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Social Cognitive Aging

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Brains and bodies age together. But an old brain has an important advantage over an old back or knee in that the accumulated experience that resides in the mind can help the brain compensate for neurobiological losses brought about by senescence. As a consequence, the cognitive changes that emerge with age paint a complex picture of loss, gain, and stasis, as diminished functioning in some domains offsets or interacts with enhanced knowledge and abilities in others. Social cognitive changes with age are more complex still, as motivational changes brought about by differences in time perspective and changing life goals interact with cognitive changes. Although many of these age-related changes are influenced by personality and circumstance, the overall signature of social cognitive aging is determined primarily by the varying strength of these competing motivational, neurobiological, and cognitive forces.

On the cognitive processing side, loss is the norm with aging, with older adults typically showing declines in the “mechanics of the mind,” such as processing speed, memory, executive functioning, reasoning, etc. (Hasher, Zacks, & May, 1999; Park & Gutchess, 2006; Salthouse & Ferrer-Caja, 2003). These cognitive losses often co-occur with other age-related losses, such as reduced strength and visual and auditory functioning, suggesting an underlying general physical decline (Anstey & Smith, 1999; Christensen et al., 2001). Despite the generality of such losses, however, there are also areas of preserved or even enhanced functioning in late life. In domains that tap the “experience of the mind” such as vocabulary (Park, 2000; Salthouse, 1991) and general knowledge (Park & Gutchess, 2006; Salthouse, 1982) smaller age differences emerge, with older adults often out-performing younger adults.

Thus, one determinant of social cognitive change with age is whether the task at hand relies more on mechanics or experience.

Experience does not just accumulate over a lifetime, however, it also differs systematically across historical time periods. Thus, the importance of experience is also evident in the differences between cohorts that are inevitably confounded with age. From a social cognitive perspective it can be important to consider whether age differences are associated with changes in the mechanics of the mind, the accumulated experience of the mind, or the types of experience to which the mind has been exposed. For example, are older adults more prejudiced than younger adults because they came of age in more prejudiced times or because of age-related changes in cognitive or emotional processes? In the absence of longitudinal studies – which are not the norm in social cognition research – questions such as these can be difficult if not impossible to answer.

This picture is then made more complex by the fact that social cognition often involves dual processes, with automatic and controlled processes each contributing to – and sometimes competing for – judgmental and behavioral outcomes (Chaiken & Trope, 1999). Although aging disrupts processing speed and other factors that play a role in automatic processes, the primary impact of age is on controlled processes, with automatic ones relatively spared in late life (Fleischman et al., 2004). Because controlled processes are sometimes recruited to inhibit automatic ones (e.g., Devine, 1989), the influence of automatic processes can become more apparent with age as the influence of controlled processes wanes. Thus, a further determinant of social cognitive change with age is whether the task at hand relies more on

automatic or controlled processing and whether automatic and controlled processes tend to work together or at cross-purposes. This interaction between controlled and automatic processes is also influenced by the fact that automatic and controlled processes appear to wax and wane in a compensatory fashion, such that some automatic processes peak when controlled processes are at their weakest (May, Hasher, & Foong, 2005). Older adults might thus be particularly likely to rely on automatic processes when they are tired and show the largest deficits in controlled processing.

In addition to these interacting cognitive forces, there are also motivational shifts that appear to be due to changed time perspective as well as other changes in the brain. Older adults tend to prioritize emotional goals more highly (Blanchard-Fields, 2007) and focus more on positive information (Carstensen & Mikels, 2005) than younger adults, and they are more oriented toward prevention than promotion (Freund, 2006). These motivational changes influence social cognitive processes just as assuredly as the cognitive changes, and can sometimes completely counteract them (von Hippel, Henry, & Matovic, 2008).

In the pages that follow we review research on social cognitive aging in an effort to examine the combined effects of cognitive and motivational changes with age. We first discuss emotional and motivational changes with age and then consider how deficits in executive functions lead to social cognitive changes. We then examine age differences in processes involved in understanding others, in decision making, and in attitude change. We close this review with a consideration of factors that can delay or compensate for age-related cognitive losses. As the research covered in this review makes apparent, the study of social cognitive aging not only provides wide-open vistas for theory testing but it is also a highly generative field in its own right.

EMOTIONAL AND MOTIVATIONAL CHANGES

Positivity

Emotionally salient information is more likely to be recalled and attended to than neutral information, and this emotional enhancement effect is robust across the adult life span (Murphy & Isaacowitz, 2008). Nevertheless, many studies have found that age interacts with the valence of emotional material such that older adults show

increased attention to positive and decreased attention to negative information compared to younger adults (Carstensen & Mikels, 2005; Charles et al., 2003; Kwon et al., 2009; Mather & Carstensen, 2005). This finding is in contrast to the cognitive priority given to negative information in young adults, a phenomenon that may be associated with survival mechanisms (Grühn et al., 2005). Some of the clearest evidence for enhanced processing of positive information comes from eye gaze experiments. For example, whereas young adults exhibit mood congruent gaze, older adults in a bad mood look away from negative stimuli and towards positive stimuli (Isaacowitz, Toner, Goren, & Wilson, 2008). These data suggest that older adults use gaze to regulate and improve mood. They also suggest that older adults are sacrificing information integrity in an effort to maintain positivity, a strategy that makes more sense in late life when world knowledge is greater and when threats to immune functioning place a premium on a positive outlook (as positive emotions enhance immune functioning; Marsland, Pressman, & Cohen, 2007).

One possibility is that positivity preferences reflect cognitively demanding “top-down” processes intended to achieve mood-regulatory goals (Kennedy et al., 2004; Mather & Knight, 2005). Alternatively, it may be that these attentional biases reflect “bottom-up” processes, whereby information processing is automatically simplified by defaulting to a positive orientation (Labouvie-Vief, Diehl, Jain & Zhang, 2007). To address this issue, Isaacowitz, Allard, Murphy, and Schlangel (2009) assessed the temporal characteristics of older adults’ preferential fixation toward positive stimuli and away from negative stimuli. Their results indicated that in the early stages of stimulus onset (500 ms), no positivity preferences emerged for young or old. Rather, preferences only emerged later on, implying a role for top-down processes. Furthermore, only for older adults did the strength of these preferences increase linearly over time. These data suggest that the preferential fixations seen in late adulthood rely on cognitive control, and are not simply an automatic means of simplifying information processing (see also Leclerc & Kensinger, 2008).

Positivity effects in late adulthood have also been attributed to age-related impairments in adrenergic and amygdala functioning (Cacioppo et al., 2011). Neuroimaging data show that the amygdala is activated less when viewing negative than positive emotional stimuli in older compared to younger adults (Mather et al., 2004). This finding could be evidence of reduced amygdala functioning – a similar pattern of greater response to positive than negative information is shown by individuals with focal amygdala damage but not

other types of brain damage (Berntson, Bechara, Damasio, Tranel, & Cacioppo, 2007). Consistent with this interpretation of the positivity effect, St Jacques, Dolcos, and Cabeza (2010) found that older adults experienced negatively valenced stimuli as less negative compared to their younger counterparts, and that these behavioral differences coincided with age-related reductions in functional connectivity with the right amygdala. Older adults in their research had good functional connectivity with ventral anterior regions, but reduced connectivity with posterior brain regions. These functional differences might reflect decreased perceptual processing of negative stimuli, in addition to controlled processes that attenuate responses to negative emotion (see also St Jacques, Dolcos & Cabeza, 2009). Indeed, proponents of the motivational model of positivity argue that these age-related neural changes are the consequence of motivational shifts, not the cause. Whichever perspective is correct, both models predict that in late adulthood emotional arousal to positive information will be preserved, but there will be a diminution in arousal to negative information (see Mather et al., 2004). Consistent with this view, event-related potential measures indicate that neural activity to negative images declines linearly with age, but there is stasis in responses to positive images across most of the adult life span (Kisley, Wood, & Burrows, 2007).

These changes in positivity are considered to be among the most important factors contributing to changes in life satisfaction across the adult life span. Older adults typically report that during everyday life they experience lower intensity of negative emotions and higher frequency of positive emotions than their younger counterparts (Gross et al., 1997; Mroczek & Kolarz, 1998). Consistent with these day-to-day reports, most longitudinal evidence indicates that life satisfaction rises in a non-linear fashion, generally increasing up to the age of 65–70, but then starting to decline. This decline may represent a psychological harbinger of death. Using longitudinal data of deceased participants from Germany, the United Kingdom, and the United States, Gerstorf et al. (2010) found that, “something is seriously wrong at the end of life.” In all three nations, well-being was relatively stable across the adult age range until 3–5 years prior to death, when a rapid decline was seen. These findings suggest that mortality-related mechanisms may be responsible for changes in well-being at the end of life. These data also align with other longitudinal evidence showing that higher life satisfaction predicts lower risk of mortality, even after controlling for variables such as age, gender, education, marital status, and health status (Collins, Gleib, & Goldman, 2009; Gerstorf et al., 2008). Thus, except for the

end of life, it appears that life satisfaction increases throughout the adult years, and enhanced positivity in late life seems to be the primary cause.

Emotion regulation

Although emotional responses have evolved to be consistent with the consequences of an event for an individual's well-being, emotional responses are not always appropriate for the social setting. We may be delighted at the demise of an arch-enemy, but laughter at a funeral is still inappropriate. In situations such as these, people have various strategies that they can use to modulate their emotions. Although emotions can feel overwhelming and often arise spontaneously, they are not obligatory and can be regulated (Feldman Barrett, Mesquita, Ochsner, & Gross, 2007). Emotion regulation can involve the experience or expression of emotion, and may result in increasing, decreasing, or sustaining an emotion, either positive or negative, consciously or unconsciously.

Two broad strategies for regulating emotions can be delineated (Gross, 1998). *Antecedent-focused* strategies are applied early in the emotion generation process and influence not only what is expressed behaviorally but also what is experienced subjectively. In contrast, *response-focused* strategies occur after the emotion response tendencies have been triggered, and require management of the ongoing emotional expression and physiological responses. A typical example of the former strategy is reappraisal of the emotion-eliciting situation, while an example of the latter is suppression of emotional impulses that have already arisen. Antecedent-focused strategies are associated with increased positive affect, improved interpersonal functioning, and greater well-being, and response-focused strategies are associated with negative affect, impaired interpersonal functions, and poorer well-being (Gross & John, 2003). These differential outcomes have been attributed to the fact that response-focused strategies produce an incongruence between the emotion experienced and the emotion expressed, leading to a sense of “inauthenticity” and to less effective mood repair. With antecedent-focused strategies no such discrepancy is experienced (Gross & John, 2003).

Gross et al. (1997) argue that life experience typically leads to greater reliance on reappraisal processes, with the end result that older adults should experience less frequent negative affect than younger adults. Although this may be the case, the data suggest that compared to younger adults, older adults are just as effective (if not more so) at both antecedent-focused and response-focused emotion regulation strategies. Despite the

fact that behavioral suppression is generally regarded as a poor strategy, one possibility is that its effective use may depend on practice, as it may become automatic by the time people reach late adulthood. Evidence consistent with this possibility can be found in the dissociation between older adults' abilities to engage in cognitive and emotional inhibitory processes. In contrast to the increasing difficulties in deliberate thought and behavioral suppression that emerge among older adults (Kramer, Humphrey, Larish, Logan, & Strayer, 1994; Rabbitt, Lowe, & Shilling, 2001), suppression of emotional expression either improves or remains stable across the life span (Emery & Hess, 2008; Kunzmann et al., 2005; Phillips et al., 2008; Shiota & Levenson, 2009). It appears that emotional suppression incurs fewer cognitive costs for older compared to younger adults, apparently due to a lifetime's accumulated experience of controlling affect (Scheibe & Blanchard-Fields, 2008).

There is less evidence on how age impacts the ability to apply antecedent-focused regulatory strategies, but again, improvement (or at least stasis) in this capacity appears likely. In one study, footage from an undercover documentary that investigated animal abuse was viewed by older and younger adults under conditions of positive refocusing or expressive suppression (Phillips et al., 2008). When instructed to suppress their emotional display, both older and younger adults showed reduced external display of negative affect. When given instructions to regulate emotions by positive refocusing, older adults showed lower levels of experienced and expressed emotions but younger adults did not. This finding suggests that older adults were more effective in implementing at least this particular antecedent-focused regulation strategy than younger adults.

Similar effects have also been suggested by studies of real-life experiences. For example, older adults in an experience-sampling study conducted over 1 week reported as much positive affect as their younger counterparts but less negative affect. Furthermore, when negative affect was experienced, older adults returned to a neutral or positive state more quickly than the younger adults (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000). These results may reflect age differences in positivity, but the latter finding also hints at age-related gains in the proficiency of emotion regulation. Findings such as these are typically attributed to older adults' extensive life experience with interpersonal communication (Dougherty, Abe, & Izard, 1996). Older adults are believed to take advantage of knowledge accumulated throughout their lives to better understand, anticipate, and react to emotional situations (Magai, 2001). Consistent with these behavioral

outcomes, compared to younger adults, older adults also rate themselves as relying on more effective emotion regulation strategies (Gross et al., 1997; Phillips, Henry, Hosie, & Milne, 2006).

Goals

Late life is typically accompanied by physical decline and an awareness of impending mortality. These two uncomfortable facts have a major impact on the goals held by older adults. Decline brings with it a focus on loss prevention, and thus older adults typically move from a promotion frame to a prevention frame (Ebner, Freund, & Baltes, 2006; Freund, 2006). We expand on this change in self-regulatory focus in the section on risk and loss aversion below. Awareness of impending mortality leads to the other major change in goals, as older adults begin to focus on emotion-related goals due to a sense that time is running out (Carstensen, Fung, & Charles, 2003). According to Socioemotional Selectivity Theory, "the approach of endings – the penultimate of which is old age – activates a reorganization of goal hierarchies such that emotionally meaningful goals are prioritized." (Mather & Carstensen, 2003, p. 409). This increased focus on emotionally salient goals is thought to be a major factor leading to improved emotion regulation skills and the increased positivity in late adulthood.

According to Socioemotional Selectivity Theory, as people age and have a sense that time is running out, there is an increased focus on the present rather than the future. This motivational shift leads to a greater investment in important social relationships and less interest in pursuing new or peripheral social contacts. As noted, however, the mechanism underlying this effect is considered not to be age per se, but rather time perspective (Carstensen et al., 2003). In the first study to demonstrate this effect, Fredrickson and Carstensen (1990) asked participants aged 11–94 to choose among three different social partners: a member of the participants' family; the author of a book that the participant had read; or an acquaintance with whom the participant seemed to have much in common. Some participants were asked to make this selection as they would if they were shortly moving across country alone. Results indicated that older adults' preference was always to spend time with the familiar social partner, but only when time was perceived as limited did younger adults also show this preference. The reverse effect has also been shown. When older adults in the United States and Hong Kong were asked to imagine an expansive future in which medical advances ensure 20 more healthy years

beyond when they expect to live, their preference for familiar social partners disappeared (Fung, Carstensen, & Lutz, 1999). Findings such as these suggest that the perception of time is an important determinant of social goals.

Because Socioemotional Selectivity Theory predicts an increased focus on positive emotions, older adults should be more effective than younger adults at planning their lives to ensure positive experiences. One strategy for achieving this goal is maintaining contact with people who are already known and loved rather than pursuing interactions with people who are not known well. Consistent with this possibility, older adults typically maintain a similar number of close friends to younger people but a smaller number of peripheral social partners (Fung et al., 2001; Lang, 2001; Lee & Markides, 1990). Proponents of Socioemotional Selectivity Theory contend that such findings are attributable to a selective "pruning" of peripheral social networks towards the end of the life span that prioritizes emotionally close social partners (Carstensen et al., 2003). Of course, cognitive, health, and mobility constraints might also result in such a pattern of selective friendship maintenance.

Risk and loss aversion

Consistent with increased positivity and prioritization of emotional goals, there is evidence for increased hedonic and decreased contra-hedonic motivations in late adulthood. Although people generally strive to attain positivity and reduce negativity, in certain circumstances reduction of positive affect may confer benefits (e.g., by enhancing concentration) as might sustaining negative affective states (e.g., anger may enhance determination). Such contra-hedonic motivations can therefore lead to the attainment of utilitarian goals. In a recent experience sampling study, Riediger, Schmiedek, Wagner, and Lindenberger (2009) found that goals to maintain positive affect and reduce negative affect were strongest in late adulthood, whereas contra-hedonic motivations were most prevalent in adolescence. Notably, Riediger et al. (2009) found that older adults sought to maintain but not enhance positive affect, and suggested that perhaps this regulation strategy is less resource intensive. An alternative possibility is that age leads to change in regulatory focus, with older adults shifting from promotion to a prevention orientation (Ebner et al., 2006; Freund, 2006), and thus older adults may be more focused on preventing losses in positive affect than in promoting gains.

This interpretation is also consistent with predictions from the life span developmental theory of *selection, optimization, and compensation*

(Baltes & Baltes, 1990). According to this model, the increasing salience of resource limitations in late adulthood precipitates a shift in personal goal orientation as the ratio of gains to losses decreases in the second half of life (Baltes, 1987, 1997). These age-related changes in developmental opportunities and constraints are reflected in a shift from an orientation toward growth and gains to an orientation toward maintenance and loss prevention (Ebner et al., 2006). Such shifts in goal orientation are considered necessary and beneficial, in light of the resource limitations in older age. Indeed, Ebner et al. (2006) found that for younger adults well-being was negatively correlated with degree of prevention orientation, whereas for older adults well-being was positively correlated with degree of prevention orientation. Furthermore, younger and older adults alike seem aware of this change, as they associate young adults with promotion goals and older adults with prevention goals (Ebner, Riediger, & Lindenberger, 2009).

These changes in regulatory focus should lead to age-related differences in decision making in various domains. For example, Mikels and Reed (2009) showed that there are age differences in the framing effect, whereby individuals are risk averse when decisions are framed as gains but risk seeking when decisions are framed as losses (Tversky & Kahneman, 1981). Mikels and Reed (2009) presented older and younger adults with a gambling task in which expected outcomes were equal, but framed in terms of keeping a proportion of an initial endowment (e.g., keep \$20 of \$100) vs losing a proportion of the initial endowment (e.g., lose \$80 of \$100). Although both younger and older adults were risk averse in the gain frame, only younger adults showed risk seeking in the loss frame.

Changes in regulatory focus provide another perspective for interpreting older adults' tendency to put their energies into a smaller circle of closer friends, with less interest in seeking novel social partners. In the context of Socioemotional Selectivity Theory, such findings are thought to reflect motivational shifts whereby emotion-related goals are prioritized. In the context of regulatory focus theory, these friendship changes can be interpreted in terms of a prevention framework, according to which older adults are focused less on promoting new social opportunities than on preventing the loss of current friendships.

Regret

The experience of regret is common across the life span. Regret is typically accompanied by counterfactual thoughts, such as, "What would

have happened if...,” and is usually associated with negative emotions such as anger, sadness, or desperation. Regrets can take on greater importance in late life, perhaps because regretted episodes are less easily fixed later in the life (Heckhausen & Schulz, 1995), and thus regrets predict life satisfaction more strongly in older than younger adults (Lecci, Okun, & Karoly, 1994). Indeed, regret intensity predicts increased diurnal cortisol secretion and physical health problems experienced in late adulthood (Wrosch et al., 2007).

Regrets can be divided into many types, but a simple division is into regrets of action vs inaction, or sins of commission vs omission. In the short run, people tend to regret their actions more than their inactions (Kahneman & Tversky, 1982). It seems that the counterfactual is simply more available in the case of actions than inactions, as actions are more easily undone. Nevertheless, this difference in regret is soon reversed, as people overwhelmingly nominate sins of omission as their greatest regrets, and they do so across the life span (Erskine, 1973; Kinnier & Metha, 1989). There are several reasons for this reversal, but perhaps the most important is that regretted actions can typically be undone, but regretted inactions often cannot (Gilovich & Medvec, 1995). Too often, missed opportunities are simply no longer available with the passage of time.

Although regrets of inaction loom larger than regrets of action across adulthood, there is reason to believe that this effect should be exacerbated late in life. As Gilovich and Medvec (1995) explain, “there is an important asymmetry in the perceived negative consequences of regrettable actions and inactions: Regrets of action center around bad things that actually happened; regrets of inaction involve good things that one believes *would have* happened.” (p. 386). Because older adults emphasize the positive over the negative, it seems possible that the bad things that happened fade in late life, whereas the good things that did not happen may retain their importance. Weak support for this possibility can be found in Gilovich and Medvec (1994), who reported a non-significant trend for older adults to have a higher ratio of inaction to action regrets compared to younger adults. To our knowledge this hint of an age effect has not been pursued in subsequent research, but it would seem to be an issue worthy of further study.

Regrets can be resolved through primary control processes, whereby behavioral changes are made that overcome regrets, such as reconciling with estranged family members. Regrets can also be resolved through secondary control processes, whereby cognitive strategies are engaged, such as reappraising past actions or forgiving oneself.

Life-span control theory suggests that younger adults are more likely to benefit from primary control processes, as early in life there is generally greater opportunity to actively undo the consequences of regrets (Heckhausen & Schulz, 1995). Thus, regret in early adulthood may confer benefits by motivating adaptive actions, and indeed in younger adults self-regulatory efforts such as taking responsibility for a regretted event are associated with lower regret intensity and fewer intrusive thoughts (Wrosch & Heckhausen, 2002).

In contrast, opportunities to overcome regret are likely to be more limited in late adulthood, and thus older adults should benefit from secondary control processes. This perspective implies that effective management of regret in late adulthood will depend on regulation processes related to self-protective attributions and disengagement. Consistent with this possibility, older adults who do not blame themselves for a regretted event or who are disengaged from undoing the consequences of regret report lower levels of regret intensity and higher subjective well-being compared to their peers who do not engage in these regulatory processes (Wrosch & Heckhausen, 2002; Wrosch et al., 2005). Of course, the causal order of these effects is ambiguous, as older adults with milder regrets might be less likely to blame themselves and more likely to be disengaged from the consequences of the regrets.

COGNITIVE CHANGES I: EFFECTS OF EXECUTIVE DECLINE

The mental processes known as executive functions are responsible for initiating, planning, and coordinating the basic cognitive processes with which we navigate our everyday lives. Executive functions include planning, task switching, and inhibition of thought and behavior. Thus, rather than being considered a unitary ability, executive functions refer to the ensemble of higher-order processes that permit contextually sensitive flexible behavior as well as sustained goal pursuit. Because executive functions impose particular demands on frontal neural substrates, and because these structures are subject to age-related deterioration, aging has been linked to diminished executive control (Dempster, 1992; Hasher, Zacks, & May, 1999; West, 1996).

Failures at thought control lead to contamination of ongoing mental activities with unwanted information, and thus age-related deficits in inhibitory ability have been implicated in a variety of cognitive deficits (Hasher et al., 1999). But executive functions are not only important for

regulating cognition, they also play a central role in social functioning (Finkel et al., 2009; Macrae, Bodenhausen, Schloerscheidt, & Milne, 1999; Payne, 2005; Richeson & Shelton, 2003). Indeed, many theorists believe that it was the demands of social living that led to the development of such large frontal lobes in humans (Dunbar & Schultz, 2007), and there is considerable evidence for social abnormalities in populations with executive impairment (Stuss & Levine, 2002). Thus, despite the fact that aging is associated with improvement in some aspects of socioemotional functioning (Blanchard-Fields, 2007; Carstensen, Gottman, & Levenson, 1995), age-related executive deficits have the potential to disrupt social judgment and behavior in a variety of domains. In this section we discuss research in two such domains.

Behavioral restraint

Age-related inhibitory losses have been implicated in several types of socially disinhibited behavior. First, older adults are more likely than younger adults to talk excessively and about topics that are irrelevant to the stream of conversation (Pushkar et al., 2000). This “off-target verbosity” is associated with diminished inhibitory ability, which leaves older adults less capable of stopping their conversation and remaining on topic (Pushkar et al., 2000). Verbosity also appears to be related to different conversational goals of younger and older adults, as younger adults are more likely than older adults to be focused on transmitting information (Trunk & Abrams, 2009).

Inhibition also appears to be necessary to restrain oneself from verbalizing thoughts that are better left unsaid (von Hippel & Gonsalkorale, 2005), and thus inhibitory deficits might lead older adults to make socially inappropriate remarks. Consistent with this possibility, von Hippel and Dunlop (2005) found that older adults were more likely than younger adults (according to their peers) to inquire about private issues in public settings, and this age difference in peer-reported social inappropriateness was mediated by inhibitory deficits. Furthermore, these age differences emerged despite the fact that older and younger adults agreed that it is inappropriate to inquire about such issues in public settings. Indeed, older adults in particular felt less close to those who inquired about private issues in public.

This evidence of social disinhibition in older adults was conceptually replicated by Henry, von Hippel, and Baynes (2009), who found that older adults were more likely to engage in a

variety of socially inappropriate behaviors than younger adults (again, according to their peers). Furthermore, this peer-reported increase in social inappropriateness was again mediated by participants’ own performance on measures of executive functioning. Importantly, this effect of executive decline was found to be independent of the effect of general cognitive decline, suggesting that increased social inappropriateness in late life is specific to executive deficits. Further evidence for this possibility comes from research with younger adults, which also indicates that socially inappropriate behavior is associated with individual differences in executive functioning (von Hippel & Gonsalkorale, 2005).

Findings such as these suggest that disinhibition is socially costly because it often manifests in socially inappropriate behavior. Nevertheless, it seems plausible that there are also benefits to a more disinhibited style of social functioning. Particularly if mixed with warmth and sympathy, an honest but socially difficult appraisal of the situation may sometimes be more valuable than polite disingenuousness. In a test of this possibility, Apfelbaum, Krendl, and Ambady (2010) presented older and younger adults with a photograph of an obese adolescent who reported having a variety of difficulties that are typically associated with obesity (lack of energy, poor social engagement). Participants were then videotaped as they offered advice to the obese adolescent. In this socially awkward situation, it was primarily older adults with poor executive functioning who offered direct advice about the adolescent’s obesity – advice that was rated by obesity doctors as most likely to lead to lifestyle changes. Older adults with good executive control and younger adults both chose to dance around the issue, and instead offered briefer and more placebic advice. These data suggest that, in combination with the positivity that is common in older adults, a little disinhibition can be a socially valuable commodity.

Stereotyping and prejudice

In an influential model of prejudice, Devine (1989) proposed that because everyday culture is often suffused with stereotypes, these stereotypes become over-learned and automatically activated upon encounters with individual members of the stereotyped groups. What differentiates non-prejudiced from prejudiced people is not whether prejudiced thoughts are activated, but whether people inhibit those thoughts and replace them with more egalitarian beliefs. Prejudiced people endorse the stereotypic thoughts that are

automatically activated, and non-prejudiced people reject and subsequently inhibit the stereotypic thoughts. This model suggests that older adults might be more prejudiced than younger adults because they are less capable of inhibiting their unintentionally activated stereotypes. There are now several lines of research that support this possibility.

In a study of explicit stereotyping and prejudice, von Hippel, Silver, and Lynch (2000) found that older White adults show greater stereotyping and prejudice toward African Americans than younger White adults. This age difference emerged despite the fact that the older adults were more concerned about impression management and more motivated to control their prejudice than the younger adults. Older adults also performed more poorly than younger adults on a measure of inhibitory ability, and this age difference in inhibition mediated the age differences in stereotyping and prejudice. Additionally, individual differences in inhibition were associated with individual differences in prejudice among both older and younger adults. This finding suggests that the link between inhibition and prejudice in older adults is not simply a byproduct of their shared relationship with general cognitive decline. Rather, because younger adults also show a correlation between inhibitory ability and prejudice, there appears to be something unique about inhibition that plays a critical role in the prevention of prejudice.

There are, of course, interpretive problems associated with the findings of von Hippel et al. (2000), and subsequent research has addressed these issues in a variety of ways. First, it is possible that older adults are no more prejudiced than younger adults, but are simply more willing to express their prejudices in the politically correct confines of the university laboratory. To address this possibility, Henry, von Hippel, and Baynes (2009) asked a close friend or family member of the participants to report on the participants' prejudice level. Participants then completed measures of executive functioning. Henry et al. (2009) found that older adults were more prejudiced than younger adults (according to their peers), and that this age difference in peer-reported prejudice was mediated by the participants' own performance on measures of executive functioning.

This finding addresses problems associated with political correctness and social desirability, but it does not circumvent the fact that prejudice is still measured as public expression. To address this issue, Radvansky, Copeland, and von Hippel (2010) conducted an experiment in which older and younger adults were presented with stories that contained stereotype-suggestive sentences that were not explicitly stereotypic. After these

suggestive sentences, participants were occasionally interrupted to complete a lexical decision task assessing activation of a word highly related to the stereotypic inference (e.g., after the sentence, "Susan saw that Jamal didn't help," participants were tested with the word *lazy*). Participants were also presented with lexical decisions after inference-inviting sentences that were stereotype neutral (e.g., the sentence, "Jamal watched with anticipation," followed by the word *hungry*) and after sentences in which no inference was likely (which were used as control sentences). Results revealed that, compared to the lexical decisions in the control sentences, younger adults were faster to identify the inference-relevant neutral words but slower to identify the inference-relevant stereotypic words. Older adults were also faster to identify the neutral words, but non-significantly faster rather than slower to identify the stereotypic words.

These findings suggest that younger adults inhibit their stereotypic inferences as they encode new information, but older adults fail to do so. Two different types of modeling data reveal results that are consistent with this possibility. First, Gonsalkorale, Sherman, and Klauer (2009) used the Quadruple Process model (Conrey et al., 2005) to examine the source of age differences in implicit prejudice that emerged in a large national data set with the Implicit Association Test (IAT; Greenwald, McGhee, & Schwarz, 1998). Their modeling results indicate that older adults are less successful than younger adults in regulating automatic bias toward African Americans, but show no differences in degree of bias itself. Second, Stewart, von Hippel, and Radvansky (2009) conceptually replicated this result using the process dissociation procedure (Jacoby, 1991). Stewart et al. (2009) found that age differences in implicit prejudice toward African Americans emerged only in the control component of implicit prejudice, with older adults showing decreased control over their automatic biases. Furthermore, this age difference in prejudice control was mediated by age differences in inhibitory ability. Finally, Stewart et al. also found that self-reported motivation to be non-prejudiced only translated into low-prejudice responses on the IAT when participants also had good control over their automatic biases. The results of Gonsalkorale et al. (2009) and Stewart et al. (2009) suggest that age differences in prejudice are the result of poor inhibitory control of prejudicial associations and are not just evidence of a greater willingness among older adults to express their prejudices.

These experiments provide evidence for unintended stereotyping and prejudice among older

adults, but the question remains whether older adults can compensate for these executive losses. In support of such a possibility, recent evidence suggests that older adults can be just as effective as younger adults at inhibiting stereotypes when they know the stereotype is irrelevant at encoding (Radvansky, Lynchard, & von Hippel, 2009). In their research, Radvansky et al. (2009) presented younger and older adults with stories about a person who held a stereotypically male or female occupation (e.g., a plumber vs a babysitter). Half of the time participants were explicitly given a gender label when first learning about the protagonist (e.g., “the babysitter was a young boy who...”) and half the time they were not (e.g., “the babysitter was a young teenager who...”). Additionally, half of the time the gender of the protagonist was occupation-stereotypic and half the time it was counter-stereotypic. Later in the story, participants encountered a pronoun that communicated the gender of the protagonist, and the critical measure was whether they read the sentence containing the counter-stereotypic pronoun more slowly than the sentence containing the stereotypic pronoun. Results indicated that both younger and older adults read the sentence containing the counter-stereotypic pronoun more slowly when they had not initially been provided an explicit gender label, but both younger and older adults read the counter-stereotypic pronoun just as quickly as the stereotypic pronoun when they had already been provided a gender label.

This finding suggests that older adults are just as capable as young adults of putting aside their stereotypes when they know at the moment they encounter the person that their stereotypes are irrelevant to the situation at hand. These findings are also consistent with informal observations from our laboratory that older adults are often just as capable as younger adults of suppressing a socially inappropriate response when they know in advance that the need to suppress a response is likely to be imminent. Older adults seem to get into trouble primarily when they do not anticipate the self-regulatory demand in advance and prepare themselves for it.

COGNITIVE CHANGES II: UNDERSTANDING OTHERS

With motivational shifts leading to increased prioritization of emotion-related and relationship maintenance goals in late adulthood, it might be anticipated that older adults would show enhanced social understanding relative to their younger counterparts. In fact, the dominant picture depicts

one of loss – with deficits seen in emotion recognition, mental state attributions, and the ability to infer deceit or potential harmful intent in others. Thus, in terms of emotion *recognition*, the predominant pattern across all emotions and modalities is of age-related decline. Most aspects of explicit empathic processing also appear to be disrupted, although the implicit processing of empathic information may be preserved. Analogously, explicit (but perhaps not implicit) detection of deceit and social threat is disrupted. Despite the evidence of deficits in each of these social domains, in at least some contexts older adults appear to use more sophisticated heuristics than their younger counterparts in forming social judgments. These latter findings align with domains in which the accumulation of social experience across the adult life span leads to more sophisticated and accessible knowledge structures.

Emotion recognition and empathy

Age-related difficulties in understanding emotional signals have implications for social interactions in older adults. Indeed, emotion misrecognition in late life is associated with reduced social competence and interest, poor interpersonal functioning and communication, reduced quality of life, and inappropriate social behavior (Carton et al., 1999; Phillips et al., 2010; Shimokawa et al., 2001). A recent meta-analytic review indicates that the predominant pattern across emotions (with the exception of disgust) is of age-related decline – with recognition of anger and sadness particularly impaired (Ruffman, Henry, Livingston, & Phillips, 2008). This particular decline in detection of negative emotions might be a function of the increased positivity/decreased negativity that is associated with late adulthood, as inattention to negative expressions might make them more difficult to identify. Furthermore, significant impairment was seen across all modalities assessed (recognition of emotions from faces, voices, bodies, and matching voices to faces), indicating that this is unlikely to be a face-specific processing deficit. Indeed, tasks that required matching a facial expression to an auditory expression were associated with particularly large age deficits, perhaps because problems in either domain will create problems on a matching task. Evidence also indicates that age-related deficits with emotion recognition extend to video stimuli (Henry et al., 2008), and may reflect difficulty integrating incongruent semantic content (what is said) with affective prosody (how something is said; Dupuis & Pichora-Fuller, 2010).

Older adults' difficulties evaluating social stimuli are not restricted to emotion recognition. Relative to young adults, they also appear to have a poorer understanding of others' complex emotions and mental states (cognitive empathy). In the first study of age-related differences in cognitive empathy, Pratt et al. (1996) asked participants to solve moral dilemmas such as deciding upon the appropriate punishment for a doctor involved in an illegal euthanasia case. Pratt et al. found that young adults showed better perspective-taking skills than their older counterparts. More recent studies have corroborated these age-related deficits in cognitive empathy (German & Hehman, 2006; McKinnon & Moscovitch, 2007; Phillips, MacLean, & Allen, 2002).

These deficits in cognitive empathy appear to emerge from age-related executive decline, with older adults disproportionately impaired on measures that impose greater demands on control operations (Bailey & Henry, 2008; German & Hehman, 2006; McKinnon & Moscovitch, 2007). One possibility is that executive selection processes are relied upon to choose the most appropriate mental state attribution from a number of potential candidates (German & Hehman, 2006). In addition, the self-perspective is regarded as the cognitive default, driven in part by the automatic link between perception and action (Decety et al., 1997). Therefore, to evaluate another's perspective, some form of active inhibitory mechanism is necessary to regulate the prepotent self-perspective. Thus, it appears that as we age it becomes more difficult to see the world from someone else's point of view, with these deficits particularly pronounced when executive demands are high. These deficits in cognitive empathy may then be compounded by older adults' difficulty following eye-gaze cues, which disrupts their ability to engage in joint attention (Slessor, Phillips, & Bull, 2008).

Relatively less research has been conducted on the affective component of empathy, which refers to emotional responses to the cognitive or affective state of another. The few attempts to index affective empathy in late adulthood have been guided by the notion of *motor* empathy (Blair, 2005; Chartrand & van Baaren, 2009; Decety & Jackson, 2004). This form of empathy is the tendency for individuals to automatically mimic the facial expressions and behavior of another (Chartrand & van Baaren, 2009). Two studies to date have assessed facial expression mimicry in late adulthood, and imply that although subconscious facial mimicry is spared in late adulthood (Bailey & Henry, 2009), later stages of the mimicry process may be disrupted by conscious difficulties at emotion recognition (Bailey, Henry, & Nangle, 2009). These data provide

preliminary support for the possibility that at least some aspects of affective empathy may decline in late adulthood.

Detecting deception

Detection of deception or nefarious intent in the facial expressions of others is an important aspect of understanding others – and one that seems likely to have significant social and material outcomes, particularly in older adulthood when time to recoup losses is more limited. Given older adults' increased difficulties recognizing emotions and seeing things from other's perspectives, it follows that they may also have difficulties detecting deceitful or harmful intentions, and available evidence indicates that this is the case. For example, relative to their younger counterparts, older adults are at greater risk of becoming victims of fraud (Cohen, 2006), and are up to 10 times more likely to be misled by deceptive information (Jacoby, 1999). Executive and general cognitive decline probably play a role in their susceptibility, but several studies connect emotion recognition problems with difficulties detecting deception and hurtful intent. For example, Stanley and Blanchard-Fields (2008) found an association between older adults' difficulty detecting deceit and reduced recognition of facial expressions of fear (an emotion that might be briefly displayed by a deceptive person who fears being caught in the lie). Older adults also have greater difficulty differentiating between genuine and posed smiles, and are more likely to approach an individual displaying a posed smile (Slessor et al., 2010). Additionally, and similar to adults with amygdala damage (Adolphs, Tranel, & Damasio, 1998), older adults have greater difficulty distinguishing between faces normatively judged as being high or low in threat (Ruffman, Sullivan, & Edge, 2006). These findings suggest that the greater positivity/diminished negativity of older adults might also play a role in their enhanced susceptibility to deception.

Despite these losses in explicit judgments of deception and threat, older adults show some evidence of maintained implicit threat detection mechanisms. Specifically, older adults are faster to detect an emotionally discrepant face in an array if that face displays anger rather than happiness or sadness (Mather & Knight, 2006; Ruffman, Ng, & Jenkin, 2009). This pop-out effect suggests that at least some aspects of implicit threat detection are preserved in older adulthood, although older adults' apparently greater willingness to approach posed smilers (Slessor et al., 2010) suggests that other aspects of implicit threat detection may be compromised.

Attribution and social inference

The preceding sections present a rather grim picture of how age relates to social understanding, with older adults showing deficits in emotion recognition, some aspects of empathy, and the detection of deceit. Such processes rely primarily on the mechanics of the mind, and thus they are diminished by atrophy of the brain. However, some aspects of social inference rely more clearly on the experience of the mind, and here age has the potential to enhance social judgment. A case in point is that age is associated with increased use of trait-diagnostic behavioral information in making social judgments. In one study demonstrating this effect, Hess and Auman (2001) presented individuals aged 20–84 with a series of brief behavioral descriptions. Each description included two positive and two negative behaviors executed by the same target individual, half of which related to honesty, and half of which related to intellect. Participants were asked to form impressions of the target individual. Consistent with the differential diagnosticity of positive and negative information in the domains of competence vs morality (Skowronski & Carlston, 1989), greater weight was given to negative information when character judgments related to honesty but to positive information when judgments related to intelligence. Of particular interest was the finding that this use of trait-diagnostic behavioral information was greatest in late adulthood – as evident in both attentional focus and in the impressions that were formed. With increasing age, greater attention was focused on high diagnostic (dishonest, intelligent) relative to low diagnostic (honest, unintelligent) behavioral information, with corresponding judgments more negative in the honesty domain and more positive in the intelligence domain.

If older adults are more sensitive than younger adults to trait-diagnostic information, then increasing the salience of the trait diagnosticity should attenuate or eliminate this age difference. In a test of this possibility, Leclerc and Hess (2004) presented younger and older adults with behavioral descriptions that varied in the number of diagnostic clues (one vs three), and the extremity of the behavioral information (moderate vs extreme). Increasing either the amount or the extremity of behavioral information affected both age groups, but disproportionately influenced younger adults, thereby eliminating age differences in impressions. These data imply that older adults require fewer cues than younger adults to form clear impressions of others, perhaps because they rely on their greater social experience when forming social judgments.

COGNITIVE CHANGES III: ATTITUDES AND DECISION MAKING

Attitudes and persuasion

Changes in attitudes and persuasibility across the life span implicate a variety of cognitive and motivational processes. Early research on aging and attitudes suggested that older adults might be more rigid in their attitudes, and thus relatively difficult to persuade (Glenn 1974, 1980). Consistent with this possibility, Krosnick and Alwin (1989) found with nationally representative data in the United States that people are most susceptible to attitude change in late adolescence and early adulthood (the “impressionable years” hypothesis: Sears, 1981), and then susceptibility drops precipitously and stays low throughout middle and late adulthood.

As Visser and Krosnick (1998) pointed out, however, there is interpretive ambiguity with these data in that older adults may be less likely to be exposed to counter-attitudinal information. For example, older adults tend to have smaller circles of closer friends, and thus their attitudes may be less likely to be challenged. For this reason, it is important to subject the attitudes of younger and older adults to persuasive attempts to assess whether older adults really are more rigid than younger adults. Visser and Krosnick (1998) went on to hypothesize that older adults might be more rather than less susceptible to attitude change due to (a) cognitive losses with aging (which limit counter-arguing effectiveness), (b) reduced social support for their attitudes, or (c) role changes that bring about attitude changes as well. Consistent with this possibility, when they challenged the attitudes of people of various ages, they found a U-shaped curve, whereby younger and older adults showed the greatest susceptibility to attitude change. They also found the opposite U-shaped curve when they measured attitude certainty, importance, and perceived attitude-relevant knowledge, such that younger and older adults reported the least certainty, importance, and knowledge. These results suggest possible mechanisms for increased susceptibility to persuasion in late life – via reduced certainty, importance, and knowledge – but they do not indicate what the source of these changes might be, as decreased social support, role changes, and cognitive losses could all decrease attitude certainty, importance, and knowledge.

At this point, there is no basis for excluding any of these factors as sources of attitude change late in life. With regard to social roles, two findings appear relevant. First, middle-aged adults are the most likely to be in positions of power,

and powerful roles often call for a resolute approach in the face of persuasive attempts (Eaton, Visser, Krosnick, & Anand, 2009). Consistent with this possibility, age changes in the power of social roles partially mediated the effect of aging on persuasibility (Eaton et al., 2009). Second, the changing temporal perspective that underlies Socioemotional Selectivity Theory might also increase susceptibility to attitude change late in life, as people who see time as limited are more likely to modify their attitudes to match their social partners and to achieve peer consensus (DeWall, Visser, & Levitan, 2006). With regard to cognitive loss, evidence suggests that diminished working memory also plays a role in increased susceptibility to persuasion among older adults, as working memory losses mediated age differences in attitude change when people's attitudes were challenged (Wang & Chen, 2006).

Decision making

In the case of decision making we again see evidence for competing consequences of aging. Older adults often make poorer decisions due to general cognitive decline, but they make excellent use of cognitive short cuts, they benefit from their greater life experience, and they often end up happier with their decisions due to their greater positivity. In this sense, the literature on aging and decision making is reminiscent of research with satisficers and maximizers, in which maximizers made more thorough decisions with objectively better outcomes, but satisficers were nonetheless happier with their choices (Iyengar, Wells, & Schwartz, 2006).

Perhaps the most important consequence of the decline in mental mechanics is that older adults show deficits in most aspects of the types of decisions that support everyday life (Thornton & Dumke, 2005). For example, when older adults are presented with vignettes such as, "What should an elderly woman who has no other source of income do if her social security check does not come one month?", they generate fewer effective solutions than younger adults (Heidrich & Denney, 1994). Meta-analysis reveals that this effect is robust across different types of measures, with the exception that older adults' self-ratings often suggest preserved or even better everyday decision making than young adults (Thornton & Dumke, 2005). This latter finding is sometimes interpreted as evidence of effective decision making in late life, but it is also possible that older adults believe they are making better decisions when in fact they are making worse ones, which can be a recipe for disaster. Alternatively, by virtue of their tendency to focus on the positive,

older adults may simply be happier than younger adults with their decisions (Kim et al., 2008).

Despite this overall decline in everyday decision making, there are domains of preserved ability, and this can be seen most clearly with interpersonal decisions. As has been noted elsewhere, older adults sometimes outperform younger adults in interpersonal domains due to their greater experience (Grossman et al., 2010). Older adults have an additional advantage, in that they tend to take a long-term perspective and focus more on preserving relationships than on solving particular problems (Blanchard-Fields, 2007). Older adults also benefit in some tasks by the fact that they do not over-weight negative information, and thus are more capable of balancing positive and negative outcomes (Wood et al., 2005). Lastly, older adults are also strategic about when they engage in controlled processing (Peters, Hess, Västfjäll, & Auman, 2007) – rightly perceiving it as a limited resource – and thus deficits in their decision-making prowess can be more or less apparent depending on situational demands and their willingness to devote limited processing resources (Hess, Leclerc, Swaim, & Weatherbee, 2009; Mata, Schooler, & Rieskamp, 2007).

The age-related pattern of deficits in controlled processes but preservation of automatic processes also has clear implications for a variety of different types of decision processes. On the controlled side of the equation, correction for possible sources of bias is regarded as an effortful process, and thus it follows that older adults should often fail to correct, or under-correct, compared to younger adults. Consistent with this possibility, Chen and Blanchard-Fields (2000) found that older adults were more likely than younger adults to rely on information that had earlier been identified as false. These data suggest failure to correct, but they do not indicate if older adults are incapable of correcting when the situational cues are strong enough. To examine this possibility, Wang and Chen (2004) presented younger and older adults with five Midwestern cities or five exotic vacation spots, and asked them to rate how much they would like to take a vacation to these locations. Participants were then given five additional Midwestern cities to evaluate either with no differentiation from the prior set, with a note that they would now be considering a different group of locations (subtle cue), or with a note that the next group has very different characteristics from the prior group (strong cue). Wang and Chen found the typical contrast effect among young and old participants when there had been no demarcation between groupings, such that those who had previously rated exotic locales subsequently rated Midwestern cities as less appealing than those who had previously rated other Midwestern

locales (see Wegener & Petty, 1995). Furthermore, when given the strong cue both young and old participants corrected for this contrast bias, and showed no effect of prior ratings. When given a subtle cue, however, younger adults corrected for their inherent contrast bias but older adults continued to rate the Midwestern cities more negatively if they had previously evaluated exotic locales. These findings suggest that older adults are capable of correcting for contextual biases, but need greater environmental support to engage in such correction processes.

Controlled processes also have the potential to play an important role whenever decision making is enhanced by counterfactual simulations of possible outcomes. Poorer autobiographical memory among older than younger adults (Craik & Salthouse, 2000; Schlagman, Kliegel, Schultz, & Kvavilashvili, 2009) is likely to translate into lower quality simulations, as theory and evidence suggest that episodic memory is one of the foundations for imagining and predicting future events (Schacter & Addis, 2007; Suddendorf & Corballis, 1997, 2008). Consistent with this possibility, recent evidence suggests that older adults have fewer details in their simulations of the future, and this impoverishment in foresight is associated with less detailed recall of the past (Addis, Wong, & Schacter, 2008). Because people often engage in counterfactual reasoning prior to making important decisions, these losses in memory have the potential to result in poorer decisions among older adults.

On the automatic side of the equation, Gigerenzer and colleagues have argued that there are a number of heuristics that enable people to make fast and frugal judgments that are sufficiently accurate for most everyday purposes (Gigerenzer et al., 1999). If fast and frugal heuristics enable people to make reasonably accurate decisions with less cognitive effort, then it follows that older adults should be particularly likely to rely on such strategies. Consistent with this reasoning, Pachur, Mata, and Schooler (2009) found that older adults rely on the recognition heuristic (the notion that if one recognizes an item it is more likely to be important than if one does not) just as younger adults do, and in fact were less capable than younger adults of suspending their reliance on this heuristic when it was identifiably less appropriate.

Automatic processes have the potential to play a further role once the decision has been made, as they can facilitate engagement in the appropriate behavior at the appropriate time. Because implementation intentions automatize planned behaviors by linking behavioral intentions to environmental contingencies (Gollwitzer & Sheeran, 2006), older adults might benefit by forming

implementation intentions and thereby automatizing their planned behavior. Consistent with this possibility, older adults were more successful at performing planned medical tests when they made implementation intentions to do so rather than simply rehearsing or deliberating about their plans to do so (Liu & Park, 2004). Thus, data from different domains suggests that older adults can take advantage of their preserved automatic functioning to make good decisions and then execute them.

COGNITIVE CHANGES IV: INDIVIDUAL DIFFERENCES IN LOSS

We end this review by considering the first question that is typically asked about cognitive loss with age: Can it be prevented? It turns out that the answers to this question are intertwined with social cognitive functioning, both long term and acute.

Age stereotypes

Stereotypes create their own reality, but reality also creates stereotypes (Lee, Jussim, & McCauley, 1995). Thus, an important question in aging research is the degree to which stereotypes about cognitive losses in late life – which are widely endorsed by older adults themselves (Ryan, 1992) – can create those very losses. To address this question we turn to the literature on self-stereotyping and stereotype threat among older adults, and the role played by these factors in cognitive maintenance and loss.

The first clear evidence that self-stereotyping might contribute to cognitive loss with aging was provided by Levy and Langer (1994), who demonstrated that older deaf Americans and older Chinese showed smaller memory deficits than older hearing Americans. Importantly, deaf Americans and Chinese have more positive views of aging than are prevalent among hearing Americans, and Levy and Langer (1994) found that these more positive views were associated with smaller cognitive losses. Levy (1996) then reasoned that if these results were a function of positive views of aging in these cultures, it might be possible to prime such positive views to create a similar effect on cognitive performance of older adults. Consistent with this reasoning, Levy (1996) found that priming wisdom among older adults led to better memory performance and priming senility led to worse memory performance. Subsequent research demonstrated that these effects are also domain specific, as frailty primes

have a larger effect on physical performance and senility primes have a larger effect on mental performance of older adults (Levy & Leifheit-Limson, 2009).

One interpretation of these behavioral effects is that they are simply evidence of priming, and have little or nothing to do with self-stereotyping. Such priming effects can be seen, for example, in the work of Bargh, Chen, and Burrows (1996), who found that younger adults walked more slowly after being primed with concepts stereotypic of older adults. In contrast to this interpretation, the consequences of these acute manipulations of positive and negative images of older adults appear to be induced primarily by stereotype threat. Three results support this view. First, these cognitive consequences emerged when positive and negative images of older adults (e.g., *wise vs senile*) were presented to older but not younger adults (Hess, Hinson, & Statham, 2004; Levy, 1996). Second, these cognitive consequences emerged not only from priming positive and negative images but also from the standard stereotype threat instructions (e.g., *younger adults tend to do better than older adults on these memory tests*; Hess, Emery, & Queen, 2009). Finally, these cognitive consequences emerged primarily when the tests were made particularly challenging (e.g., by limiting time for reflection; Hess et al., 2009).

These data suggest that negative stereotypes of aging can create their own cognitive reality via both chronic and acute effects. The acute effects appear to be a function of stereotype threat, but the chronic effects are likely a combination of stereotype threat (e.g., disengagement; Steele, 2010) and self-stereotyping. That is, to the degree that older adults expect to show losses, they are likely to do so. For example, a lack of self-efficacy in cognitive domains can lead older adults not to engage in mental effort even when it is required (Stine-Morrow, Shake, Miles, & Noh, 2006). Self-stereotyping can also change people's view of reality by realigning their past; older adults tend to recollect being worse in their youth on attributes thought to improve with aging and better on attributes thought to decline with aging (McFarland, Ross, & Giltrow, 1992). Perhaps the most dramatic effects of self-stereotyping can be seen in research on health and mortality, in which negative stereotypes about aging measured earlier in life predict a greater likelihood of cardiovascular problems (Levy, Zonderman, Slade, & Ferrucci, 2009) and mortality at a younger age (Levy, Slade, Kunkel, & Kasl, 2002). Of course, such effects are likely to be multiply mediated, as negative stereotypes about aging could emerge from observations of one's parents or from individual experiences with how the body and

brain respond to aging well before people enter late adulthood. Thus, despite the fact that disentangling the effects of stereotyping on reality and reality on stereotyping is no easy task, the data suggest that expectations of cognitive loss in late life are likely to exacerbate those losses.

Mental activity

Intertwined with people's stereotypes about age changes in cognitive functioning are the actual mental activities in which they engage. Although genetic factors play an important role in cognitive losses with age (Reynolds et al., 2005), environmental influences that result in different mental activity levels may play an important role as well. Complexity in leisure and at work has long been thought to provide a protective function against cognitive loss (Kohn & Schooler, 1978, 1983), under the assumption that the facilitating effect of mental activity is analogous to that of physical exercise. Evidence in support of this possibility can be found in meta-analyses that show that complexity in education, at work, and in everyday life all delay the onset of cognitive decline (Valenzuela & Sachdev, 2006). Such evidence is also available from retirement studies, which show that complexity at work is associated with enhanced cognitive functioning primarily while people are still working, as the rate of decline tends to accelerate with retirement (Finkel, Andel, Gatz, & Pederson, 2009). Interestingly, in the Finkel et al. (2009) research, it was only social complexity that appeared to protect older adults from loss; complexity with data and objects appeared to have no effect. Although further research is clearly necessary to validate the importance of social complexity, this finding is consistent with evidence that even brief social interaction enhances processing speed and working memory (Ybarra et al., 2008), and that social engagement preserves processing speed in older adults (Lövdén, Ghisletta, & Lindenberger, 2005). Moderate extraversion is also associated with less cognitive impairment in late life (Crowe et al., 2006), perhaps due to the enhanced social activities of extraverts.

If mental practice preserves functioning in late life, then bilingualism might enhance attentional control processes, as bilinguals must continually inhibit one language to use the other (Green, 1998). Consistent with this possibility, bilingual adults show enhanced executive functioning compared to monolinguals, and this effect is even more evident in late adulthood (Bialystock, Craik, Klein, & Viswanathan, 2004; see Park and Gutches, 2006, for related cross-cultural effects). These results, and those of job and leisure complexity, reveal practice effects that are

undoubtedly based on thousands of hours of mental activity. Nevertheless, effects of very short-term mental activity are also evident, at least with younger adults (Ybarra et al., 2008), and thus it remains possible that older adults would also benefit from acute cognitive training. Consistent with this possibility, 24 hours of training with strategy video games has been shown to enhance performance on a variety of measures of executive functioning (e.g., task switching and working memory; Basak, Boot, Voss, & Kramer, 2008).

Mental activity does not just delay the onset of cognitive aging, it can also compensate for it. One important variety of compensation shown by older adults is neural “over-activation,” in which additional neural regions are recruited by older adults to solve the same problems as younger adults (see Reuter-Lorenz & Cappell, 2008). Although there is no single explanation for over-activation, at least some of the time it appears to be compensatory. For example, older adults who recruit both hemispheres to solve problems that are solved unilaterally by younger adults have been shown to suffer performance deficits if activation in either hemisphere is disrupted by transcranial magnetic stimulation (Rossi et al., 2004). Data such as these suggest that older adults compensate for reduced functioning in some areas of the brain by recruiting additional brain regions to solve the same problems. Nevertheless, over-activation can also be evidence of age-related failure to inhibit unwanted or irrelevant cognitive processes (Gazzaley, Cooney, Rissman, & D’Esposito, 2005; Persson, Lustig, Nelson, & Reuter-Lorenz, 2007).

CONCLUSION

As the research reviewed in this chapter indicates, social cognitive aging is a complex process that is subjected to a variety of forces. Age-related deficits in controlled processes are sometimes offset by preserved automatic processes, but sometimes further undermined by them. These processes represent the *mechanics* of the mind, and they underlie changes in a wide variety of mental functions. In contrast, age-related increases in knowledge accumulated through a lifetime of experience enhance social cognitive functioning, particularly with regard to interpersonal processes. These processes represent the *experiences* of the mind, and they too underlie changes in a wide variety of mental functions. Finally, motivational changes with age also play an important role, as advancing age changes people’s goals and values, and even their self-perceptions. These various cognitive and motivational changes

interact in numerous ways, some of which are reasonably well understood but most of which remain to be explored. With aging populations worldwide, such explorations are becoming more valuable and more feasible.

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