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OLDER MALES, COGNITIVE FUNCTION, AND ALCOHOL CONSUMPTION

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Abstract

We investigated the question, how do older men who drink alcohol differ from those who do not drink on measures of cognitive function, memory, affect, and health? Of the nonprobability sample of male participants (N = 60), 35 (58%) of the males reported some degree of alcohol consumption. Eleven men had one or more drinks per day, 14 had one or more drinks per week, and 9 were occasional drinkers. The drinkers reported significantly less depression, had higher self-reported general health and vitality, and had higher cognitive performance, cognitive flexibility, and verbal memory, and greater knowledge of memory processes.

Cognitive aging researchers are interested in the identification of preventive behaviors that will promote function and independence (Stuck, Walthert, Nikolaus, Bula, Hohmann, & Beek, 1999; Unger, Johnson, & Marks, 1997; Wang, van Belle, Kukull, & Larson, 2002). Moderate consumption of alcohol has been positively associated with maintenance of cognitive function and physical health (Blow et al., 2000; Krahn, Freese, Hauser, Barry, & Goodman, 2003; Leroi, Sheppard, & Lyketsos, 2002; Peele & Brodsky, 2000); a reduced risk of cardiovascular disease (Mann & Folts, 2004; Scherr et al., 1992) and cognitive disorders (Broe et al., 1998; Klatsky, Armstrong, & Friedman, 1997; Mukamal & Rimm, 2001; Orgogozo et al., 1997; Zuccala et al., 2001); decreased symptoms of depression and greater mental health (Bridevaux, Bradley, Bryson, McDonell, & Fihn, 2004; Schutte, Moos, & Brennan, 1995); lowered mortality (Simons et al., 2000); and increased high density lipoprotein (HDL) levels (Mukamal & Rimm, 2001). Alcohol use in moderation clearly has health benefits for older adults, but the health concerns associated with overuse remain, particularly in older males who consume more than four drinks on any day and more than fourteen drinks in a typical week (U.S. Department of Health & Human Resources, 2003). Therefore, continued scientific inquiry is important to clarify relationships among health factors (Johnson, 2000; Miller & Cervantes, 1997; Molgaard, Nakamura, Stanford, Peddecord, & Morton, 1990; Reid, Boutros, O'Connor, Cadariu, & Concato, 2002; Schoenborn & Adams, 2001; Stall, 1987; Wilsnack, Vogeltanz, Wilsnack, & Harris, 2000).

Executive function encompasses several domains, and goal-directed behaviors such as planning, sequencing, and monitoring of behavior have been found to be associated with independent activities of daily living (IADL) skills (Barberger-Gateau, Fabrigoule, Helmer, Rouch, & Dartigues, 1999; Laukkanen, Kauppinen, Era, & Heikkinen, 1993; Mahurin, DeBettignies, & Pirozzolo, 1991). Carlson et al. (1999) tested executive functions with the Trail Making Test, and found an association with slower performance of IADL (using a telephone) in high-functioning, community-residing older women. Findings by Wetherell,

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Reynolds, Gatz, and Pedersen (2002) indicated that a higher state anxiety was associated with poorer performance on several of the cognitive tests. The purpose of this paper was to investigate the question, How do older men who drink alcohol differ from those who do not drink on measurements of cognitive function, memory, affect, and health?

METHOD

Eligibility and Screening

The study was promoted in the community as a health promotion intervention in which the participants would be taught strategies for successful aging. Study participants were drawn from a metropolitan area in Central Texas through print and TV media, and through direct recruitment at city-run senior activity centers, churches, health fairs, and festivals. All participants were seen in face-to-face interviews or by telephone for the eligibility testing. To be eligible participants must have been 65 or older, spoke or understood and read English, lived independently in the community, had reliable transportation, and agreed to come for an initial screening meeting.

Participants who were eligible and came for the initial screening meeting gave informed consent and completed the screening battery. At the screening interview participants were administered the following measures of intellectual and executive functioning: the Mini-Mental Status Examination (Folstein, Folstein, & McHugh, 1975; Tombaugh & McIntyre, 1992); the Controlled Oral Word Association Test (COWAT) from the Multilingual Aphasia Examination (Summerall, Timmons, James, Ewing, & Oehlert, 1997), and the Trail-Making Test (Reitan, 1958). Participants were required to achieve a score of 23 or higher on the Mini-Mental Status Examination to be eligible for the study. Those participants who passed the other eligibility tests, but had a score just below the cutoff on this test were reviewed on a case-by-case basis for inclusion.

Organizational strategy was measured with the Controlled Oral Word Association Test (COWAT). The COWAT is part of the Multilingual Aphasia Examination employed to assess organizational strategy (Summerall, Timmons, James, Ewing, & Oehlert, 1997). Participants were required to achieve an age and education corrected score of 24 or higher to be eligible for the study. Those participants who passed the other eligibility tests, but had a score just below the cutoff on this test were reviewed on a case-by-case basis for inclusion into the study.

Cognitive flexibility was measured with the Trail-Making Test, Parts A and B (Reitan, 1958). Cognitive flexibility was specifically assessed using the Trail-Making Test B. On Part B, randomly arrayed numbers and letters must be connected in an ascending alphanumeric sequence (1-A, 2-B, 3-C, etc.). Participants were required to pass Trails A and/or Trails B at or above the 10th percentile for their age group for inclusion into this study.

Cognitive Variables

Those individuals who met the cognitive screening criteria were given the study battery. Verbal memory performance was tested with the Hopkins Verbal Learning Test-Revised (HVLT-R). The HVLT-R tests immediate recall, delayed recall, and recognition memory by requiring the individual recall a 12-word list presented over three successive learning trials with the highest score equaling 36 (Benedict, Dobraski, & Goldstein, 1999; Brandt, 1991; Brandt, Corwin, & Krafft, 1992; Shapiro, Benedict, Schretlen, Brandt, 1999). After a brief delay, the individual is again asked to recall the same list without the benefit of another exposure, and then asked to identify target words from memory with a “yes” response and nontargets with a “no” response.

Visual memory performance was determined with the Brief Visuospatial Memory Test-Revised (BVMT-R). The BVMT-R has a similar administration format. An individual is presented with a matrix of six geometric designs for ten seconds and then asked to reproduce the designs with paper and pencil (Benedict, Dobraski, & Goldstein, 1999).

Memory performance was measured with the Rivermead Everyday Behavioural Memory Test (RBMT). The RBMT is designed to reflect everyday memory, and is a bridge between laboratory-based measures of memory and assessments obtained by questionnaire and observation (Cockburn & Smith, 1989; Wilson, Cockburn, Baddeley, & Hiorns, 1989). The components are remembering a name (first and surname), hidden belonging, appointment, picture recognition, brief news article, face recognition, new route (immediate), new route (delayed), message, orientation, and date. To help control for practice effect, the test is available in four alternate (parallel) forms. The RBMT has proved an acceptable test of memory for adults over the age of 70 years. It is relatively resistant to moderate impairments of vision or hearing, and is not influenced by self-reported anxiety or depression (Cockburn & Smith, 1991, 1994; Wilson, Cockburn, & Baddeley, 1985).

Functional ability was measured by self-report and performance based measures. The Direct Assessment of Functional Status (DAFS), a performance-based instrument that includes 85 items (Lowenstein et al., 1989; Lowenstein et al., 1992), measures a broad spectrum of behaviors within each of the seven functional domains and is readily administered in an outpatient setting. The IADL items are complex, require skill, and require combinations of tasks to complete. The items test time orientation, communication abilities, transportation, financial skills, shopping skills, eating skills, and dressing/grooming skills. The instrument has been tested with elders living in the community. The DAFS required 30 minutes for administration.

Self Report IADLs were evaluated with the Instrumental Activities of Daily Living (IADL) Scale (Lawton & Brody, 1969; Lawton, Moss, Fulcomer, & Kleban, 1982; Lawton, 1988), a self-report test of IADL items which are complex skills requiring combinations of tasks to complete. The instrument has a total of eight items such as using the telephone, going shopping, preparing meals, cleaning the house, doing the laundry, providing transportation, taking medications, and handling money. Response formats varied from a minimum of three choices (finances, laundry, and medications), to four choices (cooking, shopping, and telephone) to five choices (housekeeping and transportation).

Health was evaluated with the Medical Outcomes Study Health Scale (SF-36), a measure of self-rated health including overall health, functional status, and well-being (Ware & Sherbourne, 1992). The instrument includes eight concepts: (a) limitations in physical activities due to health problems, (b) limitations in social activities because of physical or emotional problems, (c) limitations in usual role activities because of physical health problems, (d) bodily pain, (e) mental health (psychological distress and well-being), (f) limitations in usual role activities because of emotional problems, (g) vitality (energy and fatigue), and (h) general health perceptions. Individuals respond to 36 items on a Likert scale ranging from "*poor*" to "*excellent*" and from "*much worse*" to "*much better*" (McHorney, Ware, & Raczek, 1993).

Alcohol consumption was determined with a question inquiring about alcohol consumption that was embedded in the health interview self-report questionnaire. The participants were asked to indicate whether they drank alcohol or abstained (yes/no) and if they indicated that they did drink, to describe how many drinks they consumed in a given period of time (day/week/month).

Anxiety was operationalized with the Spielberger State/Trait Anxiety (STAI) measure for adults (Spielberger, Gorsuch, & Lushene, 1970). The STAI consists of 40 questions with a

range of four responses: “almost never,” “sometimes,” “often,” or “almost always.” The scale differentiates between the temporary condition of “state anxiety” and the long-standing “trait anxiety.” The STAI has been used to detect treatment change in memory improvement studies with elderly participants (Yesavage, 1984; Yesavage, Sheikh, Tanke, & Hill, 1988).

Depressive symptoms were operationalized with the Center for Epidemiological Studies Depression Scale (CES-D) on which individuals respond using a 4-point Likert scale that ranged from “rarely” or “none of the time” to “most” or ‘all of the time.’ Scores ranged from 0 to 60, with a score ≥16 considered to be symptomatic of greater depressive symptoms (Radloff & Teri, 1986).

Memory self-efficacy was measured with the Memory Self-Efficacy Questionnaire (MSEQ) (Berry, West, & Dennehey, 1989). The MSEQ is a Guttman scale consisting of 50 items, five questions for each of ten everyday tasks: objects, text, groceries, photographs, story, number sets, locations, animals, phone numbers, and pictures. In the Bandurain tradition, subjects make performance predictions on self-efficacy level (Yes or No) and on strength and confidence in each performance prediction, from 10% to 100%. In this study, the text details (B), digits (F), and line drawings (G) subscales were dropped, therefore reducing the scale to 35 questions (McDougall, 1994, 2004).

Metamemory was measured with the Metamemory in Adulthood Questionnaire (MIA) that captures the subjective memory components of knowledge, beliefs, and affect (Dixon, Hultsch, & Hertzog, 1988). The MIA consists of 108 statements, with responses rated on a 5-point Likert scale, from “all of the time” or “always” to “none of the time” or “none.”

Data Analysis

We used Chi-square and *t* tests to compare the drinking and non-drinking groups for all demographic, affective, health status, functioning, and cognitive measures. For all variables, we report means and standard deviations or frequency and percents as well as the *p*-value for the significance test. We attempted to use analysis of covariance to determine the independent effect of alcohol use given other demographic and affective measures. However, we discovered strong correlations among some the independent variables (Table 1). These correlations caused colinearity among the covariates in the analysis resulting in unreliable results. The small sample size in addition to the colinearity made complex multi-variable analyses untenable.

RESULTS

There were 60 men, of whom 35 (58%) reported some degree of alcohol consumption. The drinkers reported considerable variability in both the amount and frequency of alcohol consumed and the types of alcohol. Eleven men had one or more drinks per day, 14 had one or more drinks per week, and 9 were occasional drinkers. Alcohol use data was missing on one person. Drinks varied widely from one drink every two weeks to three to four drinks in one day.

Seventy-one percent of the drinkers responded that they lived with someone and 68% of the non-drinkers lived with someone. The age and education of both groups were comparable. Table 2 is a report of the demographic variables for the drinking and non-drinking groups. Age, education, and living status were not significantly different between the two groups although the drinking group was somewhat younger. However, the drinking group was significantly better off financially (4.8 vs. 3.7) and had a significantly smaller proportion of minority men (20% vs. 48%).

The analysis results of the affective measures of depression and anxiety are reported in Table 3. The drinking group exhibited significantly less depression than the non-drinkers. Anxiety was not significantly different between the two groups; both state and trait anxiety were somewhat lower for drinkers.

The self-reported perceived health status was significantly higher for the drinkers than for the non-drinkers (13.94 ± 2.27 for drinkers vs. 12.20 ± 2.58 for nondrinkers; $p = 0.008$, pooled effect size = −0.72).

Table 4 gives the statistics for the functioning measures for each group and the results of the comparison between non-drinkers and drinkers. For all functioning measures drinkers scored higher than non-drinkers, significantly so for SF-36 measures of general health and vitality.

Performance measures of cognition were better for drinkers than for non-drinkers. Drinkers scored significantly higher than non-drinkers for cognition, memory performance, and verbal memory; drinkers did marginally significantly better on cognitive flexibility (Table 5).

An examination of the effect sizes associated with these differences reveals that many meet Cohen's (1992) criteria for moderate ($d > .50$) or large ($d > .80$) effects. The largest difference between drinkers and non-drinkers is associated with their self-reported adequacy of financial resources ($d = 1.06$). The percentage of minority respondents also was higher among non-drinkers than among the drinkers ($d = .62$). Large differences were observed in two memory performance measures, the Rivermead ($d = .85$) and the Hopkins Verbal Learning Test ($d = .62$), as well as the Mini Mental Status ($d = .74$). Other large differences between drinkers and non-drinkers were seen on the health status ($d = .72$), the CESD ($d = .55$), the Task subscale of the Metamemory ($d = .57$), and two scales from the SF-36 (d for General Health = .60; d for Vitality = .57). Moderate effects sizes were associated with differences on the Controlled Oral Word Search, the Trails A and B, the Direct Assessment of Functional Status, the Spielberger State Anxiety Measure, the Metamemory Memory Capacity and Change subscales, and the SF-36 Social Functioning, Physical Functioning, and Mental Health Scales.

DISCUSSION

Even though the study provides interesting new data on the affective and cognitive function of a group of community dwelling older males, it has several limitations. First, the participants were volunteers from the community. Second, the data on drinking patterns was gathered via self-report, and the forced choice nature of the question may have contributed to a lack of specificity. Third, even though the sample in this study was tri-ethnic, the abstinence group contained a higher percentage of minority participants. Fourth, participants may have underreported their alcohol consumption to please the interviewer who was sitting across the table from the participant during the questionnaire administration. Finally, the circumstances under which people drink are complex and may not have been accurately measured in this study. Nevertheless, the males in the drinking group reported significantly less depression, had higher self-reported general health and vitality, had higher cognitive performance, greater cognitive flexibility, and increased verbal memory. In addition, these men had greater knowledge of memory processes.

Fifty-eight percent of the males in this sample reported that they consumed alcohol. Among the drinkers, alcohol consumption varied widely from one beer every two weeks to three to four beers in one day. There was greater variability in both the amount and frequency of alcohol consumed by the males compared to the females in this study (Zimmerman, McDougall, & Becker, 2004). Other studies have reported similar findings, that is, the consumption patterns of males compared to females is greater in both frequency and quantity and that older males are at greater risk for problems with alcohol abuse than are older females (Miller et al., 1997;

Moos, Schutte, Brennan, & Moos, 2004; Wilsnack et al., 2000). In this study 42% of the males stated they did not drink. In reports from national samples, abstinence rates for males 75 years of age and older range from 11% to 56% (Blow et al., 2000; Molgaard et al., 1990; Schoenborn & Adams, 2001). However, given the type of questions about drinking behaviors asked in this study, we were unable to determine lifelong patterns of abstinence, consumption, and problem drinking.

On cognitive variables, the males in the drinking group scored higher on cognitive function; on verbal memory performance tests including immediate and delayed recall, and recognition memory; and on everyday memory performance. These findings have been supported in longitudinal studies (Leroi et al., 2002; Wang et al., 2002). The developers of the RBMT provided cut-off points for four groups of memory function. Based on these performance scores, both groups of males in the study would be categorized as having poor memories (Wilson, Cockburn, & Baddeley, 1985). This did not mean they have memory impairment, but that they were having difficulty and problems remembering everyday concerns.

Other studies have reported better mental and physical health in males who consume moderate amounts of alcohol and are not problem drinkers (Blow et al., 2000; Bridevaux et al., 2004; Schutte et al., 1995). The majority of the males, both drinkers (71%) and non-drinkers (68%) stated that they were living with someone. Married males often have better health and engage in more health behaviors than males who are not married (Schone & Weinick, 1998). The functional ability of both groups was similar in both self-reported and performance-based instrumental activities of daily living. Executive functions of planning, sequencing, and monitoring of behavior have been associated with independent living skills and in this study the males in the non-drinking group performed on average ten seconds slower than the drinkers. A positive association between IADL performance and executive function has been documented in other studies with older adults (Barberger-Gateau et al., 1999; Carlson et al., 1999; Laukkanen et al., 1993; Mahurin et al., 1991). Other studies have reported no gender differences in self-reported health and poorer IADL function among men and women who consumed no alcohol, more than three drinks per occasion, and seven drinks per week (Blow et al., 2000; Moore, Endo, & Carter, 2003; Stuck et al., 1999; Wang et al., 2002). On self-reported general health, the male drinkers reported higher scores in general health and vitality. This finding is interesting since the males in the drinking group scored significantly higher on personal finances.

On subjective evaluation of memory (memory self-efficacy and metamemory) the findings were curious. On memory self-efficacy, both groups of males scored relatively high compared to other samples of community-residing older males (Berry et al., 1989; McDougall, 2004; McDougall & Kang, 2003). On the metamemory component of task, the drinking group scored significantly higher than the non-drinkers. *Task* is knowledge of basic memory processes, especially the knowledge of how most people perform, and a high score indicates greater knowledge. Even though there were no significant group differences on the *Change* scale of the metamemory questionnaire, the males in the drinking group scored lower than the non-drinkers. *Change* is the perception of memory abilities as generally stable or subject to long-term decline. A lower score indicated that the males who drink believed their memories were unstable or declining. Even though the men in the drinking group scored on average three points higher on everyday memory performance than the non-drinking group, they believed their memory performance was worsening. In previous studies, change was inversely associated with depression; however, in this study as in other studies, the drinkers had significantly lower depressive symptom scores than the non-drinkers (Bridevaux et al., 2004; Schutte et al., 1995). The findings from longitudinal studies indicated that among males, fewer depressive symptoms predicted less alcohol consumption later on (Schutte et al., 1995). Both the

metamemory and depression questionnaires were self-report and participants may have been biased in their subjective evaluations of their mood and memory.

In this study, the participants were volunteers of community-based elders and were different from the Blow et al. (2000) and Moos et al. (2004) samples recruited from primary care and medical clinics and the random samples from other national studies (Rousse & Clawson, 1992). Since there were fewer minority males in the drinking group, it could be argued that non-minority men who are reasonably well off financially tend to be drinkers and also tend to have less depression and anxiety and better cognition and functioning because they have fewer financial worries and can afford health care and education. Because of the high correlation of drinking with other socioeconomic markers, namely race/ethnicity and financial status, it was not possible to determine if the effect that we are measuring with our drinking status variable is that of drinking itself or that of socioeconomic status (SES). Future studies might examine whether older males of similar SES who drink are different from males who do not drink.

With the aging of baby boomers, alcohol use in relation to health promotion is an important area of inquiry. The number of older adults with alcohol disorders is on the rise (Miller & Cervantes, 1997; O'Connell, Chin, Cunningham, & Lawlor, 2003; Resnick et al., 2003; Wang, van Belle, Kukull, & Larson, 2002; Wilsnack, Vogeltanz, Wilsnack, & Harris, 2000). In longitudinal and national samples, when comparing males and females, males consume more alcohol on occasion per week than do females, and therefore exceed recommended drinking guidelines (Breslow & Smothers, 2004; Moos et al., 2004). Future studies with older adults will require more in-depth evaluation of drinking patterns.

The use and abuse of alcohol in older adult populations appear to go unnoticed by clinicians and health care providers, although the health complaints presented by older adults may be proxies for alcohol problems (Atkinson, 1990; Shugarman, Fries, Wolf, & Morris, 2003). Among older adults, there is a lack of awareness and knowledge regarding the recommended amount and frequency of moderate alcohol consumption (Masters, 2003). The message that moderate consumption of alcohol has health benefits has been in the public awareness for almost ten years, since the federal government acknowledged that wine with food had moderate health benefits. This paradigm shift was reflected in the 1995 dietary guidelines. The scientific literature on alcohol use and older adults is split between the public health researchers that determine drinking patterns and the more recent studies that emphasize the health benefits of moderate consumption. In this paper we argue that the moderate consumption of alcohol has health benefits for older males. This paper adds to the body of knowledge and supports these findings.

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TABLE 1

Correlations among Drinking Status, Demographic Characteristics, and Affective Measures

	Drink	Age	Finance	Education	Live with someone	Minority race/ethnicity	Depression	State anxiety
Age	−0.22							
	0.096							
Finance	0.47	−0.25						
	<0.001	0.054						
Education	0.03	−0.02	0.53					
	0.849	0.910	<0.001					
Live with	0.04	0.23	0.12	−0.02				
Someone	0.780	0.078	0.347	0.903				
Minority	−0.30	−0.10	−0.56	−0.548	−0.02			
Race/ethnicity	0.021	0.457	<0.001	<0.001	0.859			
Depression	−0.27	0.09	−0.51	−0.36	−0.17	0.42		
	0.040	0.508	<0.001	0.005	0.195	0.001		
State	−0.19	0.22	−0.32	−0.16	−0.02	0.28	0.78	
Anxiety	0.161	0.089	0.014	0.225	0.882	0.030	<0.001	
Trait	−0.06	−0.04	−0.27	−0.18	−0.16	0.22	0.79	0.71
Anxiety	0.644	0.788	0.035	0.181	0.219	0.094	<0.001	<0.001

TABLE 2

Demographic Characteristics of the Drinkers and Non-Drinkers

Characteristic	Non-drinkers (*n* = 25)	Drinkers (*n* = 35)	*p*-value	Pooled effect size
Age (years)	74.7 ± 6.5	72.3 ± 4.7	0.117	0.44
Education (years)	14.3 ± 4.9	14.5 ± 4.0	0.846	−0.05
Finance (6-point scale: low–high)	3.7 ± 1.2	4.8 ± 0.9	<0.001	−1.06
Living with someone (yes)	68% (17)	71% (25)	0.775	−0.07
Minority (yes)	48% (12)	20% (7)	0.022	0.62

Mean ± standard deviation.

Percent (frequency).

TABLE 3

Affective Measures for Drinkers and Non-Drinkers

Measure	Non-Drinkers	Drinkers	*p*-value	Pooled effect size
Depression	9.68 ± 6.56	6.29 ± 5.90	0.040	0.55
Anxiety—State	29.63 ± 9.01	26.57 ± 7.44	0.161	0.38
Anxiety—Trait	29.75 ± 8.61	28.71 ± 8.26	0.644	0.12

Mean ± standard deviation.

TABLE 4

Health and Functioning Measures for Drinkers and Non-Drinkers

Measure*	Non-Drinkers	Drinkers	*p*-value	Pooled effect size
DAFS	80.44 ± 5.52	82.26 ± 4.62	0.171	−0.36
IADL	26.00 ± 1.38	26.19 ± 1.08	0.569	−0.16
PF	63.00 ± 28.61	72.43 ± 27.18	0.200	−0.34
RP	66.67 ± 37.27	77.14 ± 36.06	0.278	−0.29
BP	70.88 ± 24.64	71.60 ± 24.43	0.911	−0.03
GH	66.08 ± 22.43	78.63 ± 19.52	0.025	−0.60
VT	61.25 ± 21.43	71.57 ± 15.66	0.050	−0.57
SF	85.50 ± 20.63	92.14 ± 16.63	0.173	−0.36
RE	90.67 ± 24.57	93.33 ± 21.08	0.654	−0.12
MH	82.50 ± 16.25	87.09 ± 11.60	0.241	−0.34

Mean ± standard deviation.

* DAFS = Direct Assessment Functional Status; IADL = Instrumental Activites of Daily Living; PF = Physical Function; RP = Role Physical; BP = Bodily Pain; GH = General Health; VT = Vitality; SF = Social Functioning; RE = Role Emotional; MH = Mental Health.

TABLE 5

Cognition, Memory, Executive Function, and Memory Evaluation Measures for Drinkers and Non-Drinkers

Measure	Non-Drinkers	Drinkers	*p*-value	Pooled effect size
Performance*				
RBMT	16.92 ± 3.64	19.77 ± 3.15	0.002	−0.85
COWAT	39.36 ± 9.88	43.51 ± 11.83	0.157	−0.38
TRAIL-A	46.92 ± 37.83	36.74 ± 19.38	0.226	0.36
TRAIL-B	148.76 ± 97.52	110.94 ± 61.09	0.095	0.48
BVMT-R	5.12 ± 3.19	6.00 ± 3.24	0.301	−0.27
HVLT-R	38.60 ± 12.54	46.03 ± 11.68	0.022	−0.62
MMSE	26.72 ± 2.57	28.29 ± 1.72	0.012	−0.74
Self-Report†				
MSEQ35	49.84 ± 18.15	48.38 ± 17.09	0.754	0.08
ACH	3.90 ± 0.31	3.92 ± 0.40	0.797	−0.07
ANX	3.22 ± 0.66	3.10 ± 0.60	0.453	0.20
CAP	3.09 ± 0.51	2.88 ± 0.55	0.137	0.40
CHG	2.68 ± 0.65	2.36 ± 0.63	0.063	0.50
LOC	3.64 ± 0.47	3.69 ± 0.54	0.757	−0.08
TSK	3.82 ± 0.38	4.05 ± 0.43	0.035	−0.57
STR	3.59 ± 0.55	3.64 ± 0.49	0.696	−0.10

Mean ± standard deviation.

*RBMT = Rivermead Behavioural Memory Test; COWAT = Control Oral Word Association Test; BVMT-R = Benton Visual Memory Test Revised; HVLT-R = Hopkins Verbal Learning Test Revised; MMSE = Mini Mental State Exam.

†MSEQ35 = Memory Self-Efficacy; ACH = Achievement; ANX = Anxiety; CAP = Capacity; CHG = Change; LOC = Locus; TSK = Task; STR = Strategy.