

Aging, Executive Functioning, and Social Control

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ABSTRACT—Aging is associated with atrophy of the frontal lobes of the brain, which are the seat of executive functions. Because successful social functioning often requires executive control, aging can lead to unintended social changes via deficits in executive control. In this article I review evidence that, due to losses in executive control, aging leads to increased prejudice and social inappropriateness and, under certain circumstances, increased depression and problem gambling. I then discuss theory and research suggesting possible interventions that might ameliorate unwanted social changes brought about by executive decline.

KEYWORDS—executive functioning; inhibition; prejudice; social inappropriateness; late-onset depression; gambling

In late adulthood, the brain gradually shrinks in total volume and weight. The frontal lobes in particular show significant atrophy with age (Dempster, 1992). The frontal lobes are the seat of executive functions, which include tasks such as planning and controlling thought and behavior. An important consequence of atrophy of the frontal lobes is poor executive functioning, including reduced ability to inhibit irrelevant or unwanted thoughts (Dempster, 1992). Because such failures at thought control lead to contamination of ongoing mental activities with unwanted information, age-related deficits in inhibitory ability have been implicated in a variety of cognitive deficits (Hasher, Zacks, & May, 1999). Inhibitory processes are also theoretically linked to a variety of social behaviors and cognitions, but to date there are only a few empirical investigations of the impact of age-related inhibitory losses on social functioning. This research on aging, inhibition, and social functioning is the focus of this article.

AGING, INHIBITION, AND PREJUDICE

Older Americans tend to be more prejudiced than their younger counterparts (Schuman, Steeth, Bobo, & Krysan, 1997). This age

difference is thought to be related to the historical periods in which the different generations were socialized, and indeed people were more prejudiced 30 and 50 years ago than they are today (Schuman et al., 1997). Nevertheless, this generational explanation for age differences in prejudice might be only part of the story. Automatic or unintentional stereotypic thoughts appear to be common in most people (Devine, 1989), and it might be that older adults have greater difficulty inhibiting these stereotypic thoughts despite their efforts to avoid being prejudiced. Thus, older adults might also be more prejudiced than younger adults because they can no longer inhibit their unintentionally activated stereotypes.

Consistent with this line of reasoning, we found that older White adults show greater stereotyping and prejudice toward African Americans than younger White adults do, despite being more concerned about impression management and more motivated to control their prejudices (von Hippel, Silver, & Lynch, 2000). Furthermore, when we measured inhibitory ability (by giving participants paragraphs that contain distracting text and asking them to read the paragraphs aloud without vocalizing the distracting text), we found that the age differences in stereotyping and prejudice were mediated by age differences in inhibition. That is, older adults only showed greater stereotyping and prejudice to the degree that they also showed greater difficulty inhibiting their vocalization of the distracting text. Additionally, individual differences in inhibition were associated with individual differences in prejudice among both older and younger adults, suggesting that the inhibition–prejudice link in older adults is not simply a byproduct of early stages of dementia.

These data suggest that because prejudice toward African Americans conflicts with prevailing egalitarian beliefs, older adults attempt to inhibit their racist feelings, but fail. Not all prejudices conflict with egalitarianism, however, and thus not all age differences in prejudice should be mediated by inhibitory deficits. For example, people who are prejudiced against gays perceive homosexuality as a chosen lifestyle, and thus for them anti-gay prejudice does not conflict with egalitarianism (and thus is unlikely to be met with inhibitory efforts). Consistent with this reasoning, a nationally representative survey of older and younger White Americans (von Hippel, Radvansky, & Copeland, 2007) revealed that increased prejudice toward gay men

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among older adults was fully mediated by age differences in conservatism, whereas increased racism among older adults was unrelated to conservatism. Thus, some age differences in prejudice (e.g., anti-gay prejudice) might represent cohort effects whereas others (e.g., anti-Black prejudice) might not.

AGING, INHIBITION, AND SOCIAL INAPPROPRIATENESS

Age-related inhibitory losses have also been implicated in two other types of social inappropriateness. 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 increase in “off-target verbosity” is associated with diminished inhibitory ability (measured via the Trail Making Test, which requires participants to trace a pathway among randomly scattered letters and numbers—from A to 1 to B to 2, etc.—and thus to inhibit the natural tendency to follow either an alphabetic or numeric sequence; the Stroop test, which requires participants to name the ink color in which different color words are printed; and verbal fluency), which leaves older adults less capable of stopping their conversation and remaining on topic.

Inhibition might also be necessary to restrain oneself from verbalizing thoughts that are better left unsaid, and thus inhibitory deficits might lead older adults to make socially inappropriate remarks. Consistent with this possibility, we found that older adults were more likely than younger adults to inquire about private issues in public settings; this age difference in social inappropriateness appeared to be brought about by inhibitory deficits (measured with a trivia test that includes misleading items that require respondents to inhibit their initial response, e.g., answering “Black” to “What color are a tiger’s spots?”; von Hippel & Dunlop, 2005). Furthermore, these age differences emerged despite the fact that older and younger adults agree that it is inappropriate to inquire about such issues in public settings (and indeed, older adults in particular felt less close to those who inquired about private issues in public). These findings suggest a dissociation between knowledge of social rules and the ability to follow them that is consistent with other types of frontal lobe damage.

We have also found that individual differences in inhibitory ability (measured via the Stroop test) predict inappropriate social responding among younger adults when they are placed in a sufficiently challenging social situation (von Hippel & Gonsalkorale, 2005). These results with young adults suggest that increased social inappropriateness with age is not just a sign of early stages of dementia, as younger adults also appear to rely on their inhibitory skills to keep socially inappropriate thoughts in check.

AGING, INHIBITION, AND DEPRESSION

Poor inhibitory ability is not only associated with cognitive and social problems; it is also related to depression (Hertel, 1997).

Although depression might cause inhibitory deficits, age-related inhibitory deficits might also contribute to late-onset depression by impairing control of excessive rumination (a tendency to focus on one’s problems without engaging in active problem-solving, which exacerbates and prolongs depression). Note, however, that inhibitory deficits should not lead all, or even most, older adults to excessive rumination. Rather, only those older adults who rely on inhibitory control to stop themselves from ruminating (either chronically or when confronted by negative life events) are likely to develop problems with rumination if they have poor executive control. Older adults disinclined to ruminate and older adults who ruminate but do not try to suppress their ruminative thoughts should not show a relationship between inhibition and rumination.

Consistent with this reasoning, we found that inhibitory deficits (measured via the Stroop test, the distracting-text task described above, and a working-memory task) predicted greater depression among late-onset but not early-onset depressed older adults, and that inhibitory deficits had their impact via their role in rumination. That is, among older adults with late-onset depression, poorer inhibition predicted increased rumination, which in turn predicted increased depression. In contrast, among older adults with early-onset depression, inhibitory deficits were not associated with ruminative tendencies, suggesting that these individuals were not relying on inhibition to control their rumination and in all likelihood had developed depression for other reasons (von Hippel, Vasey, Gonda, & Stern, in press).

In the case of depression, however, we cannot rule out the possibility that dementia is the root cause of the apparent relationship between inhibitory deficits and late-onset depression, as both are highly associated with dementia. Nevertheless, recent evidence suggests that inhibitory ability is also linked to rumination among younger adults (Whitmer & Banich, 2007), and thus further research might disentangle dementia from the relationship between inhibition and depression by focusing on a younger cohort. Although individual differences in executive control among younger adults are much smaller than those between older and younger adults or among older adults, sufficiently sensitive measures might reveal that inhibitory functioning predicts depression across the lifespan in those with ruminative tendencies who control them via thought suppression.

AGING, INHIBITION, AND PROBLEM GAMBLING

Analogous to the case with late-onset depression, poor inhibitory ability is unlikely to lead to gambling problems in all or even most older adults. Rather inhibitory deficits might lead to gambling problems only among those who struggle with their impulse to gamble. That is, people who gamble and who are impulsive by nature might be at risk for developing gambling problems as they age, due to losses in the ability to restrain their urge to gamble. Consistent with this possibility, we found that older adults who gamble and are impulsive suffered from greater

gambling problems to the degree that they also have poor executive control (measured via the Trail Making Test; von Hippel, Ng, Hucker, & Hilliar, 2007). In contrast, older adults who are low in impulsiveness showed no relationship between executive control and gambling problems. Because nonimpulsive older adults have no strong impulse to restrain, even when they have poor executive control they appear unlikely to have problems gambling. Thus, inhibitory deficits seem to lead to gambling problems among the subset of older adults who gamble and have an impulsive personality.

MINIMIZING SOCIAL CONSEQUENCES OF FRONTAL LOBE ATROPHY

There are very few studies addressing how the social consequences of frontal lobe atrophy might be ameliorated, but theory and research suggest some possibilities. First, circadian rhythms are known to influence inhibitory ability, with older adults typically showing better inhibition earlier rather than later in the day and younger adults showing the opposite pattern (Hasher et al., 1999). These patterns of inhibitory functioning appear to reflect age differences in broader circadian rhythms in biological and cognitive functioning that also emerge in non-human animals. Knowledge of such circadian patterns could be used to facilitate social functioning among disinhibited older adults by scheduling their important social activities earlier rather than later in the day. Consistent with this possibility, Sang Cheung and I recently conducted an (unpublished) experiment in which older and younger Australians were presented with a provocative remark in the context of soliciting their opinion about world events (a Chinese experimenter provided an example of his opinion that China would soon be the world's superpower). No age differences emerged in the frequency with which participants argued with the provocateur when the experiment was conducted in the morning, but in the afternoon older adults were more likely than younger adults to voice their disagreement (see Fig. 1).

Gambling problems among older adults might be similarly responsive to time-of-day manipulations. In a test of this possibility, von Hippel, Ng, Hucker, and Hilliar (2007) report a second experiment in which older adults played a computerized gambling game with real winnings, either in the morning or the afternoon. The game was preprogrammed to appear random but initially provide more wins than losses. After participants had accumulated some winnings, they were told that they could continue to play for as long as they liked or until they lost all their winnings. Unbeknownst to them, at that point the program shifted so that the game no longer provided any wins, thereby enabling the assessment of perseverance in the absence of reward. Consistent with predictions, older adults responded more readily to the absence of reward and stopped playing more quickly in the morning than they did in the afternoon, and this

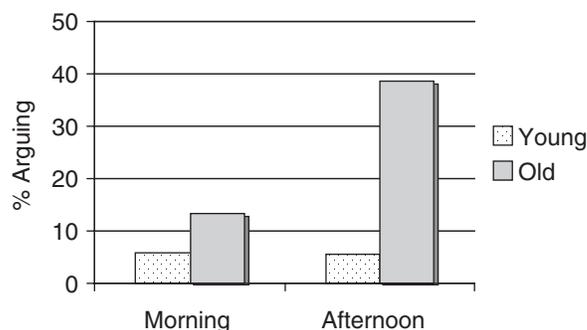


Fig. 1. Gratuitous arguments as a function of age and time of day.

effect was most pronounced among older adults whose circadian rhythms identified them clearly as “morning types.”

The findings of these initial experiments suggest that interventions could be based on other activities that are known to enhance frontal lobe functioning. For example, aerobic exercise enhances frontal lobe functioning among older adults (Kramer et al., 1999) and caffeine consumption attenuates cognitive deficits among older adults who are off-cycle in their circadian rhythms (Ryan, Hatfield, & Hofstetter, 2002), suggesting that both have the potential to enhance social control among disinhibited older adults.

POSITIVE VERSUS NEGATIVE SOCIAL CONSEQUENCES OF AGING

The focus of this article has been on the negative social consequences that emerge from age-related atrophy of the frontal lobes. It should be noted, however, that some of these negative effects might be offset by other changes in social and cognitive functioning that emerge in late adulthood. For example, it is well known that older adults attend more to positive emotions than younger adults do, and indeed older adults show decreased responding in the amygdala (a brain region involved in emotional experience) to negative but not to positive events (Carstensen & Mikels, 2005). This increased positivity and decreased negativity with age has a number of important social consequences, such as a more affectionate style of conflict resolution among older adults in long-term marriages (Carstensen, Gottman, & Levenson, 1995). Older adults are also more effective at solving some types of social problems than younger adults are, in part because they are more likely to integrate their long-term emotional goals with their immediate instrumental intentions (Blanchard-Fields, 2007).

These studies suggest that there are likely to be circumstances in which the social behavior of older adults is facilitated by increases in positivity and other circumstances in which it is disrupted by deficits in executive control. Indeed, the same circumstances might elicit both types of responses. For example, Blanche Savage and I conducted an (unpublished) experiment in which we asked younger and older adults to describe their relationship conflicts. Ostensibly to provide an example of the type

of conflict that participants might describe, the experimenter gave provocative accounts of her own conflicts in which she was egregiously to blame. Older adults were more likely than younger adults to offer gratuitous negative comments about the experimenter's behavior, but older adults were also more likely to offer sympathetic and positive comments (despite being less likely to make neutral comments). These findings provide suggestive evidence of age-related positivity and disinhibition operating simultaneously, although positive and negative responses were never provided by the same individuals. Some older adults appeared to have difficulty inhibiting their opinions about how others should conduct their affairs, but other older adults were more sympathetic of the blameworthy behaviors of others. Future research should consider the situational and individual differences that predict these competing responses, and perhaps consider whether circumstances exist in which older adults show disinhibited positivity.

CONCLUSIONS AND FUTURE DIRECTIONS

Social changes commonly occur with age, and they are widely assumed (often by older adults themselves) to be a function of changes in preferences and values as people get older. Although changed preferences and values might underlie some age-related social changes (e.g., the tendency to maintain a smaller circle of closer friends; Carstensen & Mikels, 2005), the research reviewed here suggests that cognitive changes caused by frontal lobe atrophy might also be responsible for many social changes that emerge in late adulthood. Thus, the current research paints a picture of age-related social change as often unintended and brought about by losses in executive control.

Furthermore, it is important to note that the social changes described in this article likely represent just a fraction of those that are influenced by atrophy of the frontal lobes. Due to their pervasive role in higher-order thought, executive functions are involved in a wide variety of social behaviors, many of which have the potential to be disrupted by aging. For example, when people engage in goal-directed behavior they must first prioritize their goals and then inhibit those secondary goals (e.g., to socialize) that compete with their primary intentions (e.g., to complete a project). Such selective goal inhibition (known as goal shielding) is likely to be more difficult for older than younger adults (cf. Hasher et al., 1999).

Perhaps most importantly, however, there is a pressing need for longitudinal research on executive control and social functioning. By definition, this work takes time, but the extant literature is almost exclusively cross-sectional and thus heavily reliant on correlational data, with all of the problems and limitations that entails. Nevertheless, the available research suggests that the study of aging, executive functioning, and social control appears likely to yield insight into the manner in which changes in the brain can lead to unintended social changes.

Knowledge of the neurological and cognitive sources of these social changes might also have applied value, as early returns suggest that it is possible to undo, or at least attenuate, the impact of some executive deficits on social functioning.

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