## SUPPLEMENTAL MATERIAL

#### TIME TO RETIRE: WHY AMERICANS CLAIM BENEFITS EARLY AND HOW TO ENCOURAGE DELAY

Melissa A. Z. Knoll, Kirstin C. Appelt, Eric J. Johnson, & Jonathan E. Westfall

Znoll, Office of Retirement Policy, Social Security Administration; Appelt, Johnson, and Westfall, Center for Decision Sciences, Columbia Business School. Corresponding author's email: <u>eric.johnson@columbia.edu</u>

# Study 1 Method and Analysis

#### Method

In Study 1, we explored the claiming decision, testing whether consumers making hypothetical claiming decisions think about early claiming first and most often and whether this leads to a preference for early claiming. Because similar methods were used in all three studies, we explain the methodology in detail for Study 1 and then only describe differences in methodology for subsequent studies. Each study used unique participants who had not participated in any of the other studies.

**Participants.** We conducted a web-based study of older Americans who were provided by a market-sampling firm (Survey Sampling International) and compensated at the firm's regular rate. The benefit-claiming decision was relevant to all participants: All responded to a screening questionnaire indicating that they were participating in good faith (that is, paying attention to the materials presented and proceeding conscientiously), between the ages of 45 and 70 years, and either already were or would become eligible to receive Social Security retirement benefits.<sup>1</sup> Across studies, participants (67% were women,  $M_{age} = 59.25$  years,  $SD_{age} = 6.66$  years) came from a range of socioeconomic backgrounds: 58% had at least a two-year college degree, 55% were married, 73% had children, and median household income was \$35,000-\$49,999 (for more details and a comparison with a nationally representative panel, see Table S1).

#### Table S1

			Sam	ole Demograj	ohics	
		HRS <sup>a</sup>	Study 1	Study 2A	Study 2B	Study 3
Ν		13,078	1,292	408	377	418
Age	% <55	20.88	18.27	32.11	34.04	31.58
(in years)	% 55-59	20.17	25.62	24.51	25.8	22.01
	% 60-64	15.59	29.18	19.12	26.33	21.05
	% 65-69	12.19	22.37	19.36	18.09	20.81
	% 70-74	10.66	4.57	4.9	1.33	4.55
	% 75+	20.51	N/A	N/A	N/A	N/A
Gender	% Men	45.92	31.5	32.6	37.94	33.73
	% Women	54.08	68.5	67.4	62.06	66.27
Race	% Black/African American	9.55	4.4	4.4	7.16	7.4
	% White/Other	83.55	95.4	93.1	90.98	92.9
	% Hispanic	6.9	0.8	2.5	1.86	0.5
Marital	% Blank	0.03	N/A	N/A	N/A	N/A
status	% Married	59.31	55.88	53.19	54.11	55.98
	% Living together	5.3	5.5	5.88	7.69	5.26
	% Divorced/Living separated	13.53	19.97	21.32	19.63	19.86
	% Widowed	16.94	7.66	6.37	6.37	7.66
	% Single	4.89	10.99	13.24	12.2	11.24
Education	% <12	20.12	2.09	4.41	2.12	2.63
(in years)	% 12	32.89	37.62	42.65	40.05	44.26
	% 13-15	22.31	23.84	22.06	21.49	19.14
	% 16+	24.68	36.46	30.88	36.34	33.97
Income	Mean	\$61,777	\$59,914	\$53,757	\$57,384	\$54,556
	SE mean	\$427,145	\$1,203	\$1,963	\$2,219	\$1,978

Sample Demographics for Each Study, as Compared with a Nationally Representative Sample

<sup>&</sup>lt;sup>1</sup> Participants eligible for other types of Social Security benefits (for example, disability, survivor, or spousal benefits) were excluded, but we did not exclude participants if they were currently receiving retirement benefits.

*Note*. A breakdown by (randomly assigned) condition for Studies 2A, 2B, and 3 indicates the same pattern of demographics across conditions.

<sup>a</sup> The Health and Retirement Study (HRS) is sponsored by the National Institute on Aging (Grant NIA U01AG009740) and is conducted by the University of Michigan.

For Study 1 (N = 1,580), data from 288 (18%) participants were excluded for one of two reasons: (a) 285 participants did not finish the entire study and (b) three participants listed numbers rather than relevant thoughts on the thought-listing task.<sup>2</sup> This left data from 1,292 participants for further analysis. Across the three studies, we used similar exclusion criteria; the nature and magnitude of our exclusions are typical for online research. Excluding data from careless participants reduces noise but does not alter major trends or conclusions.

**Procedure.** All participants were presented with a scenario suggesting they were approaching retirement and were eligible for Social Security retirement benefits based on their previous years of work (see the screenshots below for the study materials). Participants then read retirement benefits information patterned after standard Social Security Administration (SSA) materials and tailored to their cohort. Participants listed their thoughts about the decision (which they later coded, see below) and reported their intended claiming age. Finally, they completed demographic questions. In Study 1, a subset of participants (n = 390) also completed a measure of time preferences as part of a second, otherwise unrelated session.

**Claiming decision.** To mimic SSA's presentation of benefits information, we used both text and a graph to explain how claiming at different ages between 62 and 70 years would affect the monthly benefit amount participants would receive for the rest of their lives. Benefits information was tailored to participants' cohort to reflect the increasing age at which

 $<sup>^{2}</sup>$  As is often the case with online research facilitated by market-sampling firms, we cannot estimate standard response rates as respondents were recruited for several studies at once. Although selection effects are possible, we believe our sample is reasonable because Study 1 results mimic real-world patterns and participant demographics are similar to those of a nationally representative panel (see Table S1). In addition, participants are randomly assigned to conditions in Studies 2 and 3, so the internal validity of these results is not affected.

beneficiaries receive full retirement benefits. In Study 1, the graph corresponded to Figure 1A (in our main manuscript) but showed the monthly benefit as a percentage of full benefits (as shown in screenshots below).

Thought listing and coding. Query theory (Johnson, Häubl, & Keinan, 2007; Weber & Johnson, 2011; Weber et al., 2007) posits that decision makers construct their preferences by decomposing the decision into queries about the pros and cons of the available choice options. These queries are asked sequentially, and arguments in favor of the most salient alternative (for example, the focal option, default option, or reference point) are generated before arguments in favor of other choice options (Willemsen, Böckenholt, & Johnson, 2011). Because of output interference (that is, the effect of earlier arguments suppressing individuals' ability to generate later, conflicting arguments), retrieval for later queries is less successful (Anderson, Bjork, & Bjork, 1994; Anderson & Spellman, 1995; Perfect, Moulin, Conway, & Perry, 2002; Veling & van Knippenberg, 2004). Thus, the focal alternative becomes the most supported choice option and decision makers tend to decide in its favor.

To test whether query theory could provide a process understanding of how people approach the claiming decision, we needed to measure the content and order of participants' thoughts about the claiming decision. To do so, we used a type-aloud protocol that asks participants to report their thoughts one at a time (Johnson et al., 2007; Weber et al., 2007). Prior to the main task, participants learned how to use the thought-listing interface by completing a standard warm-up thought-listing task, which did not involve any study-related content. After being presented with the claiming decision but before making their choices, participants were prompted to report any thoughts that went through their minds as they contemplated the decision. After reporting their decision, participants coded each of their own previously listed thoughts as favoring early claiming, full claiming, delayed claiming, or none of the above.<sup>3</sup>

**Demographics and normative predictors.** Participants reported standard demographics, their perceived risk of outliving their retirement assets (that is, their perceived longevity risk; 1 = extremely unlikely to 7 = extremely likely), and their perceived current health (1 = poor to 5 = excellent; adapted from the Health and Retirement Study, 2013).

**Time preferences.** To estimate time preferences at the individual level, we used an adaptive questionnaire, Dynamic Experiments for Estimating Preferences (DEEP) Time (Toubia et al., 2012), which measures time preferences by assessing a quasi-hyperbolic model of discounting, representing both participants' present bias, measured by the parameter  $\beta$ , and their personal discount rate, measured by the parameter  $\delta$ . Specifically, the model estimated is of the following form (Benhabib, Bisin, & Schotter, 2010; Laibson, 1997; Phelps & Pollak, 1968):

$$U(x,t) = xd(t)$$

where 
$$d(t) = \begin{cases} 1 & \text{for } t = 0 \\ \beta \exp(-rt) & \text{for } t > 0 \end{cases}$$
.

DEEP Time presents participants with 20 binary choices between a smaller, sooner amount and a larger, later amount. It starts with a choice pair drawn from a prior population distribution and generates the most informative new choice pair based on both a Bayesian update and prior responses. In addition, DEEP Time adjusts participants' parameters to give more weight to their responses when they are consistent and more weight to the prior distribution when their responses are inconsistent (for more details, see Toubia et al., 2012).

#### Data, Analyses, and Results

<sup>&</sup>lt;sup>3</sup> Previous research has established both that these self-codings correlate highly with the codings of masked raters (Weber et al., 2007) and that the nondirected thought-listing task (that is, asking participants to list all thoughts; see below for a screenshot) does not impact responses to the choice task (Hardisty, Appelt, & Weber, 2013).

Claiming preferences. Figure 2 in the main article shows a histogram of the frequency of preferred claiming ages for participants already eligible for benefits and for participants not yet eligible. In line with observed behavior, there were spikes in claiming at both the earliest age at which individuals can claim benefits (age 62 years) and the age at which individuals would receive full benefits (age 66 or 67 years in this sample). Forty-seven percent of participants preferred to claim benefits early (that is, before the age at which they would receive full benefits) and 33% of participants preferred to claim benefits as early as possible (that is, at 62 years;  $M_{\text{preferred claim age}} = 65.34$  years, SD = 2.91), despite the economic advantages of claiming later (Coile, Diamond, Gruber, & Jousten, 2002). This pattern mirrors observed behavior in the real world, where 62% of men and 68% of women claimed benefits early and 37% of men and 42% of women claimed benefits as early as possible in 2012 (Social Security Administration, 2014). Using hypothetical claiming scenarios that provided participants with standard benefits information, we replicated survey and real-world data showing that many Americans prefer to claim benefits early (Behaghel & Blau, 2010; Coile et al., 2002; Muldoon & Kopcke, 2008; Song & Manchester, 2007; Social Security Administration, 2014).

**Eligibility and claiming.** As would be expected if impatience is one of the drivers of claiming, the trend toward early claiming was less pronounced for those not yet eligible for benefits and more pronounced for those already eligible for benefits. For participants who were not yet eligible to claim retirement benefits, 36% preferred to claim early and 26% preferred to claim as early as possible. For those who were already eligible to receive benefits, 61% preferred to claim early and 42% preferred to claim as early as possible. This is consistent with survey data showing that consumers who are considering the retirement decision prospectively think they will claim later than they actually do (Helman, Copeland, & VanDerhei, 2009). An independent

samples *t* test (assuming unequal variances) confirmed that participants who were eligible for benefits preferred to claim at significantly earlier ages (M = 64.50 years, SD = 2.69) than did participants who were not yet eligible for benefits (M = 65.94 years, SD = 2.91), t(1210.1) = 9.16, p < .001, Cohen's d = 0.51 (see Table S2 for additional analyses).<sup>4</sup>

Table S2

(dummy coded)

coded)

income

savings

health

longevity risk

Retirement plan (dummy

Standardized education

Standardized household

Standardized retirement

Standardized perceived

Standardized perceived

	Preferred claiming age							
				Not-yet	t-eligible	Elig	gible	Ī
	All part	icipants <sup>a</sup>		partic	ipants <sup>b</sup>	partici	ipants <sup>c</sup>	
Predictor	В	SE		В	SE	В	SE	
Constant	65.65***	0.20		65.64***	0.27	65.06***	0.28	
Prominence of early-claiming thoughts	-1.99***	0.07		-2.03***	0.10	-1.91***	0.11	
Eligibility (dummy coded)	-0.55***	0.14						
Female (dummy coded)	0.10	0.14		0.12	0.21	0.05	0.20	1
Married or living together			T					1

0.15

0.17

0.07

0.08

0.08

0.07

0.07

0.15

 $-0.42^{\dagger}$ 

0.27\*\*

0.11

-0.08

0.37\*\*\*

0.07

0.21

0.23

0.10

0.11

0.12

0.11

0.10

-0.07

-0.15

0.15

0.03

-0.02

0.32\*\*

 $0.18^{\dagger}$ 

0.21

0.24

0.10

0.13

0.11

0.10

0.09

0.05

-0.32<sup>†</sup>

0.22\*\*

0.08

-0.05

0.35\*\*\*

 $0.12^{\dagger}$ 

Predictors of Preferred Claiming Age for All Participants, Not-Yet-Eligible Participants Only, and Eligible Participants Only, Study 1

<sup>&</sup>lt;sup>4</sup> An analysis of the subset of participants in the same cohort finds the same result as the analysis on the full sample: Among participants with a full retirement age of 66 years, eligible participants preferred to claim at significantly earlier ages (M = 64.47 years, SD = 2.67) than did not-yet-eligible participants (M = 65.70 years, SD = 2.87), t(1053.6) = 7.25, p < .001.

*Note.* The dependent variable was preferred claiming age (62–70 years). <sup>a</sup> N = 971. <sup>b</sup> N = 555. <sup>c</sup> N = 416. †p < .10. \*\*p < .01. \*\*\*p < .001.

To look at differences in what predicted claiming as a function of eligibility, we conducted separate linear regressions for participants not yet eligible for benefits and for participants already eligible for benefits. The regressions used present bias (standardized  $\beta$ ), discount fraction (standardized  $\delta$ ), standardized perceived longevity risk, and standardized perceived health as predictors of preferred claiming age (see Table S3). First we looked at how the effects of present bias and discount fraction differed by eligibility. For those not yet eligible, neither present bias nor discount fraction was significant, whereas for those already eligible, present bias predicted earlier claiming (B = 0.47, SE = 0.23), t(159) = 2.06, p = .04, partial  $r^2 = .03$ , but discount fraction was not significant. Taken together, these results demonstrate that present bias predicted a preference for claiming at earlier ages for eligible participants but not for not-yet-eligible participants.

#### Table S3

Comparison of Time Preferences and Normative Predictors of Preferred Claiming Age for Not-Yet-Eligible Participants Only and Eligible Participants Only, Study 1

	Preferred claiming age		·	
	Not-yet	-eligible		
	partici	pants <sup>a</sup>	Eligible par	rticipants <sup>b</sup>
Predictor	В	SE	В	SE
Constant	65.75***	.19	64.55***	.21
Standardized beta	0.04	.21	0.47*	.23
Standardized delta	0.31	.22	-0.15	.22
Standardized perceived				
longevity risk	0.55**	.20	0.40*	.20
Standardized perceived				
health	0.42*	.20	0.15	.18

*Note.* The dependent variable was preferred claiming age (62–70 years). <sup>a</sup> N = 226. <sup>b</sup> N = 164. \*p < .05. \*\*p < .01. \*\*\*p < .001.

We also looked at differences in which normative predictors predicted claiming as a function of eligibility. For those not yet eligible, both greater perceived longevity risk and better perceived health predicted claiming at later ages, B = 0.55, SE = 0.20, t(221) = 2.76, p = .006, partial  $r^2 = .03$ , and B = 0.42, SE = 0.20, t(221) = 2.12, p = .04, partial  $r^2 = .02$ , respectively. For those already eligible, greater perceived longevity risk marginally significantly predicted claiming at later ages (B = 0.40, SE = 0.20), t(159) = 1.99, p = .05, partial  $r^2 = .02$ , but perceived health was not significant. For participants who were not yet eligible, traditional economic factors significantly predicted claiming preferences significantly predicted claiming preferences whereas time preferences did not. For participants who were already eligible, time preferences significantly predicted claiming preferences whereas traditional economic factors were less strong predictors.

**Query theory and claiming.** If consumers approach claiming as a delay-framed intertemporal choice (in which early claiming is the explicit or implicit focal option), early claiming may be considered more than later claiming. To examine this, we used participants' self-coded thoughts to identify which claiming age they thought about most: early, full, or

delayed (that is, the relative number of thoughts about claiming before, at, or after the age at which individuals receive full benefits, respectively). A minority of participants reported no relevant thoughts (2%) or thought about two or more claiming periods equally (14%). As expected, early claiming (42%) was treated as the focal option by more participants than were full claiming (18%) or delayed claiming (24%). This pattern is more pronounced for participants who report that they are already receiving benefits but still holds for participants who report that they are not yet receiving benefits and even participants who report they have not yet even considered the decision (see Table S4). Although the claiming decision does not have an explicit default, these results suggest that early claiming is an implicit focal option for many participants, regardless of the level of planning or deliberation they have previously conducted.

#### Table S4

Implicit Focal Option for All Participants, Participants Already Receiving Benefits, Participants Not Yet Receiving Benefits, and Participants Not Yet Receiving Benefits and Reporting No Prior Consideration, Study 1

			Impli	cit focal o	ption	
	Ν	Early claiming	Full claiming	Delayed claiming	Multiple implicit focal options	No relevant thoughts
All participants	1292	42%	18%	24%	14%	2%
Participants who are already						
receiving benefits	413	61%	16%	10%	11%	1%
Participants who are not yet						
receiving benefits	879	34%	18%	30%	16%	2%
Participants who are not yet						
receiving benefits and report that						
they "haven't thought about it"	26	31%	23%	27%	15%	4%

*Note.* Implicit focal option is the claiming option for which a participant reported the highest relative number of thoughts.

Query theory posits that consumers will be likely to choose the option they consider to be the implicit focal option. To test this, we conducted additional analyses on participants' selfcoded thoughts. Participants listed an average of 2.80 relevant thoughts (Mdn = 2.00, SD = 2.41). Data from 27 participants providing only thoughts coded as "none of the above" were excluded from analyses on relevant thoughts. We measured thought clustering and order using the

standardized median rank difference metric: 
$$SMRD = \frac{2(MR_L - MR_E)}{n}$$
, where  $MR_L$  is the median

rank of thoughts favoring full or delayed claiming (that is, claiming at or after the age at which the individual would receive full benefits; *later-claiming thoughts*),  $MR_E$  is the median rank of thoughts favoring early claiming (that is, claiming before the age at which the individual would receive full benefits; *early-claiming thoughts*), and *n* is the total number of relevant thoughts (Johnson et al., 2007). Positive numbers indicate participants listed early-claiming thoughts before later-claiming thoughts, whereas negative numbers indicate the opposite—participants listed later-claiming thoughts before early-claiming thoughts. Randomly distributed earlyclaiming and later-claiming thoughts produce an SMRD of zero in expectation. We also subtracted the number of later-claiming thoughts from the number of early-claiming thoughts to measure the balance of support. We then created a measure of the *prominence of early-claiming thoughts* by averaging the *z* scores of SMRD and balance of support, r(1265) = .65, p < .001. Higher numbers indicate a greater prominence of early-claiming thoughts (that is, both earlier and more thoughts favoring early claiming).

We conducted a linear regression with prominence of early-claiming thoughts as a predictor. Confirming that the focal option predicts choice, the prominence of early-claiming thoughts was highly significant (B = -2.15, SE = 0.07), t(1263) = -32.61, p < .001, partial  $r^2 = .46$ . The earlier and more thoughts participants had in favor of claiming at early ages, the earlier

they preferred to claim: The participants with the most prominent early-claiming thoughts (that is, participants scoring in the top 25% on prominence of early-claiming thoughts) preferred to claim benefits over 4.5 years earlier than did the participants with the least prominent early-claiming thoughts (that is, participants scoring in the bottom 25%). In a second linear regression including traditional economic factors as predictors, participants' thoughts remained a strong predictor of preferred claiming age, even compared with benefit eligibility and traditional economic factors, such as education, wealth, perceived longevity risk, and perceived health (see Table S2).<sup>5</sup>

## Study 2

#### **Method and Analysis**

Study 1 showed that, given the standard presentation of benefits information, many people treat early claiming as an implicit focal option and this leads to a preference for early claiming in a hypothetical claiming decision. In Studies 2A and 2B, we tested representation interventions that revised the standard graphical presentation of benefits information to reframe early claiming as a loss compared with a reference point of later claiming and to make later claiming more visually prominent. We expected this to increase the prominence of later claiming in participants' thoughts (that is, to encourage people to think about later claiming more often and before early claiming) and to induce more people to prefer later claiming ages.

#### Method

**Participants and procedure.** Participants (N = 521 in Study 2A; N = 377 in Study 2B) met the same eligibility requirements and were recruited from the same online panel as in Study

<sup>&</sup>lt;sup>5</sup> Analyses that address the correlation between age and eligibility (for example, a regression controlling for the absolute value of the difference between current age and age of eligibility and a regression using only the subset of participants who are within two years of their age of eligibility) revealed the same pattern of results.

1. For Study 2A, excluding data from 113 (22%) participants who did not complete the study left data from 408 participants for further analysis. The procedure and measures were the same as in Study 1, except that the graphical presentation of benefits information was modified as described below.

**Benefits information.** As in Study 1, participants were presented with cohort-tailored benefits information that used both text and a graph to explain how claiming at different ages between 62 and 70 years would affect the monthly amount they would receive for the rest of their lives. Unlike in Study 1, participants were randomly assigned to see either the standard graph (Figure 1A in the main article or the screenshot below) or an alternative graph. Because of a programming error, the graphs for Studies 2A and 3 had incorrect dollar amount labels on the bars for very late claiming ages (the monthly benefit for claiming at 68 years was mislabeled as \$1,116 instead of \$1,160; at 69 years, as \$1,124 instead of \$1,240; and, at 70 years, as \$1,132 instead of \$1,320). However, the height of the bars was correct, as were the dollar amounts in the text. Corrected graphs are shown in Figure 1 in the main article; original graphs appear in screenshots below. The error was the same in both the control and the treatment conditions and thus should not impact between-conditions analyses. Further, comparison of control condition results with Study 1 (where the graph was correctly labeled) revealed no significant effect of this error.

In Study 2A, the alternative graph had a shifted *x*-axis (that is, *x*-axis at \$1,000 rather than \$0; see Figure 1B in the main article or the screenshot below). Whereas the standard graph depicts later claiming as a gain (that is, a larger monthly benefit compared with a reference point of early claiming), the shifted-axis graph was intended to reframe early claiming as a loss (i.e., a smaller monthly benefit compared with a reference point of later claiming). In Study 2B, the

alternative graph (see Figure 1C in the main article or the screenshot below) was redesigned so that claiming age was on the *y*-axis, monthly benefits were shown as amounts relative to full benefits, and bars were color coded (positive amounts were shown in green and negative amounts were shown in red). These changes were intended to be an even stronger manipulation reframing early claiming as a loss. In both Studies 2A and 2B, the written description of benefits was held constant across conditions.

#### Data, Analyses, and Results

Independent samples *t* tests indicated that neither representation intervention had a significant effect on the prominence of later-claiming thoughts or on preferred claiming age. However, in both studies, means were in the expected directions for preferred claiming age: In Study 2A, participants viewing the shifted axis graph (M = 65.63 years, SD = 2.92) preferred to claim slightly later than did participants viewing the standard axis graph (M = 65.41 years, SD = 2.96), and, in Study 2B, participants viewing the redesigned graph (M = 65.32 years, SD = 2.95) preferred to claim slightly later than did participants viewing the standard graph (M = 65.22 years, SD = 2.92). Thoughts coded by participants showed no differences between conditions.

#### Study 3

#### Method and Analysis

In Study 2, representation interventions that use graphical depictions of benefits information to reframe the claiming decision and increase the visual prominence of later claiming did not lead participants to think more or earlier about later claiming, nor did they significantly impact preferred claiming age. In Study 3, we tested a process intervention that actively encourages people to change the order in which they consider their claiming options. We expected asking participants to focus on the future first would increase the prominence of later claiming in participants' thoughts (that is, encourage people to think about later claiming more often and before early claiming) and induce more people to prefer later claiming ages.

#### Method

**Participants and procedure.** Participants (N = 521) met the same eligibility requirements and were recruited from the same online panel as in Study 1. Excluding data from 103 (20%) participants who did not complete the study left data from 418 participants for further analysis. The procedure and measures were the same as in Study 1, except that the thought-listing task was modified as described below.

**Thought listing.** Participants completed two separate thought-listing tasks, the order of which was randomly assigned. In the standard thought order condition, participants were first asked to list all of their thoughts in favor of early claiming (that is, claiming before the age at which individuals receive full benefits). They were then asked to list all of their thoughts in favor of later claiming (that is, claiming at or after the age at which individuals receive full benefits). In other words, participants were asked to list their thoughts in the order cued by the standard presentation of benefits information in Study 1. In the reverse thought order condition, this order was flipped—participants were first asked to list all of their thoughts favoring later claiming and then asked to list all of their thoughts favoring early claiming. The thought-coding task was the same as in Study 1.

#### Data, Analyses, and Results

**Impact of thought order.** To gauge the impact of changing the order in which participants considered claiming options, we first looked at participants' self-coded thoughts. Ninety-six participants listed the wrong type of thoughts in the first thought-listing task (that is, listed thoughts favoring later claiming when asked for thoughts favoring early claiming, or vice versa); this did not differ between conditions. Because these participants did not follow task instructions, we excluded their data from analyses of the manipulation. We used the relative number of thoughts about early or later claiming to determine participants' implicit focal option; for this analysis only, we excluded 106 participants who thought about two or more claiming periods equally. As expected, more participants treated later claiming as the focal option in the reverse thought order condition (44%) than in the standard thought order condition (18%). An independent samples *t* test confirmed that participants in the reverse thought order condition treated later claiming ages as focal, t(214) = -3.32, p = .001, Cohen's d = 0.45.

Furthermore, the process manipulation successfully delayed preferred claiming age. Participants who listed their thoughts in the reverse order (M = 65.59 years, SD = 2.93) preferred to claim benefits at a later age than did participants who listed their thoughts in the standard order (M = 64.81 years, SD = 2.72). As expected, an independent samples *t* test (assuming unequal variances) confirmed that participants in the reverse thought order condition preferred to claim benefits later, t(319.9) = -2.47, p = .01, Cohen's d = 0.28.

**Mediation by prominence.** Participants listed an average of 4.52 relevant thoughts (*Mdn* = 4.00, SD = 2.32). As in Study 1, after excluding data from one participant who provided only "none of the above" thoughts, we created a measure of the prominence of early-claiming thoughts by averaging the *z* scores of SMRD and balance of support, r(321) = .25, p < .001. Higher numbers indicate a greater prominence of early-claiming thoughts (that is, both earlier and more thoughts favoring early claiming). Participants who were asked to list thoughts about claiming later before thoughts about claiming early (M = -0.62, SD = 0.53) expressed fewer and later thoughts favoring early claiming (and therefore more prominent thoughts favoring later claiming) than did participants who were asked to first list their thoughts about claiming early

and then listed thoughts about claiming later (M = 0.62, SD = 0.35). An independent samples *t* test (assuming unequal variances) showed that the manipulation successfully reduced the prominence of early-claiming thoughts, t(283.1) = 25.01, p < .001, Cohen's d = 2.77.

Because the query theory process intervention was successful in changing participants' thoughts and claiming preferences, we were able to test whether the reduced prominence of participants' early-claiming thoughts mediated the effect of the manipulation on claiming preferences. Following the steps outlined by Baron and Kenny (1986) and Shrout and Bolger (2002), we performed a series of linear regressions. First, we regressed preferred claiming age onto condition (dummy coded: 0 = early-claiming thoughts first, 1 = later-claiming thoughts first), which was significant (B = 0.80, SE = 0.32), t(319) = 2.53, p = .01, partial  $r^2 = .02$ . Second, we regressed prominence of early-claiming thoughts onto condition, which was significant (B = -1.25, SE = 0.05), t(319) = -24.72, p < .001, partial  $r^2 = .66$ . Third, we regressed preferred claiming age onto condition and prominence of early-claiming thoughts. Unexpectedly, condition was significant in the opposite direction from before (B = -1.70, SE = 0.51), t(318) = -3.31, p = .001, partial  $r^2 = .03$ . Although this result is surprising, the net effect of the manipulation is still a delay in preferred claiming age but suggests that the query order manipulation affected other, unmeasured mediators of claiming age (Zhao, Lynch, & Chen, 2010), a question that is deserving of further research. It is important to note that, as predicted, prominence of early-claiming thoughts remained significant (B = -2.00, SE = 0.33), t(318) = -6.01, p < .001, partial  $r^2 = .10$ . Bootstrapping tests found significant mediation (p < .001). As expected, participants asked to list thoughts in the reverse order had later and fewer thoughts favoring early claiming and this led to a preference for later claiming.

## Screenshots of Study Materials

**Claiming Decision.** To mimic SSA's presentation of benefits information, we used both text and a graph to explain how claiming at different ages between 62 and 70 years would affect the monthly benefit amount participants would receive for the rest of their lives. Benefits information was tailored to participants' cohort to reflect the increasing age at which beneficiaries receive full retirement benefits. For each study, the screenshot depicts the task seen by participants with a full retirement age (that is, the age at which the participant was eligible to receive full retirement benefits) of 66 years.<sup>6</sup> Participants with a full retirement age of 67 years saw the same task, but with ages and benefits appropriate for their cohort.

<sup>&</sup>lt;sup>6</sup> Because of a programming error, the graphs used in Studies 2A and 3 had incorrect dollar amount labels on the bars for very late claiming ages; however, the height of the bars and the dollar amounts in the text were correct. Figure 1 in the main article shows corrected graphs. The error was the same in both the control and treatment conditions and thus should not impact between-conditions analyses. Further, comparison of control condition results with Study 1 (where the graph was correctly labeled) revealed no significant effect of this error.

### **Collecting Social Security Benefits.**

In this part of the study, we will ask you to think about, and express your thoughts about, collecting Social Security benefits.

#### Please consider the following scenario:

Imagine that you are approaching retirement and eligible for Social Security benefits based on your previous years of work. As you consider collecting benefits, you have 3 options:

1. You may begin collecting benefits at full retirement age (age 66).

- 2. You may begin collecting benefits early (ages 62-65).
- 3. You may begin collecting benefits late (ages 67-70).

As shown below, the size of your benefits depends on the age at which you begin collecting them.



**Full Retirement Age:** If you begin collecting benefits at age 66, you will receive 100% of your benefits. In other words, you will receive a monthly check for 100% of your benefits each month for the rest of your life.

**Early Retirement:** If you begin collecting benefits **before** age 66, your benefits will be reduced based on the number of months early that you begin collecting. For example, if you collect benefits at age 62, you will receive 75% of your benefits. In other words, you will receive a monthly check for 75% of your benefits each month for the rest of your life.

**Delayed Retirement:** If you begin collecting benefits **after** age 66, your benefits will be increased based on the number of months late that you begin collecting. For example, if you collect benefits at age 70, you will receive 132% of your benefits. In other words, you will receive a monthly check for 132% of your benefits each month for the rest of your life.

Click here to continue



**Full Retirement Age:** If you begin receiving benefits at age 66, you will receive 100% of your benefits. In other words, you will receive a monthly check for 100% of your benefits each month for the rest of your life. In the example above, you would receive a monthly check for \$1,000 (not including cost-of-living adjustments) each month for the rest of your life.

**Early Retirement:** If you begin receiving benefits **before** age 66, your benefits will be **reduced** based on the number of months early that you begin receiving. For example, if you collect benefits at age 62, you will receive only 75% of your benefits. In other words, you will receive a **monthly check for 75% of your benefits each month for the rest of your life.** In the example above, you would receive a monthly check for \$750 (not including cost-of-living adjustments) each month for the rest of your life.

**Delayed Retirement:** If you begin receiving benefits **after** age 66, your benefits will be **increased** based on the number of months late that you begin receiving. For example, if you collect benefits at age 70, you will receive 132% of your benefits. In other words, you will receive **a monthly check for 132% of your benefits each month for the rest of your life.** In the example above, you would receive a monthly check for \$1,320 (not including cost-of-living adjustments) each month for the rest of your life.

Click here to continue



the number of months late that you begin receiving. For example, if you collect benefits at age 70, you will receive 132% of your benefits. In other words, you will receive a monthly check for 132% of your benefits each month for the rest of your life. In the example above, you would receive a monthly check for \$1,320 (not including cost-of-living adjustments) each month for the rest of your life.

Click here to continue

Study 2B: Redesigned graph condition.



# Thought-Listing Task

# Studies 1, 2A, and 2B.

Your Thoughts /	About Collecting Benefits
Before you indicate consider this decisio retirement age (age 6	your preference, please tell us everything you are thinking of as you on between beginning to collect benefits early (ages 62-65), at full 56), and delayed (ages 67-70).
We would like you to decision. Please enter	list any thoughts, <b>positive</b> or <b>negative</b> , that you might have about this ryour thoughts one at a time.
Please type your firs the "Enter" key to su	<b>t complete thought</b> in the box below and, as soon as you are done, hit ubmit your thought.
Thought 1:	
	(Maximum of 200 characters per thought.)

**Study 3:** Standard thought order condition.

Be	efore you indicate your preference, we would like you to first think about all of the reasons
yo	ou would want to <b>receive benefits early (before full retirement age)</b> .
Tł	his includes thoughts about:
	<ul> <li>why it would be good to receive benefits early (before full retirement age).</li> <li>why it would be bad to receive benefits later (at full retirement age or later).</li> </ul>
Pl	ease list any thoughts that would <b>favor receiving benefits early</b> . Please enter your
th	oughts one at a time. For your reference, the information about benefits reappears below.
Pl	ease type your <b>first complete thought</b> in the box below and, as soon as you are done, hit
th	as " <b>Enter</b> " key to submit your thought.
	Thought 1:

Thank you! Now that you have listed all of the reasons you would want to receive benefits early, we would like you to <b>think about all of the reasons you would want to receive benefits later (at full retirement age or later).</b> Click here to continue
Your Thoughts About Receiving Retirement Benefits LATER
Please think about all of the reasons you would want to <b>receive benefits later (at full retirement age or later)</b> .
This includes thoughts about:
<ul> <li>why it would be good to receive benefits later (at full retirement age or later).</li> <li>why it would be bad to receive benefits early (before full retirement age).</li> </ul>
Please list any thoughts that would <b>favor receiving benefits later</b> . Please enter your thoughts one at a time. For your reference, the information about benefits reappears below.
Please type your <b>first complete thought</b> in the box below and, as soon as you are done, hit the <b>"Enter</b> " key to submit your thought.
Thought 1:
(Maximum of 200 characters per thought.)

**Study 3:** Reverse thought order condition.

Your Thoughts About Receiving Retirement Benefits LATER
Before you indicate your preference, we would like you to first think about all of the reasons you would want to <b>receive benefits later (at full retirement age or later)</b> .
This includes thoughts about:
<ul> <li>why it would be good to receive benefits later (at full retirement age or later).</li> <li>why it would be bad to receive benefits early (before full retirement age).</li> </ul>
Please list any thoughts that would <b>favor receiving benefits later</b> . Please enter your thoughts one at a time. For your reference, the information about benefits reappears below.
Please type your <b>first complete thought</b> in the box below and, as soon as you are done, hit the " <b>Enter</b> " key to submit your thought.
Thought 1:

Thank you! Now that you have listed all of the reasons you would want to receive benefits later, we would like you to <b>think about all of the reasons you would want to</b> <b>receive benefits early (before full retirement age).</b> Click here to continue
Your Thoughts About Receiving Retirement Benefits EARLY
Please think about all of the reasons you would want to <b>receive benefits early (before full retirement age)</b> .
This includes thoughts about:
<ul> <li>why it would be good to receive benefits early (before full retirement age).</li> <li>why it would be bad to receive benefits later (at full retirement age or later).</li> </ul>
Please list any thoughts that would <b>favor receiving benefits early</b> . Please enter your thoughts one at a time. For your reference, the information about benefits reappears below.
Please type your <b>first complete thought</b> in the box below and, as soon as you are done, hit the <b>"Enter</b> " key to submit your thought.
Thought 1: (Maximum of 200 characters per thought.)

#### **Additional** References

Anderson, M. C., Bjork, R. A., & Bjork, E. L. (1994). Remembering can cause forgetting:

Retrieval dynamics in long-term memory. Journal of Experimental Psychology:

Learning, Memory, and Cognition, 20, 1063-1087. http://dx.doi.org/10.1037/0278-

7393.20.5.1063

Anderson, M. C., & Spellman, B. A. (1995). On the status of inhibitory mechanisms in cognition: Memory retrieval as a model case. *Psychological Review*, 102, 68–100. http://dx.doi.org/10.1037/0033-295X.102.1.68

- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173–1182. http://dx.doi.org/10.1037/0022-3514.51.6.1173
- Behaghel, L., & Blau, D. M. (2010). Framing Social Security reform: Behavioral responses to changes in the full retirement age (IZA Discussion Paper No. 5310). Retrieved from Social Science Research Network website: <u>http://ssrn.com/abstract=1708756</u>
- Benhabib, J., Bisin, A., & Schotter, A. (2010). Present-bias, quasi-hyperbolic discounting, and fixed costs. *Games and Economic Behavior*, 69, 205–223. http://dx.doi.org/10.1016/j.geb.2009.11.003
- Coile, C., Diamond, P., Gruber, J., & Jousten, A. (2002). Delays in claiming social security benefits. *Journal of Public Economics*, 84, 357–385. http://dx.doi.org/10.1016/S0047-2727(01)00129-3
- Hardisty, D. J., Appelt, K. C., & Weber, E. U. (2013). Good or bad, we want it now: Fixed-cost present bias for gains and losses explains magnitude asymmetries in intertemporal choice. *Journal of Behavioral Decision Making*, *26*, 348–361. http://dx.doi.org/10.1002/bdm.1771
- Health and Retirement Study. (2013, April). *HRS 2010 tracker final (Version 1.0) public use dataset*. Ann Arbor: University of Michigan.
- Helman, R., Copeland, C., & VanDerhei, J. (2009, April). *The 2009 Retirement Confidence Survey: Economy drives confidence to record lows; many looking to work longer* (Issue Brief No. 328). Retrieved from Employment Benefit Research Institute website: <a href="http://www.ebri.org/pdf/briefspdf/EBRI\_IB\_4-2009\_RCS2.pdf">http://www.ebri.org/pdf/briefspdf/EBRI\_IB\_4-2009\_RCS2.pdf</a>

- Johnson, E. J., Häubl, G., & Keinan, A. (2007). Aspects of endowment: A query theory of value construction. *Journal of Experimental Social Psychology: Learning, Memory, and Cognition, 33*, 461–474. http://dx.doi.org/10.1037/0278-7393.33.3.461
- Laibson, D. (1997). Golden eggs and hyperbolic discounting. *Quarterly Journal of Economics*, *112*, 443–477. http://dx.doi.org/10.1162/003355397555253
- Muldoon, D., & Kopcke, R. W. (2008). Are people claiming Social Security benefits later?(Issue in Brief No. 8-7). Retrieved from Center for Retirement Research at Boston College website:

http://crr.bc.edu/briefs/are people claiming social security benefits later.html

- Perfect, T. J., Moulin, C. J. A., Conway, M. A., & Perry, E. (2002). Assessing the inhibitory account of retrieval-induced forgetting with implicit-memory tests. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 28*, 1111–1119. http://dx.doi.org/10.1037//0278-7393.28.6.1111
- Phelps, E. S., & Pollak, R. A. (1968). On second-best national savings and game-equilibrium growth. *Review of Economic Studies*, *35*, 185–199. http://dx.doi.org/10.2307/2296547
- Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods*, 7, 422–445. http://dx.doi.org/10.1037//1082-989X.7.4.422
- Social Security Administration. (2014). Modeling income in the near term, Version 6 (MINT6). Retrieved July 29, 2014, from <u>http://www.ssa.gov/retirementpolicy/projection-</u> <u>methodology.html</u>
- Song, J., & Manchester, J. (2007). Have people delayed claiming retirement benefits? Responses to changes in Social Security rules. *Social Security Bulletin, 67,* 1–23.

- Toubia, O., Johnson, E. J., Evgeniou T., & Delquié, P. (2012). Dynamic experiments for estimating preferences: An adaptive method of eliciting time and risk parameters.
   *Management Science, 59*, 613-640. <u>http://dx.doi.org/10.1287/mnsc.1120.1570</u>
- Veling, H., & van Knippenberg, A. (2004). Remembering can cause inhibition: Retrievalinduced inhibition as cue independent process. *Journal of Experimental Psychology: Learning, Memory and Cognition, 30*, 315–318. http://dx.doi.org/10.1037/0278-7393.30.2.315
- Weber, E. U., & Johnson, E. J. (2011). Query theory: Knowing what we want by arguing with ourselves. *Behavioral and Brain Sciences*, 34, 91–92. http://dx.doi.org/10.1017/S0140525X10002797
- Weber, E. U., Johnson, E. J., Milch, K. F., Chang, H., Brodscholl, J. C., & Goldstein, D. G.
  (2007). Asymmetric discounting in intertemporal choice: A query-theory account. *Psychological Science*, 18, 516–523. http://dx.doi.org/10.1111/j.1467-9280.2007.01932.x
- Willemsen, M. C., Böckenholt, U., & Johnson, E. J. (2011). Choice by value encoding and value construction: Processes of loss aversion. *Journal of Experimental Psychology: General*, 140, 303–324. http://dx.doi.org/10.1037/a0023493
- Zhao, X., Lynch, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research*, 37, 197–206.