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The Aging Process and Field Sobriety Tests

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Introduction

It is not surprising that every year 1.4 million Americans are diagnosed with cancer [1], the second leading cause of death next to heart disease. It should be surprising that there are also approximately 1.4 million DWI/DUI arrests (1 of every 139 licensed drivers) in the country a year with 16,685 alcohol related fatalities in 2005 [2]. "Alcohol related" fatalities defined as at least one driver or nonoccupant involved in the crash having a blood alcohol concentration of 0.01 grams per deciliter or higher. These figures include fatalities that were NOT caused by the presence of alcohol [3]. Boiled down, NHTSA has led a colossal campaign against DWI/DUI, arresting a disproportionate amount of people compared to the real threat of fatalities on the road (alcohol related fatalities representing 1% of the arrested drivers).

The field sobriety tests are a mechanism to convict people not test whether or not they are sober. The standardized field sobriety tests are a witch-hunt perpetuated by law enforcement on people. Even a recent 2006 NHTSA publication admits, "Road tests have long been considered the gold standard for measuring driving ability. They have widely-recognized limitations" [4]. One would not know this by visiting courtrooms across America. This paper addresses one of the most common sense problems contributing to false convictions, the condition and age of the subject.

Dr. Marcelline Burns, developer of the standardized field sobriety tests (SFSTs) has conceded that the tests were not designed to determine impairment of driving [5]. So what relevance do the SFST(s) have in determining whether or not a person is driving while intoxicated or driving while under the influence? Not much, particularly when you factor in their condition and age. Documentation supports the fact that deterioration in sensory functions and motor performance occurs with the normal aging process [6]. Sensory functions necessary in communication also show increased impairment with age [7]. Age-related slowing in cognitive and motor processes include longer reaction time and movement execution time. Resulting in an increase of neural noise, which causes less detection of signals in the central nervous system [8]. Before the SFSTs were developed, in the early decades of experimental psychology, it could already be shown that skill learning ability and motor performance accuracy deteriorate with increasing age [9]. The original SFST data seemed to take this into account by setting 65 as the upper limit to SFST usefulness. Categorizing the effects of age chronologically as the SFST(s) do by stating a 65-year-old age limit is both arbitrary and false. Aging results in increasing biologic diversity so that we become less alike as we age [10]. Biologic and chronologic ages are not the same, and body systems do not age at the same rate within an individual [11]. The bio-psychological state of a person is important, including most notably fitness and nutrition. Many studies support that these factors improve attention and psychomotor performance across all age groups [12]. The National Highway Traffic and Safety Administration (NHTSA), much akin to their arbitrary cutoff, 65 years of age, [13] also references that an individual 50 lbs or more overweight may have difficulty with the one-leg stand test [14]. Of relevance is the fact that 64.5% of Americans are overweight and 30.5% are obese [15]. Regarding physical fitness, the annual number of lives lost through physical inactivity is estimated at more than 250,000 per year [16]. Concerning the aging process there is a gradual decline in performance. As opposed to an abrupt drop off of cognitive and motor skills, as seen in the case of an acute stroke [17]. In short, a gradual decline in cognitive and motor processes results from chronological age, fitness, and nutrition in given individual.

Changes within the brain are primarily responsible for a loss of motor skills. Poor performance on executive function tasks is associated with a smaller volume of prefrontal cortex mass and increased White Matter Hyper intensity Burden [18]; known as (WMHV), which is a small-vessel disease associated with cognitive impairment and dementia. Postmortem studies of individuals reveal age-related differences in brain structure including reduced brain weight and volume [19]. Sensory motor integration can be specifically linked to prefrontal activation of the brain, proving that the prefrontal cortex serves an executive function for motor skills. Age-related deterioration of the prefrontal cortex contributes to cognitive declines, which has significant consequences for motor behavior [20]. Simply put, the frontal lobes are more sensitive to the effects of and directly related to motor functions [21]. Specifically, dopamine receptors within the brain are linked to locomotor functions and learning [22]. Dopamine neurons account for less than 1% of the total neuronal population of the brain but have a profound effect on motor function [23]. They act as chemical messengers similar to adrenaline connecting the brain processes that control movement [24]. Dopamine receptors are reduced up to 50% in the brains of aged humans [25]. Dopamine neurons in basal ganglia decline 5-10% per decade [26]. Parkinson's disease sufferers are a prime example of loss of control of motor activity in regards to dopamine neuron loss [27]. Early postmortem brain studies in the 1960s revealed a significant loss of dopamine in Parkinson patients [28]. Treatments exist which treat Parkinson's by addressing the prevention of dopamine loss [29], or by stimulating the growth of dopamine receptors not natural in the human aging process [30]. Aging slows sensory processing, with 95% of the change attributable to the aging of the central nervous system and only 5% attributable to slowing outside the brain [31].

Declining hormone levels that occur naturally compound the effect of dopamine neuron loss. Several studies have shown that testosterone positively affects performance in certain cognitive domains such as memory and spatial ability [32]. An academic study of men aged 48-80 shows that older men with less testosterone had lower levels of function in working memory, speed, and attention, as well as spatial relations. For men, the use of synthetic hormones did not mediate the performance problem [33]. The same proving true for aged women in the administration of synthetic estrogen [34]. The average rate of decline of testosterone is about 3.2 ng/dL per year for men age 23-91, [35,36] and 11 ng/dL per year for men aged 61-87. The normal and healthy amounts of testosterone in males are between 300-1000 ng/dl, and for females the healthy amounts of estrogen are between 24-149 ng/dl.

Memory, of course, becomes relevant under many scenarios of the DWI/DUI investigative process from short-term capacity that includes remembering instructions, to longer-term memory in cooperating with interrogations. The phenomenon of memory aging begins in the 20s among aging adults who report themselves in good health [37]. Aging memory affects us all, not just those with significant memory disorders such as Alzheimers. In the periods of early and middle adulthood, the memory-aging phenomenon is associated with a shift of the entire distribution of memory. It is not simply attributable to a small percentage of individuals experiencing large memory loss due to pathology, with the remaining individuals maintaining the same level of performance [38]. With aging, there is a loss of neurons in the gray matter in the cerebellum and hippocampus, which seems to be involved in some aspects of memory function [39], with less dramatic changes occurring in the deeper brain structures. In a study using a dual-task combination of walking and memorization, it was revealed that older adults prioritized the sensorimotor brain function over the memory task to avoid a loss of balance, resulting in a performance decrease of the memory task [40]. This explains how the counting may suffer on various field sobriety tasks as the subject focuses more on the physical tasks of balance, regarding the walk and turn and one-leg stand tests. There is a distinction in the memory regarding automated and effortful processing where the effects of aging increase the amount of effort required in the performance of new, unlearned or unnatural coordination patterns [41]. This explains why so many people perform a pivot on the walk and turn exercise versus taking a small series of steps. First, they do not comprehend the turn instructions well because of undue focus on the sensorimotor skills needed to maintain an unnatural and difficult positional stance. The turn itself is a new instruction on an unnatural turn pattern normally encountered in everyday settings. Older adults have much more difficulty with the performance of new tasks, albeit slight, due to the additional cognitive load that must be engaged for learning to occur [42]. Sensory memory lasts much less than a second and because of sensory changes that occur with aging this puts the aged at a disadvantage [43]. That explains why older people have much more difficulty in adjusting to the positional stance of the walk and turn, which requires a high level of sensorimotor control. Normally, this level of control is not required unless one is walking a tightrope or gymnastics on the balance beam.

Clearly the SFST(s) are divided attention tests. It's known that the rate of shifting attention from different sources shows a clear-cut reduction with age [44]. A research project supported by a seed grant from the Center on Aging and Cognition demonstrated on a simple gripping test combined with recitation that even after intense practice older adults needed more attentional resources than younger adults to perform a dual-task [45]. This proves that cognitive performance and force control are interconnected in older adults. In a dual-task bicycling and counting test where the subject had to bicycle in a certain direction and count the number of times an image appeared on a computer screen, it was found that performing the coordination patterns together with the attention task caused a decrease in phasing accuracy and stability in older versus younger people [46]. Driving is a divided attention task also but does not require the gravitational force control necessary in the one-leg stand or memory number recitations to the degree called for in the walk and turn, one-leg stand, or manual dexterity tests such as the finger countdown. Older adults may experience temporary lapses of attention or executive control, which contributes to greater inconsistency of performance, [47] as seen in variations of the same field tests both at the roadside and in the station. Higher anxiety has also been associated with poorer divided attention performance in older but not younger adults [48]. Of course, basic psychomotor functions are required for a divided attention test, but basic too is the premise that age-related changes in psychomotor functions will affect the performance scores [49].

In a study involving 99 young people from ages 17 to 36, and 763 older people from ages 54-94 on a reaction time test, it was determined that variability between persons (diversity), variability within persons across tasks (dispersion) and variability within persons across time (inconsistency), were greater in older compared to younger adults even when group differences in speed were statistically controlled [50]. Studies contrasting younger and older adults have all found increased inconsistency in response time distributions with increasing age [51].

It is suggested that more studies need to be conducted in the field of experimental aging research to understand the effects of aging, anxiety and motor control [52]. An environmental stress study was conducted examining the performance of younger and older skilled miniature golf players during training and competition. Both younger and older adults showed a similar increase in heart rate and self-reported anxiety, but whereas younger adults improved their performance during competitive play the older adults' deteriorated, demonstrating diminished capacity to cope with high arousal conditions due to age-related deficits in cognitive abilities [53]. This is explained by the fact that aging is normally associated with neural degeneration in the hippocampus of the brain, which is critical for some forms of memory, and recent research suggests that anxiety and stress may have further detrimental effects on the hippocampus [54].

Most DWIs/DUIs occur at night also putting older people at a disadvantage. Across the adult lifespan there is a shift in the self-reported time of peak arousal or attention awareness. This shift reflects a tendency for the optimal time of day (TOD) to become earlier with advancing age [55]. Since the earliest days of experimental psychology it has been known that TOD can dramatically influence the efficiency of cognitive processing including short-term memory, sustained attention, inhibitory processing and semantic activation [56]. Age-related deficits of working memory are magnified at non-optimal times of day [57]. It is undoubtedly obvious, that older subjects who have not been drinking at all will be disadvantaged compared to their younger counterparts. In an experiment regarding reaction time to a stop signal paradigm, there was a 20% difference in stopping efficiency between younger and older folks at non-optimal times (11% difference at optimal times) [58].

Dizziness associated with stress is one of the most prominent symptoms of both panic attacks and hyperventilation [59]. As one grows older; however, the disturbances with balance are greater compared to younger people [60]. Of more notable concern is the fact that older people are less likely to view their dizzy condition as a self-perceived handicap [61]. People tend not to seek medical treatment for conditions associated with normal aging or ailments of which there are no known treatments. This is particularly true for dizziness. In a study of 100 consecutive outpatients in the United States with dizziness less than one third received a diagnosis for which a treatment plan exists

[62]. The symptomatic prevalence in the community for dizziness has been estimated at more than 20%, yet recorded annual consultation rates of less than 2% indicate this is a significant, silent, untreated problem [63]. The lifetime prevalence rate of dizziness of Americans resulting from outpatient self-reports has been estimated at 25% [64]. What is alarming is the duration of dizzied impairment. In a London study of citizens aged 18 to 64, it was found that women were more likely to report dizziness than men; people under 36 were more likely to report non-handicapping dizziness; and handicapping dizziness was significantly more common in individuals aged 36 to 64 [65]. Of more concern is the duration of symptoms: 26% reported less than 6 months, 44% between 6 months and five years, and 30% more than five years [66]. More than half reported basic postural unsteadiness [67]. Dizziness is caused by both physical and psychological factors ranging from cardiovascular problems to anxiety [68]. Vertigo is episodic dizziness considered as an imbalance originating within the vestibular system [69]. It is interesting to note that several lines of research have suggested that dopamine has a protective role on cochlear [70] and vestibular function [71], once again spotlighting dopamine's dramatic role of loss of executive motor control in the natural aging process.

Just to maintain a stance requires a greater portion of attentional resources in older compared to younger adults [72]. Postural stabilization has to do with the role of afferent/efferent signals related to eye movements [73]. Recent studies [74] have shown that postural sway during pursuit of a moving target or when looking straight ahead in the darkness is higher than when fixating on a stationary target or nystagmus is suppressed. In the latter two, extra-ocular signals are reduced [75], resulting in less postural sway. Neck muscles are also involved in stabilizing the head during HGN; yet one's inability to keep one's head still is frequently used as a sign of intoxication or inability to follow directions. Horizontal gaze position is associated with head neck muscle activity. It is difficult to not move the head when focusing. In fixed head subjects there is a dynamic coupling of the neck splenius muscle and horizontal eye position with the oculomotor brain command being distributed to both eye and neck muscles [76]. In a moving platform experiment comparing: healthy young adults; older adults and older adults with a mild increase in fall risk. Participants were placed on a stationary platform under various conditions, and it was found that healthy older adults had considerable more difficulty maintaining balance both with and without the cognitive task of counting backwards [77]. Platform conditions varied with side-to-side and front to back movements simulating real world conditions where one might be asked to perform the sfst(s) on inclined or unleveled surfaces. It is preposterous that in the quest for more convictions, the recent NHTSA SFST manual goes so far as to say, "Recent field validation studies have indicated that varying environmental conditions have not affected a suspect's ability to perform this test" [78]. Motor control and postural control are inextricably linked [79]. If the surface area or testing conditions do not support basic postural control, performing a walk and turn or one-leg stand test is inherently flawed. All motor tasks, unless performed while a subject is fully supported, require complex interactions of postural adjustments to maintain intersegmental coordination and equilibrium during the task [80].

Although not a standardized test for DWI/DUI, in some jurisdictions the Rhomberg test is still administered. This is a medical test used to detect the presence of brain lesions and is clearly inappropriate for forensic purposes. Police routinely use the test for sobriety testing purposes. The subject is asked to hold their head back close their eyes and estimate the passage of 30 seconds. This test is skewed with or without alcohol or drug because one's natural vestibular system sways to adjust for postural balance, becoming more pronounced with age. Head flexion or extension deteriorates postural stability as a result of vestibular input even where visual information is kept the same [81].

The peripheral sensory functions of hearing and vision tend to show increased impairment with age, suffering remarkably after age 50 [82]. Many visual changes accompany the aging process even in the absence of known visual pathology [83]. Among these changes that normal adults exhibit is a loss of contrast sensitivity [84], shrinkage of the "useful field of view" (UFOV) [85], a decrease in central and peripheral acuity, spatial vision, and a weakening of the cognitive control of eye movements. Translated to the real world practicality of HGN, older adults have difficulty converging their eyes to focus on a target at a close distance. As far as lack of smooth pursuit, older adults are less able to smoothly pursue a moving stimulus. Tracking an object shows clear-cut age deficits. Following the stimulus, in general, is more difficult because reaction time in dealing with visuospatial tasks have been proven to slow for older adults. Age differences in oculomotor control translate to saccadic movements (lack of smooth pursuit), which have greater latency and slower peak velocity.

One might argue that the ultimate test in a DWI/DUI investigation is the actual operation of a motor vehicle with vehicle accidents reflecting intoxication. As there are obvious reasons for accidents outside of intoxication, it is important to note age-related concerns in automobile accidents. One age-related analysis of traffic accidents in Finland showed that attention fatigue is a drastic factor in traffic accidents. Most DWI/DUIs are not occurring at optimal TOD for older people. One's useful field of view (UFOV), which diminishes with age, also turns out to be a good predictor of increased driving accidents.

Age-related hearing loss (AHL) is the most common type of hearing impairment in humans. 60 % of people older than 70 years of age have hearing loss of at least 25 decibels the prevalence of hearing loss among middle-aged people are not well known. In a comprehensive study of hearing loss in Beaver Dam, Wisconsin of people aged 48-92, 46 % had some form of hearing loss. It was found that for every 5 years of age the risk of hearing loss increased by almost 90% with men being 4 times more likely to have hearing loss than women. Education and income level were inversely associated; with people who had not completed high school being 2.42 times more likely to suffer hearing loss compared to those with a college education. Those earning less than $30k a year were approximately twice as likely as those earning $60k a year to suffer hearing loss largely due to occupational exposure. Hearing impairment increases with age. The most common hearing loss occurs at higher frequencies making speech especially difficult to understand against background noise, like the roadside noise of a typical DWI/DUI setting. Temporal resolution is necessary to distinguish the background noise in everyday listening situations. The precedence effect refers to the finding that short onset-to-onset stimulus delays and leading and lagging sounds will perceptually fuse into a single auditory image. Even older people with normal hearing sensitivity perform more poorly than younger listeners on a precedence-effect task. Both temporal resolution and the precedence effect deteriorate with age and hearing loss, with temporal resolution more closely associated with age than hearing loss. We are all born with a set of sensory cells and at about age 18 we slowly start to lose those. AHL is also known as presbycusis, or a decrease in hearing loss. Because presbycusis progresses slowly most people do not notice changes until well after age 50. According to the National Institute on

Deafness and other Communication Disorders (NIDCD), presbycusis usually affects both ears equally. As people age, structures of the ear become less responsive to sound waves contributing to hearing loss. More specifically, there is a progressive degeneration of the cochlea's sensory cells and spinal ganglion cells with the outer hair cells the most severely affected. There are strong psychosocial concerns and consequences due to the social stigma of wearing hearing aids. One study, which addresses the stigma, estimated only 8% of an elderly population who could benefit from hearing devices requested one after an audiologic evaluation. Considering the fact that the walk and turn test is not fully demonstrated to 9 steps, people who suffer temporal resolution even without hearing loss as well as those with hearing loss may miss the important instruction of taking only 9 as opposed to 10 steps making them appear intoxicated. A subject is not asked to repeat the instructions on the SFST(s) only that they are understood.

The walk and turn is a tightrope exercise requiring an unnatural coordination of muscles and balance. By the time one is aged 60; maximum muscular force is reduced by about 50% and the maximum movement speed up to 90%. There are both automatic and effortful processes involved in movement control. When it comes to walking, healthy older people select strategies that maximize stability when balance is perturbed. For example, in a test where older people were asked to walk a figure 8 in order to maintain balance they shortened their steps. Normal age-related decline in leg strength may be the primary limiting factor that prevents older people from walking at an equivalent speed to younger people. Differences of walk are even more pronounced between older and younger people when walking on irregular surfaces. Just general differences of gait between a younger officer and an older citizen on video reflect age-related declines in body systems, and yet are deceptively portrayed as signs of a slowed central nervous system due to alcohol or other depressants. In a walking coordination stability test comparing older and younger adults, it was proven that along with poorer visual acuity, contrast sensitivity, depth perception and vibration sense, older people also had less ankle dorsiflexion and quadriceps strength for walking. We know that elderly people show a significant decrease in both cutaneous vibratory and joint sensations essential for walking and limb coordination. The attentional cost associated with gait by means of dual-task paradigms have revealed that this common task requires a greater portion of attentional resources in older as compared to younger adults. This reflects the essential fact that older brains need to recruit additional resources to manage executive functions of otherwise relatively simple tasks.

Miscounting is often offered up as a sign of intoxication or the loss of the normal use of one's mental faculties. Although it is not a technical clue on the SFST guidelines, optional tests routinely used by officers such as the finger countdown or hand slap test, penalize a citizen for miscounting. In an exercise where the subject, while attempting to maintain balance on a moving platform, was asked to count backwards in threes starting from random numbers with no alcohol or drugs involved, out of 20 younger adults the average number of correct counting responses was 12.5 +/- 2.9, and for 20 older adults it was 9.8 +/- 2.6. Recent brain imaging data has shown that during performance of repetitive finger or wrist movements, the aging brain must recruit additional sensorimotor regions. In this way, age-related proprioceptive processing deficits compromise motor functions for which sensory information is of critical importance.

Regarding the one-leg stand, a study in 2 British towns administered the one-leg stand to 70 participants upon leaving a bar or nightclub. The majority of those tested ranged in age from 18 to 36 (therefore not even inclusive of the older aged population) with only 23 deemed under the influence of alcohol or a drug, it was determined that the majority of people failed the one-leg stand making it an unfit test to determine impairment. In a massive research project conducted at the Center for Clinical and Lifestyle Research in late 1994 and 1995, involving tests on 349 men and women by Dr. James M. Rippe, M.D. the "Advil Fit over Forty" standards were developed. These standards have since been presented at a variety of national scientific and medical meetings including: The American College of Sports Medicine; The American Heart Association; and the Gerontological Society of America. Interestingly enough, one of the tests in which a person can assess their health in terms of fitness and balance is the one-leg stand test, in which a person merely lifts a leg (simpler than the SFST one-leg stand test where one lifts and holds out their leg) for a timed 30 seconds. The following is based on a chart that gages one's level of fitness clearly indicating that the rigid grading criteria of the one-leg stand are ludicrous. In the Fit Over Forty book by Dr. James M. Rippe, there is an enlightening chart on page 32 (which is shown below) that includes among other things what would be considered average for holding one's leg back for middle aged people.

Balance: One-leg/Eyes Open (in Seconds) - Females				
	40-49	50-59	60-69	70-79
Above average	>15.5	>8.7	>4.5	>2.6
Average	7.2-15.5	3.7-8.7	2.5-4.5	1.5-2.6
Below average	<7.2	<3.7	<2.5	<1.5
Balance: One-leg/Eyes Open (in Seconds) - Males				
	40-49	50-59	60-69	70-79
Above average	>14.8	>6.7	>4.0	>3.3
Average	4.1-14.7	3.2-6.7	2.5-4.0	1.8-3.3
Below average	<4.1	<3.2	<2.5	<1.8

Table 1: Advil Fit Over Forty Standards.

In one analysis of the sfst(s) using data over a four-state area, between 1986-1993, there was a significant trend toward decreased sensitivity with increasing driver age over 44 years. Sharply contrasting with NHTSA's 65 years of age. This study referenced some of the misclassification "to be a result of aging", and yet it is perilous and ignorant to associate aging by a mere chronological index. When evaluating the walk and turn and one-leg stand tests overall, 50% of doctors in Strathclyde Scotland consulted in a law enforcement study expressed concerns that the tests were inappropriate for use in determining sobriety regardless of age. The physicians with postgraduate qualifications were significantly more concerned about the tests than doctors without postgraduate qualifications. The problem with the widespread promulgation of sfst(s) in the alcohol and drug arena by American NHTSA related psychologists is the lack of true scientific reliability as opposed to purported self-serving statistics, which amount to "face validity." In a study analyzing a sample of 38 papers from 16 journals covering all the major drug types from 1972 to 1988 no papers were found to have documented true scientific reliability or validity. Although Dr. Marcelline Burns has been widely quoted in her 1995 study, which claims "validation" for the sfst test battery; the validity of these tests has been questioned. It is no different than the problem with the DRE validation: "It has to be acknowledged the author of the initial studies which tended to validate the DRE program, was intimately associated with the DRE protocol and involved in the L.A. test which 'touted' the DRE accuracy". It has been published in the peer reviewed journal: the Journal of Clinical Forensic Medicine, that "No evidence has been presented that there is any correlation between a person's performance on any aspect of the battery of tests used in FIT (field impairment testing, SFST(s) in the United States) and that person's ability to drive. It is our belief that the use of these tests has led, and will continue to lead, to the arrest and conviction of motorists whose only crime is that they cannot 'pass' the FIT procedures". The Association of Forensic Physicians has gone one record stating, "Field Impairment Testing (FIT) as currently performed in the UK has NOT been validated and there is increasing anecdotal evidence that errors of interpretation are being made which could lead to wrongful convictions". Put simply, the problem with SFST(s) is that they only account for one variable: the person's performance at the time of testing, without accounting for any other variables. An experimental design systematically manipulates independent variables to discover their effects on dependent variables. To attribute cause and effect correctly, all other variables must be controlled, usually by eliminating those that can't be eliminated, counterbalancing those that cannot, or measuring those that cannot be eliminated or counterbalanced. The problem with the sfst(s) is that the variables such as age and pathology are not accounted for. Variables that are not accounted for can confound the results in the psychometrics of testing making it impossible to distinguish which variable has caused which effect. The sfst(s) are an incorrect testing matrix by design. Any psychological test should be valid, reliable, and sensitive in that it should measure what it purports to measure, do so consistently, and be capable in basic design of detecting changes in what it measures. Although these principles are commonly applied in areas of psychology such as personality, intelligence, and clinical occupational testing, they are rarely applied to performance assessment and hardly at all in the assessment of drugs on performance, as can be seen with the sfst(s).

As we age the rate of decline is intra-individual. Individuals become less alike as a function of differences in change. Age-related decreases in performance and increasing intraindividual variability in neurobiological mechanisms in the brain drive increases in interindividual differences in performance. Due to the fact that aging is a gradual process and most studies focus on the differences between the elderly and young populations, it is necessary to extrapolate across the ages that the physiologic decay of the body occurs over time. Middle-aged people largely reflect the biologic changes that produce chronic degeneration affecting the body systems. Hypertension (high blood pressure) is one of the most chronic conditions for men and women over the age of 40 with 1 out of every 3 Americans suffering this condition. Blood pressure affects circulation within the brain, so vital to dopamine receptor health. High blood pressure has even been judicially recognized as a known cause for HGN. In terms of circulation health, vital for good brain function, it is known that by the time a man is 50 years of age in the U.S., he has over a 30% chance of having coronary artery disease and by age 60, a 20% chance he has suffered a heart attack. One of every four people over age 50 suffers from arthritis, which of course has obvious implications on the walk and turn and one-leg stand tests. Even one's ability to go to the bathroom (as sometimes commented on by police officers in DWI/DUI cases) is significantly affected by aging, as the kidney function of an average 70-year is approximately 50% of an average 30 year old.

In conclusion, age and the consumption of alcohol have its benefits. It has been widely recognized by the medical community that alcohol decreases the risk of heart disease by raising the level of healthy HDL cholesterol in one's blood. Alcohol in the form of flavonoids, common in red wine, has also been proven to impede blood clots, which form in heart attacks. It is reasonable to assume that alcohol ingestion and driving are issues that shall continue to present themselves; the scientific and law community owe it to society to address the grave injustices currently employed in assessing whether or not one has operated a vehicle while intoxicated or impaired.

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