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Driving-Related Cognitive Performance in Older Adults with Pharmacologically Treated Cardiovascular Disease

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Abstract

The objective of this study was to determine if older drivers with pharmacologically treated hypertension and/or heart disease demonstrate impaired performance on established driving related cognitive measures. Data regarding self-reported demographic variables (i.e., age, sex, race, income, mental and physical health diagnoses, and prescription drug use) and performance on driving-related measures of cognitive function (i.e., Trail Making Test B; and Useful Field of View (UFOV® subtest 2) were gathered from 865 licensed drivers. No group cognitive performance differences were found among the treated hypertensives and the healthy control group, thus underscoring the importance of effective hypertension management. However, older adults with pharmacologically treated heart disease demonstrated poorer performance than older adults without heart disease on Trails B and UFOV® subtest 2. Although it is generally agreed that assessment and early intervention with regard to heart disease risk factors (i.e., cholesterol, tobacco smoking, obesity, etc.) beneficially affect physical health, the current results also indicate that addressing such risk factors prior to the development of heart disease may benefit cognitive function, as well.

Keywords

older drivers; heart disease; hypertension; cognition

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This research has not been submitted elsewhere and has never been presented at a scientific meeting.

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INTRODUCTION

Driving-related functional abilities are more likely to become impaired with advanced age. In most states, scrutiny of driving-related abilities and license renewal requirements increase with driver age. Additionally, some age-related medical conditions, such as hypertension and heart disease, can affect certain aspects of cognitive function (Elwood, Pickering, Bayer, & Gallacher, 2002; Harrington, Saxby, McKeith, Wesnes, & Ford, 2000) which can have an adverse effect on driving-related abilities. The objective of this study is to determine if older adults with pharmacologically treated hypertension and/or heart disease demonstrate poorer performance on established driving-related cognitive measures.

Background

The population of older adults is increasing dramatically in the United States and is projected to account for about 20 percent of the population in 2030 (Federal Interagency Forum on Aging-Related Statistics, 2004). Diseases of the cardiovascular system, specifically hypertension and heart disease, are among the most prevalent chronic conditions in adults aged 65 and older (Wan, Sengupta, Velkoff, & DeBarros for the U.S. Census Bureau, 2005). High prevalence rates of hypertension and heart disease, as well as the potential negative impacts on cognition and mobility, make these diseases a top priority for further study.

Numerous studies, including a cumulative meta-analysis by Clay and colleagues (2005), have established a relationship between impaired performance on a measure of processing speed and divided attention (i.e., Useful Field of View® test), and an increased risk for negative driving-related outcomes, including retrospective and prospective collisions using state records, as well as driving performance on the road or in a driving simulator (see Clay et al., 2005 for a review; also see Owsley et al., 1998). In addition, Staplin and Hunt (2004) provide a review of the literature that links decreased performance on a measure of mental set-switching (i.e., Trail Making Test B) with increased errors and dangerous maneuvers during an on-road driving evaluation, as well as increased numbers of on-road and simulator-based collisions.

Proposed Study

An extensive review of the literature failed to uncover any studies comparing the cognitive function of pharmacologically treated hypertensives to cardiovascular disease-free controls, which may be due to the fact that null findings are not readily apparent in the literature. Typically, studies have: 1) compared untreated adults with elevated blood pressure to medication-free and disease-free older adults (e.g., Starr, Whalley, Inch, & Shering, 1993); 2) explicitly excluded those taking antihypertensive medications from research protocols (e.g., Harrington et al., 2000); 3) assessed adults with hypertension, but not controlled for or assessed the use of antihypertensive medication; 4) discontinued medication prior to cognitive testing; or 5) compared the cognitive effects of one anti-hypertensive medication to another.

In the area of transportation, the possibility that some age-related disorder could be related to driving safety in some cases leads to discriminatory practices. This study intends to first evaluate whether between-group cognitive differences do exist between pharmacologically treated hypertensive and control participants, and if not, to use these findings as a demonstration that there is no evidence of increased risk of crash involvement for hypertensive older adults receiving pharmacological treatment.

In contrast, older adults with pharmacologically treated heart disease may demonstrate poorer cognitive performance when compared to peers without heart disease. This expectation is based primarily on the fact that heart disease is physiologically more severe than controlled hypertension, and often includes microangiographic changes or undetected minor infarctions

in the brain, which may have cognitive and behavioral consequences, depending on infarct size, location, and number (Barclay, Weiss, Mattis, Bond, & Blass, 1988; Elwood et al., 2002).

METHODS

This secondary analysis was based on previous research conducted between November 1998 and October 1999 in three Motor Vehicle Administration (MVA) field offices in Maryland (Ball et al., 2006). All participants provided written informed consent to participate in this IRB-approved study. After renewing their drivers' licenses, adults aged 55 and over were approached and asked to participate in an evaluation of a series of new assessment measures designed to predict motor-vehicle-collision involvement. Of those approached in the MVA field sites (N = 4,173), 45.8% (n = 1,910) agreed to participate. Those who declined participation primarily cited lack of time as the reason for refusal. The license renewal process included vision screening, and thus all participants demonstrated 20/70 or better visual acuity and a 140° visual field. Data collected included demographic measures, performance on driving-related functional and cognitive measures, self-reported everyday mobility, driving practices, and prospective motor vehicle collisions.

Excluded Cases

All of those who completed the assessment battery (n=1,910) were asked if they would be willing to participate in a longer follow-up interview over the phone. A total of 1,550 participants consented, and 60% of those (n = 930) were randomly selected from the 1,550 for follow-up. Only a sub-sample of those consented were contacted due to limited resources of the study. Of the 930 selected, 865 (93%) were successfully contacted and completed the interview. The telephone interview obtained information about medical conditions and use of prescription medications. Medical history data were self-reported in response to "In the past year have you been diagnosed and/or treated (includes being prescribed medication) by a physician for any of the following medical conditions?" Use of prescription medication was obtained by asking participants to "Please list any prescription medications you take."

In order to evaluate the impact of hypertension and/or heart disease on cognitive function, potentially confounding cases were excluded from analysis. Participants who reported certain medical conditions known to negatively impact cognition were excluded from this study (i.e., diabetes mellitus (n = 94; Bussing & Taylor, 2000), cancer (n = 43; Tannock, Ahles, Ganz, & Van Dam, 2004), Parkinson's disease (n = 8; Thanvi, Munshi, Vijaykumar, & Lo, 2003), stroke (n = 6; O'Brien et al., 2003), Alzheimer's disease (n = 3; Graham, Emery, & Hodges, 2004), epilepsy (n = 2; Velez & Selwa, 2003), multiple sclerosis (n = 1; Asghar-Ali, Taber, Hurley, & Hayman, 2004) and drug or alcohol addiction (n = 3; Hulse, Lautenschlager, Tait, & Almeida, 2005). Other exclusions included: cases missing medical condition data (n = 19), participant refusal to report medications (n = 2), participant report of medications known to potentially enhance cognition (n = 2), and participant age less than 55 years (n = 33).

Cardiovascular Medications

Participants reported prescription medication use by brand name or generic formulation. These data were used to determine whether or not participants were being treated for hypertension and/or heart disease. Extensive literature searches revealed pharmaceutical classifications indicated for hypertension (hypotensive agents, vasodilators), heart disease (antiarrhythmics, anticoagulants, cardiac drugs, lipid lowering agents, nitrates), and for both conditions (ACE inhibitors, alpha-blockers, angiotensin II antagonists, beta blockers, calcium channel blockers, diuretics). These classifications were then verified according to *Davis' Drug Guide for Nurses* (Deglin & Vallerand, 2005). Furthermore, evaluation of the literature indicated in

general that cardiovascular medications do not appear to have a negative impact on cognitive function or contribute to cognitive deterioration (for example see, Farmer et al., 1990; Louis, Mander, Dawson, O'Callaghan, & Conway, 1999).

Each case was manually examined to determine if the participant was being treated for either or both of these conditions. Cases reporting hypertension or heart disease but not receiving treatment (n = 23) were excluded from the study in an attempt to create four mutually exclusive groups (i.e., treated hypertension only, treated heart disease only, both treated hypertension and treated heart disease, or neither cardiovascular condition) as homogenous as possible.

Many of the participants included aspirin in their list of medications, even though only prescription medications were requested. Although aspirin use does not require a prescription, it often is prescribed for the treatment of both heart disease and hypertension (Hennekens, Dyken, & Fuster, 1997). During the *initial* coding of whether or not a participant was being treated for hypertension or heart disease, aspirin was not considered as a treatment for the condition(s). After all cases were coded, it was clear that the vast majority of participants were treated with prescription medication. However, there were three cases of heart disease that were treated by aspirin alone and two separate cases of hypertension that were treated by aspirin alone. For these five cases, aspirin was considered as treatment for the condition.

In addition, each reported medication was evaluated for its likeliness to negatively impact cognition (Deglin & Vallerand, 2005). Medication classifications known to negatively impact cognitive function include: anticonvulsants, antihistamines, antipsychotics, anxiolytics, corticosteroids, opioid analgesics, and sedatives/hypnotics. After reviewing each participant's list of medications, they were classified by whether or not they had reported one of the aforementioned classes of medication.

Finally, the cognitive effects associated with taking multiple prescription medications are well-documented (Hanlon, Gray, & Schmader, 2001). A variable concerning polypharmacy was created based on the total number of prescription medications reported by the participant. Given its over-the-counter availability, aspirin was not included in the total number of prescription medications (not even for the five cases who were treated by aspirin alone).

In sum, each participant's list of medications was coded into five variables: treatment for heart disease (yes/no), treatment for hypertension (yes/no), treatment for heart disease and hypertension (yes/no), negative effect on cognition (yes/no), and total number of prescription medications.

Demographic Variables

Certain demographic variables, such as age (Vokonas & Kannel, 1998), sex (Taylor & Simpson, 2000), race (Greenlund, Croft, & Mensah, 2004), and depression (Ariyo at al., 2000), may vary with heart disease and hypertension. Additionally, age (Stine-Morrow & Soederberg Miller, 1999), depression (Huber & Taylor, 2000), annual household income (Cagney & Lauderdale, 2002), and education have been correlated with cognitive performance. Therefore, these variables were examined for group differences prior to comparing cognitive performances between groups.

Comparison Groups

After excluding cases based on medical conditions or missing demographic information (n = 239), the sample was examined for cases missing outcome variable data. These cases (n = 29) were excluded using listwise deletion, so that baseline group comparisons would be conducted on the exact sample of cases that would later be automatically selected for the multivariate analysis of variances (MANOVAs). Thus, the final sample (n = 597) was obtained.

The cases in the final sample were sorted into four mutually exclusive groups based on whether or not the participant was considered to have (1) treated hypertension only (n = 185), (2) treated heart disease only (n = 41), (3) both treated hypertension and treated heart disease (n = 56), or (4) neither cardiovascular condition (n = 315). Those participants who reported neither heart disease nor hypertension, and were also free of the aforementioned excluded medical conditions listed in Table 1 served as the control group for this study.

Dependent Variables

Two cognitive measures, Trail Making Test B and Useful Field of View® (specifically the UFOV® subtest 2), were selected for analysis based on previous research linking poor test performance with current and/or prospective driving impairment (Clay et al., 2005; Edwards et al., 2005; Owsley et al., 1998; Staplin, & Hunt, 2004). These two measures are currently used by the Maryland Medical Advisory Board to determine whether a road test is warranted.

The Trail Making Test B (Trails B) is an assessment of scanning, visuomotor tracking, divided attention, and cognitive flexibility (Reitan, 1958). Trails B requires participants to sequentially connect a mix of integers and letters in alternating and ascending order as quickly as possible (i.e., A-1-B-2-C-3…). Time (seconds) to completion is recorded for each test. For drivers aged 55 and over, completion times greater than 147 seconds have been linked to impaired driving among seniors (Ball et al., 2006).

For the sake of brevity, only subtest 2 of the UFOV® test was used for driver assessment. This divided attention task was chosen because it correlates highly with the UFOV® total score, has been used in previous analyses, and is the subtest that best predicted crash involvement in earlier research (Owsley et al., 1998). Additionally, a recent meta-analysis concluded that poorer UFOV® test performance is associated with numerous measures of poor driving performance, such as on-road evaluations, state motor vehicle collision records, and driving simulator performance (Clay et al., 2005).

The UFOV® subtest 2 requires participants to identify a central target and locate a simultaneously presented peripheral target. The test is performed binocularly and measures speed of processing while performing this divided attention task. Detection thresholds greater than 353 milliseconds have been linked with driving impairment among drivers aged 55 and older (Ball et al., 2006). Recent research supports the reliability and validity of the UFOV® test to objectively identify older drivers at increased risk for motor vehicle collision (Edwards et al., 2005).

RESULTS

Data were analyzed using SPSS v.12 (SPSS Inc., Chicago, IL). Analysis of Variance and Pearson's Chi-Square (χ^2) were used to compare the cases excluded (n = 268) from analysis to those retained (n = 597). These groups differed significantly on race ($\chi^2_{(1, 812)} = 5.237$; $P = .022$), but not on age, gender composition, education, income, depression, medications taken, or cognitive function. The results revealed that 4.6% of the retained cases were 'non-white,' whereas 8.6% of the excluded cases were 'non-white.' This discrepancy was most likely due to the exclusion of individuals reporting diabetes mellitus, of whom a greater proportion were African-American.

Second, baseline comparisons among the four groups were conducted to evaluate differences in demographic variables, depressive symptoms, and prescription medications. Results indicate that the four groups, defined by disease state, differed significantly on age ($F_{(3, 593)} = 5.709$; $P = .001$), percentage of males ($\chi^2_{(3)} = 8.481$; $P = .037$; see Table 1), and total number of prescription medications ($F_{(3, 593)} = 73.596$; $P < .001$). Post-hoc comparisons (Tukey

Honestly Significant Difference test) indicated that the control group was significantly younger than both the hypertensive group and the heart disease group. Additionally, post-hoc comparisons showed that men were more likely to have heart disease than women. Finally, given that each comparison group was defined by disease and the presence of pharmacological treatment, it is reasonable that the groups would differ on number of prescription medications. The group with both hypertension and heart disease reported significantly more medications than all other groups. The control group reported significantly fewer medications than all other groups. No difference in number of prescription medications was found for the hypertensive only group relative to the heart disease only group. In sum, the number of cardiovascular conditions (i.e., 0, 1, or 2) was positively related to the number of prescription medications reported.

Planned orthogonal comparisons were then performed. Specifically, the "treated hypertension only" group was compared with the control group, and those with heart disease were compared with those without heart disease (i.e., combined control and hypertension only groups) on demographic and cognitive variables. The control group and the treated hypertensive group did not differ on measures of cognitive performance (see Table 2). This comparison did reveal, however, that the control group was significantly younger than the hypertensive group ($F_{(1, 498)} = 6.920$; $P = .009$; Cohen's d = 0.24). Additionally, the hypertensive group included a greater percentage of non-Caucasian participants ($\chi^2_{(1)} = 4.023$; $P = .045$) and also reported a greater number of prescription medications ($F_{(1, 498)} = 102.915$; $P < .001$; Cohen's d = 0.94) than the control group. All of these differences, however, would bias results toward a cognitive difference between groups, and not in the direction of no difference.

Given that treated hypertensives did not perform differently than controls on the cognitive measures, the control group and the hypertensive only group were combined and compared with any case reporting heart disease (i.e., heart disease only as well as heart disease plus hypertension) (Table 3). The heart disease group was found to be significantly older ($F_{(1, 595)} = 7.760$; $P = .006$; Cohen's d = 0.32) than the control/hypertensive group, and contained significantly more males ($\chi^2_{(1)} = 7.113$; $P = .008$). Not surprisingly, those reporting heart disease also reported a greater number of prescription medications ($F_{(1, 595)} = 105.846$; $P < .001$; Cohen's d = 1.05) than the comparison group. Additionally, multivariate analysis of variance (MANOVA) revealed the heart disease group performed significantly worse on the cognitive measures (Wilk's Lambda = .988, $F_{(2, 594)} = 3.721$; $P = .025$). Follow-up univariate analyses revealed that the heart disease group performed significantly worse on both Trails B ($F_{(1, 595)} = 6.259$; $P = .013$; Cohen's d = 0.27), and on UFOV® subtest 2 ($F_{(1, 595)} = 4.586$; $P = .033$; Cohen's d = 0.26).

DISCUSSION

The objective of this study was to determine if older drivers with pharmacologically treated hypertension and/or heart disease demonstrate poorer performance on established driving-related cognitive measures. The findings indicate that older adults with treated hypertension and no heart disease perform similarly to the control group. However, older adults with heart disease, regardless of hypertension status, performed comparably worse than other participants in this study.

The results of several group comparisons were consistent with the literature. The control group was significantly younger (Vokonas & Kannel, 1998; Wenger, 1998). In addition, group differences were found with regards to participant gender. Results indicated that men were more likely to have heart disease, whereas women were more likely to have hypertension (Aronow, 2003; Harrington et al., 2000).

After the four groups were examined for baseline differences, the first planned orthogonal comparison evaluated the demographic variables, medication use, and cognitive performance of the hypertensive group as compared with the control group. Most notably, we found that the hypertensive group performed as well on the cognitive measures (Trails B and UFOV® subtest 2) even though they were older and taking more prescription medications. This finding demonstrates that older adults reporting pharmacologically treated hypertension can perform as well as their peers without hypertension on measures of cognitive flexibility and divided attention. During literature review, attempts to find studies comparing treated hypertensives to cardiovascular disease-free controls were unsuccessful, perhaps because other researchers have been unable to establish group differences, as well. However, this finding is valuable and should be considered strong support regarding the importance of appropriate pharmacological management of hypertension.

After finding no significant differences regarding cognitive performance between the hypertensives and control group, these two groups were combined and compared with all other cases reporting heart disease. As expected, the heart disease group was 2.5 years older on average and included more males. However, unlike the treated hypertensives, those with treated heart disease, with and without comorbid hypertension, performed significantly worse on both cognitive measures. It is reasonable to speculate that the poorer cognitive performance observed in the heart disease group is most likely related to cardiovascular pathology, such as arterial blockages and partial blockages that increase the likelihood of myocardial infarction, or heart attack (Taylor & Simpson, 2000). Myocardial infarction and lesser disruptions in cardiovascular physiology contribute to an increased likelihood for major and minor infarctions in the brain, which can result in a wide array of cognitive and behavioral dysfunction (Barclay et al., 1988; Elwood et al., 2002).

Although demographic variables were assessed for group differences, these variables were not included as covariates in the multivariate analysis of variance (MANOVA) for several reasons. First, there is a high degree of shared variance among cardiovascular pathology, age, sex, and number of prescription medications (i.e., it is challenging to disentangle the impact of each variable individually). Second, group differences regarding the number of prescription medications are to be expected, given that comparison groups, aside from the control group, were defined based on whether the participant reported having hypertension, heart disease, or both, *and* was being pharmacologically treated for their condition(s). Thus, including prescription medication as a covariate is redundant with treatment group definition (i.e., those with two cardiovascular conditions are on more medications than those with one condition, and likewise, those in the control group require significantly fewer medications). Third, there is no evidence from the larger study (Ball et al., 2006) that males and females perform differently on the cognitive outcome measures.

Finally, comparisons revealed that age differed significantly among groups, although all group means were within five years of each other (Tables 1-3). In order to evaluate if age alone could account for the poorer cognitive performance of the participants with heart disease, all cases in the control group aged 70.00-72.99 (n = 48) were compared to all cases in the control group aged 73.00-75.99 (n = 26). No age-related cognitive performance differences were found (Wilk's Lambda = .925, $F_{(2, 71)} = 2.872$; $P = .063$) in the control group. Therefore, group differences which were largely created due to the way the groups were defined were not included as covariates in the analyses.

Past research has indicated that poorer performance on Trails B and UFOV® subtest 2 is related to increased risk for motor-vehicle-collision (Clay et al., 2005; Edwards et al., 2005; Owsley et al., 1998; Staplin, & Hunt, 2004). Often, departments of motor vehicles increase scrutiny of drivers based on age alone. However, the current results indicate that a medical condition (i.e.,

heart disease), previously thought to be unrelated to driving performance and collision risk, may in fact be a useful indicator of potential at-risk or elevated-risk drivers, and may serve as a useful trigger for further cognitive evaluation of those drivers.

The cases excluded from this study were evaluated to see if they differed systematically from the retained cases. Results indicate that the excluded cases were similar to the retained cases on all variables except race, which is most likely due to the fact that cases reporting diabetes mellitus were excluded from the study and were more likely to be non-white. Future research that includes a broader range of medical conditions and a larger sample of African Americans and other minority populations could help clarify the extent to which the current findings are accurate in minority aging populations. However, given the similarities across other measured variables, including cognitive performance, it is likely that our sample is representative of drivers aged 55 and over presenting for license renewal in the state of Maryland.

The limitations of this study are primarily the result of conducting secondary analyses on an existing database not originally intended to answer the proposed questions. First, there are no data regarding serum cholesterol levels, which has been strongly linked to cardiovascular disease (Thom et al., 2006). Data regarding cholesterol levels would have been particularly relevant, given that high levels are associated with increased risk of myocardial infarction, another condition associated with cognitive impairment for which we had no data.

Second, when examining group differences related to cardiovascular disease, it would be beneficial to have other objective, physiological measures, such as blood pressure, height, weight, and a fitness index (e.g., a stress test). Such data would provide a greater degree of information and also would allow for stronger statistical inferences. Also, other factors that could likely contribute to health status and cognitive performance include exercise level, smoking status, diet information, alcohol consumption, etc.

Third, although we attempted to account for the use of prescription medications, these data could only be examined on a categorical level. Participants were only asked to report the name of any prescription medications consumed. Thus, there were no data regarding medication amount, frequency, duration, or adherence.

In conclusion, the results of this study underscore the importance of hypertension treatment and medication compliance, given that older adults reporting hypertension treatment performed just as well as controls on cognitive measures. However, older adults being treated for heart disease demonstrated poorer performance on cognitive measures which have been previously linked to driving competence and risk of motor vehicle collision. Further research is warranted to more fully understand the complex relationships between heart disease, cognitive function, and driving competence.

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Table 1

Demographic and Cognitive Variables Across Groups

Variable	Control (n = 315)	HTN (n = 185)	HD (n = 41)	HTN+HD (n = 56)	For χ^2	*P*
	Mean (Standard Deviation)					
Age	70.05 (8.30)	72.04 (7.80)	74.72 (7.80)	72.26 (7.35)	5.709	.001*
Sex (% male)	44.8	40.0	61.0	55.4	8.481	.037*
Race (% white)	97.0	93.1	97.4	92.6	5.247	.155
Education	14.26 (3.04)	13.58 (2.85)	13.54 (2.08)	13.19 (3.41)	1.890	.131
Income ($US)	65,328 (13,501)	64,376 (13,402)	66,761 (10,434)	62,425 (12,434)	1.082	.356
Depression (%Y)	3.5	4.9	4.9	3.6	.677	.879
Total number prescription meds.	1.04 (1.45)	2.38 (1.41)	2.93 (1.93)	3.77 (1.95)	73.596	<.001*
Meds. with negative effect (%Y)	9.84	8.10	14.63	10.91	1.768	.622

*significant at $p < .05$

Table 2
Group Comparisons of Treated Hypertensives and Controls

Variable	Control (n=315)	HTN (n=185)	F or χ^2	P
	Mean (Standard Deviation)			
Age	70.05 (8.30)	72.04 (7.96)	6.920	.009*
Sex (% male)	44.8	40.0	1.078	.299
Race (% white)	97.0	93.1	4.023	.045*
Income ($US)	65,328 (13,501)	64,376 (13,402)	.553	.457
Depression (%yes)	3.5	4.9	.572	.449
Total number prescription meds.	1.04 (1.45)	2.38 (1.41)	102.915	<.001*
Meds. with negative effect (%yes)	9.84	8.10	.419	.517
MANOVA (Wilks' Lambda = .996)			.934	.394
Trails B (seconds)	99.46 (43.57)	105.12 (46.46)	-	-
Useful Field of View subtest 2 (range 16-500ms)	167.82 (149.68)	176.60 (151.46)	-	-

* significant at $p < .05$

Table 3
Orthogonal Comparison of Heart Disease and Non-Heart Disease

Variable	Control+HTN (n=500) Mean (Standard Deviation)	Any HD (n=97) Mean (Standard Deviation)	F or χ^2	*P*
Age	70.79 (8.22)	73.30 (7.68)	7.760	.006*
Sex (% male)	43.0	57.7	7.113	.008*
Race (% white)	95.6	94.6	.196	.658
Income ($US)	64,982 (13,458)	64,216 (11,788)	.259	.611
Depression (% yes)	4.0	4.1	.003	.955
Total number prescription meds.	1.54 (1.57)	3.41 (1.98)	105.846	<.001*
Meds. with negative effect (% yes)	9.2	12.5	.998	.318
MANOVA (Wilks' Lambda = .988)			3.721	.025*
Trails B (seconds)	101.56 (44.70)	114.02 (45.98)	6.259	.013*
Useful Field of View subtest 2 (range 16-500ms)	171.07 (150.25)	206.25 (136.25)	4.586	.033*

* significant at $p < .05$