of female participants in each country's sample for implicit (median = 59%, range = 34% – 81%) and explicit age attitudes (median = 59%, range = 32% – 81%) and

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<sup>11</sup> Separate weights were calculated for implicit and explicit age biases, as inverse variance weights based on standard errors, rather than sample sizes, before being log-transformed.



the sample's average age (median for both implicit and explicit= 27.8 years, range-implicit = 22.9 – 35.1 years, range-explicit = 22.7 – 33.5 years). These sample covariates were then standardized ( $M = 0$ ,  $SD = 1$ ) within the sample of 99 countries.

**National level predictor variables.** All predictor variables represent nation-level information, and were standardized ( $M = 0$ ,  $SD = 1$ ) within the sample of 99 countries.

The key predictor variable was nations' percentage of adults aged 60 and older in the population (median = 14%, range = 2 – 30%; for other nations, United Nations, 2009; for Taiwan, US Census Bureau, 2009). Given previous research on cross-cultural differences (Löckenhoff et al., 2009; Nosek et al., 2009; Oishi, Diener, Lucas, & Suh, 1999) and to examine the *modernization* hypothesis, I also included indicators of nations'

socioeconomic development. Economic productivity was represented as per-capita Gross Domestic Product (GDP, in purchasing power parity units equivalent to US dollars; median = 12156 ppd, range = 362 – 54626 ppd) and education level as the combined gross ratio (median = 80%, range = 39 – 114%) of students enrolled in primary, secondary, or tertiary schooling (for education level: Singapore, 2010; Taiwan, 2009; for all others: United Nations Development Programme, 2009). Because more economically developed nations tend to have larger older populations (United Nations, 2009), national-level indicators were, as expected, substantively positively related to one another.

Nations' older-population representation was substantially correlated with economic productivity,  $r(99) = .62$ ,  $p < .001$ , and educational attainment  $r(99) = .70$ ,  $p < .001$ , which were also substantially correlated with one another,  $r(99) = .66$ ,  $p < .001$ <sup>12</sup>.

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<sup>12</sup> For the multiple regressions reported here, I examined estimates of the predictors' variance inflation (for collectivism, all  $\leq 3.83$ , all others  $\leq 2.52$ , well below the critical threshold of 10). I also tested

## Weighted Regression Results: Age-Burden for both Implicit and Explicit Age Attitudes

I examined the age burden hypothesis by using weighted hierarchical regression analysis, regressing national-level averages of implicit and explicit age attitudes on nations' population proportions of adults aged 60 and older, first by itself and then with several covariates. The age-burden hypothesis posits that the proportion of a nation's population aged 60 and older positively relates to how strongly national averages of explicit and implicit age attitudes favor the young. The results of this analysis are summarized in Table 5-2. In the first model, national levels of implicit age attitudes favoring the young were significantly stronger among nations with larger older adult populations,  $F(1, 97) = 14.94, p < .001, R^2 = .13, \beta = .37$ . This relationship is presented graphically in Figure 5-1 (Panel 1). The same relationship was present for explicit age attitudes, which favored the young more strongly as the size of nations' populations of older adults increased,  $F(1, 97) = 31.86, p < .001, R^2 = .25, \beta = .50$ , see Figure 5-1 (Panel 2).

Because of the relatively small number of nations available in the analysis and the wide range of nations' sample sizes, I next examined regression influence indices recommended by J. Cohen and colleagues (2003, pp. 397-410)<sup>13</sup>. For the weighted and unweighted regressions of age attitudes, Japan emerged as an outlier on leverage for

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models that added the nations' economic productivity and education level as regressors *before* adding nations' older-population percentage; national indicators of socioeconomic development were consistently only weakly related to age attitudes, while older-population proportion accounted for significantly more variance in age attitudes.

<sup>13</sup> Critical thresholds were set as those for small sample sizes for leverage  $> .06$ , and DFFITS  $> |1.0|$  and as the sample-size threshold ( $N = 99$ ), for Cook's D (F distribution procedure)  $> .70$ , and studentized residuals (Bonferroni procedure)  $> |3.39|$ .

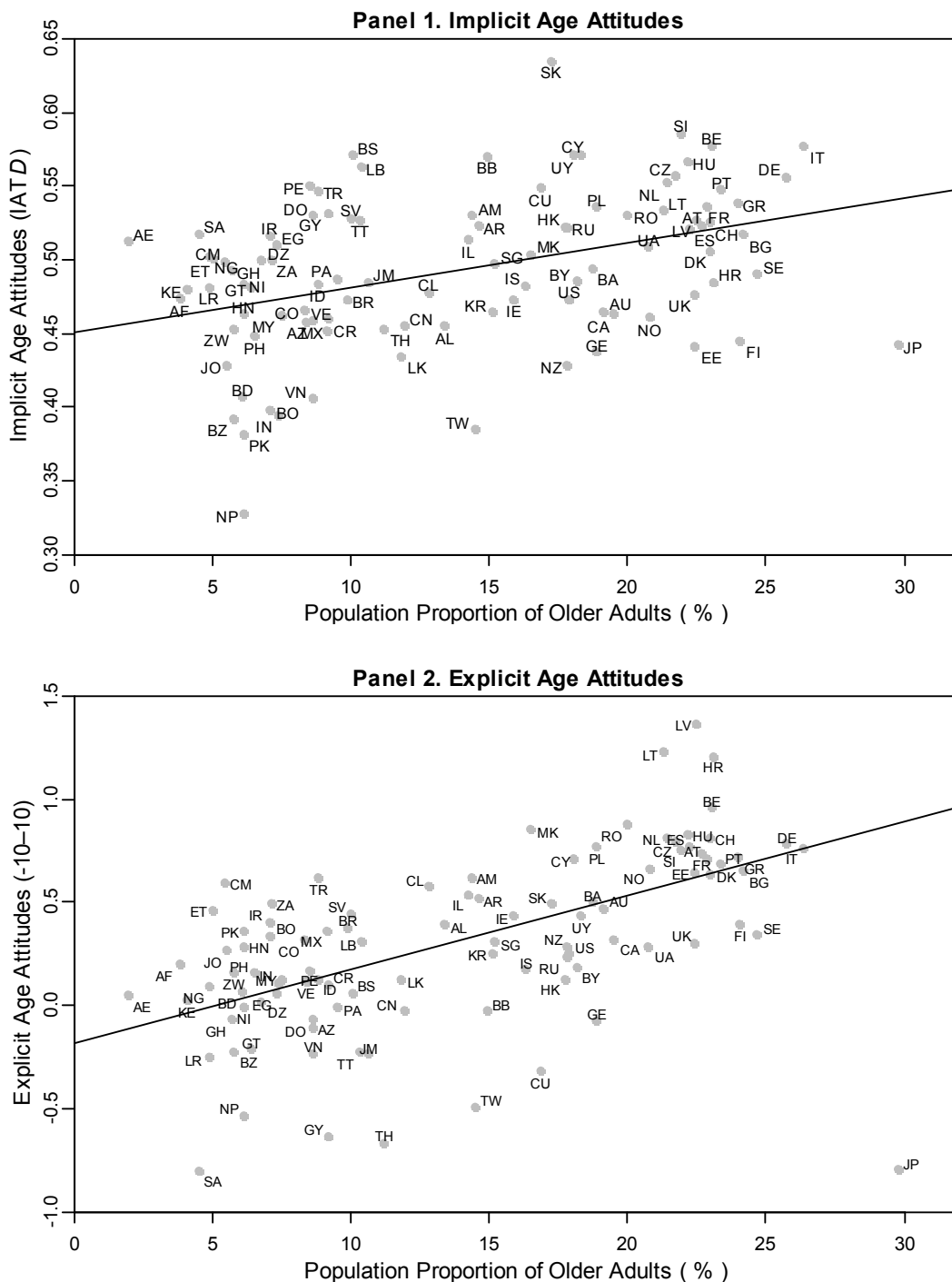
implicit age attitudes and as an outlier for DFFITS, Cook's D, the studentized residual, and leverage for explicit age attitudes.

Table 5-2. *Hierarchical Regressions Predicting National Differences in Age Attitudes.*

Model and Parameter	Predicting Implicit			Predicting Explicit		
	$R^2$	$\beta$	$p$	$R^2$	$\beta$	$p$
<b>M1</b>	.134			.247		
Nations' older-population proportion		.365	<.001		.497	<.001
<b>M2: Drop Outlier of Japan</b>	.164			.392		
Nations' older-population proportion		.405	<.001		.626	<.001
<b>M3: Add Sample Covariates</b>	.202			.405		
Nations' older-population proportion		.375	<.001		.629	<.001
Sample proportion of women		.129	.186		-.117	.168
Sample average age		.193	.051		-.031	.716
<b>M4: Add National Covariates</b>	.210			.428		
Nations' older-population proportion		.460	.001		.798	<.001
Sample proportion of women		.137	.175		-.112	.193
Sample average age		.210	.039		-.003	.968
Nations' per-capita GDP		.011	.935		-.078	.518
Nations' educational enrollment ratio		-.134	.363		-.173	.171

After removing this single influential outlier (new  $Ns = 98$ ), the relationship between the nations' population-percentage of older adults and both explicit age attitudes,  $R^2 = .39$ ,  $F(1, 96) = 61.98$ ,  $p < .001$ ,  $\beta = .63$ , and implicit age attitudes,  $R^2 = .16$ ,  $F(1, 96) = 18.81$ ,  $p < .001$ ,  $\beta = .40$ , persisted (see Model 2, Table 5-2). And as represented by Model 3, including covariates representing implicit or explicit sample characteristics, as the national samples' proportion of female participants or average age, accounted for some additional variation in implicit age attitudes,  $\Delta R^2 = .038$ , but little additional variation in explicit age attitudes,  $\Delta R^2 = .012$ .

Figure 5-1. Relationship between nations' older-population representation and average implicit age attitudes (Panel 1) and average explicit age attitudes (Panel 2). Both weighted regression lines exclude the outlier nation of Japan. Refer to Table 5-1 to translate country codes into country names.

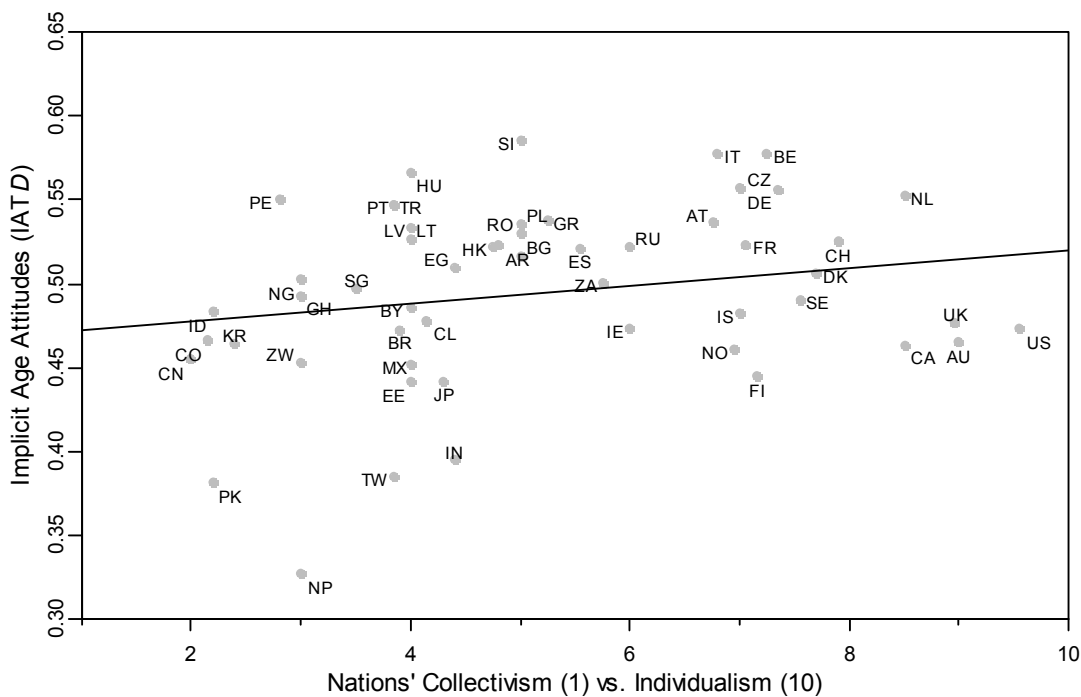


**Modernization hypothesis predicts no additional differences in nation-level age attitudes.** Model 4 (Table 5-2) next examined the *modernization hypothesis* – that citizens of more modern, industrialized nations would express greater negativity toward older adults (Bengtson et al., 1975; Cowgill, 1974; Palmore & Manton, 1974). To evaluate this hypothesis, I added indicators of nations’ socioeconomic development, as represented by their per-capita GDP and education levels (e.g., Löckenhoff et al., 2009, Nosek et al., 2009). The results failed to support the modernization hypothesis. These indicators of socioeconomic development were unrelated to national averages of implicit and explicit age attitudes, all  $t_s \leq 1.38$ . And compared to Model 3, these indicators predicted very little additional variation in either implicit ( $\Delta R^2 = .008$ ) or explicit ( $\Delta R^2 = .024$ ) age attitudes. However, the results indicate that even after adjusting for these covariates, national levels of implicit, age attitudes favored the young more strongly,  $\beta = .46, p = .001$ , in nations with larger proportions of older adults in the population, and the same relationship was present for explicit age attitudes favoring young relative to old people,  $\beta = .80, p < .001$ . These effect sizes indicate that for each 1 standard deviation increase in nations’ population-percentage of older adults, implicit or explicit pro-young preferences increased by 0.46 or 0.80 standard deviations, respectively.

**Individualism/collectivism predicts no additional differences in nation-level age attitudes.** I also examined whether national differences in individualism were related to age attitudes among a subset of nations ( $N = 53$ ) for which estimates of their individualism were available (Oishi et al., 1999). These estimates of nations’ individualism are anchored on 1 (*most collectivist*) and 10 (*most individualist*), as the averaged ratings of two expert researchers in the field (Geert Hofstede and Harry

Triandis, see Oishi et al., 1999, p. 984). Contrary to a collectivism hypothesis, nation-level estimates of individualism were either weakly or nonsignificantly correlated with implicit age attitudes,  $r(53) = .22, p = .112$  (see Figure 5-2 for this relationship) or with explicit age attitudes,  $r(53) = .27, p = .049$ <sup>14</sup>. The previously-described diagnostic procedure to identify influential outliers in the relationship between age attitudes and individualism indicated that in this subset of 53 nations, Japan was an outlier in the explicit regression only (for all diagnostic indicators except leverage).

Figure 5-2. Lack of relationship between nations' individualism and average implicit age attitudes. See Table 5-1 to translate the country IDs into country names.



As in the model with all 99 countries, among the 53 nations for which collectivism estimates were available, national levels of implicit age attitudes favored young significantly more strongly in nations with larger older populations,  $R^2 = .192, \beta =$

<sup>14</sup> And after accounting for sample composition, no direct relationship between nations' collectivism and implicit ( $\beta = .06, p = .728$ ) or explicit ( $\beta = .25, p = .176$ ) age attitudes remained.

.44,  $p = .001$ . In the baseline model,  $\Delta R^2 = .064$ ,  $F(5, 47) = 3.24$ ,  $p = .014$ , comparable to Model 4 in Table 5.2—which added both sample covariates of the sample’s average age and gender composition and the nation-level socioeconomic development covariates—only nations’ population-percentage of older adults was a significant predictor of implicit age attitudes,  $\beta = .51$ ,  $p = .008$ , all other  $|\beta|s < .31$ ,  $ps \geq .130$ . Compared to this model, nations’ individualism,  $\beta = -.18$ ,  $p = .453$ , did not predict any additional variation in implicit age attitudes,  $F(6, 46) = 2.77$ ,  $p = .022$ ,  $R^2 = .266$ , beyond what nations’ population-percentage of older adults,  $\beta = .53$ ,  $p = .006$ , already predicted. The samples’ female representation,  $\beta = .12$ ,  $p = .448$ , average age,  $\beta = .32$ ,  $p = .105$ , and nations’ economic productivity,  $\beta = -.23$ ,  $p = .321$ , and education level,  $\beta = .11$ ,  $p = .585$ , did not relate to nations’ average levels of implicit age attitudes.

Similarly, national averages in explicit attitudes favoring the young were significantly stronger in nations with higher percentages of older adults in the population,  $R^2 = .368$ ,  $\beta = .61$ ,  $p < .001$ , after removing the outlier Japan. In the baseline model, national levels of explicit age attitudes favoring the young,  $R^2 = .435$ ,  $F(5, 46) = 7.07$ ,  $p \leq .001$ , were predicted only by nations’ population-percentage of older adults,  $\beta = .79$ ,  $p < .001$ , but not significantly by covariates representing sample demographic characteristics,  $|\beta|s < .09$ ,  $ps > .665$ , or nations’ socioeconomic development, as economic productivity,  $\beta = -.34$ ,  $p = .055$ , or education level,  $\beta = .04$ ,  $p = .818$ . Compared to this model, estimates of nations’ individualism,  $\beta = -.16$ ,  $p = .474$ , accounted for no additional variation in explicit age attitudes favoring the young,  $\Delta R^2 = .006$ ,  $F(6, 45) = 5.92$ ,  $p \leq .001$ . Only the size of nations’ older population predicted differences in explicit age attitudes,  $\beta = .82$ ,  $p < .001$ , while covariates representing sample demographic characteristics and nations’

socioeconomic development predicted no differences in explicit age attitudes favoring the young,  $t_s \leq 1.33$ ,  $|\beta|_s \leq .27$ ,  $p_s \geq .189$ .

### Discussion

The results of Studies 1 through 4 highlight the persistent difficulty in identifying the factors that predict *individual differences* in how strongly one implicitly favors young relative to old people. But in Study 5, I found that when setting the unit of analysis as nations rather than individuals, both implicit and self-reported age attitudes do vary cross-nationally and correlate with one another. Overall, I found that as the proportion of older adults in nations' populations increased, that national levels of both implicit and explicit age attitudes favored young relative to old people more strongly. These relationships persisted after adjusting for differences in sample composition. And contrary to a modernization hypothesis (Bengtson et al., 1975; Cowgill, 1974; Palmore & Manton, 1974), these relationships remained just as strong after adjusting for nations' socioeconomic development.

Furthermore, estimates of nations' individualism (for 53 nations where estimates of their individualism were available, Oishi et al., 1999) did not predict any national differences in either implicit or explicit age attitudes. This is contrary to the popular understanding of Western-Asian cultural differences, but fits with previous research on collectivism's dissociation from attitudes toward older adults and old age (Boduroglu et al., 2006; Cuddy et al., 2005; Giles et al., 2000; Harwood et al., 1996; Ryan et al., 2004). It also fits with evidence from multilevel modeling (Löckenhoff et al., 2009) that citizens of nations with larger proportions of older adults reported that their culture viewed old age more negatively. I extended this idea, finding that this relationship is also present in



national averages of *citizens' own attitudes* toward older adults, for *both* their implicit and self-reported age attitudes.

However, one caveat is that Japan was a clear outlier (see Figure 5-1) relative to the 98 other nations. Despite being the nation with the largest proportion of older citizens, Japanese citizens' implicit and self-reported age attitudes were less favorable toward young relative to old people than predicted. This is despite ongoing national discussions of how Japan will care for its rapidly aging population (e.g., Ezrati, 1997). One possibility is that an untested cultural factor accounts for Japan's distinctness from other aging but collectivist nations.

The proportion of older adults in the population was positively related to both implicit and self-reported age attitudes. But national averages for *implicit* attitudes universally favored young people relative to old people, while on average, citizens either self-reported preferring young and old people equally or reported less than 1.5-points difference in how warmly they felt toward young relative to old people (see Figure 5-1 Panel 2). And despite the weak correlations between *individuals'* implicit and explicit age attitudes, *national* levels of implicit and explicit age attitudes were moderately and positively correlated with one another, and were each correlated with nations' population proportions of older adults. This suggests that when ignoring individual differences, by aggregating at the national level and comparing *between* nations rather than *within* nations and between individuals, national indicators of population aging do relate to national levels of negative attitudes toward older adults. Moreover, the range across nations in implicit and explicit age attitudes does suggest that as I hypothesized, cultural contexts present different messages about old people and aging. National levels of both

implicit and explicit age attitudes were positively related to nations' population aging; this suggests that not only does culture influence the strength of negative associations toward old people that are assessed as implicit attitudes, individuals are willing to endorse these negative associations in their self-reported attitudes.

The present research focused entirely on nation-level indicators of population aging, rather than on individual differences in implicit age attitudes. The ecological fallacy—in which a relationship present in aggregated groups of individuals (such as national averages) differs from the relationship among individual group members—could suggest that the age-burden hypothesis would not be present at the individual level; but the multilevel model results (see Appendix 4) argue against this. And these cross-national results suggest an avenue for future research that could examine the age-burden hypothesis at the individual level.

Individuals' implicit age attitudes could be related to negativity toward the costs of an aging population, rather than negativity toward individual older adults. I hypothesized, but could not test directly, that national differences in age attitudes would be driven by differing national discussions of aging-related concerns, such as the costs of entitlement programs, the labor challenges of a smaller young population, and health issues related to old age. Previous research (Silverstein et al., 2001) on changes over time in Americans' opinions about retirement benefits found that these opinion changes were driven by young adults' beliefs that retirement-age adults were less deserving of benefits. This could suggest that individuals' concerns about the cost of retirement benefits or skepticism of the older population's deservingness would be positively related to their implicit or explicit age attitudes.

Table 5-1. *Descriptive Statistics for 99 Nations*

Country Information			Implicit Sample			Explicit Sample		
ID	Name	% Old Pop.	<i>N</i>	<i>M</i>	( <i>SD</i> )	<i>N</i>	<i>M</i>	( <i>SD</i> )
SK	Slovakia	17	68	0.64	(0.36)	77	0.49	(2.07)
SI	Slovenia	22	100	0.59	(0.35)	118	0.75	(2.36)
BE	Belgium	23	950	0.58	(0.36)	1,109	0.96	(2.03)
IT	Italy	26	705	0.58	(0.38)	869	0.77	(2.12)
CY	Cyprus	18	181	0.57	(0.39)	216	0.71	(1.96)
UY	Uruguay	18	52	0.57	(0.44)	62	0.44	(2.47)
BS	Bahamas	10	67	0.57	(0.33)	99	0.06	(2.55)
BB	Barbados	15	60	0.57	(0.41)	77	-0.03	(2.05)
HU	Hungary	22	289	0.57	(0.37)	326	0.83	(1.99)
LB	Lebanon	10	103	0.56	(0.33)	126	0.31	(2.42)
CZ	Czech Republic	22	153	0.56	(0.38)	179	0.80	(2.03)
DE	Germany	26	4,182	0.56	(0.38)	5,057	0.79	(2.03)
NL	Netherlands	21	2,710	0.55	(0.38)	3,141	0.82	(1.74)
PE	Peru	9	244	0.55	(0.39)	273	0.17	(2.38)
CU	Cuba	17	151	0.55	(0.40)	167	-0.32	(2.23)
PT	Portugal	23	352	0.55	(0.36)	418	0.68	(2.20)
TR	Turkey	9	521	0.55	(0.39)	674	0.62	(2.38)
GR	Greece	24	270	0.54	(0.37)	328	0.72	(2.10)
AT	Austria	23	501	0.54	(0.37)	625	0.72	(2.18)
PL	Poland	19	919	0.54	(0.40)	1,108	0.77	(2.29)
LT	Lithuania	21	170	0.53	(0.36)	199	1.23	(2.28)
GY	Guyana	9	64	0.53	(0.40)	76	-0.63	(2.63)
DO	Dominican Republic	9	175	0.53	(0.38)	207	-0.07	(2.59)
RO	Romania	20	427	0.53	(0.38)	507	0.88	(2.54)
AM	Armenia	14	44	0.53	(0.38)	61	0.62	(3.18)
SV	El Salvador	10	113	0.53	(0.38)	125	0.45	(2.42)
TT	Trinidad & Tobago	10	174	0.53	(0.37)	201	-0.23	(2.36)
LV	Latvia	22	126	0.53	(0.39)	149	1.37	(2.28)
CH	Switzerland	23	583	0.53	(0.39)	674	0.81	(1.96)
FR	France	23	921	0.52	(0.39)	1,084	0.74	(2.17)
AR	Argentina	15	650	0.52	(0.38)	782	0.52	(2.39)
RU	Russian Federation	18	394	0.52	(0.40)	455	0.23	(2.20)
HK	Hong Kong	18	653	0.52	(0.38)	793	0.13	(2.48)
ES	Spain	22	648	0.52	(0.39)	772	0.77	(2.05)
SA	Saudi Arabia	4	66	0.52	(0.35)	85	-0.80	(2.59)
BG	Bulgaria	24	237	0.52	(0.41)	273	0.65	(2.37)
IR	Iran	7	190	0.52	(0.41)	244	0.41	(2.46)
IL	Israel	14	565	0.51	(0.42)	704	0.54	(2.14)
AE	United Arab Emir.	2	49	0.51	(0.38)	62	0.05	(2.63)
EG	Egypt	7	95	0.51	(0.39)	116	0.06	(2.51)
UA	Ukraine	21	166	0.51	(0.35)	188	0.29	(2.26)
DK	Denmark	23	633	0.51	(0.38)	712	0.63	(2.00)
MK	Macedonia	17	54	0.50	(0.31)	62	0.85	(2.08)
NG	Nigeria	5	250	0.50	(0.40)	331	0.09	(2.61)
ET	Ethiopia	5	91	0.50	(0.38)	121	0.46	(2.82)
ZA	South Africa	7	594	0.50	(0.40)	698	0.50	(2.07)
DZ	Algeria	7	71	0.50	(0.36)	105	0.02	(2.76)
CM	Cameroon	5	51	0.50	(0.41)	70	0.60	(2.68)
SG	Singapore	15	842	0.50	(0.38)	1,024	0.31	(2.24)

Table 5-1 continued

Country Information			Implicit Sample			Explicit Sample		
ID	Name	% Old Pop.	<i>N</i>	<i>M</i>	( <i>SD</i> )	<i>N</i>	<i>M</i>	( <i>SD</i> )
BA	Bosnia & Herzegovina	19	119	0.49	(0.40)	167	0.50	(2.71)
GH	Ghana	6	96	0.49	(0.36)	115	-0.07	(2.47)
SE	Sweden	25	2,162	0.49	(0.40)	2,564	0.34	(1.90)
PA	Panama	10	80	0.49	(0.41)	97	-0.01	(2.61)
BY	Belarus	18	74	0.49	(0.36)	96	0.19	(1.89)
JM	Jamaica	11	296	0.49	(0.41)	354	-0.24	(2.56)
HR	Croatia	23	288	0.48	(0.39)	326	1.21	(2.34)
NI	Nicaragua	6	97	0.48	(0.41)	113	-0.01	(2.27)
ID	Indonesia	9	221	0.48	(0.35)	271	0.13	(2.08)
IS	Iceland	16	119	0.48	(0.40)	137	0.18	(1.97)
LR	Liberia	5	62	0.48	(0.40)	79	-0.25	(2.58)
GT	Guatemala	6	112	0.48	(0.37)	133	-0.21	(2.22)
KE	Kenya	4	159	0.48	(0.36)	200	0.03	(2.41)
CL	Chile	13	147	0.48	(0.40)	177	0.58	(2.27)
UK	United Kingdom	22	9,800	0.48	(0.40)	11,526	0.31	(1.92)
AF	Afghanistan	4	610	0.47	(0.37)	785	0.20	(2.44)
IE	Ireland	16	967	0.47	(0.38)	1,150	0.43	(1.93)
US	United States	18	340,749	0.47	(0.39)	395,086	0.25	(2.16)
BR	Brazil	10	927	0.47	(0.39)	1,096	0.38	(2.39)
CO	Colombia	8	402	0.47	(0.40)	447	0.32	(2.27)
AU	Australia	19	4,778	0.46	(0.40)	5,910	0.47	(2.03)
KR	South Korea	15	1,603	0.46	(0.39)	2,123	0.26	(2.59)
CA	Canada	20	15,196	0.46	(0.39)	17,696	0.32	(2.07)
HN	Honduras	6	63	0.46	(0.43)	90	0.29	(2.39)
MY	Malaysia	8	474	0.46	(0.39)	589	0.13	(2.16)
NO	Norway	21	1,428	0.46	(0.36)	1,633	0.67	(1.92)
CR	Costa Rica	9	69	0.46	(0.42)	78	0.10	(2.57)
AZ	Azerbaijan	9	41	0.46	(0.34)	58	-0.10	(2.41)
VE	Venezuela	8	267	0.46	(0.38)	293	0.12	(2.40)
CN	China	12	1,124	0.46	(0.38)	1,334	-0.03	(2.56)
AL	Albania	13	190	0.45	(0.41)	238	0.39	(2.39)
ZW	Zimbabwe	6	59	0.45	(0.44)	76	0.16	(2.29)
TH	Thailand	11	206	0.45	(0.38)	248	-0.67	(2.59)
MX	Mexico	9	1,436	0.45	(0.40)	1,620	0.36	(2.45)
PH	Philippines	7	814	0.45	(0.40)	994	0.16	(2.13)
FI	Finland	24	827	0.45	(0.41)	989	0.40	(1.83)
JP	Japan	30	940	0.44	(0.44)	1,149	-0.80	(2.36)
EE	Estonia	22	100	0.44	(0.37)	114	0.65	(2.27)
GE	Georgia	19	72	0.44	(0.47)	81	-0.07	(2.14)
LK	Sri Lanka	12	70	0.43	(0.36)	79	0.13	(2.28)
NZ	New Zealand	18	1,158	0.43	(0.39)	1,380	0.29	(1.99)
JO	Jordan	6	51	0.43	(0.39)	63	0.27	(2.55)
BD	Bangladesh	6	115	0.41	(0.38)	152	0.07	(3.03)
VN	Vietnam	9	241	0.41	(0.40)	291	-0.23	(2.61)
BO	Bolivia	7	78	0.40	(0.34)	119	0.34	(2.47)
IN	India	7	2,338	0.39	(0.39)	2,825	0.11	(2.37)
BZ	Belize	6	44	0.39	(0.38)	67	-0.22	(3.73)
TW	Taiwan	14	509	0.38	(0.40)	633	-0.49	(2.49)
PK	Pakistan	6	288	0.38	(0.38)	402	0.36	(2.37)
NP	Nepal	6	106	0.33	(0.44)	128	-0.53	(2.47)

## General Discussion

The research described in this dissertation contributed to scientific knowledge by examining the construct validity of implicit age attitudes. It did so by adding to the accumulated “nomological net of facts, relationships, and validity evidence that clarifies the identity and utility of the construct” (Nosek & Smyth, 2007, p. 15; see Cronbach & Meehl, 1955 for the first elucidation of this approach). In Study 1, I illustrated how implicit age attitudes failed to demonstrate the relationships that construct validation of implicit attitudes more generally would anticipate, highlighting the need to investigate the construct validity of age attitudes. I found that implicit age attitudes (a) are remarkably dissociated from self-reported age attitudes and (b) are not moderated by individuals’ age-group membership—implicitly, older adults favor young relative to old people as strongly as young adults do. On their own, these findings leave ambiguous whether implicit age attitudes are simply distinct from other implicit social cognitions or whether either the construct or its measurements have weak validity.

The subsequent studies pursued construct validation in detail. Taken together, the research conducted for this dissertation develops the case for the construct validity of implicit age attitudes by accumulating the following four pieces of evidence. First and contrary to the initial results, I found evidence for construct validity in that implicit age attitudes varied depending on individuals’ age identity, as social-identity theories predict (Greenwald et al., 2002; Tajfel & Turner, 1986), but remained pro-young on average, as system justification theory predicts (Jost et al., 2004). That is, implicit age attitudes were

sensitive to individuals' own age when middle-aged adults represented either *younger people* or *older people* (Studies 3 & 4). This suggests that the "standard" age IAT shows little variation across the age span because it represents the category "old" as extremely old, and few people identify with that age category. Second, implicit age attitudes consistently favored younger relative to older people; this pro-younger implicit preference generalized to multiple measures of implicit age attitudes (Studies 2, 3, & 4), but varied depending on which age groups represented the concepts *younger people* and *older people* (Studies 3 & 4).

Third, although implicit and explicit age attitudes were consistently dissociated, I ruled out several alternative explanations for the strength of implicit attitudes favoring *young*, which would have altered the understanding of the implicit age attitude construct. That is, although implicit age attitudes were unrelated to self-report constructs relevant to intergroup relations, such as intergroup contact, age-group identity, and multiple measures of self-reported age-group preferences (Studies 1 & 2), they were also unrelated to other self-reported sources of negativity toward older adults, such as expectations about one's own aging process and concerns about mortality and ill-health (Study 2) and feelings about *being* young or old (Study 1). This dissociation generalized to multiple measures of implicit age attitudes (Studies 2, 3, & 4) and persisted even though both implicit and explicit age attitudes were similarly sensitive to experimental manipulation of which age groups represented the group categories (Studies 3 & 4).

And, fourth, despite the dissociation between *individuals'* implicit and self-reported age attitudes, I found evidence at the *national* level for the predictive validity of implicit age attitudes (Study 5). Specifically, attitudes, particularly implicit attitudes, are

thought to develop from experience, both indirect and direct, with attitude objects (Nosek & Hansen, 2008). Those experiences would include exposure to messages in the surrounding environment, such as one's culture. I hypothesized that the cumulative cultural associations between older adults and negativity would be stronger in nations with larger older populations, because of greater discussion of national concerns about the elderly and aging. I found evidence for predictive validity, in that the criterion variable of nations' population-aging was positively associated with national levels of implicit and explicit attitudes favoring young relative to old people.

### **The value of examining implicit age attitudes across the lifespan**

Previous research on implicit age attitudes represented age as the extreme ends of the age spectrum, as very young and very old adults. In the existing research on implicit attitudes, the closest analogue to this would be representing race with light and dark skin tones rather than faces of European and African Americans (see Nosek, Smyth, et al., 2007 for a broad overview of these and other social attitudes, both implicitly and explicitly). But the current research on implicit attitudes toward different age-group comparisons is novel, in that (a) previous research typically has not varied *how light* and *how dark* the skin tone of the stimuli are beyond the extremes, (b) the variability in skin tone identity among participants is likely to be lower than age variability (58% of participants who completed the skin-tone IAT reported being White, Nosek, Smyth, et al., 2007), and (c) individuals' racial identity, based on their skin tone, is unlikely to *change* (or least to be expected to change). By varying which of four age groups represented *younger people* and *older people*, I found that implicit age attitudes for some age-group comparisons—those in which middle-aged adults represented *younger people*

or *older people*—were sensitive to individuals’ own age. These relationships were undetectable with the “standard” age IAT, which represents the old age category with extremely old adults. This new approach appears to represent an important measurement innovation, as it highlights the age progression and allows participants to identify their placement in that age progression. Framing the comparison between *younger people* and *older people* in such a way may be important for eliciting effects relevant to social identity in implicit and explicit age attitudes.

Although further research is needed, this also suggests that among the samples that are usually available in psychological research, implicit attitudes for *young adults* relative to *middle-aged adults* may exhibit better measurement properties than attitudes for *young adults* relative to *old adults*. Research using this measurement approach could provide further evidence for the construct validity of implicit age attitudes and could also relate more closely to individuals’ discriminatory behavior against pre-retirement-age adults. After all, it is middle-aged adults who often experience employment discrimination (Lahey, 2008; Lindner, Nosek, & Graser, 2009).

### **The present status of construct validity for implicit age attitudes**

Previous to this dissertation research, implicit age attitudes were noteworthy primarily because of their observed but unexplained differences from attitudes toward other social groups—both in how strongly implicit attitudes favored the dominant group and how they failed to demonstrate predicted interrelationships with age-group identity and explicit attitudes (Hummert et al., 2002; Levy & Banaji, 2002; Nosek et al., 2002;



Nosek, Smyth, et al., 2007)<sup>15</sup>. Implicit attitudes had largely been assessed with the IAT (for exceptions, see Chasteen, Schwarz, & Park, 2002; Gawronski, Cunningham, LeBel, & Deutsch, 2010; Perdue & Gurtman, 1990), where the concepts of *young people* and *old people* were been represented either by first names (Nosek et al., 2002) or by a single set of face stimuli, representing very young and very old adults (e.g., Nosek, Smyth, et al., 2007). Given this starting point, I made significant progress through this dissertation research in understanding how implicit age attitudes vary across individuals, whether they relate to self-report and other relevant constructs, and how they predict criterion variables of interest. As discussed below, the consistent dissociation between implicit and explicit age attitudes remains the most persistent challenge to the construct validation of implicit age attitudes.

### **What does the dissociation between implicit age attitudes and all self-reports mean?**

One of the puzzles that prompted this dissertation research was the unexpected dissociation between implicit and explicit age attitudes. For example, in one examination of the factors that moderate the strength of implicit-explicit attitude correlations (Nosek, 2005), age's relative ranking on these moderators, relative to 56 other attitude objects, would suggest that its implicit-explicit correlation should be similar in magnitude to that of other socially-sensitive social groups, such as White-Black attitudes ( $r \approx .30$ , Nosek, Smyth, et al., 2007). And in another investigation, age demonstrated one of the weakest associations between implicit and self-reported attitudes among 95 social concepts examined (Nosek & Hansen, 2008). I conclude this research without convergent evidence

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<sup>15</sup> In particular, see the unified theory of social identity, where age was the only domain of 16 that failed to exhibit the predicted relationships among self-esteem, group identity, and group attitudes (Greenwald et al., 2002).

of what the construct of implicit age attitudes represents.

Convergent validity would be demonstrated if implicit age attitudes relate to self-report constructs with which theory expects relationships. If implicit age attitudes failed to relate to self-reported age preferences but did relate to concerns about ill-health and mortality in old age, then this would necessitate a re-conceptualization of what the construct of implicit age attitudes represents. Instead, I found that implicit age attitudes were dissociated both from self-reported age preferences and self-reported versions of several constructs representing negativity toward aging and old age. It remains possible that implicit age attitudes reflect *associations* with mortality, ill-health, and the value of being young, but those associations were simply not ones that individuals self-reported. This is important clarification as implicit evaluations are related to self-report in other circumstances (Nosek, 2005). The consistent implicit-explicit dissociation is informative about implicit age attitudes' distinctiveness from implicit attitudes toward other social groups. It remains unclear whether any self-report constructs do demonstrate convergent validity with implicit age attitudes.

Despite this uncertainty, the results of these studies suggest that if implicit and explicit age attitudes are dissociated because implicit associations with older adults represent something other than age-group preferences, then this dissociation generalizes to multiple measures and designs. At present, these findings tentatively suggest that implicit and explicit age attitudes are valid constructs, but are largely dissociated. This question cannot be fully addressed without future research into (a) other self-report constructs, as suggested in Study 5 and (b) examining the predictive validity of implicit age attitudes for discriminatory behavior.

### **What remains to be done: Future directions**

**Measurement challenges unique to implicit age attitudes.** One remaining challenge in understanding the relationship between individuals' age identity and implicit age attitudes is the potential influence of age-related changes in extraneous factors related to cognitive aging. That is, consideration of any age differences, or lack thereof, in implicit age attitudes must also acknowledge the possibility that any "true" differences in older individuals' mental *associations* between old people and *good* or *bad* (e.g., Conrey, Sherman, Gawronski, Hugenberg, & Groom, 2005) could be obscured by the measurement strategy underlying most implicit attitude measures. Most measures of implicit attitudes (one notable exception being the AMP; Payne et al., 2005) infer individuals' preferences from their speed of responding. Research on cognitive aging indicates that individuals' age is associated with slowing processing speed (e.g., Salthouse, 1996). The original analysis strategy for the IAT artifactually resulted in more extreme IAT scores for all individuals with slower overall reaction-times, which includes older adults (Sriram, Greenwald, & Nosek, 2010). The current D-scoring algorithm minimizes this and other extraneous influences on IAT scores (Greenwald et al., 2003; see also Hummert et al., 2002, who found that IAT scoring with the conceptually-similar trial-level z-scoring best accounted for age-related declines in reaction-time on age preference and identity IATs). At present, the D-scoring algorithm (used in this dissertation to analyze the IAT, Brief IAT, and SPF) is the best available *scoring* strategy to maximize comparability across age cohorts.

However, interpretation of any age-cohort differences in implicit age attitudes would be strengthened by further research that either (a) examines whether accounting

for individual differences in inhibitory abilities reveals age-cohort differences in implicit age attitudes (e.g., von Hippel, Silver, & Lynch, 2000) or (b) uses process-dissociation to examine whether age-cohort differences in *association activation* are obscured by age-cohort differences in inhibition, reflected by the ability to *overcome bias* (as has been done for racial attitudes, Gonsalkorale, Sherman, & Klauer, 2009). Relevant to the present findings, this previous research on race attitudes found that age-related changes in the overcoming-bias parameter first began to decline among those aged 41-50, although the influence of these extraneous factors may be most problematic among the oldest-old participants (e.g., Hummert et al., 2002). Although the present research cannot directly examine this possibility, it appears that the relationship between participants' own age and their implicit age-group attitudes demonstrated discriminant validity, given that only implicit attitudes toward middle-aged adults changed across the examined age span (among those aged 18 to 60).

**Experimentally manipulating age attitudes.** Fundamental to modern science is the understanding that experimental manipulation represents an important method to evaluate causal inferences about a construct (e.g., Shadish, Cook, & Campbell, 2002). As I originally proposed for this dissertation research, I conducted three studies that tested the idea that misperceiving the self as unchanging over time was one source of negative implicit attitudes toward older adults. However, I consistently found that manipulating whether individuals saw the self as changing or remaining the same over time significantly altered neither implicit nor explicit age attitudes. This suggests that more remains to be done to understand the origins of implicit age attitudes and implicit negativity toward older adults. But in future research, experimentally manipulating

hypothesized sources or consequences of age attitudes will be of critical importance in demonstrating that the construct of implicit age attitudes is understood sufficiently well to generate causal inferences and evaluate its relationships with other variables of interest.

**Predictive validity: Do age attitudes predict discriminatory behavior.** In attitudes research, one critical piece of evidence for a construct's predictive validity is whether a given attitude predicts behavior (Greenwald et al., 2009). Construct validation of implicit attitudes more generally has established that both implicit and explicit attitudes influence individuals' behavior. And meta-analytic evidence finds that implicit attitudes are better predictors of discrimination in socially-sensitive domains like race (Greenwald et al., 2009), but age discrimination has not been examined directly in any published research.

As an immediate follow-up to my dissertation research, I am collaborating with several others to develop and evaluate a new paradigm that reliably and effectively assesses individuals' willingness to discriminate in social contexts. I am currently finalizing the implementation of a design that examines individuals' likelihood of recommending older job applicants for an entry-level position, relative to those same individuals' evaluations of equally-qualified older applicants. The dissociation between implicit and explicit age attitudes could allow both to exert unique effects on discriminatory behavior, although this may be overly optimistic. Previous meta-analytic research found that as the correlation between implicit and explicit attitudes increased, their ability to predict behavior also increased (Greenwald et al., 2009). If implicit age attitudes demonstrate predictive validity through their relationship with discriminatory behavior, this would provide evidence that whatever the origins of automatically-

activated negativity toward older adults, these implicit attitudes predict unwarranted and legally-prohibited (Lahey, 2010) discriminatory behavior toward older adults.

### **Conclusion**

In this dissertation research, I made significant progress toward accumulating evidence for the nomological net of relationships and validity evidence supporting the construct of implicit age attitudes. This focused approach took a step back from my earlier attempts to experimentally manipulate a hypothesized source of implicit age attitudes. Instead, I focused on understanding what “implicit age attitudes” are.

## References

- Aboderin, I. (2004). Modernisation and ageing theory revisited: Current explanations of recent developing world and historical western shifts in material family support for older people. *Ageing & Society*, *24*, 29-50. doi:10.1017/S0144686X03001521
- Allan, L. J., & Johnson, J. A. (2009). Undergraduate attitudes toward the elderly: The role of knowledge, contact and aging anxiety. *Educational Gerontology*, *35*, 1-14. doi:10.1080/03601270802299780
- Banaji, M. R. (2001). Implicit attitudes can be measured. In H. L. Roediger III, J. S. Nairne, I. Neath, & A. M. Surprenant (Eds.), *The nature of remembering: Essays in honor of Robert G. Crowder* (pp. 117-150). Washington, DC: American Psychological Association.
- Bar-Anan, Y., & Nosek, B. A. (2011). Perceptions of intentionally causing unintentional attitude effects: The case of the Affective Misattribution Procedure. *Unpublished manuscript*. Retrieved from <https://www.projectimplicit.net/nosek/papers/>
- Bar-Anan, Y., Nosek, B. A., & Vianello, M. (2009). The sorting paired features task: A measure of association strengths. *Experimental Psychology*, *56*, 329-343. doi:10.1027/1618-3169.56.5.329
- Bengtson, V. L., Dowd, J. J., Smith, D. H., & Inkeles, A. (1975). Modernization, modernity, and perceptions of aging: A cross-cultural study. *Journal of Gerontology*, *30*, 688-695. doi:10.1093/geronj/30.6.688
- Boduroglu, A., Yoon, C., Luo, T., & Park, D. C. (2006). Age-related stereotypes: A comparison of American and Chinese cultures. *Gerontology*, *52*, 324-333. doi:10.1159/000094614

- Börsch-Supan, A. (2003). Labor market effects of population aging. *Labour*, *17*, 5-44.  
doi:10.1111/1467-9914.17.specialissue.2
- Bosson, J. K., Swann, W. B., & Pennebaker, J. W. (2000). Stalking the perfect measure of implicit self-esteem: The blind men and the elephant revisited? *Journal of Personality and Social Psychology*, *79*, 631-643. doi:10.1037/0022-3514.79.4.631
- Butler, R. N. (1969). Age-ism: Another form of bigotry. *The Gerontologist*, *9*, 243-246.  
doi:10.1093/geront/9.4\_Part\_1.243
- Chasteen, A. L. (2005). Seeing eye-to-eye: Do intergroup biases operate similarly for younger and older adults? *International Journal of Aging & Human Development*, *61*, 123-139.
- Chasteen, A. L., Schwarz, N., & Park, D. C. (2002). The activation of aging stereotypes in younger and older adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *57*, P540-P547. doi:10.1093/geronb/57.6.P540
- Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Mahwah, NJ: Lawrence Erlbaum.
- Conrey, F. R., Sherman, J. W., Gawronski, B., Hugenberg, K., & Groom, C. J. (2005). Separating multiple processes in implicit social cognition: The quad model of implicit task performance. *Journal of Personality and Social Psychology*, *89*, 469-487. doi:10.1037/0022-3514.89.4.469
- Cowgill, D. O. (1974). The aging of populations and societies. *Annals of the American Academy of Political and Social Science*, *415*, 1-18.  
doi:10.1177/000271627441500102



- Cronbach, L. J., & Meehl, P. E. (1955). Construct validity in psychological tests. *Psychological Bulletin*, 52, 281-302. doi:10.1037/h0040957
- Cuddy, A. J. C., Fiske, S. T., & Glick, P. (2007). The BIAS map: Behaviors from intergroup affect and stereotypes. *Journal of Personality and Social Psychology*, 92, 631-648. doi:10.1037/0022-3514.92.4.631
- 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. doi:10.1111/j.1540-4560.2005.00405.x
- Ebner, N. C. (2008). Age of face matters: Age-group differences in ratings of young and old faces. *Behavior Research Methods*, 40, 130-136. doi:10.3758/BRM.40.1.130
- Ezrati, M. (1997). Japan's aging economics. *Foreign Affairs*, 76(3), 96-104.
- Fazio, R. H. (1990). Multiple processes by which attitudes guide behavior: The MODE model as an integrative framework. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 23, pp. 75-109). New York: Academic Press.
- Fiske, S. T. (1998). Stereotyping, prejudice, and discrimination. In S. T. Fiske, D. T. Gilbert, & G. Lindzey (Eds.), *Handbook of Social Psychology* (4th ed., Vol. 2, pp. 357-411). New York: McGraw-Hill.
- Fiske, S. T., Cuddy, A. J. C., & Glick, P. (2002). Emotions up and down: Intergroup emotions result from status and competition. In D. M. Mackie & E. R. Smith (Eds.), *From prejudice to intergroup emotions: Differentiated reactions to social groups* (pp. 247-264). New York: Psychology Press.
- Garstka, T. A., Schmitt, M. T., Branscombe, N. R., & Hummert, M. L. (2004). How

young and older adults differ in their responses to perceived age discrimination.

*Psychology and Aging*, 19, 326-335. doi:10.1037/0882-7974.19.2.326

Gawronski, B., & Bodenhausen, G. V. (2006). Associative and propositional processes in evaluation: An integrative review of implicit and explicit attitude change.

*Psychological Bulletin*, 132, 692-731. doi:10.1037/0033-2909.132.5.692

Gawronski, B., Cunningham, W. A., LeBel, E. P., & Deutsch, R. (2010). Attentional influences on affective priming: Does categorisation influence spontaneous evaluations of multiply categorisable objects? *Cognition & Emotion*, 24, 1008-

1025. doi:10.1080/02699930903112712

Giles, H., Noels, K., Ota, H., Ng, S. H., Gallois, C., Ryan, E. B., Williams, A., et al.

(2000). Age vitality across eleven nations. *Journal of Multilingual and*

*Multicultural Development*, 21, 308-323. doi:10.1080/01434630008666407

Gire, J. T. (2011). Cultural variations in perceptions of aging. In K. D. Keith (Ed.),

*Cross-cultural psychology: Contemporary themes and perspectives* (pp. 110-130).

Singapore: Wiley-Blackwell.

Gonsalkorale, K., Sherman, J. W., & Klauer, K. C. (2009). Aging and prejudice:

Diminished regulation of automatic race bias among older adults. *Journal of*

*Experimental Social Psychology*, 45, 410-414. doi:10.1016/j.jesp.2008.11.004

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

doi:10.1111/j.1559-1816.2004.tb02557.x

Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: Attitudes, self-

esteem, and stereotypes. *Psychological Review*, 102, 4-27. doi:10.1037/0033-

295X.102.1.4

Greenwald, A. G., Banaji, M. R., Rudman, L. A., Farnham, S. D., Nosek, B. A., & Mellott, D. S. (2002). A unified theory of implicit attitudes, stereotypes, self-esteem, and self-concept. *Psychological Review*, *109*, 3-25. doi:10.1037/0033-295X.109.1.3

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. doi:10.1037/0022-3514.74.6.1464

Greenwald, A. G., Nosek, B. A., & Banaji, M. R. (2003). Understanding and using the Implicit Association Test: I. An improved scoring algorithm. *Journal of Personality and Social Psychology*, *85*, 197-216. doi:10.1037/0022-3514.85.2.197

Greenwald, A. G., Poehlman, T. A., Uhlmann, E. L., & Banaji, M. R. (2009). Understanding and using the Implicit Association Test: III. Meta-analysis of predictive validity. *Journal of Personality and Social Psychology*, *97*, 17-41. doi:10.1037/a0015575

Harris, D. K., Changas, P. S., & Palmore, E. B. (1996). Palmore's first facts on aging quiz in a multiple-choice format. *Educational Gerontology*, *22*, 575-589. doi:10.1080/0360127960220605

Harwood, J., Giles, H., Ota, H., Pierson, H. D., Gallois, C., Ng, S. H., Lim, T.-S., et al. (1996). College students' trait ratings of three age groups around the Pacific Rim. *Journal of Cross-Cultural Gerontology*, *11*, 307-317. doi:10.1007/BF00115798

He, W., Sengupta, M., Velkoff, V., & DeBaros, K. (2005). *65+ in the United States:*

2005. Current Population Reports, P23-209. Washington, DC: U.S. Census Bureau. Retrieved from <http://www.census.gov/prod/2006pubs/p23-209.pdf>
- Heine, S. J. (2010). Cultural psychology. In S. T. Fiske, D. T. Gilbert, & G. Lindzey (Eds.), *Handbook of Social Psychology* (5th ed., Vol. 2, pp. 1423-1464). Hoboken, NJ: John Wiley and Sons.
- von Hippel, W., Silver, L. A., & Lynch, M. E. (2000). Stereotyping against your will: The role of inhibitory ability in stereotyping and prejudice among the elderly. *Personality and Social Psychology Bulletin*, *26*, 523-532.  
doi:10.1177/0146167200267001
- Huang, J. Y., & Bargh, J. A. (2008). Peak of desire: Activating the mating goal changes life-stage preferences across living kinds. *Psychological Science*, *19*, 573-578.  
doi:10.1111/j.1467-9280.2008.02125.x
- Hummert, M. L. (1999). A social cognitive perspective on age stereotypes. In T. M. Hess & F. Blanchard-Fields (Eds.), *Social cognition and aging* (pp. 175-196). San Diego, CA: Academic Press.
- Hummert, M. L., Garstka, T. A., O'Brien, L. T., Greenwald, A. G., & Mellott, D. S. (2002). Using the Implicit Association Test to measure age differences in implicit social cognitions. *Psychology and Aging*, *17*, 482-495. doi:10.1037//0882-7974.17.3.482
- Hummert, M. L., Garstka, T. A., Shaner, J. L., & Strahm, S. (1994). Stereotypes of the elderly held by young, middle-aged, and elderly adults. *Journal of Gerontology*, *49*, P240-P249. doi:10.1093/geronj/49.5.P240
- Jost, J. T., Banaji, M. R., & Nosek, B. A. (2004). A decade of system justification theory:

- Accumulated evidence of conscious and unconscious bolstering of the status quo. *Political Psychology*, 25, 881-919. doi:10.1111/j.1467-9221.2004.00402.x
- Kinzler, K. D., Shutts, K., & Correll, J. (2010). Priorities in social categories. *European Journal of Social Psychology*, 40, 581-592. doi:10.1002/ejsp.739
- Kite, M. E., Stockdale, G. D., Whitley, B. E., & Johnson, B. T. (2005). Attitudes toward younger and older adults: An updated meta-analytic review. *Journal of Social Issues*, 61, 241-266. doi:10.1111/j.1540-4560.2005.00404.x
- Lahey, J. N. (2008). Age, women, and hiring: An experimental study. *Journal of Human Resources*, 43, 30-56. doi:10.3368/jhr.43.1.30
- Lahey, J. N. (2010). International comparison of age discrimination laws. *Research on Aging*, 32, 679-697. doi:10.1177/0164027510379348
- Langner, O., Dotsch, R., Bijlstra, G., Wigboldus, D. H. J., Hawk, S. T., & van Knippenberg, A. (2010). Presentation and validation of the Radboud Faces Database. *Cognition & Emotion*, 24, 1377. doi:10.1080/02699930903485076
- Lasher, K. P., & Faulkender, P. J. (1993). Measurement of aging anxiety: Development of the Anxiety About Aging Scale. *The International Journal of Aging & Human Development*, 37, 247-259.
- Levy, B. R., & Banaji, M. R. (2002). Implicit ageism. In T. D. Nelson (Ed.), *Ageism: Stereotyping and prejudice against older persons* (pp. 49-75). Cambridge, MA: MIT Press.
- Levy, B. R., & Langer, E. J. (1994). Aging free from negative stereotypes: Successful memory in China among the American deaf. *Journal of Personality and Social Psychology*, 66, 989-997. doi:10.1037/0022-3514.66.6.989

- Levy, B. R., Kasl, S. V., & Gill, T. M. (2004). Image of aging scale. *Perceptual and Motor Skills, 99*, 208-210. doi:10.2466/PMS.99.4.208-210
- Lindner, N. M., & Nosek, B. A. (2010, January). *Images of old age: Contributions from lifespan psychology to social psychology*. Poster presented at the annual meeting of the Society of Personality and Social Psychology, Las Vegas, NV.
- Lindner, N. M., Nosek, B. A., & Graser, A. (2009, February). *Age-based hiring discrimination as a function of equity norms and self-perceived objectivity*. Poster presented at the annual meeting of the Society of Personality and Social Psychology, Tampa, FL.
- Löckenhoff, C. E., De Fruyt, F., Terracciano, A., McCrae, R. R., De Bolle, M., Costa, P. T. J., Aguilar-Vafaie, M. E., et al. (2009). Perceptions of aging across 26 cultures and their culture-level associates. *Psychology and Aging, 24*, 941-954. doi:10.1037/a0016901
- Martens, A., Goldenberg, J. L., & Greenberg, J. (2005). A terror management perspective on ageism. *Journal of Social Issues, 61*, 223-239. doi:10.1111/j.1540-4560.2005.00403.x
- Martens, A., Greenberg, J., Schimel, J., & Landau, M. J. (2004). Ageism and death: Effects of mortality salience and perceived similarity to elders on reactions to elderly people. *Personality and Social Psychology Bulletin, 30*, 1524-1536. doi:10.1177/0146167204271185
- Minear, M., & Park, D. C. (2004). A lifespan database of adult facial stimuli. *Behavior Research Methods, Instruments & Computers, 36*, 630-633. doi:10.3758/BF03206543

- National Research Council. (2006). *When I'm 64*. (L. L. Carstensen & C. R. Hartel, Eds.). Washington, DC: National Academies Press. Retrieved from [http://www.nap.edu/catalog.php?record\\_id=11474](http://www.nap.edu/catalog.php?record_id=11474)
- Nelson, T. D. (2002). *Ageism: Stereotyping and prejudice against older persons*. Cambridge, MA: MIT Press.
- Nosek, B. A. (2005). Moderators of the relationship between implicit and explicit evaluation. *Journal of Experimental Psychology: General*, *134*, 565-584. doi:10.1037/0096-3445.134.4.565
- Nosek, B. A., & Hansen, J. J. (2008). The associations in our heads belong to us: Searching for attitudes and knowledge in implicit evaluation. *Cognition and Emotion*, *22*, 553-594. doi:10.1080/02699930701438186
- Nosek, B. A., & Smyth, F. L. (2007). A multitrait-multimethod validation of the Implicit Association Test: Implicit and explicit attitudes are related but distinct constructs. *Experimental Psychology*, *54*, 14-29. doi:10.1027/1618-3169.54.1.14
- Nosek, B. A., Banaji, M. R., & Greenwald, A. G. (2002). Harvesting implicit group attitudes and beliefs from a demonstration web site. *Group Dynamics, Groups and Internet*, *6*, 101-115. doi:10.1037/1089-2699.6.1.101
- Nosek, B. A., Greenwald, A. G., & Banaji, M. R. (2005). Understanding and using the Implicit Association Test: II. Method variables and construct validity. *Personality and Social Psychology Bulletin*, *31*, 166 -180. doi:10.1177/0146167204271418
- Nosek, B. A., Greenwald, A. G., & Banaji, M. R. (2007). The Implicit Association Test at age 7: A methodological and conceptual review. In J. A. Bargh (Ed.), *Social psychology and the unconscious: The automaticity of higher mental processes*

(pp. 265-292). New York: Psychology Press.

Nosek, B. A., Smyth, F. L., Hansen, J. J., Devos, T., Lindner, N. M., Ranganath, K. A., Smith, C. T., et al. (2007). Pervasiveness and correlates of implicit attitudes and stereotypes. *European Review of Social Psychology, 18*, 36-88.

doi:10.1080/10463280701489053

Nosek, B. A., Smyth, F. L., Sriram, N., Lindner, N. M., Devos, T., Ayala, A., Bar-Anan, Y., et al. (2009). National differences in gender–science stereotypes predict national sex differences in science and math achievement. *Proceedings of the National Academy of Sciences, 106*, 10593 -10597. doi:10.1073/pnas.0809921106

Oishi, S., Diener, E. F., Lucas, R. E., & Suh, E. M. (1999). Cross-cultural variations in predictors of life satisfaction: Perspectives from needs and values. *Personality and Social Psychology Bulletin, 25*, 980-990. doi:10.1177/01461672992511006

Packer, D. J., & Chasteen, A. L. (2006). Looking to the future: How possible aged selves influence prejudice toward older adults. *Social Cognition, 24*, 218-247.

doi:10.1521/soco.2006.24.3.218

Palmore, E. B. (2001). The ageism survey: First findings. *Gerontologist, 41*, 572-575.

doi:10.1093/geront/41.5.572

Palmore, E. B. (2003). Ageism comes of age. *The Gerontologist, 43*, 418-420.

doi:10.1093/geront/43.3.418

Palmore, E. B., & Manton, K. (1974). Modernization and status of the aged: International correlations. *Journal of Gerontology, 29*, 205-210. doi:10.1093/geronj/29.2.205

Payne, B. K., Cheng, C. M., Govorun, O., & Stewart, B. D. (2005). An inkblot for attitudes: Affect misattribution as implicit measurement. *Journal of Personality*



- and Social Psychology*, 89, 277-293. doi:10.1037/0022-3514.89.3.277
- Perdue, C. W., & Gurtman, M. B. (1990). Evidence for the automaticity of ageism. *Journal of Experimental Social Psychology*, 26, 199-216. doi:10.1016/0022-1031(90)90035-K
- Pettigrew, T. F., & Tropp, L. R. (2005). Allport's intergroup contact hypothesis: Its history and influence. In J. F. Dovidio, P. S. Glick, & L. A. Rudman (Eds.), *On the nature of prejudice: Fifty years after Allport*. Malden, MA: Blackwell.
- Richeson, J. A., & Shelton, J. N. (2006). A social psychological perspective on the stigmatization of older adults. In L. L. Carstensen & C. R. Hartel (Eds.), *When I'm 64* (1st ed., pp. 174-208). Washington, DC: National Academies Press.
- Retrieved from [http://www.nap.edu/openbook.php?record\\_id=11474&page=174](http://www.nap.edu/openbook.php?record_id=11474&page=174)
- Rubin, D. C., & Berntsen, D. (2006). People over forty feel 20% younger than their age: Subjective age across the lifespan. *Psychonomic Bulletin & Review*, 13, 776-780.
- Ryan, E. B., Jin, Y., Anas, A., & Luh, J. (2004). Communication beliefs about youth and old age in Asia and Canada. *Journal of Cross-Cultural Gerontology*, 19, 343-360. doi:10.1023/B:JCCG.0000044688.27282.7b
- Salthouse, T. A. (1996). The processing-speed theory of adult age differences in cognition. *Psychological Review*, 103, 403-428. doi:10.1037//0033-295X.103.3.403
- Schneider, E. L., & Guralnik, J. M. (1990). The aging of America: Impact on health care costs. *Journal of the American Medical Association*, 263, 2335-2340.
- Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Boston: Houghton Mifflin.

- Silverstein, M., Angelelli, J. J., & Parrott, T. M. (2001). Changing attitudes toward aging policy in the United States during the 1980s and 1990s: A cohort analysis. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 56, S36-S43. doi:10.1093/geronb/56.1.S36
- Singapore. (2010). *Yearbook of Statistics*. Singapore: Department of Statistics. Retrieved from <http://www.singstat.gov.sg/pubn/reference/yos10/statsT-indicators.pdf>
- Smith, P. B., Bond, M. H., & Kağıtçıbaşı, Ç. (2006). *Understanding social psychology across cultures: Living and working in a changing world*. Thousand Oaks, CA: Sage.
- Sriram, N., & Greenwald, A. G. (2009). The brief implicit association test. *Experimental Psychology*, 56, 283-294. doi:10.1027/1618-3169.56.4.283
- Sriram, N., Greenwald, A. G., & Nosek, B. A. (2010). Correlational biases in mean response latency differences. *Statistical Methodology*, 7, 277-291. doi:10.1016/j.stamet.2009.10.004
- Taiwan. (2009). *Social indicators*. Executive Yuan, (Taiwan) Republic of China: Directorate General of Budget, Accounting, and Statistics. Retrieved from <http://eng.stat.gov.tw/public/Data/081717581371.pdf>
- Tajfel, H., & Turner, J. C. (1986). The social identity theory of intergroup behavior. In S. Worchel & W. G. Austin (Eds.), *Psychology of intergroup relations* (2nd ed., pp. 7-24). Chicago: Nelson-Hall.
- United Nations. (2009). *Population ageing and development 2009*. New York: Department of Economic and Social Affairs, Population Division. Retrieved from <http://www.un.org/esa/population/publications/ageing/ageing2009.htm>

United Nations Development Programme. (2009). *Human development report 2009*.

Global Reports. New York: United Nations. Retrieved from <http://hdr.undp.org/>

US Census Bureau. (2009). *International data base* (Data File). Retrieved from

<http://www.census.gov/ipc/www/idb/>

Vandello, J. A., & Cohen, D. (1999). Patterns of individualism and collectivism across

the United States. *Journal of Personality and Social Psychology*, *77*, 279.

doi:10.1037/0022-3514.77.2.279

Yoon, C., Hasher, L., Feinberg, F., Rahhal, T. A., & Winocur, G. (2000). Cross-cultural

differences in memory: The role of culture-based stereotypes about aging.

*Psychology and Aging*, *15*, 694-704. doi:10.1037/0882-7974.15.4.694

## Appendices

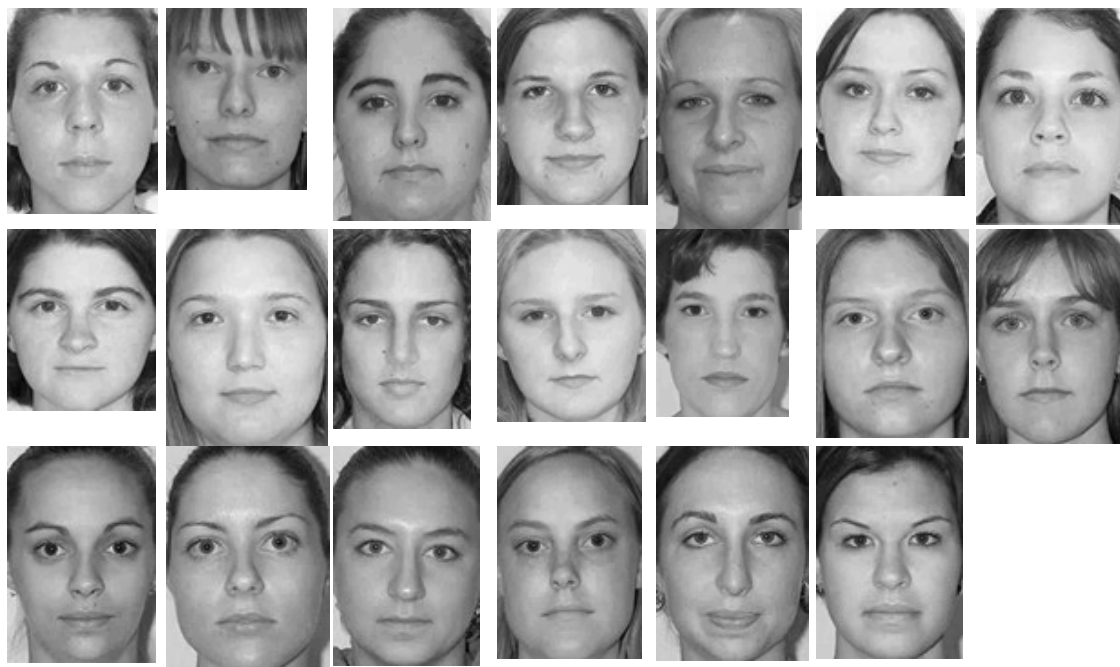
### Appendix 1 – Pool of old and young faces for implicit tasks in Study 2

#### Old Men



#### Old Women



**Young Men****Young Women**

Appendix 2 –  
 Chinese pinyin characters for AMP (Affect Misattribution Procedure) in Study 2

池 氏 名 动 副 代 词 助 介 连 量 简 声 数  
 称 地 人 姓 成 感 普 国 口 文 昔 精 半 愿  
 令 答 雄 票 曲 假 舟 术 卖 百 火 往 松 刻  
 纪 退 既 含 判 释 皮 波 承 射 堆 莫 制 键  
 赶 旁 笔 扁 注 树 律 制 铁 荣 昨 毛 彩 归  
 虎 罪 皆 叶 售 弹 卫 施 刀 块 汉 欣 马 鸟  
 鱼 佳 豸 豕 缶 弋 匸 凶 夭 毛 自 子 爪 主  
 八 巴 贝 不 才 采 册 长 丰 干 虫 串 囟 大  
 豆 而 儿 耳 二 凡 方 非 丰 干 工 弓 瓜 禾  
 几 甲 交 角 巾 斤 井 九 白 巨 亢 来 力 吕  
 矛 门 米 民 皿 木 目 乃 牛 女 朋 齐 且 曲  
 犬 日 肉 入 三 山 勺 身 尸 女 矢 氏 手 术 巳  
 它 田 土 兔 瓦 为 午 勿 西 夕 心 牙 羊 也  
 衣 已 乙 易 用 由 酉 又 予 雨 羽 玉 月 兆  
 止 至 彳 卜

**Appendix 3 – Stimuli for the Age-Groups IAT (Studies 3 & 4)****Standard IAT Stimuli: Young adults****Standard IAT Stimuli: Old adults****Children:****Young adults:****Middle-aged adults:****Old adults:**

#### Appendix 4 – Multi-level Modeling in Study 5

I used mixed-model analysis (e.g., Nosek, 2005) with individuals nested within nations ( $N = 99$ ), predicting implicit age attitudes. As I proposed, the baseline random-intercept model included random effects at both the individual and cultural levels, intraclass correlation = .012. Relative to this baseline, adding fixed effects of individual-level demographics that moderate implicit and explicit age attitudes (i.e., gender and age, as in Study 1) was a significantly better fit,  $\Delta\chi^2(2) = 33.32, p < .0001$ , such that implicit age biases were significantly lower among women compared to men and among older participants,  $t_s \geq 4.85$  and  $p_s < .0001$ . Relative to this second model, adding the proportion of adults aged 60 and older in the population as a fixed predictor at the nation level yielded a significantly better fit,  $\Delta\chi^2(1) = 151.82, p < .0001$ , such that individuals in nations with larger populations of older adults demonstrated stronger implicit age attitudes favoring the young,  $B = .0031, SE_B = .0007, t(410631) = 4.27, p < .0001$ .

However, the intraclass correlation, which compares the variability across cultures ( $\tau$ ) to the variability among individuals ( $\sigma^2$ ), indicated that only 1.2% of the total variance in implicit age biases could be explained by the individuals' nationality. Given the difficulty of predicting individual differences in implicit age attitudes from a wide variety of relevant constructs (Studies 1 through 4 of this dissertation; Lindner & Nosek, 2010) then in retrospect, the results of a preliminary multilevel model are perhaps unsurprising.

After a literature review and consultation with the departmental statistics consultant (M. Hunter, personal communication, May 7, 2011) and my dissertation chair about these results, we concluded that *relative to individual differences* (which, as I have



examined elsewhere in this dissertation, cannot be accounted for very well), cultural variation in implicit age attitudes was small. But this also means that there is very little nesting in my data. That is, an intraclass correlation represents the degree to which the regression assumption of homoscedasticity is violated, such that individuals within a culture are more like each other than they are like individuals in other cultures. The intraclass correlation “can be interpreted in two ways: it is the correlation between two randomly drawn individuals in one randomly drawn group, and it is also the fraction of total variability that is due to the group level” (Snijders & Bosker, 1999, p. 46).

Furthermore, as I implemented the multilevel analysis, I also realized that the intended goal of this study – to evaluate different explanations for how implicit and explicit age biases would vary across cultures, such as a population’s age burden, economic development, or collectivism – was not well-suited to a multilevel approach. That is, I originally intended to account for *cultural* differences, rather than *individual* differences in age biases. But multilevel modeling is by necessity designed to account for *individual* differences in the predictor variable. Thus, I focus on results of weighted multiple regressions to examine different explanations of cultural differences in age attitudes.

### References

Snijders, T. A. B., & Bosker, R. J. (1999). *Multilevel analysis: An introduction to basic and advanced multilevel modeling*. Thousand Oaks, CA: Sage.