Older adults make less advantageous decisions than younger adults: Cognitive and psychological correlates

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Abstract

This study tested the hypotheses that older adults make less advantageous decisions than younger adults on the Iowa Gambling Task (IGT). Less advantageous decisions, as measured by the IGT, are characterized by choices that favor larger versus smaller immediate rewards, even though such choices may result in long-term negative consequences. The IGT and measures of neuropsychological function, personality, and psychopathology were administered to 164 healthy adults 18–85 years of age. Older adults performed less advantageously on the IGT compared with younger adults. Additionally, a greater number of older adults' IGT performances was classified as "impaired" when compared with those of younger adults. Less advantageous decisions were associated with obsessive symptoms in older adults and with antisocial symptoms in younger adults. Performance on the IGT was positively associated with auditory working memory and psychomotor function in young adults, and in immediate memory in older adults. (JINS, 2007, 13, 480–489.)

Keywords: Decision making, Aging, Cognition, Gambling task, Frontal lobe function, Executive function

INTRODUCTION

Older adults are faced with many situations that require making important decisions about financial management, medical care, retirement, housing, and transportation. Unfortunately, it is not uncommon to read of accounts in the local newspaper of elderly individuals being victimized by a range of scams involving home repair, fraudulent lottery or sweepstake winnings, identity theft, and fraudulent charitable organizations. It is a fact that older adults are preferentially targeted by fraudulent and misleading advertising (American Association of Retired Persons, 1996), presumably because they are more likely to make ill-informed decisions that make them easier prey for scam artists.

The poor decisions observed in some older adults are thought to be due to either age-related declines in general cognitive function (Band et al., 2002) or to age-related declines in specific executive cognitive abilities associated with changes in the frontal lobe (Raz et al., 1998; West, 1996). For instance, older adults deliberate less when solving problems and have lower working memory capacity, short-term memory capacity, and speed of information processing (Johnson, 1990; Kim et al., 2002; MacPherson et al., 2002; Salthouse, 1996; Schaie & Willis, 1999). Lower working memory capacity or reduced deliberation or reflection time when making decisions is associated with impulsive decisions (Finn et al., 2002). Studies show that lower working memory capacity in younger populations is associated with less advantageous, impulsive decision making (Bechara & Martin, 2004; Finn et al., 2002; Hinson et al., 2003). Furthermore, magnetic resonance imaging studies have shown that aging is highly correlated with shrinkage in prefrontal regions such as the lateral prefrontal cortex, the orbitofrontal cortex, and in prefrontal gray and white matter volumes (Raz et al., 1997, 2004).

and colleagues (1994) to study the decision-making impairments of patients with lesions of the ventromedial prefrontal cortex who develop what is called acquired sociopathy. Decision-making impairments on this task are also associated with substance abuse problems, antisocial behavior, and personality traits reflecting low levels of socialization and higher levels of impulsivity (Bechara et al., 2001; Fein et al., 2004; Mazas et al., 2000).

Studies conducted in recent years that examine decision making on similar tasks in older adults have yielded mixed results. Recent studies using the IGT suggest that decision making in older adults is associated with different cognitive processes than in younger adults (Wood et al., 2005), and there may be some evidence that at least some older adults make less advantageous decisions than younger adults (Deakin et al., 2004; Denburg et al., 2005). Denburg and colleagues (2005) found that older adults (56–85 years of age) made generally less advantageous decisions compared with their sample of younger adults (26–55 years of age). The analyses by Denburg et al. (2005) revealed that nearly half of their older adults were clearly impaired in their decisions and never learned to shift their decision-making strategies to make more advantageous decisions. However, the other half of the older adults were not impaired at all and showed the same pattern of advantageous decisions as the younger adults in their sample. Wood and colleagues (2005) also used the IGT to assess decision making in younger (18–34 years old) and older (65–88 years old) adults. While Wood et al. (2005) did not report any significant age-related differences in advantageous decisions, the mean performance for older adults was nonsignificantly lower than that of younger adults and older adults used different strategies than younger adults when learning the task. Finally, MacPherson and colleagues (2002) reported no significant differences in advantageous decision making between younger and older adults; however, as pointed out by Denburg et al. (2005), older adults had generally flatter learning curves compared with younger adults, which seems to suggest some impairment in the ability to learn to make more advantageous decisions over time.

Table 1. Demographics, gambling game, and neuropsychological measures

Variable	Younger group Ages 18–55 Men (n = 49)	Younger group Ages 18–55 Women (n = 63)	Older group Ages 56–85 Men (n = 18)	Older group Ages 56–85 Women (n = 34)	Effect size (%) Group	Effect size (%) Gender	Effect size (%) Group × gender
Demographics							
Age (years)	35.4 ± 10.1	39.7 ± 10.8	71.5 ± 7.6	74.8 ± 7.2	N0A	N0A	N0A
Years education	16.3 ± 2.0	16.4 ± 1.6	16.5 ± 2.5	15.9 ± 1.9	0.1	0.4	0.8
Gambling game							
Sum of the "good"–"bad" decks[a]	36.6 ± 31.2	34.3 ± 29.3	21.7 ± 31.8	8.2 ±			

plus an additional bonus once they had completed the study. All of the procedures, measures, and compensation were reviewed and approved by an institutional review board.

Psychodiagnostic and Personality Assessment

Lifetime and current (prior year) psychiatric diagnoses and symptom counts were determined using the computerized version of the Diagnostic Interview Schedule (CDIS; Robins et al., 1998). Table 2 presents the number of positive diagnoses by group and gender. Personality traits reflecting antisocial tendencies (Finn & Hall, 2004) were assessed using the Psychopathic Deviance scale of the MMPI-2 (MMPI_Pd; Hathaway & McKinley, 1989), the Socialization scale of the California Psychological Inventory (CPI_So; Gough, 1969), and the sum of Conduct Disorder and Antisocial Personality Disorder symptom counts from the CDIS (CD_ASPD). Research shows that these different measures of personality and antisocial symptoms are significantly associated with disadvantageous decisions on the IGT in young adult samples (Mazas et al., 2000; Stout et al., 2005).

Neuropsychological Assessment

A neuropsychological assessment was administered on the second day of testing. This assessment began with the administration of the following individual tests: Rey–Osterrieth Complex Figure (copy, immediate, and delay; Osterrieth, 1944), Trail Making Test A and B (Reitan & Wolfson, 1985), Symbol Digit Modalities Test (written administration only; Smith, 1968), American version of the Nelson Adult Reading Test (AMNART; Grober & Sliwinski, 1991), Short Category Test (booklet format; Wetzel, 1982), Controlled Oral Word Association Test (COWAT; Benton & Hamsher, 1983), Paced Auditory Serial Addition Test (PASAT; Gronwall, 1977), Block Design (WAIS; Wechsler, 1981), Stroop Color

verage5.9Gambling measures TD 0 Tc 6516Tj /F1 1 Tf Z.3909 0 TD (A)T

and Word Test (Golden, 1975), Fregly Ataxia Battery (Fregly et al., 1973), and the Iowa Gambling Task (IGT, described in detail below; Bechara et al., 1994). After a 15-min break, the subject completed the MicroCog (MC) Assessment of

domains (see Table 1; Table 3 contains results from analyses on the raw scores). There was no difference in the average Z score across domains [$F(1, 160) = 0.15, p > .70$]. On

DISCUSSION

The current study replicates the major finding of Denburg et al. (2005) that individuals older than age 55 exhibit less advantageous decisions on the IGT compared with individuals younger than age 55. The analysis of IGT performance versus age data using polynomial regression found that a quadratic curve best fit the data. As shown in Figure 1, IGT performance as a function of age revealed that age 55 was a reasonable cutoff for demarking the beginning of age-related impairment. Using Denburg's definition of "impaired" and "unimpaired," IGT performance as being significantly worse than chance and significantly better than chance, respectively, we replicate their finding of more impaired performance in the over 55 compared with more unimpaired performance in the under 55 group. Our percentage of older individuals with unimpaired performance was lower than that in our younger sample and was comparable to that of Denburg (46% vs. 38%); however, our percentage of older individuals with impaired performance, while higher than that in our younger sample, was lower than that reported by Denburg (15% vs. 35%). In addition, Denburg did not find any associations between the IGT and performance on cognitive tests, while we reported an association with the average *Z* score across all nine cognitive domains assessed. Furthermore, Wood et al. (2005) found that older and younger adults use different cognitive strategies in regard to decision making as assessed by the IGT. Analyses of our participants also revealed that different cognitive processes are associated with decision making in older versus younger adults. Auditory working memory and psychomotor abilities were associated with IGT within the younger group, and immediate memory was associated with IGT performance in the older group.

Regarding neuropsychological performance, it is important to note that all participants performed within the normal range compared with age and education adjusted norms (see Table 1). The groups did not differ on age and education adjusted scores, except for the older group performing better on reaction time and delayed memory. These differences were subtle impairments and were not clinically significant. Furthermore, looking at the raw scores (Table 3), older adults performed worse than younger adults on these two domains. The better performance in terms of the scaled scores suggests that older adults in the Bay Area (from which our sample was drawn) perform better than the older sample from which the normative data were derived. For all subjects, the average *Z* score across domains was positively associated with advantageous decisions on the IGT, and there was no significant difference in this association between groups.

Within the younger groups, especially among the young women, there was a relatively high proportion of individuals who met lifetime criteria for depression. Analysis of covariance did not, however, reveal any association between depressive symptoms and performance on the IGT. This higher rate of depression reported in the younger groups may reflect a combination of factors. Depressed older individuals are subject to survivor effects because depressed individuals die at an earlier age than nondepressed individuals (Schulz et al., 2002). In addition, it is possible that our elderly participants were a select sample (with a relatively low rate of depression) because of their propensity to volunteer for a 4-day research study. They reported that their participation was mostly for altruistic reasons and to learn more about themselves, as compared with the younger subjects who more often reported monetary considerations as a motivating factor. Finally, possible cohort differences in the acknowledgment of psychological distress may also have played a part.

The results also indicate different psychological correlates of impaired decision making in older versus younger adults. For younger adults, even though these subjects were healthy normal individuals, antisocial behavior was significantly associated with less advantageous decisions. This result is consistent with studies that show that young adults with diagnosable disinhibitory syndromes, such as conduct disorder, antisocial personality disorder, and substance abuse, demonstrate less advantageous decisions (Mazas et al., 2000). However, for older adults, symptoms of obsessiveness were associated with less advantageous decisions. More studies are needed to replicate these findings and to determine what aspects of obsessiveness might contribute to impaired decisions in older adults. We are very aware of the difference between diagnosable psychiatric illness and subdiagnostic signs and symptoms associated with such illness. We published a study in which we examined both

ity in elderly individuals with a history of alcohol or drug abuse and may make them particularly vulnerable to making disadvantageous decisions. Studies examining decision-making ability in elderly individuals with a history of alcohol or drug abuse are warranted.

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