

## Field Sobriety Test Review

### Horizontal Gaze Nystagmus

Nystagmus is a jerking of the eye or a bouncing eye motion caused by multiple factors. It is displayed in either pendular form where the eye oscillates equally in two directions, or jerk form where the eye moves slowly away from a fixated point and then rapidly corrects by a fast movement or saccade. Horizontal Gaze Nystagmus (HGN) is a form of jerk nystagmus where the eye's saccadic movement is towards the direction of the gaze. HGN is an involuntary motion that is not controlled by the subject.

### Categories of Nystagmus

#### Vestibular

- *Rotational:* Nystagmus occurs when an individual is spun around rapidly causing the fluid in the inner ear to be disturbed. This cannot happen at roadside. *Only occurs while the person is spinning!*
- *Post Rotational:* Nystagmus is present when an individual stops spinning because the fluid in the inner ear remains disturbed for a period of time. *These types of nystagmus only last for a few seconds and will not interfere with the HGN test.*
- *Caloric:* Nystagmus is caused by movement of inner ear fluid due to a difference in temperature of the fluid between the left and right ear. *This occurs by putting warm water in one ear and cold water in the other. This is not a roadside practice of law enforcement.*
- *Positional Alcohol:* Nystagmus occurs when a foreign fluid, such as alcohol, alters the specific gravity of the blood in unequal concentrations in the blood and the vestibular system. If the subjects head is uneven and they have this fluid inequity, this type of nystagmus may occur. For this reason, the head is held straight (note that the person can be standing, seated, or supine for the HGN test)

*You will **ALMOST NEVER** see Positional Alcohol Nystagmus in the field. The only way you will is if the defendant is lying down on a backboard and you turn his head to the side. The action of turning the head will induce Positional Alcohol Nystagmus.*

### **Neural Activity Nystagmus:**

- *Optokinetic: Refer to NHTSA Student Manual Session 8-13 <sup>[1]</sup> Occurs when the eyes fixate on an object that suddenly moves out of sight or when they watch sharply contrasting moving images such as watching scenery from a moving vehicle or watching a train go by while parked at a crossing, etc. This type of nystagmus only lasts as long as it takes for the object to stop moving or for the person to stop looking at the moving object. You can avoid this by facing subject away from moving traffic and turning off your overheads (or also facing subject away from overheads and traffic). You can also be certain it is not Optokinetic when the subject's eyes converge and is focused on your stimulus.*
- *Epileptic Nystagmus: occurs during epileptic or other type of seizures which are easily detectable at scene!*
- *Physiological: Refer to NHTSA Student Manual Session 8-14 <sup>[1]</sup> Is a natural nystagmus that keeps the sensory cells of the eye from tiring. It is the most common type of nystagmus. It occurs in all of us all the time. It causes extremely minor tremors or jerks in the eyes, but these are generally too small to be seen with the naked eye and if visible, not sustained if proper HGN procedures are followed.*
- *Gaze: Refer to NHTSA Student Manual Session 8-14-16 <sup>[1]</sup> Nystagmus occurs as the eyes move from the center position. It is separated into three types.*
  1. *Horizontal Gaze Nystagmus: occurs as the eyes move side to side.*
  2. *Vertical Nystagmus (VGN): up and down jerking of the eyes as they are held in the upmost position. The presence of VGN may indicate a high dose of alcohol or other drugs for that individual and will not be present without HGN.*
  3. *Resting Nystagmus: is referred to as jerking as the eyes look straight ahead and is indicative of a pathological condition or the influence of Dissociative Anesthetic.*

## **Nystagmus Caused by Certain Pathological Disorders:**

- Refer to NHTSA Student Manual Session 8-16 <sup>[1]</sup> these include brain tumors and other brain damage or some diseases of the inner ear. These disorders occur in very few people and in even fewer drivers. Many of these causes are so severe that it is unlikely that a person afflicted with the disorder would be driving (and if they do have it, notify the medical board of DPS). *These types of nystagmus tend to be pendular rather than jerk nystagmus.*

## **Additional Nystagmus Information:**

*Natural Nystagmus:* A very small number of people exhibit a visible natural nystagmus. The number is so small according to Dr. Burns, who has carried out many NHTSA studies and who has been in the field for over 30 years, that she herself can't count the total number of individuals with this condition on her hands.

Visible nystagmus is evident only at particular angles of gaze, but not before or beyond that point. During the test for HGN you are looking for not only nystagmus at a particular angle of gaze, but lack of smooth pursuit and end point nystagmus as well.

There are 47 different types of nystagmus. Caffeine and nicotine are stimulants. Stimulants do not create or make HGN visible to the naked eye. There is no evidence that smoke causes HGN. In addition to the stimulants mentioned above, none of the following drug types create HGN: cannabis, hallucinogens, and narcotic analgesics.

*Fatigue Nystagmus:* Refer to NHTSA Student Manual Session 8-31 <sup>[1]</sup> (End- Point Nystagmus) is caused by holding the eye at maximum deviation for 30 seconds or longer. It has **nothing to do** with fatigue causing nystagmus.

According to Dr. Burns, general fatigue or tiredness has no bearing on the manifestation of HGN. This finding was validated by a 1981 NHTSA study that showed fatigue had no significant effects.

**Only 2 things cause Horizontal Gaze Nystagmus:** Refer to NHTSA Student Manual Session 8-15 <sup>[1]</sup> The DID Drugs (Depressants such as alcohol, Xanax, Valium, etc., Inhalants, and Dissociative Anesthetics such as PCP), and Serious Brain Stem Injury.

## Things You Should Know About HGN

- In addition to the questions asked of the subject, the first 2 stages of the test check for medical impairments: tracking ability and pupil size. If the eyes do not track together or the 2 pupils are of distinctively different size, these are signs of possible medical impairments. Medical personnel should be contacted and the subject should be asked more about head trauma.
- Always ask the subject if he has any medical conditions and have the subject explain the conditions. It is beneficial to ask about treatment plans for the condition and symptoms.
- Always **start with the subject's left eye** <sup>[1]</sup>. This is the standardized performance. Although it makes no scientific difference, this is the way the test is written and should be performed. While it would not invalidate the result, it would add confusion for the fact finder and impeachment for the officer. The stimulus is held **12-15 inches** <sup>[1]</sup> in front of the subject's nose and slightly higher than the level of his/her eyes. Deviations from the instructions are discouraged because they are NHTSA guidelines, but do not affect the validity of the test. They are simply guidelines for ease of viewing and comfort of the subject.
- **Lack of Smooth Pursuit:** Refer to NHTSA Student Manual Session 8-27 <sup>[1]</sup> 2 passes for each eye. It should take approx. 2 seconds to bring the eye from center to side and 4 seconds across the body. The time suggestion is required by NHTSA because it is an effective amount of time for the tester to view the required nystagmus. Defense counsel will attack speeding up the process.
- **Distinct and Sustained Nystagmus at Maximum Deviation:** Refer to NHTSA Student Manual Session 8-30 <sup>[1]</sup> Take eye out until it has gone as far as possible. No white showing. Hold for a minimum of 4 seconds. Unless a valid reason can be articulated, do not hold at maximum deviation for longer than ten seconds. Again while holding over 10 seconds, but less than 30 does not affect the validity, officers should follow the standardized performance. Holding the stimulus for longer than 30 seconds can induce fatigue nystagmus. Repeat the procedure.

- **Onset of Nystagmus Prior to 45 Degrees:** Refer to NHTSA Student Manual Session 8-32 <sup>[1]</sup> you will reach 45-degrees when you have moved the stimulus about 15 inches to the side, if you held the stimulus 15 inches from subject's nose. Two indicators to determine this angle are: at 45 degrees, some white usually will be visible in the corner of the eye and you will be lined up or slightly beyond the edge of the subject's shoulder. Move stimulus slowly, this should take approximately 4 seconds to reach the edge of the shoulder. When you think you see jerking, stop moving the stimulus and hold it steady at that position to verify that the nystagmus is distinct and sustained. When you locate the onset of nystagmus, verify it is prior to 45-degrees (white showing and before edge of subject's shoulder). Repeat the procedure.
- **Vertical Gaze Nystagmus (VGN):** Refer to NHTSA Student Manual Session 8-39 <sup>[1]</sup> this test reveals whether or not the tested individual has ingested certain drugs or a high dose of alcohol. An up and down jerking of the eyeball is indicative of the presence of VGN. Position the stimulus in a horizontal position approximately 12-15 inches from the subject's nose, tell the subject to hold their head still and follow with their eyes only, raise the stimulus until the eyes are elevated as high as possible, and hold for a minimum of 4 seconds to look for jerking.
- The clues are cumulative. Distinct and Sustained Nystagmus at Maximum Deviation will normally not be observed without the observation of Lack of Smooth Pursuit and Onset of Nystagmus Prior to 45 Degrees will normally not be observed without observing both Lack of Smooth Pursuit or Distinct and Sustained Nystagmus at Maximum Deviation. The implication is that the suspect has a BAC above 0.08 if the officer observes 4 or more clues. This <sup>[1]</sup> **test is 77% accurate in and of itself at the 0.10 level** <sup>[1]</sup> when done according to NHTSA guidelines by trained and experienced officers. This percentage does not take into account other clues of impairment such as smell of alcohol, slurred speech etc. Defense attorneys will try to commit you to 77% accuracy, but keep in mind that this study was done in the lab, in the 1970s, with untrained officers.
- This 77% figure does not mean that the remaining 23% of people aren't intoxicated. Rather the studies revealed that officers failed to detect clues and released intoxicated drivers (according to Dr. Burns, this is the most common error made by police: giving the subject the benefit of the doubt and releasing too many intoxicated drivers). Additionally, simply because a person's BAC is below a 0.08 does not mean the individual is not impaired or maintains their normal use of mental or physical faculties. Most studies show measurable impairment at BACs as low as 0.05. The American Medical Association in a directive recommends that the national limit be lowered from 0.08 to 0.05 where most individuals are measurably impaired

- All people have Nystagmus; it's just not visible by the naked eye (except in extremely limited circumstances).
- **The American Optometric Association** in June of 1993 passed a resolution [2] that stated "that the American Optometric Association acknowledges the scientific validity and reliability of the HGN test as a field sobriety test when administrated by properly trained and certified police officers."
- **Comparison of SFST Accuracies 1981 vs. 1998**

Study: Combined Tharp, Burns, & Moskowitz (1981)

- BAC: 0.10
- HGN: 77%
- WAT: 68%
- OLS: 65%
- Combined: 81%

Study: Stuster & Burns (1998)

- BAC: 0.08
- HGN: 88%
- WAT: 79%
- OLS: 83%
- Combined: 91%

The greater component and overall accuracies found during the 1998 study are attributable to 17 years of law enforcement experience with the SFSTs since the original study and a lower criterion BAC than in the original study (i.e., 0.08 vs. 0.10 percent).

### **Other Field Sobriety Tests and Info You Should Know**

- 1) What are field sobriety tests? *Field sobriety tests are methods for assessing another's mental and/or physical impairment. Some of the tests are considered divided attention tests in that they require the individual to divide their ability between adhering to simple instructions and performing simple instructions. This basically means that a person will have to perform two tasks at one time. Impaired individuals have difficulty dividing their attention.*
- 2) What do you mean by divided attention tests? *The test requires the suspect to divide attention among mental and physical tasks. Equate it in driving to looking forward, in the mirrors, watching the speedometer, braking, etc., at the same time.*

- 3) Why is this important? *Divided attention capabilities are important because most intoxicated people can concentrate on one task, such as standing straight. They exhibit their intoxication when forced to concentrate on two or more different tasks. An example would be that an intoxicated person may see and focus on a child stepping out into the street in front of them, but would have trouble estimating the distance to the child and more difficulty in applying the brakes. Another example of this is NHTSA's 1/2 inch heel to toe requirement on the walk and turn: this can be equated to missing the brake pedal by 1/2 inch when attempting to brake.*
- 4) Is driving an automobile a multi-tasked function? *Yes, a driver engages in many tasks at once, such as controlling speed, keeping the car in its lane, keeping an eye on other traffic, monitoring speed, etc.*
- 5) Are field sobriety tests simple or complex tasks? *Simple. NHTSA performed these tests on hundreds of people, young and old, athletes and couch potatoes, large and skinny, tired and alert, etc. This group of normal people could pass the test within NHTSA guidelines when sober, but could not when intoxicated.*
- 6) Does fatigue affect a person's ability to perform these tests? *Fatigue does not have a significant effect on a person's ability to perform these tests. In any case, a highly trained officer will take into consideration the subject's tiredness and give the subject the benefit of the doubt.*
- 7) Original research for walk and turn suggested that subjects older than 65 years of age or those with back, leg, or inner ear problems had difficulty performing this test. It is a misperception that weight invalidates this test (compared to the OLS). The test can still be conducted if safe for the officer and the subject, but the clues may simply be observational. Refer to NHTSA Student Manual Session 8-41<sup>[1]</sup>
- 8) Original research for the one-leg stand suggested that subjects older than 65 years of age, those with back, leg, or inner ear problems, or those who are more than 50 pounds overweight had difficulty performing this test. Unlike the WAT, weight can be a factor in this test. The test can still be conducted if safe for the officer and the subject, but the clues may simply be observational. Refer to NHTSA Student Manual Session 8-49<sup>[1]</sup>
- 9) **Walk and Turn:** If the subject exhibits 2 clues out of a possible 8, the implication is that suspect's BAC is above 0.08. **The test is 68% accurate in detecting intoxicated individuals, in and of itself, at or above the 0.10 level and 79% accurate at or above the 0.08 level.** Refer to NHTSA Student Manual Session 8-5, 47<sup>[1]</sup>

10) **One Leg Stand**: If the subject exhibits 2 clues out of a possible 4, the implication is that suspect's BAC is above a 0.08. **The test is 65% accurate in detecting intoxicated individuals, in and of itself, at or above 0.10 levels and 83% accurate at or above 0.08.** Refer to NHTSA Student Manual Session 8-53 <sup>[1]</sup>

11) **Horizontal Gaze Nystagmus**: Refer to NHTSA Student Manual Session 8-37<sup>[1]</sup>

There are six clues or three in each eye.

1. Lack of smooth pursuit
2. Distinct and sustained nystagmus at maximum deviation
3. Onset of nystagmus prior to 45 degrees

If the subject exhibits 4 or more clues, the inference is that the subject's BAC is above 0.08 and impaired.

12) **Walk and Turn**: Refer to NHTSA Student Manual Session 8-44-47<sup>[1]</sup>

There are eight clues on this test

1. Loses balance during instructions
2. Starts too soon
3. Stops while walking
4. Misses heel-to-toe by more than ½ inch while walking
5. Steps off line
6. Uses arms to balance (6 inches or more)
7. Turns improperly
8. Takes the wrong number of steps

If subject exhibits two or more clues, the implication is that they are impaired. If they cannot perform test document that fact, and list only the clues you were able to see. List other observations that indicate impairment but are not counted as clues: fails to count steps out loud, etc. Remember the age, weight, and physical disability requirements.

13) **One Leg Stand**: Refer to NHTSA Student Manual Session 8-51-53 <sup>[1]</sup>

There are four clues on this test:

1. Swaying
2. Using arms to balance (raising or using arms more than 6 inches)
3. Hopping
4. Putting the foot down before 30 seconds.

Decision point: If subject exhibits two or more clues, the inference is that they are impaired. The subject should not be instructed to stop when they reach the count of One Thousand - Thirty. The officer is to stop the defendant when the officer's watch reaches 30 seconds. List other observations that indicate impairment but are not counted as clues: not holding foot parallel to the ground, miscounting, etc. Remember the age and weight considerations.

- 14) Some maintain that HGN is the only SFST that should be performed on people over 65 and more than 50 pounds overweight. However, this is not good police procedure as it affords a defense attorney an opportunity to attack your failure to give the benefit of the doubt to the defendant. So do the tests, but take into consideration the age and weight. If you determine that only HGN should be done, have subject do some alternate FST's such as the alphabet, counting backwards, finger count, Romberg, etc. Note the difference between Standardized Field Sobriety Tests or SFSTs (which are the validated HGN, WAT, and OLS) and Field Sobriety Tests or FSTs which are not validated.
- 15) N.H.T.S.A. stands for the National Highway Traffic Safety Administration.
- 16) VALADATION STUDIES ON SFST'S AT .08

#### **A) Florida**

Dr. Burns and the Southern California Research Institute (SCRI): The study used officers with an average of 9.5 yrs. experience, who conducted the 3 test standardized battery, and who followed the NHTSA guidelines. The study demonstrated that **95% of the officers' decisions to arrest drivers were correct** <sup>[1]</sup> using 0.08 as legal intoxication. Again, some of those released were intoxicated, but the officers gave them the benefit of the doubt. Dr. Burns states that overwhelmingly, when officers err, they err by releasing intoxicated individuals and not by arresting sober individuals.

#### **B) Colorado 1995**

Dr. Burns and the SCRI revealed that snow, cold, and slightly sloped sidewalks did not affect the officer's ability to make the correct arrest decision. Seven agencies were involved. Observers were in half the police vehicles. These observers were SFST trained. They were there to ensure SFST's were done correctly. These observers also tested people who were released. The study revealed that officers the using SFST battery, **made the correct arrest decision 93% of the time** <sup>[1]</sup>. This was corroborated by a breath test.

### C) San Diego 1998

Dr. Burns and the SCRI used trained officers in this study using the SFST battery. The study revealed that the **officers made the correct arrest decision 91% of the time** <sup>[1]</sup>. In this study there were no observers riding with the officers and the officers were allowed to use portable breath test devices (PBTs).

#### 17) **NHTSA's Psychophysical Tests for DWI Arrest** <sup>[3]</sup>

NHTSA (June 1977):

This was a study to determine the easiest and most effective methods of roadside testing in order to increase the ability of police to detect impaired drivers. The study concluded that alcohol gaze nystagmus (later called Horizontal Gaze Nystagmus) testing was most effective, along with the walk-and-turn and one-leg stand tests.

#### 18) **Development and Field Test of Psychophysical Tests for DWI Arrest**

<sup>[4]</sup>

NHTSA (March 1981):

A study to determine the effectiveness of the sobriety test battery and standardized the administration and scoring of each test. The test battery was subjected to laboratory and field evaluation. It concluded that more field testing needed to be performed, but the study showed that the test battery would be effective in increasing the ability of police officer's to detect impaired drivers.

#### 19) **Evaluation of a Behavioral Test Battery for DWI** <sup>[5]</sup>

NHTSA (September 1983):

This study utilized a larger sample size to confirm the effectiveness of the standardized field sobriety test battery. It concluded that the HGN test was the most effective of the three tests and that greater accuracy in determining whether a subject's BAC is over .10 can be gained by combining the scores of the HGN and Walk-and-Turn tests.

#### 20) **American Medical Association**

Under Policy H-30.973, encourages state medical societies to urge their state legislators to adopt a blood alcohol level of 0.05 as per se illegal for driving. They also support working with Congress to make federal highway funds to states contingent upon state adoption of a blood alcohol level of 0.05 as per se illegal for driving.

*The AMA:*

- 1) *Encourages state medical societies to urge their state legislators to adopt a blood alcohol level of 0.05 percent [policy H-30.986, modified in 1997 calls for 0.04 percent] as per se illegal for driving; and*
- 2) *Supports working with Congress to make federal highway funds to states contingent upon state adoption of a blood alcohol level of 0.05 percent as per se illegal for driving. (Res. 1, I-89)*

21) **Study: A Review of the Literature on the Effects of Low Doses of Alcohol on Driving-Related Skills** <sup>[6]</sup>

By Dr. Herbert Moskowitz (April 2000):

This study reviewed the scientific literature regarding the effects of alcohol on driving-related skills. One hundred and twelve articles – from 1981 to 1987 – were reviewed. The review of the literature provided strong evidence that impairment of some driving-related skills begins with any departure from zero BAC. By 0.050 g/dl, the majority of studies have reported measurable impairment by alcohol. By BACs of 0.080 g/dl, more than 94% of the studies reviewed exhibited skills impairment. Specific performance skills are differentially affected by alcohol. Some skills are significantly impaired by BACs of 0.01 g/dl, while others do not show impairment until BACs of 0.06 g/dl.

22) **Study: Driver Characteristics and Impairment at Various BACs** <sup>[7]</sup>

NHTSA (August 2000):

This study used a driving simulator and a divided attention task. The data obtained with 168 subjects demonstrates that alcohol impairs driving-related skills at 0.02, the lowest level tested. The magnitude of impairment increased consistently at BACs through 0.10, the highest level tested. While there is partial evidence of impairment at 0.02, a major conclusion of this study is that by 0.04, all measures of impairment that are statistically significant are in the direction of degraded performance. The data provides no evidence of a BAC below which impairment does not occur. Rather, there was evidence of significant impairment throughout the BAC range of 0.02 to 0.10, with increasing percentage of subjects impaired and increasing magnitude of impairment at higher BACs.

23) **Study: Analysis and Evaluation of the Effect of Varying Blood Alcohol Concentrations on Driving Ability** <sup>[8]</sup>

Dr. Maurice E. Dennis (April 2000)

Dr. Dennis trained 19 people on a Driving Skills Enhancement Program that consisted of 6 different complex driving situations. They were: Skid Control, Auto Control Monster, Crash Simulator, T-Turn, Blocked Lane, and the Slalom. There were also Non-Driving Exercises involving balance, vision, and reaction time. All subjects received training on all aspects of the experiment. The test subjects were given a test using the Intoxilyzer to ensure they had no alcohol in their system. They were given a pretest on all driving and non-driving activities to determine their pre-drinking abilities. The data was recorded on all subjects for comparison with ability after reaching designated BAC's. The subjects were then dosed to 0.04, 0.07, and 0.10 and given all the tests after each designated BAC.

Results: On Complex Driving Exercises (Skid Pad, Auto Control Monster, Crash Simulator)

**BAC DECLINE**

.04 13%

.07 17%

.10 24%

On Less Complex Exercises (Blocked Lane, T-Turn, Slalom)

**BAC DECLINE**

.04 2%

.07 3%

.10 8%

24) Study: Nystagmus Testing in Intoxicated Individuals <sup>[9]</sup>

Dr. Karl Citek (November 2003):

Dr. Citek, who is an ophthalmologist, did a study testing HGN and VGN at different position; standing, seated, and supine. He confirmed the validity of the HGN test in the standing posture to discriminate blood alcohol levels of .08 and .10. He also established, with similar accuracies and reliabilities, the use of the HGN test in the seated and supine postures. There was a statistical difference in the observation of HGN based on test posture. The difference happened in the seated position and was attributed to the difficulty of seeing the eyes. If officers have to conduct the HGN in the seated position, it is recommended that they position the subject in such a way that the subject's eyes can be seen easily throughout the test. This may involve asking the subject to turn the body slightly at the waist, in addition to the head turn used in the current study. Such a minor change in posture will not affect the result. They also confirmed that VGN is present only when signs of HGN are present, and that the VGN test can be used to identify high levels of impairment at any test posture.

25) Robustness of the Horizontal Gaze Nystagmus Test <sup>[10]</sup>

Marcelline Burns, (September 2007):

Dr. Burns conducted a study to determine if variations in how officers give the HGN test that are the subject of attacks by defense attorneys make the results inaccurate, thereby invalidating the test. The three important experiments test three major challenges by defense attorneys: change in stimulus speed; change in stimulus elevation; and stimulus distance from eyes.

The first experiment varied the speed of the stimulus from 1, 2, and 4 seconds.

*Conclusion:* In summary, the principal effect of variations in the speed of the stimulus was found to be false negatives, failures to detect a breakdown of smooth pursuit movements (failure to detect clues). The finding that rapid stimulus movement lessens the likelihood of observing lack of smooth pursuit is relevant to law enforcement. In the interest of accuracy, stimulus speed should not be faster than 2 seconds.

The findings do not support the suggestion the variations in stimulus speed led to false alarm errors and thus should not invalidate test findings.

The second experiment tested variations in stimulus level compared to eye level, 2 inches above eye level, and 4 inches above eye level.

*Conclusion:* Greater accuracy in detecting nystagmus was observed when HGN was conducted at eye level and four inches above eye level. A four inch stimulus elevation results in the test subject opening the eyes more thereby making clue observation easier for the officer. It did not increase false positive observations in comparison to the other conditions. It has been suggested that this position engages different eye muscles than more moderate positions and would, therefore, yield radically different observations. The data does not confirm that claim nor do they provide evidence that would support a change in current training.

The third experiment varied the distance of the stimulus from 10 inches, to 12-15 inches, and to 20 inches. *Conclusion:* NHTSA recommends that the stimulus be held 12-15 inches from the eyes. Increasing that distance to 20" did not alter the number of signs observed. When the distance was decreased to 10", officers correctly reported more signs. The magnitude of the difference is small, however, and is viewed as insufficient basis for changing the current standard.

*Over-All Conclusion:* Variations in the way HGN is performed tend to lead to false negatives, not false positives, and do not invalidate the HGN test.

- 26) [The Visual Detection of DWI Motorists" US Department of Transportation, DOT HS808 677](#) <sup>[11]</sup>

#### *Problems Maintaining Proper Lane Position*

Weaving, weaving across lanes, straddling a lane line, swerving, turning with a wide radius, drifting, almost striking a vehicle or other object

#### *Speed and Braking Problems*

Stopping problems (too far, too short, or too jerky), accelerating or decelerating for no apparent reason, varying speed, slow speed (10+ under speed limit)

#### *Vigilance Problems*

Driving in opposing lanes or wrong way on one-way, slow response to traffic signals, slow or failure to respond to officer's signals, stopping in lane for no apparent reason, driving without headlights at night, failure to signal or signal is inconsistent with action

### *Judgment Problems*

Following too closely, improper or unsafe lane change, illegal or improper turn, (too fast, too slow, or too jerky), driving on other than designated roadway, stopping inappropriately in response to officer, inappropriate or unusual behavior (throwing, arguing, etc.), appearing to be impaired.

#### 27) Experimental Evaluation of an FST Battery in the Marine Environment <sup>[12]</sup>

US Coast Guard (June 1990)

In this study, 97 volunteers were dosed with alcohol in a recreational boating setting. Experienced marine officers estimated the subject's BAC through field sobriety testing. The agents estimated impairment correctly 82% of the time. It was concluded that the accuracy of FSTs, notably the HGN, was not deteriorated in the marine environment. All officers gave the HGN test on the boat and on land. The remaining water tests consisted of some combination of the "hand pat," "alphabet recital," or "nose touch." On land, after allowing the subjects ten minutes to regain "land legs," the subjects were then given either the WAT or the OLS (in addition to all being given the HGN again).

#### 28) Validation of Sobriety Tests for the Marine Environment

D.D. Fiorentino (2010)

In this study, 331 boaters were administered four float tests in a seated position on The Lake of the Ozarks to determine their effectiveness in detecting impaired boaters. The four tests were the HGN, the Finger to Nose (FTN), the Palm Pat (PP), and the Hand Coordination (HC) tests. The study concluded that the four tests' results were consistent with the findings in roadside SFSTs and that these tests may be useful for marine officers to use in determining impairment at 0.08 and above for operators on the boat. HGN alone correctly predicted BAC status in 85% of the cases. FTN alone correctly predicted BAC status in 67% of the cases. PP alone correctly predicted BAC status in 65% of the cases. HC alone correctly predicted BAC status in 59% of the cases. Administering the HGN test alone was the most predictive of impairment even when combined with the other tests, although HGN and any one of the other tests was also 85% predictive. The study found that officers who could properly administer the test may confidently rely on HGN done on the water.



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[6]<http://www.nhtsa.gov/people/injury/research/pub/hs809028/title.htm>

[7]<http://ntl.bts.gov/lib/9000/9500/9512/impairment.pdf>

[8][http://adtsea.org/adtsea/Chronicle/Chronicle/Issues/Issues/2002\\_Fall.pdf](http://adtsea.org/adtsea/Chronicle/Chronicle/Issues/Issues/2002_Fall.pdf)

[9]<http://www.decp.org/pdfs/nystagmus.pdf>

[10]<http://www.nhtsa.gov/DOT/NHTSA/Communication%20&%20Consumer%20Information/Traffic%20Tech%20Publications/Associated%20Files/tt339.pdf>

[11]<http://www.nhtsa.gov/staticfiles/nti/pdf/808677.pdf>

[12]<http://www.dtic.mil/dtic/tr/fulltext/u2/a227182.pdf>