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Older and wiser? An affective science perspective on age-related challenges in financial decision making

Mariann R. Weierich,[1,2] Elizabeth A. Kensinger,[1,3] Alicia H. Munnell,[4] Steven A. Sass,[4] Brad C. Dickerson,[1] Christopher I. Wright,[1] and Lisa Feldman Barrett[1,3]

[1]Martinos Center for Biomedical Imaging, Massachusetts General Hospital and Harvard Medical School, Charlestown, MA 02129, USA, [2]Hunter College, CUNY, Department of Psychology, New York, NY 10065, USA, [3]Boston College, Department of Psychology, Chestnut Hill, MA 02467, USA, and [4]Center for Retirement Research at Boston College, Chestnut Hill, MA 02467, USA

Financial planning decisionss are fundamentally affective in nature; they are decisions related to money, longevity and quality of life. Over the next several decades people will be increasingly responsible for managing their own assets and investments, and they will be subject to the affective influences on active, personal decision-making. Many of these crucial decisions are made and revised across the lifespan, including when to buy or sell a home, how to save for childrens' education, how to manage healthcare costs, when to retire, how much to save for retirement and how to allocate retirement funds. As average life expectancy increases, many retirees will be faced with inadequate savings to live comfortably until the end of their lives. In the current article, we examine the problems of and potential solutions to inadequate financial planning through the lens of affective science, with an emphasis on how brain-based changes in affective processing with age might contribute to the challenge of financial planning.

Keywords: affect; neuroscience; retirement; decision-making; aging

INTRODUCTION

The first wave of Baby Boomers is reaching retirement age just as their investment portfolios have been drastically impacted by the latest economic crisis. A very large number of older adults must decide whether to retire as planned but with perhaps inadequate income, or to continue working for a few more years to rebuild their nest eggs as best they can. Regardless of their retirement plans, all adults with investments must decide whether and how to re-allocate their contributions as they age. An increasing number of people now must navigate the increasingly complicated and uncertain world of individual finance. They must make momentous decisions that have serious implications for themselves, their children and other family members, and for any organization or institution that relies upon their contributions. These crucial decisions are made under conditions of fluctuating risk and great uncertainty.

Under conditions of uncertainty, people largely rely upon heuristics to make decisions (e.g. Tversky and Kahneman, 1974) and in such situations often default to using affect to guide them (e.g. Forgas, 1995; Schwarz, 2000; Weber and Johnson, 2009). 'Affect' refers to the mental counterpart of internal bodily sensations associated with changes in homeostasis; it is typically described as a hedonic state varying in arousal (Russell, 2003; Bliss-Moreau and Barrett, 2009). Immediate affective responses can improve financial decisions where the consequences are immediate (Seo and Barrett, 2007) and can even overcome frame effects in decision-making (Seo *et al.*, 2010). How affect influences complex financial decisions with changing outcomes over the long term is a pressing question. In this article, we suggest that the propensity to use affect to guide financial decision making might become even more marked as people age. Using research in affective science, we discuss some of the challenges faced by people deciding how best to manage their personal finances. In addition, although affect influences decision making for everyone (e.g. Forgas, 1995), age-related changes in affective processing might be especially likely to contribute to less than optimal decision making in older adults. The research strongly suggests that individual financial decision making in older adults might not be as rational and forward-looking as it needs to be.

We begin by characterizing the problem of ever-increasing individual responsibility for financial management. A particularly salient example of this trend is the de-institutionalization of retirement. We then address the manner in which age-related changes in affective processing can influence the quality of financial decisions, especially for American workers now approaching traditional retirement age. In particular, we discuss how older adults may be less able to draw upon detailed past experience to accurately forecast their

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Correspondence should be addressed to Mariann Weierich, North Building Room 627B, Hunter College CUNY, 695 Park Avenue, New York, NY 10065, USA. E-mail: weierich@nmr.mgh.harvard.edu

own financial futures, leading them to rely more heavily on momentary experience when making such decisions. Because older individuals quickly regulate away negative feelings, and they might have reduced access to 'gut feelings' in the first place, they might project a blurry, but bright, financial future. Throughout the article, we pay particular attention to age-related changes in affective brain regions and circuitry; these changes can have a considerable influence on how people experience affect during decision-making and how people recruit affect to make choices (i.e. to choose the option that 'feels right'). Based on these findings, we present suggestions at individual, cultural and policy levels.

THE PROBLEM OF FINANCIAL PLANNING FOR THE FUTURE

Individual responsibility for financial planning is a relatively new phenomenon. In many countries, there is ever-increasing individual access to the capital market on the assumption that people can manage investment risk on their own. This 'democritization of finance' (Erturk *et al.*, 2007) now is involuntarily extended to many working adults, and people must decide for themselves how to allocate and manage investments. We focus on retirement planning, as it is one form of financial planning that is present across age groups (i.e. initial choices about retirement plans and subsequent decisions regarding re-allocation of funds), and is the goal of many financial decisions across the lifespan.

Around the turn of the last century (ca.1880–1920), retirement became institutionalized: long-term retirement decisions were made for workers, not by workers. Many large employers in the US (e.g. government, large corporations and universities) had accumulated a significant number of older employees (e.g. 70+ years of age) whose productivity often had declined with age.[1] For example, older adults were driving locomotives and negotiating major business deals, frequently below the desired level of competence (e.g. Graebner, 1980). During the early 20th century, workers routinely were encouraged to exit the workforce at around the age of 65. Rather than quitting or being fired, workers accepted the convention, collectively establishing a well-defined cultural pattern that was reinforced by fairly powerful financial incentives to stop working. Such institutionalized retirement had many advantages for both employer and worker. It routinized a fairly important personnel decision and transitioned workers out with little or no distress when (or before) their productivity began to wane. It provided employees with a more orderly and predictable work environment (Licht, 1983). Employers introduced defined benefit pension plans, thereby avoiding the public relations nightmare of dismissing elderly workers to a life of poverty. Social Security, which began as a kind of insurance against the inability to work for a wage (DeWitt, 1999) was paid to all retirees, augmenting their employer sponsored pension programs (US Social Security Administration, 2006). Perhaps most importantly, institutionalized retirement reduced uncertainty and personal responsibility for individual management of finances throughout the working years by ensuring financial health in old age. It introduced clear expectations about when a working relationship would end (Sass, 1997; Munnell and Sass, 2007, 2008) and did not require people to take much responsibility for setting up and managing their income past a certain age.

In sharp contrast to the era of institutionalized retirement, retirement now represents a self-designed and extended stage of life in the US and in other countries.[2] Many workers have been retiring earlier even as longevity increases, and the average length of time that people have to support themselves after ending their formal work life has expanded from ~10 years in the middle of the last century to 20 or 30 years by the century's end (e.g. Burtless *et al.*, 2002; US Social Security Administration, 2006). Key financial management decisions—how to save, how to invest savings and when to retire—now are made by workers, not for workers. In 2004, 63% of wage and salary workers covered by an employer retirement plan were covered by a defined contribution (i.e. employee allocation of funds and subject to market fluctuations) plan alone (Munnell and Sass, 2008). Defined benefit plans (i.e. employer-directed with guaranteed retirement income) covering many of the remaining 37% of covered workers, moreover, were shifting to hybrid formats that were legally defined as benefit programs, but for employees functioned much like a 401(k) (Munnell and Sass, 2008). According to some, since the 1970s, the notion of 'permanent income' has been irrelevant (Erturk *et al.*, 2007).

Even during the best of times and under the best circumstances, financial planning is tremendously complex. Decisions about how to allocate investment funds, how to buy or sell a home, how to save for childrens' education, and when to retire involve a host of considerations, including the projected costs and benefits of work *vs* leisure, projections about longevity and the potential cost of increasing health and long-term care needs,[3] understanding the risks and benefits of the range of financial products, projections about the path of returns on financial investments, whether or not to trust a financial advisor and how to choose one, and estimating the impact of inflation. It is difficult to obtain correct information about each of these factors, let alone set the optimal weighting for each or understand how they might influence each other. There are challenges in

[1]There is a vast range of individual differences in employee competence at any age; we are not implying here that older adults are necessarily less productive.

[2]Many countries continue to maintain national, government sponsored defined-benefit plans. In this article we focus on the decisions made by adults in countries for which defined contribution plans are becoming the norm (e.g. US, UK, Germany, Sweden, Russia and many Latin American countries), and for adults in any country where additional individual investments are the norm. Although we use retirement as the most salient example of future-oriented financial planning, we expect that the age-related phenomena will hold across financial situations in which individuals must make the decisions initially and perhaps revise those decisions as circumstances change.

[3]For example, one third of US citizens aged 65 and older are expected to spend at least one year in a nursing home, the cost of which is not covered by Medicare. Medicare also does not cover dental care and items that require private Medigap insurance, including some prescription medications (US Department of Health and Human Services).

estimating weighting over time, whereby the same rewards seem more valuable in the present than in the future (i.e. hyperbolic discounting; e.g. Ainslie and Haslam, 1992). In addition, the average level of financial literacy, or understanding of finances, is relatively low. For example, in a recent survey, 55% of adults and 66% of high-school students in the US did not understand the concept of inflation or interest rates, and 37% of Australians with investments did not know that their investments could fluctuate in value (OECD, 2004). Put it all together, and we are left with the conclusion that merely gathering more information might not clearly point to the wisest (i.e. most accurate) financial decisions.

Given this complexity, the shift from standardized employer-directed to individualized worker-directed planning now affects people across the lifespan. Young workers have time to plan appropriately for their financial futures, but also face the challenge of complex financial decisions that are made more difficult by high information load. This is particularly problematic, as retirement goal clarity has been shown to account for a significant percentage of financial planning activities (Hershey *et al.*, 2007). A combination of increased personal responsibility and unclear planning options may be responsible for an overall age cohort decrease in financial risk taking (i.e. modeled financial risk taking for Generation X members at age 50 was lower than the reported financial risk taking of Baby Boomers at age 50; Jianakoplos and Bernasek, 2006). Although a more conservative financial planning strategy is safer, it also does not allow for greater accumulation of wealth. Young workers will not fully experience the consequences of failing to plan adequately (or of planning too conservatively) until many years in the future. Middle-aged workers, for whom retirement rapidly has become a de-institutionalized, risk-laden stage of life (Munnell and Sass, 2008), are navigating financial planning often without the benefit of having witnessed their own parents making such decisions. For many of these workers, financial planning has shifted mid-stream from employer-directed benefit pensions to 401(k) plans that workers choose and manage themselves. These adults will receive reduced Social Security benefits, but they are increasingly exposed to rapidly rising health care costs, along with recent economic upheaval that has drastically affected their savings. They also might be influenced by investment firm ads that encourage them to purchase risky or costly products that are difficult to understand. Middle-aged adults thus must manage financial decisions that people find challenging at any age, and these decisions are made even more difficult by a number of affective factors. For example, uncertainty regarding the current economic situation was reflected in a recent Pew Research Survey (2009) finding that 52% of US adults aged 50–64 have considered delaying retirement in the past year.

Older adults are the majority of current retirees who retired following a long-term relationship with a single employer and whose employer-defined pension plans (augmented by Social Security funds) now might not be sufficient to see them through to the end of their lives. These adults must decide how to manage their remaining assets and balance them with increasing healthcare costs. Financial decisions thus are fraught with uncertainty even as they have major implications for individual and family quality of life. Although most research investigating age-related changes in affective processing has focused on older adults (e.g. >65 years), some studies suggest that findings of age-related affective changes are quite relevant for middle-aged adults as they grow into older adulthood. For example, the breakpoint for decision making performance on the Iowa Gambling Task in adults aged 26–85 was age 55 (Fein *et al.*, 2007), which was consistent with earlier work demonstrating less advantageous decision making in 56–85-year-old compared to 26–55-year-old (Denburg *et al.*, 2005).

A BRIGHT BUT BLURRY FUTURE?

One salient aspect of financial decision-making is the need to envision the future with sufficient detail to estimate later needs and desires. In this section, we discuss how older individuals have difficulty imagining the future, leading them to rely more heavily on their current affective state to make decisions whose outcomes will not actually be realized until much later. Unfortunately, using current feelings to predict the future is not always advisable, and it can lead to affective forecasting errors. Furthermore, older individuals exhibit habitual affect regulation strategies are characterized by marked inattention to negative information and, to some extent, increased attention to positive, potentially compounding the challenges of anticipating the daily reality of the future (e.g. retirement). The result is a recipe for optimistic, but not necessarily realistic, financial planning.

Diminished mental time travel

To plan for their financial future, people must first envision that future. Envisioning the future requires drawing upon past experiences (i.e. memory) to simulate what will happen or how events will feel in the future (Addis *et al.*, 2007; Tulving, 1985). Although people do not expect future events to be exactly the same as specific moments from the past, they do anticipate that the future will contain many of the same who–what–where elements that were experienced previously (Schacter *et al.*, 2008). The strongest recent evidence for the role of memory in prospective mental time travel comes from neuroimaging studies that compare blood oxygen level dependent (BOLD) responses during remembering and during imagining of the future (e.g. Addis *et al.*, 2007; Schacter *et al.*, 2007; Szpunar *et al.*, 2007). The same regions that are recruited during memory retrieval (i.e. the hippocampal formation within the medial temporal-lobe, the lateral prefrontal cortex and lateral parietal regions) also show increased activation when thinking about the future, suggesting a common circuitry for mental time

travel. In fact, medial temporal lobe activation can be even greater when thinking about the future compared to the past (Okuda *et al*., 2003), because imagining the future requires features from past experiences to be combined in novel ways. The medial temporal lobe is a region known to be essential for the recombination and re-experiencing of different elements of a memory; its activity corresponds to the ability to know the context of a past event and to remember features such as who was present or where the event occurred (see Eichenbaum and Lipton, 2008; Suzuki, 2008 for recent reviews). Individuals with amnesia secondary to hippocampal damage display a marked inability to imagine future events, demonstrating that the unavailability of past information impairs the generation of future scenarios (Hassabis *et al*., 2007).

There are significant reductions in hippocampal volume and function with normal aging (e.g. Raz *et al*., 2004; Dennis *et al*., 2008), and there are related decreases in episodic memory (e.g. Light, 1991; Small *et al*., 2002; Head *et al*., 2008). These deficits are particularly pronounced when older adults try to remember the specific features of past experiences. For example, older adults are more likely to remember only the 'gist' or general theme of presented information (e.g. 'I studied a bunch of furniture') rather than the details (e.g. 'I saw a table and a couch and a bed'; Tun *et al*., 1998; Koutstaal, 2003). Even when both gist-based and detailed information are available to older adults, older adults are less likely than young adults to focus on the detailed information. Older adults seem more rigidly tied to retrieval of gist-based information, whereas young adults seem to have more flexibility in terms of the types of information that they can retrieve (Koutstaal, 2003, 2006). Many of these deficits are not only due to shrinkage of the medial temporal lobe, but also from a failure to recruit the medial temporal lobe during episodic encoding and retrieval (see Budson, 2009; Sperling, 2007 for recent reviews). Older adults also show altered recruitment of the prefrontal cortex in the context of episodic memory (see review by Budson and Price, 2005), and these frontal changes may affect their ability to retrieve specific episodic details (e.g. Rajah *et al*., 2010) or to engage in effective retrieval monitoring (e.g. Guillaume *et al*., 2009).

These findings suggest that older adults will be somewhat impaired in using detailed memory for past experiences to project themselves into a detailed future, and indeed, this appears to be the case. Just as older adults' past retrievals are less specific, older adults' future projections tend to be more general (less detailed) than young adults' future projections (Addis *et al*., 2008), potentially further implicating changes in hippocampal function with aging. In addition, older adults with the poorest associative memory, an ability that relies upon hippocampal function, also have the most over-general future episodic simulations (Addis *et al*., 2008). This finding is consistent with the hypothesis that hippocampal re-binding of episodic features allows people to generate detailed future simulations (Schacter and Addis, 2007). Without the ability to clearly remember and re-bind episodic features, older adults might be left with only the ability to envision a 'blurry' future. Although focusing on the big picture can be beneficial for some types of decision making, an inability to imagine the details of retirement, for example, might make it difficult for people to accurately make financial decisions, such as predicting when to retire, and the relative costs of no longer working.

Older adults also might erroneously view the future as exceptionally bright because of age-related changes in processing rewards and losses. Anticipated reactions to positive and negative future events can be more intense than reactions to remembered past events (Van Boven and Ashworth, 2007), but compared to young adults, older adults show less negative affect when anticipating loss (Nielsen *et al*., 2008). Both age groups also show similarly strong insula responses when anticipating rewards, although older adults showed a relative lack of insula activation when anticipating loss (Samanez-Larkin *et al*., 2007). Thus, older adults' visions of the future might be driven more strongly by their reactions to possible rewards (e.g. leisure time) than by their reactions to possible costs (e.g. loss of income, loss of social contacts, reduced feelings of efficacy).

Taken together, these findings predict that when thinking about future financial decisions, such as when to retire, older adults will think about the positive aspects of their future in a general, gist-based fashion (e.g. 'I will travel', 'I will relax') rather than focusing on the specifics (e.g. Where will I travel? With whom? How much money will that require?), or on potential negative aspects (e.g. 'I will not see my colleagues and work friends', 'My income will be fixed and restricted'). Moreover, even if older adults consider potential negative aspects of future retirement, they might have a weaker response to this anticipated loss. As a consequence, older adults are at risk of viewing life after retirement through hazy rose colored glasses.

The power of now

The bright but blurry future in retirement might be enhanced by the way in which people use their current affective state to augment forecasts about the future. When there is little detailed information about the future, either because it cannot be retrieved or because it was not available in the first place, people tend to use how they feel in the moment as a proxy for what the future will hold (for a review, see Gilbert and Wilson, 2009). With advancing age, the tendency to use current affective reactions to predict the future might be enhanced and lead to additional bias in conceptualizing the nature of retirement. In the absence of readily available specific information from the past to guide mental time travel into the future, older adults might be more likely to default to how they feel in the moment as a means of predicting the future and influencing decision making. In so doing, they might be likely to overestimate

the impact of a future event on their emotional response (Gilbert *et al.*, 1998). Although all people have been shown to exhibit such affective forecasting errors, the limits to older adults' recollections of the past make this error particularly impactful. Exacerbating the error is the fact that, when predicting the future, people tend to craft a mental representation that contains only the essential features that define an event and omit the features that are merely incidental to it (Wilson *et al.*, 2000; Gilbert and Wilson, 2007). The failure to insert more incidental or contextual features of future events leads people to mis-predict their affective reactions to future events as more extremely positive or negative (e.g. Liberman *et al.*, 2002). People also make predictions about the initial stages or aspects of a future event, rather than how it unfolds over time (Gilbert and Wilson, 2007), and the concept of retirement as an extended vacation may stem from this tendency. The reality of retirement is somewhat different, however; following an initial 'honeymoon' or 'rest and relaxation' phase, periods of disenchantment, reorientation, and more realistic routine eventually follow (Atchley, 2000).

Of course, not all momentary affective experience is pleasant, and people also make affective forecasting errors on the basis of unpleasant, negative affect (Liberman *et al.*, 2002). In particular, making decisions based on negative expectations (Golub *et al.*, 2009) or predicted future regret (Gilbert *et al.*, 2004) seem to be especially costly and unnecessary; people usually overestimate their experience of future negative affect and thus make unnecessary decisions to avoid imagined future discomfort. We speculate that older individuals are less likely to use momentary negative affective experiences for affective forecasting, although the evidence is far from straightforward. It is now well known that people use the somatovisceral cues that derive from autonomic arousal to make financial decisions (e.g. Denburg *et al.*, 2005). The anterior insula is a key brain structure for constructing an interoceptive (feeling-based) representation of somatovisceral cues (Craig, 2002, 2009). Some recent evidence suggests that somatovisceral cues, experienced as negative affect (i.e. the 'pain of paying'; e.g. Rick *et al.*, 2008), can keep people from spending unwisely. Knutson and colleagues recently showed that insula activity increases when people are confronted with excessive prices for potential purchases, supporting the idea that the prospect of paying can be painful (Knutson *et al.*, 2007). Similarly, strong increases in anterior insula activity occur when people select risky options in a decision-making task (Paulus *et al.*, 2003), and individuals with larger insula responses to anticipated losses are better able to learn to avoid them (Samanez-Larkin *et al.*, 2008). The ventral striatum, including the nucleus accumbens, also is implicated in the interoceptive experience of risky choices (e.g. Kuhnen and Knutson, 2005; Knutson and Greer, 2008). Older adults demonstrate less ventral striatal activation during in-the-moment reward learning (Mell *et al.*, 2009), again highlighting the difficulty of accurate risk predictions in older age. Older adults also display more temporal variability in the nucleus accumbens compared to young adults; this variability is associated with sub-optimal risk taking performance (Samanez-Larkin *et al.*, 2010).

Older individuals appear to receive less intense afferent sensory information from the body, which could differentially influence their ability to affectively forecast negative experiences. Meta-analytic evidence shows that negative affective experiences involve significantly more autonomic arousal than both pleasant and neutral experiences (Cacioppo *et al.*, 2000). Older people, however, often have blunted peripheral nervous system responses (e.g. Tsai *et al.*, 2000), including less intense sympathetic nervous system reactions to risk (for example, an absence of differences in skin conductance responses to advantageous and disadvantageous choices in the Iowa Gambling Task; Denburg *et al.*, 2006). Older adults also show deficits in the dopaminergic system that are associated with a decreased ability to make reward associations (e.g. Li *et al.*, 2007; Mohr *et al.*, 2010), which is consistent with a dampened affective response that could lead to difficulty with risk assessment. Older adults also appear to be less interoceptively sensitive (Mendes, 2010). Taken together, this evidence suggests that older individuals may not experience the 'pain of paying' when they imagine forgoing their regular income to retire. It also might be difficult for them to forecast their discomfort at the prospect of running out of money near the end of their lives. We note that this difficulty is not unique to older adults, but that, in combination with other age-related changes in affective processing, it is especially likely to impact financial decision making for older adults. On the other hand, older individuals routinely show increased anterior insula responses to evocative stimuli (e.g. Fischer *et al.*, 2005; Keightley *et al.*, 2007) and risk taking (Lee *et al.*, 2008) in the moment. This age-related increase might be compensatory, however, because the caudal insula, which serves as primary sensory cortex for somatovisceral cues, thins with age (e.g. Sowell *et al.*, 2003).

Alternatively, sensory information might be available from the body at similar levels across the lifespan, but older individuals might learn to ignore it. Older adults are less able to regulate their autonomic functioning with age (i.e. they are less able to maintain homeostasis; e.g. Pfeifer *et al.*, 1983), so that they may routinely experience more variability in their bodily states. Given that much of this variation will not be psychologically meaningful or predictive, older individuals may learn to ignore the sensory cues that come from autonomic fluctuation, making it more difficult for them to use negative affective experience for the purpose of affective forecasting. On the other hand, older individuals appear to have an aversion to annuities (i.e. guaranteed payments for the remainder of the policy holder's life that require the initial investment of all funds; c.f. Poterba *et al.*, 2003), which might be evidence that even elderly individuals

can experience the discomfort of paying if it is intense enough.

The positivity effect

Whether or not older adults enact negative affective forecasting, the evidence shows that they are motivated to regulate negative experiences away, producing a 'positivity effect' that has implications for financial decision making. Older individuals are more likely to focus selectively on and cultivate the positive at the expense of the negative. They seem to engage in a kind of proactive emotion regulation strategy by which they divest themselves of activities and people that make them unhappy and limit their experiences to those that will make them feel pleasant (c.f. Mather and Carstensen, 2005). With only so many years left, it is important to spend them wisely. According to Socioemotional Selectivity Theory (Carstensen *et al*., 1999), people begin to prune negativity from their lives when they perceive time as more limited (as happens naturally with advancing age; Fung and Carstensen, 2004; Carstensen, 2006; Pruzan and Isaacowitz, 2006). People begin to focus less on opportunities (e.g. starting a career, buying a home) and more on limitations (e.g. not enough time left to switch careers) (Cate and John, 2007), and begin to prioritize positive activities and experiences. By other accounts, this positivity effect occurs because negative information is usually more complex than positive information, and so focusing on the positive is a way of dealing with declining cognitive resources (Consedine *et al*., 2002; Labouvie-Vief *et al*., 2003). Either way, early retirement might be a side effect of the positivity effect. Except for the wealthy, early retirement can jeopardize financial security near the end of life, yet early retirement is not uncommon. Regardless of their original plans, people sometimes decide to retire on the spur of the moment; for example, after a particularly bad day in the office. Pre- and post-retirement interviews with almost one hundred middle-income individuals showed that frustrations on the job are often the proximate cause of retirement, and that the triggering frustrations elicited a more tolerant response when workers were middle-aged (Weiss, 2005). This phenomenon is part of the reason why older adults retire, on average, at age 63 instead of retiring at age 67 (as they should) or age 65 (as they originally planned). Rather than retiring outright, some older adults quit a stressful job in favor of a lower stress and often lower-paying position (Hutchens, 1988, 1993), or a part-time position (Johnson and Kawachi, 2007). Although this delays retirement until an older age, lower wages and decreased contributions to retirement accounts also put retirement income at risk.

The tendency to retire early or downgrade a job to avoid ongoing stressful experiences of the workplace might be exacerbated by the fact that older individuals likely have more difficulty using cognitive means to regulate negative affect, leading them to rely more heavily on behavioral disengagement strategies. Older adults are able to avoid the negative and focus on the positive only when they have good cognitive control and when their cognitive resources are not occupied by a second task (Mather and Knight, 2005; Knight *et al*., 2007). Under cognitive load, however, older individuals show a focus toward the negative that is at least as strong as that in young adults (Mather and Knight, 2005; Knight *et al*., 2007). When not under load, older adults performed better than young adults on an emotional working memory task when the stimuli were positive compared to negative, whereas the pattern of results was reversed in younger adults (Mikels *et al*., 2005). Because older adults also have more difficulties with dividing attention than young adults (Verhaeghen and Cerella, 2002), perhaps due to age-related declines in prefrontal regions associated with cognitive control (e.g. Braver and Barch, 2002; see also Buckner, 2004), it is plausible that they would also find it more challenging to meet the demands of affect regulation during working hours. Moreover, as adding even a relatively easy distractor task is sufficient to deplete older adults' cognitive resources, older adults might be more likely to routinely experience such depleted states during the work day. When older adults have depleted cognitive resources, they might be less able to avoid negative information or to effectively regulate their negative affect.

Although the neural mechanisms leading to the regulatory effect in aging have not been investigated, at least some affect regulation processes (i.e. those that draw upon lateral prefrontal cortical regions; e.g. Ochsner *et al*., 2002) overlap with the same prefrontal cortical processes that are recruited to assist with dual-task coordination (e.g. Jiang, 2004; Yoo *et al*., 2004), inhibition of prepotent responses (e.g. Chikazoe *et al*., 2009), or selection of relevant information from among competing associations (see Wager and Smith, 2003 for review). Thus control of affect relies upon many of the same processes that are used to control other forms of cognition or behavior (Ochsner and Gross, 2005). Cognitive control typically is thought of as a limited resource; when resources are depleted in order to achieve task coordination or prioritization, those resources might not be available for emotion regulation.

In addition to selecting situations and interaction partners to maximize pleasant feelings, older individuals show a reduced tendency to attend and remember negative information, which could increasingly cast a rosy glow on retirement. A recent meta-analysis indicates that, in comparison to young adults, older adults direct less attention to and have worse memory for negatively valenced (*vs* neutral) stimuli, but this age difference was small (and tends to be more significant in tasks that require controlled processing; Murphy and Isaacowitz, 2008). Both older and younger individuals showed equal attention to or had better memory for positively valenced (*vs* neutral) stimuli, although there are notable exceptions to this meta-analytic finding. Older adults demonstrate a tendency to respond faster to positive compared to neutral face stimuli, and slower to negative

compared to neutral stimuli (Mather and Carstensen, 2003) and they have shown better memory for positive information compared to negative or neutral information (e.g. Charles *et al.*, 2003; Mather *et al.*, 2004; Mather and Carstensen, 2005). More recent studies of gaze patterns suggest, however, that older individuals do tend to look preferentially toward positive and away from some negative stimuli (Isaacowitz *et al.*, 2009). This positive preference in older adults emerged only 500 ms and later after stimulus onset and increased linearly over time, consistent with the idea that this positivity effect is due to cognitive control (Knight *et al.*, 2007). In addition, age-related deficits in long-term memory are sometimes erased when information is positive, whereas older adults typically are impaired in the long-term retention of negative or neutral information (e.g. Charles *et al.*, 2003; Kensinger *et al.*, 2007a and b). As a result of the age-related bias for positive and against negative information, retirement might seem like a great idea now and an even better idea for the future.

Age-related changes in the amygdala, the centerpiece of affective circuitry in the brain, also appear to occur for the processing of negative, rather than positive, stimuli. When viewing affective pictures (i.e. images from the International Affective Picture System), older adults had greater amygdala activation for positive *vs* negative pictures (Mather *et al.*, 2004). However, when compared with young controls matched on subjective ratings, the age-related differences were driven by decreased activation to negative pictures in older compared to younger adults rather than greater activation to positive pictures (Mather *et al.*, 2004). In addition, when using a finite impulse response analysis to model the timecourse of the amygdala response to affective pictures, older and young participants did not differ in magnitude of amygdala activation to positive IAPS images (compared to negative and neutral images; Moriguchi *et al.*, 2010). Instead, older and young individuals showed different timecourses of amygdala response to negative images. Young adults amygdala activation to negative information showed the canonical shape of peak BOLD activation followed by a gradual decrease over several seconds in the hemodynamic response. Older adults, however, showed a steep (i.e. rapid) decrease in amygdala activation following initial peak activation to negative information. This age-related difference in amygdala response was not due to vascular changes that occur with age (i.e. the timecourse of activation in other brain areas did not show the same efficient decrease).

Older adults' more efficient offset of the amygdalar response to affect is not specific to negative information. Novelty activates the same affective circuitry in the brain as valence and arousal (Weierich *et al.*, 2010), and older adults demonstrate similar timecourse differences in the amygdala response to novelty (Moriguchi *et al.*, 2010). Even when novel material is not overtly affective (i.e. it does not contain material with hedonic value), this material still broadly engages affective circuitry. That novelty is inherently affective suggests that affective processing might play a role in many forms of memory regardless of the hedonic value of stimuli. The functional implications of this new finding are just starting to be explored. For example, just as older adults divest themselves of negative experiences, in some cases appear to dismiss negative information, they also might develop a similar tendency to rapidly process and dismiss novel (i.e. potentially uncertain) information. In younger adults, uncertainty magnifies other affective reactions (Bar-Anan *et al.*, 2009) that could be used to inform relevant decisions, but the effect on older individuals is as yet unknown.

Although the cause of this increased efficiency of older adults' amygdala response to novelty and negativity is not yet known, one possible factor is age-related differences in functional connectivity between the amygdala and the rest of the brain during affective responding. The truncated amygdala timecourse (i.e. more rapid offset) to negative information was more strongly associated with orbitofrontal cortical activity in older adults, whereas the maintenance effect (i.e. extended amygdala activation) was more strongly associated with inferior frontal gyrus activity in younger adults (Moriguchi *et al.*, 2010). The stronger connection between the amygdala and areas that help regulate affective responses (i.e. orbitofrontal cortex) is somewhat consistent with other findings showing a change in the functional connectivity between the amgydala and affective circuitry involved in control of sensory processing. For example, one study showed a linear decrease in rostral anterior cingulate activation in anticipation of negative stimuli with age (Erk *et al.*, 2008). In addition, during negative picture viewing, older adults showed greater functional connectivity between the amygdala and ventral anterior cingulate along with decreased connectivity between the amygdala and perceptual areas compared to young adults (St. Jacques *et al.*, 2010). These results suggest both a more coordinated regulation of responses to negative information as well as decreased perceptual processing of negative information in older adults. To the degree that a focus on the potential negative outcomes of retirement might motivate good financial planning, older adults' regulation of negative information actually might contribute to retirement planning that fails to take potentially bad outcomes into account. Similarly, older adults might not allocate an optimal level of consideration and caution to novel financial planning information, as their faster regulation of novelty might rapidly decrease the feeling of uncertainty that ordinarily prompts people to make decisions more carefully.

HYPOTHESIZED IMPLICATIONS

In this section, we have discussed how older individuals might have a vision of a bright but blurry future that can lead them astray when planning for their financial futures, with a focus on retirement decisions. Realistically, the perception of retirement as a 'golden age' is an illusion;

retirement has become an extended phase of life characterized by financial instability, complexity, and uncertainty. Uncertainty is increased by diminished 'time travel' as people age; they not only are less able to remember the past but also are less able to project themselves into a future that is different from the present. In the absence of enough information for planning this phase, people's brains might default to what 'feels right' (i.e. is consistent with current affect). Although this strategy results in decisions that are congruent with affective experience at the time of the decision, it is actually extremely risky. Using only current affect to drive decision making minimizes the influence of relevant past experience and limits objective consideration of possible future scenarios. The strategy therefore can negatively impact decisions that are essential to the financial security of adults as they transition into retirement. This risk might be exacerbated by the fact that older individuals have a positivity bias. The normative aging process is characterized by a generally adaptive propensity to pursue pleasant experiences and limit unpleasant ones. Optimal financial decision making involves a careful assessment of both positive and negative factors, however, and older adults' tendency to focus selectively on positive information might set the stage for a number of errors in financial decision making. The potential age-related problems are compounded by the fact that Americans can expect to live an additional 20–30 years after retirement. When planning for retirement, people are not likely to compare the total span of their retirement to the same span during their 'early years' (e.g. ages 25–45), and plan accordingly. Thus adults' projections of the income required to maintain their desired lifestyles are likely to be seriously underestimated.

RECOMMENDATIONS

Affect plays a major role in all financial decisions, and this role is especially striking in its implications for retirement planning. Although poor financial planning is an issue at any stage of life, it might be particularly problematic as people age. By the time adults are approaching their planned retirement age, they might find that, due to inadequate planning or major decreases in investment returns, their accumulated savings are not sufficient for comfortable living. In a slightly different scenario, adults might save adequately for a pre-estimated number of retirement years, but fail to account for unexpected longevity. Adults in either of these situations who are currently nearing their predicted retirement age require an immediate solution. There are two broad options: people might continue save at a consistent rate to fund the duration of retirement, although they will have to sacrifice their originally planned retirement age and continue to work for five additional years or more. This option, with the accompanying need for potential changes in investment allocation, is an increasing reality in the current US economic climate. However, older adults who prioritize the positive, including an idealized retirement, might not recognize the detrimental effects of retiring before age 70. As a second solution, older adults might choose to let someone else plan for them; they can purchase annuities that on the one hand guarantee income until the end of their lives, but on the other hand can be extremely expensive and can preclude the provision of inheritance for family members. The choice of an annuity usually is driven by uncertainty and risk-aversion, thus older adults, who might be less likely to experience uncertainty in general and with regard to financial planning, might be less likely choose this option. At issue in both cases are the age-related affective changes that can preclude the insight that is necessary to pursue either of these options. In order to minimize the damage of inadequate planning, both options are potentially reasonable in terms of assuring adequate retirement income. However, widespread adoption of these strategies will require additional education on several levels.

On the individual level, educating young adults about the risks of inadequate financial planning could be a prophylactic measure, as science shows that young adults are more likely to process novelty and uncertainty, are more attentive to potential negative outcomes and are more likely to make decisions to avoid projected future negative affect. Younger adults might even be willing to enter into voluntary arrangements that pool risks, much like mutual funds pool the risk of owning individual securities, although older adults might be less willing to pursue this avenue. Conversely, emphasizing the positive aspects of work (e.g. keeping the mind active, social interaction, steady income) for older adults could appeal to their preferential focus on positive experiences. Reframing the definition of work by normalizing a 'down-shift' from high-intensity to low-intensity work, or from full- to part-time work for older adults also could help in institutionalizing a more effective and pleasant yet lengthier transition from work into retirement. On a more general scale, nothing convinces people like their own experience. Effective educational campaigns might suggest that people imagine spending a week living as they would live everyday retirement life, on the income they can reasonably expect, and with the challenges of navigating boredom, the loss of job-related identity, efficacy and importance, and dependence on caregivers. Such simulation could bring home the challenges of living on a less-than-adequate income for an extended period of time.

Cultural factors broadly defined, such as traditions, norms and expectations on the family level or the institutional level, also play a role in the structure of financial decision making (e.g. Bellante and Green, 2004). To the extent that family members willingly assume the responsibility of caretaking for older or extended family members, emphasizing the ways in which wise financial planning will better position the younger generation for education, home ownership, and their own retirement planning also might have a positive impact on financial decision making. In addition, emphasizing the ways in which working longer can make people feel

better would be congruent with the positivity effect and could have an effect on perceptions of the desirability of this avenue. Also on this level, the culture of a given employer institution can have an effect on retirement behavior by helping to set the perceptions of financial planning. Such educational interventions can be implemented relatively easily and without additional cost to companies. For example, automatic enrollment in a 401(k) program that requires 'opting out' rather than 'opting in' (i.e. new hires are automatically enrolled) has been shown to significantly increase participation as well as the maintenance of the default contribution rate (Madrian and Shea, 2001). In addition, employees who commit in advance to the allocation of part of their future salary increases toward retirement savings have been shown to participate in such a savings plan at high rates, remain enrolled, and significantly increase savings rates over as little as 40 months (Thaler and Benartzi, 2004). Such institutional changes in the perceived norms for retirement planning would help decrease uncertainty around planning, and framing these choices as positive would be consistent with older adults' emphasis on positive experiences.

Finally, on a policy level, an increase in the age at which workers can collect full Social Security benefits could shift societal expectations of the 'normal' retirement to an age more likely to provide sufficient income in retirement. According to one estimate, ~60% of those who retired at age 62 would have chosen to retire at age 64 if the early entitlement age (EEA) was raised to 64 (e.g. Gustman and Steinmeier, 2002). In addition, an increase in the EEA would send a clear message to both workers and employers that they should revise their expectations about the earliest age at which 'retirement' should begin.[4] In addition, it would be helpful to educate the public so that they feel the 'pain of paying' if they retire early; early retirement costs them important savings that they will need later. For example, based on the 2002 average wage index ($33 500) economists estimated that the assets needed for 21 years of 80% income replacement for an average earner retiring at age 67 were $66 900. The assets necessary for the same rate of income replacement for an average earner retiring at age 62 were $155 450 (Munnell *et al.*, 2004).

Now that the timing of retirement is largely determined by individual decisions, and financial decisions have been made even more complex by the current economy, understanding how affect influences retirement decision-making—and communicating reliable research findings to the public and policymakers—is critically important. Individuals and their family members need to be informed about the affective factors that too often drive crucial financial decisions. Given the significance of such factors, policymakers responsible for assuring reasonably secure retirements will also need to consider counter-weights, such as public education campaigns that appeal to affective decision-making, the promotion of retirement-age norms or defaults that partially or completely re-institutionalize the retirement process, or adjustments to public program rules, such as raising the earliest age at which adults can start collecting Social Security or access a 401(k) without penalty, that decrease the likelihood that individuals will jeopardize their well-being in retirement.

Financial decision making and financial security have become more complex and more uncertain than ever. Many adults have been forced to assume greater personal responsibility for making decisions that will indelibly impact their families and their futures. The personal stakes are high, and, in order to make sound financial decisions, people must use the tools at hand: the motivation provided by the feeling of uncertainty, the currently available information about planning, and realistic predictions about the future. Older adults who might not have planned adequately, or who suddenly might need to adjust their original plans due to the economic crisis, might be at particular risk for suboptimal financial planning. The very phenomena that are related to what we value as wisdom in older adults (c.f. Ardelt, 2003; Meeks and Jeste, 2009)—memory for the good events from the past, a bias toward the pleasant (or away from the unpleasant) in the present, and positive predictions about the future—put them at risk for being unable to live comfortably until the end of their lives. This risk is driven by a collection of age-related changes in affective processing, and information about the role of affect in financial decision making should be incorporated into initiatives aimed at enhancing financial planning on the individual, cultural and policy levels.

[4]Not everyone is convinced that raising the EEA is a good idea. Although most workers who currently claim benefits early would not face significant hardship, withholding access to Social Security benefits until age 64 would impose a hardship on workers who are in poor health and lack the assets to support themselves until age 64. An additional group might be healthy enough to work but unable to find employment. Critics also say that raising the EEA would be unfair to groups with a shorter life expectancy, such as low-wage workers. The unfairness to groups with low life expectancy could be offset within a package of reforms that produced a more even overall distribution of costs and benefits. Hardships created by a higher EEA could be addressed by expanded safety net programs, such as Social Security's Disability Insurance program for those in poor health or Unemployment Insurance and Supplemental Security Income programs for those unable to find employment (Cahill and Munnell, 2004).

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