Driver Speech Yield Normalized Fitness

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1. Abstract:

Inspite of EU cost of 3.9 billion Euros and 40,000 road fatalities per year, no use is made of reliable and noninvasive means to monitor driver chemical fitness. Single or multiple chemical including inhalants, chews, medicines, drug and alcohol user/abuser impairment detection from speech is presented. Breathalyzer and drug tests cannot detect impairment, and are ineffective in the case of poly drug use below individual thresholds. Similarly medicine or medicine and alcohol caused impairment is not detectable by any drug test if alcohol tests below its threshold. Marijuana smokers test positive for three months while fit to drive within 24 to 48 hours. No drug test can account for individual tolerance level. Speech based chemical neuro-normalized impairment measure, and some experimental results are presented.

2. Introduction:

Belgium and Austrian government are planning to legalize Marijuana like Netherlands without making any provisions for removing impaired users off the road. Danish maritime industry’s attempt to drug test their sea faring employees was successfully challenged by unions on the basis of the fact that marijuana smokers are fit to function when they return to work whereas drug tests would have them test positive for THC for three months.

Germany has the highest road fatalities, 196 per million as compared to EU average of 108.6 per million in 2000, and yet many of its states are using ineffective technologies such as breathalyzer and/or US style moralistic drug tests imposed by industrial lobby and outdated laws.

US DOT, National Institute of Traffic Safety-NIHTSA recently reported a decline in alcohol related road deaths, without listing other chemicals present. European and US studies clearly show multiple use of drugs, pills, medicines with alcohol. Physicians, psychologists and toxicologists to date have no means to quantify chemical impairment for lack of interdisciplinary research including signal analysis, speech neurology, and toxicology.

Police stop a driver weaving in and out of his lane, give him a sobriety test which he fails, and check Nystagmus, which is positive showing drug use, and arrest him for intoxication while waiting for Urine test results. The next day the urine tests results turn out to be negative, and the driver goes free. That is a typical daily experience of numerous police jurisdictions. EU countries require blood tests administered by a physician and analysis by laboratory with undue costs, and delays.

NITHSA funded a study by psychologists at Maastricht University in Netherlands to study the effect of marijuana and alcohol on the driving ability, and the final report was so qualitative that the reported results would be obvious.

UK police research laboratory has been injecting cocaine into a spider to test its impairment, and hoping to extend such results to human drivers! Sweden requires zero tolerance for alcohol, which is nearly impossible to determine while cough drops and syrups are being used for c olds etc.

Exxon, KLM, and Lufthansa safety engineers are subjected to medical decision makers in case of worker chemical impairment or unfitness determination whereas medical school curricula and practice is devoid of any training in this discipline. Use of medicines is promoted by the pharmaceutical industry, and medical practitioners have no information on poly medicine impairment.

EU is proposing 8% alcohol standard, and even ready to institute drug tests for transport trucks without assessing its cost effectiveness.

3. Technical Basis:

No body fluids, hair or breath contain on-the-spot driver impairment parameters, while providing a delayed measure of chemicals ingested. Drug tests ala American style use arbitrarily set threshold for illicit drugs and alcohol. Drug tests are ineffective when medicine, chews or inhalants or poly chemicals or drugs are consumed with or without alcohol. Very few abuse only one chemical only since beer, wine and hard liquor are the social norm among western societies using medicines.

The only source of individually normalized measure of impairment consisting of cognitive, motor action, reaction time, and coordination...
retardation is optimally obtained from speech using over 67.5% of cerebral systems. The cerebral system derives its input from the nerve ends located all over the body, and these immediately sense chemical intake in addition to lungs and digestive organs processing inhaled and mouth ingested chemicals respectively. They then communicate such signals to their cerebral subsystems which in turn are the ones involved in producing speech. It is this reason why speech is indeed the optimum source of chemical impairment parameters, and is the basis of IMPAIRLYZER ™, used in this study. This impairment measures accounts for all physiological factors including tolerance and interactions between other chemical present in the body.

4. Experimental Results:

Sixty male and 11 female students were given controlled doses of alcohol, and were subjected to five sobriety tests, balanced, star tracking, backward counting, ruler drop/reaction time, and telephone recitation of words one, one, two, eight, nine. Breathalyzer was used to detect blood alcohol content, BAC, chemical impairment measure, IMI was obtained by IMPAIRLYZER ™ through a telephone link.

A scatter plot of IMI vs BAC for 41 subjects finishing the tests shows these results:

| BAC<8% | IMI<1.7 | 22 |
| BAC>8% | IMI>1.7 | 19 |

The difference between 4 unimpaired on BAC threshold of 8% compared with 22 unimpaired on IMI threshold of 1.7 may be explained by the fact that either 22 were binge drinkers with high tolerance levels or they were taking some depressant or had a very heavy meal prior to the experiment. There was no data collected on subject medicine use or disease. Three students with BAC<8% tested impaired on IMI scale, and were most likely non drinkers or first year students, and yet would pass a breathalyzer test.

The most significant result was that none of the psychomotor tests had positive correlation with 10% BAC level used for being drunk. Furthermore there was positive correlation between IMI, and elapsed time and leg total measures respectively of 0.51 and 0.36 for 24 male students.

5. Conclusion:

Drug tests do not yield true driver impairment whereas IMI provides the only individually normalized and noninvasive impairment measure.

6. References: