

RCPI Working Group on Traffic Review 2016 in
consideration of the evidence of standards to be
set by
Sláinte agus Tiomáint Medical Fitness to Drive
Guidelines 2017

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Neurological disorders

1. Kurthen M. EPILEPSY AND DRIVING ABILITY: THE NEW GUIDELINE. Praxis (Bern 1994). 2015 Oct 28;104(22):1187-93.

The Swiss Guideline concerning epilepsy and driving has recently been revised. Recommendations have changed significantly in several respects. Some modifications arise indirectly from a change in the overall concept of epilepsy. As a consequence of the application of the new ILAE definition and diagnostic criteria for epilepsy, there are now cases in which the diagnosis of epilepsy is established even after one single seizure. Furthermore, a concept of imminent epilepsy was introduced to identify patients without seizures, but with a high risk of a first seizure within twelve months. On the other hand, the concept of a "resolved epilepsy" was established to loosen driving regulations for long term seizure-free patients. In addition, the new guideline provides differential recommendations for provoked vs. unprovoked seizures in several clinical constellations.

2. Bicknell R, Ibrahim J, Bugeja L, Ranson D. THE DANGERS OF DEMENTIA: GETTING THE BALANCE RIGHT. J Law Med. 2015 Dec;23(2):303-7.

Australia's population is ageing and it is likely that there will be a threefold increase in the number of people living with dementia in the next 30 years. Caring for these individuals will incur a significant burden on our community both fiscal and personal. How we provide this care will say much about our compassion for and commitment to caring for those who are no longer part of the productive workforce. Individuals with dementia are a heterogeneous group with a wide range of function and capacity. Nevertheless, their impairment often requires a high level of formal care in order to reduce the risk of harm to themselves and others in the community. The imposition of such care arrangements can be invasive of their autonomy and in some cases their liberty. These issues are addressed in respect of some of the major risks of harm in a setting of dementia.

3. Piersma , Fuermaier AB, de Waard, Davidse RJ, de Groot J, Doumen MJ, Bredewoud RA, Claesen R, Lemstra AW, Vermeeren A, Ponds R, Verhey F, Brouwer WH, Tucha O. PREDICTION OF FITNESS TO DRIVE IN PATIENTS WITH ALZHEIMERS DEMENTIA. PLoS One. 2016 Feb 24;11(2):e0149566. doi: 10.1371/journal.pone.0149566.

The number of patients with Alzheimer's disease (AD) is increasing and so is the number of patients driving a car. To enable patients to retain their mobility while at the same time not endangering public safety, each patient should be assessed for fitness to drive. The aim of this study is to develop a method to assess fitness to drive in a clinical setting, using three types of assessments, i.e. clinical interviews, neuropsychological assessment and driving simulator rides. The goals are (1) to determine for each type of assessment which combination of measures is most predictive for on-road driving performance, (2) to compare

the predictive value of clinical interviews, neuropsychological assessment and driving simulator evaluation and (3) to determine which combination of these assessments provides the best prediction of fitness to drive. Eighty-one patients with AD and 45 healthy individuals participated. All participated in a clinical interview, and were administered a neuropsychological test battery and a driving simulator ride (predictors). The criterion fitness to drive was determined in an on-road driving assessment by experts of the CBR Dutch driving test organisation according to their official protocol. The validity of the predictors to determine fitness to drive was explored by means of logistic regression analyses, discriminant function analyses, as well as receiver operating curve analyses. We found that all three types of assessments are predictive of on-road driving performance. Neuropsychological assessment had the highest classification accuracy followed by driving simulator rides and clinical interviews. However, combining all three types of assessments yielded the best prediction for fitness to drive in patients with AD with an overall accuracy of 92.7%, which makes this method highly valid for assessing fitness to drive in AD. This method may be used to advise patients with AD and their family members about fitness to drive.

4. DJ Lawton CL, Merat N, Jamson H, Myrissa K, Hofman D, Chadwick HK, Quadt F, Wightman JD, Dye L.. CONCORD GRAPE, COGNITIVE FUNCTION AND DRIVING PERFORMANCE: A 12-WK PLACEBO-CONTROLLED, RANDOMIZED CROSSOVER TRIAL IN MOTHERS OF PRETEEN CHILDREN. *Am J Clin Nutr.* 2016 Mar;103(3):775-83. doi: 10.3945/ajcn.115.114553. Epub 2016 Feb 10.

BACKGROUND:

Daily consumption of Concord grape juice (CGJ) over 3-4 mo has been shown to improve memory function in adults with mild cognitive impairment and reduce blood pressure in hypertensive adults. These benefits likely result from the high concentration of polyphenols in CGJ. Increased stress can impair cognitive function and elevate blood pressure. Thus, we examined the potential beneficial effect of CGJ in individuals with somewhat stressful and demanding lifestyles.

OBJECTIVE:

We sought to examine the effects of the daily consumption of CGJ for 12 wk on cognitive function, driving performance, and blood pressure in healthy, middle-aged working mothers.

DESIGN:

Twenty-five healthy mothers (aged 40-50 y) of preteen children who were employed for ≥ 30 h/wk consumed 12 ounces (355 mL) of either CGJ (containing 777 mg total polyphenols) or an energy-, taste-, and appearance-matched placebo daily for 12 wk according to a randomized crossover design with a 4-wk washout. Verbal and spatial memory, executive function, attention, blood pressure, and mood were assessed at baseline and at 6 and 12 wk. Immediately after the cognitive battery, a subsample of 17 women completed a driving

performance assessment at the University of Leeds Driving Simulator. The 25-min driving task required participants to match the speed and direction of a lead vehicle.

RESULTS:

Significant improvements in immediate spatial memory and driving performance were observed after CGJ relative to placebo. There was evidence of an enduring effect of CGJ such that participants who received CGJ in arm 1 maintained better performance in the placebo arm.

CONCLUSIONS:

Cognitive benefits associated with the long-term consumption of flavonoid-rich grape juice are not exclusive to adults with mild cognitive impairment. Moreover, these cognitive benefits are apparent in complex everyday tasks such as driving. Effects may persist beyond the cessation of flavonoid consumption, and future studies should carefully consider the length of washout within crossover designs. This trial was registered at clinicaltrials.gov as NCT01411631.

5. Bergot L, Cuchard S, Mazeaud S, Magro E, Seizeur R. IMPACT OF DRIVING RESTRICTIONS DISCLOSURE ON QUALITY OF LIFE OF PATIENTS WITH A GLIAL TUMOR: A PROSPECTIVE STUDY *Bull Cancer*. 2016 Mar;103(3):236-40. doi: 10.1016/j.bulcan.2015.10.021. Epub 2016 Jan 29.

INTRODUCTION:

Disclosure of driving restrictions on patients with glial tumors is a complex and difficult task. The difficulty of such task lies in the moral and ethical conflicts it generates for the patient on one hand and caregivers on the other. These aforementioned conflicts impinge upon the patient's quality of life which is one of the important aspects of neuro-oncologic care.

PATIENTS AND METHOD: In a prospective survey of 31 patients diagnosed with glial tumors, we studied how the patient perceived the disclosure of driving restrictions specifically the amount of retained information, and the level of distress.

RESULTS: It seems that patients fail to assess the juridical implications of driving restrictions. The impact on quality of life as well as psychological and social aspects of these restrictions must not be taken lightly especially in young patients with low-grade glioma who has a long life expectancy.

CONCLUSION: Therefore, we believe that planning a specific psychological and social accompaniment of the patient in relation to driving restrictions is an undeniable necessity.

6. Ranchet M, Tant M, Akinwuntan AE, Neal E, Devos H. **COMORBIDITY IN DRIVERS WITH PARKINSON'S DISEASE.** *J Am Geriatr Soc.* 2016 Feb;64(2):342-6. doi: 0.1111/jgs.13942. Epub 2016 Jan 25.

OBJECTIVES:

To determine the effect of comorbidity on fitness-to-drive recommendations that physicians and on-road driving assessors make and to investigate the agreement in fitness-to-drive recommendations between physicians and on-road driving assessors.

DESIGN:

Retrospective.

SETTING:

Data on comorbidities associated with Parkinson's disease (PD) and fitness-to-drive recommendations were investigated.

PARTICIPANTS: Individuals with PD who underwent an official on-road test in Belgium (N = 72).

MEASUREMENTS:

Correlations between comorbidity and fitness-to-drive recommendations were calculated. Stepwise logistic regression models were used to investigate whether comorbidity was an independent predictor of fitness-to-drive recommendations (pass/fail) that the physicians or the on-road assessors made. The percentage of agreement and the prevalence and bias-adjusted kappa (PABAK) were used to investigate agreement between the physicians and the on-road assessors.

RESULTS:

Moderate correlations were found between comorbidity and fitness-to-drive recommendations that the physicians ($\rho = 0.34$, $P = .004$) and the on-road assessors ($\rho = 0.30$, $P = .01$) made. Comorbidity was the most important determinant (coefficient of determination = 0.16, $P = .005$) of the physicians fitness-to-drive recommendations. No significant effect of comorbidity on the on-road recommendations was found. The physicians and the on-road assessors agreed in 46 (64%) of the cases (PABAK = 0.46, $P < .001$).

CONCLUSION:

Comorbidity plays a role in physicians' recommendations of fitness to drive that may explain, in part, inconsistencies between physicians and on-road assessors' fitness-to-drive recommendations. This study indicates the need for an interdisciplinary dialogue between physicians and on-road assessors to reach a comprehensive fitness-to-drive decision.

7. Classen S, Velozo CA, Winter SM, Bédard M, Wang Y. PSYCHOMETRICS OF THE FITNESS-TO-DRIVE SCREENING MEASURE. OTJR (Thorofare N J). 2015 Jan;35(1):42-52.

We employed item response theory (IRT), specifically using Rasch modeling, to determine the measurement precision of the Fitness-to-Drive Screening Measure (FTDS), a tool that can be used by caregivers and occupational therapists to help detect at-risk drivers. We examined unidimensionality through the factor structure (how items contribute to the central construct of fitness to drive), rating scale (use of the categories of the rating scale), item/person-level separation (distinguishing between items with different difficulty levels or persons with different ability levels) and reliability, item hierarchy (easier driving items advancing to more difficult driving items), rater reliability, rater effects (severity vs. leniency of a rater), and criterion validity of the FTDS to an on-road assessment, via three rater groups (n = 200 older drivers; n = 200 caregivers; n = 2 evaluators). The FTDS is unidimensional, the rating scale performed well, has good person (> 3.07) and item (> 5.43) separation, good person (> 0.90) and item reliability (> 0.97), with < 10% misfitting items for two rater groups (caregivers and drivers). The intraclass correlation (ICC) coefficient among the three rater groups was significant (.253, $p < .001$) and the evaluators were the most severe raters. When comparing the caregivers' FTDS rating with the drivers' on-road assessment, the areas under the curve (index of discriminability; caregivers .726, $p < .001$) suggested concurrent validity between the FTDS and the on-road assessment. Despite limitations, the FTDS is a reliable and accurate screening measure for caregivers to help identify at-risk older drivers and for occupational therapy practitioners to start conversations about driving.

8. Pérez-Moreno, Hernández-Lloreda MJ, Gallego-Largo TR, Castellanos MÁ IMPULSIVE DRIVING: DEFINITION AND MEASUREMENT USING THE I- DRIVING SCALE (IDS). Span J Psychol. 2015 Nov 27;18:E93. doi: 10.1017/sjp.2015.98.

Impulsivity has been widely studied in the context of traffic. The trait is believed to be the root of some accidents, along with other variables like aggression and anger. The present research objective is to develop a new scale - the I-Driving Scale (IDS) - to evaluate and measure the construct of impulsivity in specific driving situations. To that end, two studies were conducted, with 162 and 107 participants, respectively. In both studies, participants were recruited via their social networks, and answered anonymously. In addition to the IDS, they completed the Use the Vehicle to Express Anger subscale of the Driving Anger Expression Inventory (DAX), the Driving Anger Scale (DAS), and the Barratt Impulsivity Scale (BIS11), and also provided demographic information. The final scale had 11 items falling into two factors: impatience, and aggressiveness/abruptness. The results show a high consistency ($\alpha_T = .81$, $\alpha_I = .70$, and $\alpha_A = .85$ in the first study; $\alpha_T = .83$, $\alpha_I = .80$, and $\alpha_A = .88$ in the second study). Statistical results of Exploratory Factor Analysis in the first sample indicated goodness of fit to a two-factor model (RMSR = .057, GFI = .98). The second study confirmed that factorial structure ($\chi^2/df = 80.50/43 = 1.87$, RMSEA = .088, CFI = .94, TLI = .92). Correlations with other measures indicated the Impatience subscale is associated with different expressions of anger behind the wheel, and directly correlated with the loss of

driver's license points. Furthermore, the Aggressiveness or Abruptness subscale was associated with more mechanical aspects, and correlated inversely with age.

9. Jones Ross RW, Scialfa CT, Cordazzo ST. PREDICTING ON-ROAD DRIVING PERFORMANCE AND SAFETY IN COGNITIVELY IMPAIRED OLDER ADULTS. *J Am Geriatr Soc.* 2015 Nov;63(11):2365-9. doi: 10.1111/jgs.13712. Epub 2015 Oct 27.

OBJECTIVES:

To evaluate the ability to predict on-road driving in cognitively impaired older drivers.

DESIGN:

Cross-sectional observational study.

SETTING:

Laboratory tests and on-road assessment.

PARTICIPANTS:

Drivers with cognitive impairment (Mini-Mental State Examination score < 26, N = 43, mean age 74).

MEASUREMENTS:

The Roadwise Review, a hazard perception test (HPT), several vision tests, and a standardized 18-km driving assessment.

RESULTS:

The best prediction of passing or failing the on-road test was a combination of the HPT, leg strength, visual acuity, visual search and working memory, and number of medications taken (Nagelkerke coefficient of determination = 0.40). The sensitivity of the model was 71%, and the specificity was 75%.

CONCLUSION:

Further research is required to determine how these tests may be used or combined with other data (e.g., medical history) to assess fitness to drive of cognitively impaired.

10. Vaucher P, Pasche C, Favrat B. Technical Comment on "SACCADIC EYE MOVEMENT PERFORMANCE AS AN INDICATOR OF DRIVING ABILITY IN ELDERLY DRIVERS". *Swiss Med Wkly.* 2015 Oct 27;145:w14194. doi: 10.4414/smw.2015.14194. eCollection 2015.

11. Pauley T, Phadke CP, Kassam A, Ismail F, Boulias C, Devlin M. THE INFLUENCE OF A CONCURRENT COGNITIVE TASK ON LOWER LIMB REACTION TIME AMONG STROKE SURVIVORS WITH RIGHT- OR LEFT-HEMIPLEGIA .*Top Stroke Rehabil.* 2015 Oct;22(5):342-8. doi: 10.1179/1074935714Z.0000000041. Epub 2015 Jan 30.

The influence of a concurrent cognitive task on lower limb reaction time among stroke survivors with right- or left-hemiplegia.

OBJECTIVE:

To determine the impact of cognitive interference on foot pedal reaction time among stroke survivors with right- (RH) or left-hemiplegia (LH).

DESIGN:

Cross-sectional comparison without randomization.

SUBJECTS/PATIENTS:

10 patients post-stroke with RH, 10 with LH; 10 age-matched controls.

METHODS:

Foot pedal response times were measured using three different reaction time (RT) paradigms: simple RT, dual-task RT (counting backward by serial 3 seconds), and choice RT (correct response contingent on stimuli to eliminate pre-programming). RH and LH used the non-paretic leg for all trials. Three 3 (RT task) × 3 (group) mixed-model factorial ANOVAs were used to compare RT, movement time (MT), total response time (TRT).

RESULTS:

Overall controls demonstrated faster RT than RH (332 ± 73 versus 474 ± 144 ms, $P < 0.001$) or LH (402 ± 127 ms, $P < 0.05$); LH group demonstrated faster RT than those with RH ($P < 0.05$). Control subjects demonstrated significantly faster RT than RH for all RT conditions ($P < 0.05$ for all). In contrast, controls achieved significantly faster RT than LH for the choice RT condition only ($P < 0.05$), but not for the simple ($P = 0.12$) or dual-task RT conditions ($P = 0.25$).

CONCLUSIONS:

Compared to controls, response time was significantly impaired among LH and RH when the response could not be pre-programmed. While current simple RT testing commonly employed by driver rehab specialists may be sufficient for detecting RT deficits in patients with RH, simple or dual-task RT tests alone may fail to detect RT deficiencies among LH, even when testing the non-paretic limb. Choice RT should be added to post-stroke driver fitness assessment, particularly for patients with LH.

12. Devos H, Ranchet M, Emmanuel Akinwuntan A, Uc EY. ESTABLISHING AN EVIDENCE-BASE FRAMEWORK FOR DRIVING REHABILITATION FOR DRIVING REHABILITATION IN PARKINSON'S DISEASE: A SYSTEMATIC REVIEW OF ON-ROAD DRIVING STUDIES. *NeuroRehabilitation*. 2015;37(1):35-52. doi: 10.3233/NRE-151239.

BACKGROUND:

Individuals with Parkinson's disease (PD) experience problems with on-road driving that can be targeted in driving rehabilitation programs.

OBJECTIVE:

To provide a framework for driving rehabilitation in PD by identifying the critical on-road driving impairments and their associated visual, cognitive, and motor deficits.

METHODS:

We conducted a systematic review of the literature on on-road driving and naturalistic driving practices in PD. Relevant databases including Pubmed, Medline, PsychINFO, ISI Web of Science, Cochrane library, and ClinicalTrials.gov, were reviewed using the key words Parkinson's disease, on-road driving, naturalistic driving, and their related entry words. On-road driving skills were mapped onto an existing theoretic model of operational, tactical, and strategic levels. The on-road and off-road cognitive, motor, and visual predictors of global on-road driving were summarized.

RESULTS:

Twenty-seven studies were included. All but one study were prospective and Class II studies according to the American Academy of Neurology Classification Criteria. Participants were on average 68 years old and in the mild to moderate stages of PD. Drivers with PD were more likely to fail a driving assessment compared to age- and gender-matched controls. Compared with controls, drivers with PD experienced difficulties on all levels of driving skill. However, the compensation strategies on the strategic level showed that drivers with PD were aware of their diminished driving skills on the operational and strategic levels. Operational and tactical on-road driving skills best predicted global on-road driving. A combination of visual, cognitive, and motor deficits underlie impaired on-road driving performance in PD.

CONCLUSION:

Driving rehabilitation strategies for individuals with PD should include training of operational and tactical driving skills or indirect comprehensive training program of visual, cognitive, and motor skills.

13. Dawkins RL, Omar NB, Agee BS, Walters BC, Riley KO. ASSESSMENT OF DRIVING OUTCOMES AFTER EPILEPSY SURGERY. *Epilepsy Behav.* 2015 Nov;52(Pt A):25- 30. doi:10.1016/j.yebeh.2015.08.035. Epub 2015 Sep 24.

INTRODUCTION:

Driving is an important factor contributing to good quality of life in patients with epilepsy. Little work has been undertaken to explore the details of driving experience alone in this patient population. We assessed the driving status of our patients prior to and following surgery for epilepsy. We also sought to determine what associations exist between patient characteristics and postoperative driving status.

METHODS:

The participants were selected from those adult patients with epilepsy who have required surgical treatment at our home institution between 2006 and 2010. Each participant received a questionnaire asking about driving and seizure status before and after surgery. The surveys were distributed using a modified Dillman approach. Perioperative patient data were obtained from the electronic medical record system in addition to a previously assembled epilepsy database from the Neurology Department at our institution. Independent variables were analyzed to look for significant associations with driving outcomes.

RESULTS:

One hundred forty eligible patients were included in the survey population; 78 patients returned a questionnaire for a response rate of 55.7%. Eighty percent of patients experienced driving as a regular part of life at some point prior to surgery. At the time of the questionnaire distribution, 68% of patients had returned to regular driving. Demographic characteristics did not play a significant role in whether or not the patient had a favorable driving outcome after surgery. However, patients who had a history of driving on a regular basis prior to surgery and those who had an Engel Class I outcome after surgery had significantly higher rates of good driving outcomes. Also, patients with an unfavorable preoperative driving status were more likely to have a favorable driving outcome after surgery if they had an Engel Class I outcome.

Patients in whom intracranial electroencephalography (EEG) was utilized prior to resection had worse driving outcomes.

CONCLUSIONS:

A surprisingly high percentage of patients with epilepsy have experienced driving on a regular basis prior to surgery. We can assume that most patients were not driving immediately prior to surgery, given the fact that they had progressed to requiring surgery for treatment of their epilepsy. Thus, a driving rate of 68% after surgery can be considered good. We found that a patient's preoperative driving history, the use of intracranial EEG before surgical resection, and Engel classification were significant predictors of postoperative driving outcomes. These data provide patients with assistance in preoperative counseling. More investigation needs to be completed in other patient variables - such as seizure types, magnetic resonance imaging (MRI) findings, and patient motivators for driving - as possible predictors of driving outcomes.

14. Punia V, Farooque P, Chen W, Hirsch LJ, Berg AT Collaborators: eSpencer S, Sperling M, Bazil C, Walczak T, Erba G, Shinnar S, Devinsky O, Vickrey B, Berg A. EPILEPTIC AURAS AND THEIR ROLE IN DRIVING SAFETY IN PEOPLE WITH EPILEPSY. *Epilepsia*. 2015 Nov;56(11):e182-5. doi: 10.1111/epi.13189. Epub 2015 Sep 22.

The aim of our study was to evaluate the role of auras in preventing motor vehicle accidents (MVAs) among patients with medically refractory epilepsy. The Multicenter Study of Epilepsy Surgery database was used to perform a case-control study by identifying patients who had seizures while driving that led to MVAs (cases) and those who had seizures while driving without MVAs (controls). We compared presence of reliable auras and other aura-related features between the two groups. Two hundred fifteen of 553 patients reported having seizure(s) while driving; 74 were identified as "controls" and 141 as "cases." The two groups had similar demographic and clinical features. The presence of reliable auras was not different between the two groups (67% in cases vs. 65% in controls; odds ratio [OR] 0.89, 95% confidence interval [CI] 0.49-1.61, $p = 0.76$). In addition, the groups did not differ in the proportion of patients who reported longer (>1 min) auras (OR 0.7, 95% CI 0.28-1.76, $p = 0.47$), or who thought that their auras were of sufficient duration to be protective (OR 1.19, 95% CI 0.62-2.00, $p = 0.77$). Our study questions the long-held belief of a protective role of reliable auras against MVAs in people with epilepsy.

15. Greve JM, Santos L, Alonso AC, Tate DG. DRIVING EVALUATION METHODS FOR ABLE-BODIED PERSONS AND INDIVIDUALS WITH LOWER EXTREMITY DIASABILITIES: A REVIEW OF ASSESSMENT MODALITIES. *Clinics (Sao Paulo)*. 2015 Sep;70(9):638-47. doi: 0.6061/clinics/2015(09)08.

Assessing the driving abilities of individuals with disabilities is often a very challenging task because each medical condition is accompanied by physical impairments and because relative individual functional performance may vary depending on personal characteristics. We identified existing driving evaluation modalities for able-bodied and lower extremity-impaired subjects (spinal cord injury patients and amputees) and evaluated the potential relationships between driving performance and the motor component of driving. An extensive scoping review of the literature was conducted to identify driving assessment tools that are currently used for able-bodied individuals and for those with spinal cord injury or lower extremity amputation. The literature search focused on the assessment of the motor component of driving. References were electronically obtained via Medline from the PubMed, Ovid, Web of Science and Google Scholar databases. This article compares the current assessments of driving performance for those with lower extremity impairments with the assessments used for able-bodied persons. Very few articles were found concerning "Lower Extremity Disabilities," thus confirming the need for further studies that can provide evidence and guidance for such assessments in the future. Little is known about the motor component of driving and its association with the other driving domains, such as vision and cognition. The available research demonstrates the need for a more evidenced-based understanding of how to best evaluate persons with lower extremity impairment.

16. Vaughan L, Hogan PE, Rapp SR, Dugan E, Marottoli RA, Snively BM, Shumaker SA, Sink KM. DRIVING WITH MILD COGNITIVE IMPAIRMENT OR DEMENTIA: COGNITIVE TEST PERFORMANCE AND PROXY REPORT OF DAILY LIFE FUNCTION IN OLDER WOMEN. *J Am Geriatr Soc.* 2015 Sep;63(9):1774-82. doi: 10.1111/jgs.13634. Epub 2015 Sep 4.

OBJECTIVES:

To investigate associations between proxy report of cognitive and functional limitations and cognitive performance and current or former driving status in older women with mild cognitive impairment (MCI) and all-cause dementia.

DESIGN:

Cross-sectional data analysis of retrospectively identified older women with adjudicated MCI and all-cause dementia in the Women's Health Initiative Memory Study-Epidemiology of Cognitive Health Outcomes (WHIMS-ECHO).

SETTING:

Academic medical center.

PARTICIPANTS:

Women (mean age \pm standard deviation 83.7 \pm 3.5) adjudicated with MCI or dementia during Year 1, 2, 3, or 4 of the WHIMS-ECHO follow-up period (N = 385).

MEASUREMENTS:

The telephone-administered cognitive battery included tests of attention, verbal learning and memory, verbal fluency, executive function, working memory, and global cognitive function plus self-report measures of depressive symptomatology. The Dementia Questionnaire (DQ) was administered to a knowledgeable proxy (family member, friend).

RESULTS:

Sixty percent of women with MCI and 40% of those with dementia are current drivers. Proxy reports of functional limitations in instrumental activities of daily living (IADLs) are associated with current driving status in women with MCI, whereas performance-based cognitive tests are not. In women with dementia, proxy reports of functional limitations in IADLs and performance-based cognitive tests are associated with current driving status, as expected.

CONCLUSION:

These findings have clinical implications for the importance of evaluating driving concurrently with other instrumental functional abilities in MCI and dementia. Additional work is needed to determine whether proxy report of cognitive and functional impairments should help guide referrals for driving assessment and rehabilitation or counseling for driving transition.

17. Sińczuk-Walczak H, Siedlecka J, Szymczak W, Gadzicka E, Walczak A, Kowalczyk G, Dania M, Bortkiewicz A. NEUROLOGICAL SYMPTOMS AND SYNDROMES IN MUNICIPAL TRANSPORT DRIVERS. *Med Pr.* 2015;66(3):333-41. doi: 10.13075/mp.5893.00208.

BACKGROUND:

The way the municipal transport drivers perform their job contributes to varied burdens linked with the body posture at work, stress, shift work, vibration, noise and exposure to chemical agents. The aim of the study was to assess the condition of the nervous system (NS) in municipal transport drivers.

MATERIAL AND METHODS:

The study covered 42 men, aged 43.4 years (standard deviation (SD): 8.3), employed as bus drivers in the municipal transport enterprise. The duration of employment was 11.8 years on average (SD: 8.6). The condition of the nervous system was assessed on the basis of clinical neurological examinations.

RESULTS:

Chronic lumbosacral syndrome was found in 54.8% of the subjects. A significant relationship between the incidence of lumbosacral syndrome and the duration of employment ($p=0.032$) was observed; significantly higher in drivers employed for 11-15 years (90.9%) in comparison to the remaining groups. Nervous system functional disorders were characterized by the increased emotional irritability (47.6%), sleep disorders manifested by excessive sleepiness (33.3%) or insomnia (28.6%) and headaches (3%), mostly tension headaches. Excessive daytime sleepiness was significantly age-dependent ($p=0.038$).

CONCLUSIONS:

The evidenced NS disorders indicate the need to undertake preventive measures tailored for the occupational group of bus drivers.

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18. Devos H, Verheyden G, Van Gils A, Tant M, Akinwuntan AE. ASSOCIATION BETWEEN SITE OF LESION AND DRIVING PERFORMANCE AFTER ISCHEMIC STROKE. *Top Stroke Rehabil.* 2015 Aug;22(4):246-52. doi: 10.1179/1074935714Z.0000000018. Epub 2015 Mar 2.

BACKGROUND:

Stroke presents with heterogeneous recovery periods, severity, and manifestation of deficits, all of which may adversely impact fitness-to-drive. Little is known about the association between site of lesion and driving performance after stroke.

OBJECTIVE:

To investigate the association between site of stroke lesion and driving performance.

METHOD:

Seventy-three participants (age = 56 ± 11 years; 66 men) underwent a detailed battery of visual, cognitive, and on-road tests to determine fitness-to-drive at about 10 months after ischemic stroke. Associations between stroke location and driving performance were calculated using rank biserial (rrb) correlation coefficients. Correlations were considered weak below 0.10, moderate between 0.10 and 0.49, and strong above 0.50. Wilcoxon rank sum tests were employed to discern differences in on-road driving performance between participants whose performance was of concern to the driving assessor and those who exhibited no major difficulties on the road.

RESULTS:

In all, 28 (38%) out of the 73 participants exhibited major difficulties on the road. Those who showed difficulties on the road performed worse in all driving skills ($P < 0.05$). Correlation analysis showed moderate to strong correlations between site of lesion and performance in several visual, cognitive and on-road tests. Lesions in the parietal lobe showed correlations ranging between 0.23 and 0.25 with driving skills including vehicle control and speed adaptations. Lesions in the occipital lobes correlated strongly with visual field ($r_{rb} = 0.53$) and moderately with visual neglect ($r_{rb} = 0.28$).

CONCLUSIONS:

Our results suggest that cortical lesions in the parietal and occipital lobes are associated with driving deficits after stroke. Further advances in our understanding of the neural correlates of driving performance may provide prognostic markers of fitness-to-drive and lead to early, targeted rehabilitation.

19. Jirsch J(1), Siddiqi M(2), Smyth P(3), Maximova K(4). *Seizure*. 2015 Aug;30:21-5. doi: 10.1016/j.seizure.2015.05.004. Epub 2015 May 12.

Bias in counseling of seizure patients following a transient impairment of consciousness: differential adherence to driver fitness guidelines.

PURPOSE:

To determine primary care physicians' counseling as well as patients' driving behaviors following seizure and non-seizure events impairing consciousness in the community.

METHODS:

Patients attending a rapid-referral first seizure clinic were entered into the study if they were deemed medically-unfit to drive according to national guidelines for driving licensure: had experienced a seizure or an unexplained episode of lost consciousness, and had a valid driver's license at the time of their index event. Risk of physician counseling in the community regarding driving cessation in the interval between initial primary care

assessment and neurological consultation was examined as a primary outcome, and patient driving cessation was examined as a secondary outcome.

RESULTS:

106 of 192 (55%) patients attending clinic met guideline criteria requiring driver fitness counseling in the primary care community, and 89 patients (46%) were deemed medically-unfit to drive following the initial specialist consultation appointment. Among medically unfit driver cases, 73% were ultimately deemed to have experienced a seizure and 27% had experienced a non-seizure event (e.g. syncope, PNES). Driver fitness counseling was more likely for seizure than non-seizure cases (unadjusted odds ratio: 4.14, $p < 0.05$), as was patient driving cessation (5.10, $p < 0.05$).

CONCLUSION:

Physician compliance with clinical practice guidelines appears strongly biased when counseling about driving following an episode of transient impairment in consciousness. The failure of the primary care medical community to apply driver fitness counseling equitably to both seizure and non-seizure drivers may have ramifications upon public safety or conversely disease-related quality-of-life.

20. Vierling JM. LEGAL RESPONSIBILITIES OF PHYSICIANS WHEN THEY DIAGNOSE HEPATIC ENCEPHALOPATHY. *Clin Liver Dis.* 2015 Aug;19(3):577-89. doi: 10.1016/j.cld.2015.04.004.

Both covert hepatic encephalopathy (CHE) and overt hepatic encephalopathy (OHE) impair the ability to operate machinery. The legal responsibilities of US physicians who diagnose and treat patients with hepatic encephalopathy vary among states. It is imperative that physicians know the laws regarding reporting in their state. OHE represents a neuropsychiatric impairment that meets general reporting criteria. The medical advisory boards of the states have not identified OHE as a reportable condition. In the absence of validated diagnostic guidelines, physicians are not obligated to perform tests for CHE. There is a need for explicit guidance from professional associations regarding this issue.

21. Basu PP, Shah NJ. CLINICAL AND NEUROLOGIC MANIFESTATION OF MINIMAL HEPATIC ENCEPHALOPATHY AND OVERT HEPATIC ENCEPHALOPATHY. *Clin Liver Dis.* 2015 Aug;19(3):461-72. doi: 10.1016/j.cld.2015.05.003.

Hepatic encephalopathy (HE) shows a wide spectrum of neuropsychiatric manifestations. A combined effort with neuropsychological and psychometric evaluation has to be performed to recognize the syndrome, whereas minimal HE (MHE) is largely under-recognized. Subtle symptoms of MHE can only be diagnosed through specialized neuropsychiatric testing. Early diagnosis and treatment may drastically improve the quality of life for many cirrhotic patients. Further research to gain better insight into the pathophysiology and diagnostic accuracy of HE will help determine future management strategies.

22. Ranchet M, Akinwuntan AE, Tant M, Neal E, Devos H. AGREEMENT BETWEEN PHYSICIAN'S RECOMMENDATION AND FITNESS-TO-DRIVE DECISION IN MULTIPLE SCLEROSIS. *Arch Phys Med Rehabil.* 2015 Oct;96(10):1840-4. doi: 10.1016/j.apmr.2015.06.010. Epub 2015 Jul 2.

OBJECTIVE:

To investigate the agreement of fitness-to-drive decisions made by the referring physicians and by the on-road assessors in individuals with multiple sclerosis (MS).

DESIGN:

Retrospective analysis.

SETTING: Driving institute.

PARTICIPANTS:

A sample of individuals with MS (N=218) who completed the medical and driving questionnaire and performed an official on-road test.

INTERVENTIONS:

Not applicable.

MAIN OUTCOME MEASURE:

Fitness-to-drive decision made by the on-road assessor.

RESULTS:

The referring physician and on-road assessor agreed on fitness to drive in 191 (88%) of the cases (prevalence-adjusted and bias-adjusted $\kappa=.81$, $P<.0001$). When compared with the on-road assessor's judgment, the physician's recommendation of fitness to drive was overestimated in 16 individuals with MS and underestimated in 11 individuals with MS. Patients with poor binocular acuity were more likely to be inaccurately classified by the physician ($P=.001$).

CONCLUSIONS:

This study showed a high level of agreement between the fitness-to-drive decisions made by the physicians and the on-road assessors in individuals with MS. Visual functions should be assessed in the doctor's office for more accurate referrals.

23. Guzman JC, Morillo CA. SYNCOPES AND DRIVING. *Cardiol Clin.* 2015 Aug;33(3):465-71. doi: 10.1016/j.ccl.2015.04.014.

The occurrence of syncope while driving has obvious implications for personal and public safety. Neurally mediated syncope is the most common type of syncope in general and, thereby, also while driving. The presence of structural heart disease (reduced ejection fraction, previous myocardial infarction, significant congenital heart disease) potentially leads to high risk and should determine driving restrictions pending clarification of underlying heart disease and etiology of syncope. The clinical approach to syncope evaluation and recommendations for driving should not differ, whether or not the syncopal spell occurred while driving.

24. Carr DB, O'Neill D. MOBILITY AND SAFETY ISSUES IN DRIVERS WITH DEMENTIA. *IntPsychogeriatr.* 2015 Oct;27(10):1613-22. doi: 10.1017/S104161021500085X. Epub 2015 Jun 26.

Although automobiles remain the mobility method of choice for older adults, late-life cognitive impairment and progressive dementia will eventually impair the ability to meet transport needs of many. There is, however, no commonly utilized method of assessing dementia severity in relation to driving, no consensus on the specific types of assessments that should be applied to older drivers with cognitive impairment, and no gold standard for determining driving fitness or approaching loss of mobility and subsequent counseling. Yet, clinicians are often called upon by patients, their families, health professionals, and driver licensing authorities to assess their patients' fitness-to-drive and to make recommendations about driving privileges. We summarize the literature on dementia and driving, discuss evidenced-based assessments of fitness-to-drive, and outline the important ethical and legal concerns. We address the role of physician assessment, referral to neuropsychology, functional screens, dementia severity tools, driving evaluation clinics, and driver licensing authority referrals that may assist clinicians with an evaluation. Finally, we discuss mobility counseling (e.g. exploration of transportation alternatives) since health professionals need to address this important issue for older adults who lose the ability to drive. The application of a comprehensive, interdisciplinary approach to the older driver with cognitive impairment will have the best opportunity to enhance our patients' social connectedness and quality of life, while meeting their psychological and medical needs and maintaining personal and public safety.

25. Chacko EE, Wright WM, Worrall RC, Adamson C, Cheung G. REACTIONS TO DRIVING CESSATION: A QUALITATIVE STUDY OF PEOPLE WITH DEMENTIA AND THEIR FAMILIES. *Australas Psychiatry*. 2015 Oct;23(5):496-9. doi: 0.1177/1039856215591326. Epub 2015 Jun 23.

OBJECTIVES:

A proportion of older people with mild dementia are safe to drive. However, driving cessation is recommended at some point as the disease progresses. Driving cessation can have significant psychological and social consequences on people with dementia and their carers. This paper aims to explore the psychosocial and adjustment issues following driving cessation for people with dementia and their supporters.

METHOD:

Participants and their supporters were interviewed within 1 month of driving-cessation advice, and again 6 months later. Issues associated with driving cessation were explored in semi-structured interviews.

RESULTS:

Seven participants and their supporters were recruited. This has generated a total of 22 transcripts for qualitative analysis including follow-up interviews. For those who could remember the details of driving cessation, most were unhappy with the decision. Carers who were supportive of driving cessation questioned the legality of it. Most participants minimised the impact of their driving cessation on their supporters. Most supporters were negatively affected by the decision.

CONCLUSIONS:

The preliminary findings highlight the need for a more comprehensive process for driving cessation in those with dementia, with closer links to regulatory bodies, and increased support for their families/carers.

26. Stolwyk RJ, Scally KA, Charlton JL, Bradshaw JL, Iansek R, Georgiou-Karistianis N. SELF-REGULATION OF DRIVING BEHAVIOUR IN PEOPLE WITH PARKINSONS DISEASE. *Cogn Behav Neurol*. 2015 Jun;28(2):80-91. doi: 10.1097/WNN.000000000000058.

OBJECTIVE:

To determine the extent and nature of driving self-regulation in drivers with Parkinson disease (PD) and factors associated with self-regulatory practices.

BACKGROUND:

Although people with PD have consistently been shown to have driving impairments, few studies have examined self-regulatory driving practices and their relationship to driving performance.

METHODS:

We used a self-report driving questionnaire to examine driving self-regulation in 37 drivers with PD and 37 healthy age-matched controls. We also analyzed factors associated with self-regulatory practices, primarily demographic, disease-related, psychological, and simulated driving performance variables.

RESULTS:

The drivers with PD reported significantly higher rates of self-perceived decline in their driving ability ($P=0.008$) and driving significantly shorter distances per week ($P=0.004$) than controls. Unfamiliar situations ($P=0.009$), in-car distractions ($P<0.001$), low visibility conditions ($P=0.004$), and long journeys ($P=0.003$) were particularly challenging for the drivers with PD, and their pattern of driving avoidance mirrored these difficulties. The use of self-regulatory strategies among drivers with PD was associated with female sex ($\rho=0.42$, $P=0.009$) and perceived decline in driving ability ($\rho=-0.55$, $P<0.001$), but not with age or objective measures of disease severity, cognition, or simulated driving performance.

CONCLUSIONS:

Drivers with PD reported driving less overall and restricting their driving to avoid particularly difficult circumstances. Further research is warranted on effective use of self-regulation strategies to improve driving performance in people with PD.

27. Pentzek M, Michel JV, Ufert M, Vollmar HC, Wilm S, Leve V. FITNESS TO DRIVE IN DEMENTIA – THEORETICAL FRAMING AND DESIGN OF A RECOMMENDATION FOR GERMAN PRACTICE. Z Evid Fortbild Qual Gesundheitswes. 2015;109(2):115-23. doi: 10.1016/j.zefq.2015.03.005. Epub 2015 May 1.

BACKGROUND:

General practitioners (GPs) are among the first to be contacted by persons with dementia and their relatives. Fitness to drive in dementia is a subject of uncertainty and conflict for GPs.

OBJECTIVE:

Development of recommendations for German general practice on managing fitness to drive in dementia.

METHODS:

Specification of problem areas by using relevant parts of a metasynthesis of international qualitative dementia research with GPs; literature review on evidence regarding the pre-defined problem areas; deduction of a preliminary design for a recommendation in a multi-professional team.

RESULTS:

The difficulties include the assessment of fitness to drive in the office setting, concerns about damaging the patient-physician relationship by raising the issue of driving fitness, and uncertainties about the GP's own legal role. A diagnosis of dementia does not per se preclude driving. The majority of elderly people would accept discussing fitness to drive with their GP. In Germany, GPs are not obliged to assess fitness to drive, or to report unsafe drivers to the Licensing Agency, but under certain conditions they do have the right to report. Addressing the issue of driving and dementia early with the patient seems to be a prerequisite for a resource-oriented and patient-centred management.

DISCUSSION:

The distinction between medical, ethical-communicative, and legal aspects enabled us to break down this complex problem and thus provide the informative basis to draft tailored recommendations. In an ongoing project, this framework will be further developed and informed by the expertise of patients, family caregivers, and professionals from various fields.

28. Stapleton T, Connolly D, O'Neill D. FACTORS INFLUENCING THE CLINICAL STRATIFICATION OF SUITABILITY TO DRIVE AFTER STROKE: A QUALITATIVE STUDY. *Occup Ther Health Care*. 2015;29(3):253-71. doi: 10.3109/07380577.2015.1036192. Epub 2015 May 28.

While a clinical pre-selection screening process for a stroke patient's suitability for driving has been acknowledged, little is known about the factors or processes influencing this screening typically conducted by clinicians practicing at a generalist level. This study explored this clinical stratification process through the use of semi-structured interviews with senior occupational therapists (n = 17) and stroke physicians (n = 7) using qualitative description methodology. The findings revealed a trichotomy stratification of stroke patients for driving in the clinical setting; those who are fit to drive, unfit to drive, and a "maybe" group who need more detailed assessment and observation. Factors that had a major influence on this clinical-based stratification of driving suitability were client's levels of awareness, insight, and impulsivity. A period of prolonged contact with the client was preferential to guide the stratification decision in order for clinicians to build a comprehensive picture of the person. A mix of assessment approaches including standardized assessment but with increased emphasis on naturalistic observation of functional performance underpinned the clinical stratification process. This study uncovers some of the factors and processes influencing the early clinical-based stratification of driving suitability after stroke, and highlights the contribution of the generalist practitioner in the assessment of fitness to drive continuum.

**29. Doherty U, Hawke AL, Kearns J, Kelly M. FITNESS TO DRIVE IN COGNITIVE IMPAIRMENT
–A QUANTITATIVE STUDY OF GPs' EXPERIENCE. *Ir Med J.* 2015 Apr;108(4):112-4.**

Assessing fitness to drive is part of the role of general practitioners. Cognitive impairment may affect an individual's ability to drive safely. The aims of our study were to question GPs about their experience of assessing patients with cognitive impairment for driving fitness and to explore their attitudes to this role. We carried out a quantitative cross-sectional anonymous postal survey of 200 GPs in counties Galway, Mayo and Roscommon. Ethical approval was obtained from the Irish College of General Practitioners. Data was analysed using Epi Info. The response rate was 62.5% (n=125). 86 (68.8%) GPs used guidelines when assessing fitness to drive in cognitive impairment. 83 (66.4%) respondents formally assess cognitive function. 52 (41.6%) GPs would certify someone as fit to drive with verbal restrictions. 102 (81.6%) respondents feel confident in assessing fitness to drive. 98 (78.4%) GPs have referred patients for further assessment.

Cardiovascular disorders

1. *Gale CP, Camm AJ. ASSESSMENT IN PALPIATIONS. BMJ. 2016 Jan 6;352:h5649. doi: 10.1136/bmj.h5649.*

2. *Valentine C. DRIVING AFTER AN ACUTE CORONARY SYNDROME. BMJ. 2015 Nov 11;351:h5988. doi: 10.1136/bmj.h5988.*

3. *Kuo J, Koppel S, Charlton JL, Rudin-Brown CM J. EVALUATION OF A VIDWO-BASED MEASURE OF DRIVER HEART RATE. Safety Res. 2015 Sep;54:55-9. doi: 10.1016/j.jsr.2015.06.009. Epub 2015 Jul 29.*

INTRODUCTION:

Internal driver events such as emotional arousal do not consistently elicit observable behaviors. However, heart rate (HR) offers promise as a surrogate measure for predicting these states in drivers. Imaging photoplethysmography (IPPG) can measure HR from face video recorded in static, indoor settings, but has yet to be examined in an in-vehicle driving environment.

METHODS:

Participants (N=10) completed an on-road driving task whilst wearing a commercial, chest-strap style heart rate monitor ("baseline"). IPPG was applied to driver face video to estimate HR and the two measures of HR were compared.

RESULTS: For 4 of 10 participants, IPPG produced a valid HR signal (± 5 BPM of baseline) between 48 and 75% of trip duration. For the remaining participants, IPPG accuracy was poor (<20%).

CONCLUSIONS:

In-vehicle IPPG is achievable, but significant challenges remain.

PRACTICAL APPLICATIONS:

The relationship between IPPG accuracy and various confounding factors was quantified for future refinement.

4. *Prokopchuk NN, Skrebtsova NV, Popov VV, Kotlov AP, Tiul'nev VG, Sinitskaya EY.*

5. *CARDIOVASCULAR SYSTEM AND COGNITIVE DISORDERS IN MALE DRIVERS. Med Tr Prom Ekol. 2015;(6):34-8.*

The authors found statistically significant differences in cognitive tests results between group of drivers and reference group ($p = 0,021$). Correlation analysis proves statistically reliable relationship between cognitive functions and hemodynamic as well as morphologic parameters of cardiovascular system.

6. *Alosco ML, Penn MS, Spitznagel MB, Cleveland MJ, Ott BR, Gunstad. REDUCED PHYSICAL FITNESS IN PATIENTS WITH HEART FAILURE AS A POSSIBLE RISK FACTOR FOR IMPAIRED DRIVING PERFORMANCE. Am J Occup Ther. 2015 Mar-Apr;69(2):6902260010p1-8. doi:10.5014/ajot.2015.013573.*

OBJECTIVE:

Reduced physical fitness secondary to heart failure (HF) may contribute to poor driving; reduced physical fitness is a known correlate of cognitive impairment and has been associated with decreased independence in driving. No study has examined the associations among physical fitness, cognition, and driving performance in people with HF.

METHOD: Eighteen people with HF completed a physical fitness assessment, a cognitive test battery, and a validated driving simulator scenario.

RESULTS: Partial correlations showed that poorer physical fitness was correlated with more collisions and stop signs missed and lower scores on a composite score of attention, executive function, and psychomotor speed. Cognitive dysfunction predicted reduced driving simulation performance.

CONCLUSION: Reduced physical fitness in participants with HF was associated with worse simulated driving, possibly because of cognitive dysfunction. Larger studies using on-road testing are needed to confirm our findings and identify clinical interventions to maximize safe driving.

**7. Guzman JC(1), Morillo CA(2). SYNCOPE AND DRIVING. *Cardiol Clin. Aug;33(3):465-71.*
doi: 10.1016/j.ccl.2015.04.014.**

The occurrence of syncope while driving has obvious implications for personal and public safety. Neurally mediated syncope is the most common type of syncope in general and, thereby, also while driving. The presence of structural heart disease (reduced ejection fraction, previous myocardial infarction, significant congenital heart disease) potentially leads to high risk and should determine driving restrictions pending clarification of underlying heart disease and etiology of syncope. The clinical approach to syncope evaluation and recommendations for driving should not differ, whether or not the syncopal spell occurred while driving.

Diabetes Mellitus

- 1. Brož J, Syčová Kriváňová L, Janíčková Žďárská D, Novák O. MOTORING VEHICLE DRIVING AND NOT ONLY DIABETES MELLITUS – CERTAIN ASPECTS OF THE LEGISLATIONS IN THE CZECH REPUBLIC. Vnitr Lek. 2016 Mar;62(3):226-8.**

A review of medical fitness to hold a drivers license in diabetes mellitus patients occurs when applying for the license and then at least every three years. Severe hypoglycemic events are an important criterion with the view of eligibility loss to drive a vehicle. All physicians regardless of their speciality who suspect the loss of eligibility in a patient they come into professional contact with are under the obligation to report this fact to the local authority in the patients place of residence.

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- 2. Brož J, Kriváňová LS, Fedáková Z, Petrosyan L, Kvapil M, Polák J. MOTOR VEHICLE DRIVING AND DIABETES MELLITUS – MEDICAL ASPECTS. Vnitr Lek. 2016 Mar;62(3):223-5.**

Diabetes mellitus is a disease which may affect the eligibility to hold a driving license and increase the risk of a road accident. Hypoglycemia while driving is considered to be the most risky situation, with diabetes increasing the mentioned risk for instance due to impaired vision in the case of possible retinopathy. The group of drivers with diabetes being at the greatest risk as to accidents are those with a case history of severe hypoglycemia or hypoglycemia occurred while driving, or possibly of a road accident. Measuring glycaemia before driving and their knowledge how to prevent and treat hypoglycemia - those are the two crucial preventive elements indispensable for insulin treated diabetes patients in order to secure safe road traffic.

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- 3. Finck H. ACTUAL SOCIOMEDICAL ASPECTS OF DIABETES AND FITNESS TO DRIVE PRIVATE AND COMMERCIAL VEHICLES AND OF DIABETES AND DISABILITY. MMW Fortschr Med. 2016 Apr 21;158 Spec No 1:59-62. doi: 10.1007/s15006-016-8097-0.**

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- 4. Brož J, Thabit H, Žďárská DJ, Syčová-Kriváňová L, Polák J, Frier B. M. LICENSING REGULATIONS FOR DIABETES AND DRIVING – TWO SIDES OF THE SAME COIN? Diabetes Res Clin Pract. 2016 Mar;113:215-6. doi: 10.1016/j.diabres.2015.12.019. Epub 2016 Jan 12.**

5. **Griffith R. STANDARDS FOR DRIVING AND IMPLICATIONS FOR PEOPLE WITH DIABETES. Br J Nurs. 2016 Jan 14-27;25(1):60-1. doi: 10.12968/bjon.2016.25.1.60.**

Richard Griffith, Senior Lecturer in Health Law at Swansea University, discusses the legal standards for driving imposed on individuals with diabetes, and sets out the likely consequences of failing to comply with those standards.

6. **Hassoun AA, Abdella N, Arouj MA, Awadi FA, Futaisi AA, Lamki MA, Madani AA, Saber FA, Nakhi AB, Beshyah SA, El-Ali S, Fiad, TM, Hussein WI, Kaddaha G, Ksseiry I2), Morcos B, Saadi H. DRIVING AND DIABETES MELLITUS IN THE GULF COOPERATION COUNCIL COUNTRIES: CALL FOR ACTION. Diabetes Res Clin Pract. 2015 Oct;110(1):91-4. doi:10.1016/j.diabres.2015.08.002. Epub 2015 Aug 22.**

The aim of the present article is to increase awareness concerning safe driving for patients with diabetes in the Gulf Cooperation Council (GCC) countries and to provide recommendations concerning the management of these patients. The cognitive, motor, and sensory skills required for driving can be adversely affected by diabetes as well as the side effects of anti-diabetic medications, particularly hypoglycemia. The prevalence of diabetes in the GCC countries is among the highest in the world. As the number of diabetic drivers in these countries continues to increase, the number at risk of having a motor vehicle accident is also expected to increase. We reviewed the available literature concerning driving and diabetes, particularly in relation to the current situation in the GCC countries. Unfortunately, very little published information is available addressing this issue in the GCC countries. Most of the GCC countries lack legislation on driving and diabetes. We have proposed recommendations to help diabetic drivers in the GCC countries as well as to provide guidance to health care professionals managing these patients.

7. **Cimino L, Deneufgermain A, Lalau JD. DRIVING LICENSE AND MELLITUS DIABETES. Presse Med. 2015 Oct;44(10):1042-7. doi: 10.1016/j.lpm.2015.03.010. Epub 2015 May 5.**

For the "light group" as for the "heavy group" driving license cannot be issued or renewed to the applicant or drivers suffering from a condition that may constitute or lead to functional disability jeopardize road safety when driving a motor vehicle. The decision to issue or renew the license by the prefectural authority is taken on the advice of the departmental medical commission or a licensed physician. The decree of August 31, 2010 establishes the list of medical conditions incompatible with obtaining or maintaining the driving license or which may give rise to the issue of driving license limited validity. "Diabetes mellitus treated with medications that can cause hypoglycemia" belongs to this list. If the medical control of driving ability comes at the initiative of the user, the treating physician

should firstly ensure the understanding of prescribed treatments that can cause hypoglycaemic episodes and other by informing diabetic person she must pass a medical examination of fitness to drive in a licensed physician.

- 8. Houlden RL, Berard L, Cheng A, Kenshole AB, Silverberg J, Woo VC, Yale JF. DIABETES AND DRIVING: 2015 CANADIAN DIABETES ASSOCIATION UPDATED RECOMMENDATIONS FOR PRIVATE AND COMMERCIAL DRIVERS. *Can J Diabetes*. 2015 Oct;39(5):347-53. doi: 10.1016/j.jcjd.2015.08.011.**

Psychiatric disorders

1. **Brunnauer A, Buschert V, Fric M, Distler G, Sander K, Segmiller F, Zwanzger P, Laux G. DRIVING PERFORMANCE AND PSYCHOMOTOR FUNCTION IN DEPRESSED PATIENTS TREATED WITH AGOMELATINE OR VENLAFAXINE. *Pharmacopsychiatry*. 2015 Mar;48(2):65-71. doi: 10.1055/s-0034-1398509. Epub 2015 Feb 2.**

OBJECTIVE:

We conducted a randomized case-control study in depressive inpatients to assess the effects of agomelatine and venlafaxine on psychomotor functions related to driving skills and on driving performance in an on-road driving test.

METHOD: 40 depressed inpatients treated with agomelatine (n = 20) or venlafaxine (n = 20) were tested before pharmacological treatment (t0), and on days 14 (t1) and 28 (t2). 20 healthy subjects were examined in the same time schedule to control for retest effects in psychomotor measures. Additionally, participants were rated in a standardized on-road driving test on day 28 by a licensed driving instructor, who was blind with respect to treatment, diagnosis and test results.

RESULTS: After 4 weeks of treatment (t2) with agomelatine or venlafaxine, patients showed a significant reduction in depressive symptoms, and a distinct improvement in psychomotor functions. Controlling for retest effects in psychomotor measures, data indicate, that both patient groups significantly improved in tests measuring reactivity and stress-tolerance. Furthermore, prior discharge to outpatient treatment (day 28), 72.5% of patients were labeled abundantly fit to drive in the on-road driving test by a licensed driving instructor. However, patients did not reach the performance level of healthy controls in functional domains tested. Significant differences between treatment groups were not observed.

CONCLUSION:

Our results indicate that depressed inpatients treated with agomelatine or venlafaxine show a better test performance on tasks related to driving skills than do untreated depressives and could predominantly be rated as fit to drive on an actual driving test prior discharge to outpatient treatment.

2. **Jonas C. CAR DRIVING AND PSYCHIATRY. *Presse Med*. 2015 Oct;44(10):1017-21. doi: 10.1016/j.lpm.2015.04.004. Epub 2015 Oct 9.**

Among the specialties involved in the order of 31 August 2010, psychiatry is in Chapter IV alongside addictive behavior and drug use may impair the ability of the driver. As well as for personal vehicles for professional vehicles the incompatibility of health with driving exists when clinical factors can interfere with the skills required of the driver. There would simply absolute incompatibility for psychoses in active phase. In the other phases of psychosis is at the discretion of specialist as for illiteracy or social maladjustment. The role of the authorized psychiatrist is therefore always subjective. This article also makes room for attention-deficit disorder with hyperactivity (ADHD), not listed, but the subject of numerous articles in the English literature.

3. **Jaber L, Kirsh D, Diamond G, Shuper A. LONG-TERM FUNCTIONAL OUTCOMES IN ISRAELI ADULTS IN CHILDHOOD WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER. *Isr Med Assoc J.* 2015 Aug;17(8):481-5.**

BACKGROUND:

Childhood attention deficit hyperactivity disorder (ADHD) is a chronic health problem with significant risk for long-term morbidity in adulthood.

OBJECTIVES:

We examined long-term outcomes of ADHD in a population-based sample of childhood ADHD cases prospectively assessed as adults.

METHODS:

Long-term outcomes for 70 adults who were diagnosed with ADHD during childhood were examined and compared with data on the general population.

RESULTS:

Most subjects admitted to persistence of ADHD-related symptoms in adulthood, despite discontinuation of regular medical treatment and follow-up. Areas most severely affected by past and ongoing symptoms included driving performance and incidence of motor vehicle accidents, and rates of marriage stability over time. Relatively unaffected were occupational and academic achievements and military service.

CONCLUSIONS:

There is a need for outreach and better services for adults who were previously diagnosed with ADHD. This condition remains a marker of a certain degree of risk regarding marital stability, interpersonal relations and driving habits.

4. **Philip P, Micoulaud-Franchi JA, Lagarde E, Taillard J, Canel A, Sagaspe P, Bioulac S. ATTENTION DEFICIT HYPERACTIVITY DISORDER SYMPTOMS, SLEEPINESS AND ACCIDENTAL RISK IN 36140 REGULARLY REGISTERED HIGHWAY USERS. *PLoS One.* 2015 Sep 16;10(9):e0138004. doi: 10.1371/journal.pone.0138004. eCollection 2015.**

BACKGROUND:

Attention Deficit Hyperactivity Disorder (ADHD) is a frequent neurodevelopmental disorder that increases accidental risk. Recent studies show that some patients with ADHD can also suffer from excessive daytime sleepiness but there are no data assessing the role of sleepiness in road safety in patients with ADHD. We conducted an epidemiological study to explore sleep complaints, inattention and driving risks among automobile drivers.

METHODS AND FINDINGS:

From August to September 2014, 491186 regular highway users were invited to participate in an Internet survey on driving habits. 36140 drivers answered a questionnaire exploring driving risks, sleep complaints, sleepiness at the wheel, ADHD symptoms (Adult ADHD Self-

Report Scale) and distraction at the wheel. 1.7% of all drivers reported inattention-related driving accidents and 0.3% sleep-related driving accidents in the previous year. 1543 drivers (4.3%) reported ADHD symptoms and were more likely to report accidents than drivers without ADHD symptoms (adjusted OR = 1.24, [1.03-1.51], $p < .021$). 14.2% of drivers with ADHD symptoms reported severe excessive daytime sleepiness (Epworth Sleepiness Scale >15) versus 3.2% of drivers without ADHD symptoms and 20.5% reported severe sleepiness at the wheel versus 7.3%. Drivers with ADHD symptoms reported significantly more sleep-related (adjusted OR = 1.4, [1.21-1.60], $p < .0001$) and inattention-related (adjusted OR = 1.9, [1.71-2.14], $p < .0001$) near misses than drivers without ADHD symptoms. The fraction of near-misses attributable to severe sleepiness at the wheel was 4.24% for drivers without ADHD symptoms versus 10.35% for drivers with ADHD symptoms.

CONCLUSION:

Our study shows that drivers with ADHD symptoms have more accidents and a higher level of sleepiness at the wheel than drivers without ADHD symptoms. Drivers with ADHD symptoms report more sleep-related and inattention-related near misses, thus confirming the clinical importance of exploring both attentional deficits and sleepiness at the wheel in these drivers. Road safety campaigns should be improved to better inform drivers of these accidental risks.

5. Groom MJ, van Loon E, Daley D, Chapman P, Hollis C. DRIVING BEHAVIOUR IN ADULTS WITH ATTENTION DEFICIT/HYPERACTIVITY DISORDER. *BMC Psychiatry*. 2015 Jul 28;15:175. doi: 10.1186/s12888-015-0566-y.

BACKGROUND:

Little is known about the impact of cognitive impairments on driving in adults with ADHD. The present study compared the performance of adults with and without ADHD in a driving simulator on two different routes: an urban route which we hypothesised would exacerbate weak impulse control in ADHD and a motorway route, to challenge deficits in sustained attention.

METHODS:

Adults with ($n = 22$, 16 males) and without ($n = 21$, 18 males) ADHD completed a simulated driving session while eye movement data were recorded simultaneously. Participants also completed the Manchester Driving Behaviour Questionnaire (DBQ) and the Conners Adult ADHD Rating Scale (CAARS). Measures of driving performance included average speed, proportion distance travelled over speed limit (speeding) and lane deviation. These variables and the eye movement measures (spread of fixations, mean fixation duration) were compared between groups and routes. Also, driving behaviours, including responses to programmed events, were categorised and the frequencies within categories were compared between groups. Finally, speech analysis was performed to compare emotional verbal expressions during driving between groups.

RESULTS:

ADHD participants reported significantly more Violations and Lapses on the DBQ than control participants and significantly more accidents. Average speed and speeding were also higher but did not interact with route type. ADHD participants showed poorer vehicle control, greater levels of frustration with other road users (including greater frequencies of negative comments) and a trend for less safe driving when changing lanes/overtaking on the motorway. These effects were predicted by hyperactive/impulsive CAARS scores. They were also more likely to cause a crash/near miss when an event occurred on the urban route.

CONCLUSIONS:

The results suggest that difficulty regulating and controlling impulsive behavior, reflected in speeding, frustration with other road users, less safety when changing lanes on the motorway and a greater likelihood of an accident following an unexpected event, underlie impaired driving in ADHD. Hyperactivity/impulsivity symptoms correlated with these indices. Deficits in sustained attention seemed to play a lesser role in this particular study, although further research is needed to determine whether effects on attention emerge over longer periods of time and/or are influenced by the novelty of the simulator environment.

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- 6. Aduen PA, Kofler MJ, Cox DJ, Sarver DE, Lunsford E. MOTOR VEHICLE DRIVING IN HIGH INCIDENCE PSYCHIATRIC DISABILITY: COMPARISON OF DRIVERS WITH ADHD, DEPRESSION, AND NO KNOWN PSYCHOPATHOLOGY. *J Psychiatr Res.* 2015 May;64:59-66. doi: 10.1016/j.jpsychires.2015.03.009. Epub 2015 Mar 21.**

Although not often discussed in clinical settings, motor vehicle driving is a complex multitasking endeavor during which a momentary attention lapse can have devastating consequences. Previous research suggests that drivers with high incidence psychiatric disabilities such as ADHD contribute disproportionately to collision rates, which in turn portend myriad adverse social, financial, health, mortality, and legal outcomes. However, self-referral bias and the lack of psychiatric comparison groups constrain the generalizability of these findings. The current study addressed these limitations and examined the unique associations among ADHD, Depression, and adverse driving outcomes, independent of self-selection, driving exposure, and referral bias. The Strategic Highway Research Program (SHRP-2) Naturalistic Driving Study comprises U.S. drivers from six sites selected via probability-based sampling. Groups were defined by Barkley ADHD and psychiatric diagnosis questionnaires, and included ADHD (n = 275), Depression (n = 251), and Healthy Control (n = 1828). Primary outcomes included self-reported traffic collisions, moving violations, collision-related injuries, and collision fault (last 3 years). Accounting for demographic differences, ADHD but not Depression portended increased risk for multiple violations (OR = 2.3) and multiple collisions (OR = 2.2). ADHD but not Depression portended increased risk for collision fault (OR = 2.1). Depression but not ADHD predicted increased risk for self-reported injury following collisions (OR = 2.4). ADHD appears uniquely associated with multiple collisions, multiple violations, and collision fault, whereas Depression is uniquely associated with self-reported injury following a collision. Identification of the specific

mechanisms underlying this risk will be critical to designing effective interventions to improve long-term functioning for drivers with high incidence psychiatric disability.

7. Koisaari T, Michelsson K, Holopainen JM, Maksimainen R, Päivänsalo J, Rantala K, Tervo T. TRAFFIC AND CRIMINAL BEHAVIOR OF ADULTS WITH ATTENTION DEFICIT-HYPERACTIVITY WITH A PROSPECTIVE FOLLOW-UP FROM BIRTH TO THE AGE OF 40 YEARS. *Traffic Inj Prev.* 2015;16(8):824-30. doi: 10.1080/15389588.2015.1029068. Epub 2015 Apr 2.

OBJECTIVE:

The purpose of this study was to investigate whether individuals with attention deficit-hyperactivity disorder (ADHD) followed up to age 40 have a higher mortality, more involvement in criminal behavior, increased traffic accidents, and frequency or registered violations against traffic rules or whether they have been more frequently victims to crimes.

METHODS:

The ADHD cohort (N = 122) born in 1971-1974 was isolated at the age of 9 years from the base cohort of 865 children who had known risk factors at birth and were still alive at the age of 5 years. Ninety-four healthy individuals born during the same years served as control subjects. None of the individuals with ADHD had used psychostimulants before their adolescence. The follow-up data were available from the newborn period until the ages of 5 and 9 years. At the ages of 16 and 30, the data were collected via questionnaire. For this study, the national police registers (last 5 years) were examined for traffic violations, crimes, or being an object of a criminal act when the persons reached the age of 40 years.

RESULTS:

Ten men and one woman with ADHD but none of the controls had died by the age of 40. Three died of disease-related incidents, and 8 (13%) died of abnormal causes such as suicide (3), traffic accident (2), substance abuse (2), or violence (1). During the follow-up period, individuals with ADHD had been involved in violent behavior or economic criminality more frequently than the control subjects. They were also more commonly victims of criminal acts. No difference was found in traffic citations between those with ADHD and control subjects (at 35-40 years) when all traffic crimes were considered. A difference was not observed in the frequency of traffic accidents. However, there was a significant difference in drunk driving (at the ages of 30 and 35-40) and the number of persons without a driver's license.

DISCUSSION:

Subjects with ADHD showed an elevated risk of being involved in criminality and had a higher risk of dying before the age of 40 years. The early detection of ADHD in childhood and appropriate treatments and family support may decrease criminality and save both money and human distress.

8. **Wickens CM, Vingilis E, Mann RE, Erickson P, Toplak ME, Kolla NJ, Seeley J, Ialomiteanu AR, Stoduto G, Ilie G. THE IMPACT OF CHILDHOOD SYMPTOMS OF CONDUCT DISORDER ON DRIVER AGGRESSION IN ADULTHOOD. *Accid Anal Prev.* 2015 May;78:87-93. doi: 10.1016/j.aap.2015.02.013. Epub 2015 Mar 6.**

BACKGROUND:

Despite limited empirical investigation, existing scientific literature suggests that individuals with a history or current diagnosis of conduct disorder (CD) may be more likely to demonstrate reckless and aggressive driving. Much of the limited research in this field examines the impact of childhood CD on driver behaviour and collision risk in young adults. Few if any, studies assess the impact of this disorder on driver behaviour beyond age 21 years. The current research is a population-based study of the impact of CD symptoms during childhood on the risk of engaging in driver aggression during adulthood.

METHODS:

Data are based on telephone interviews with 5230 respondents who reported having driven in the past year. Data are derived from the 2011-2013 cycles of the CAMH Monitor, an ongoing cross-sectional survey of adults in Ontario, Canada aged 18 years and older. A binary logistic regression analysis of self-reported driver aggression in the previous 12 months was conducted, consisting of measures of demographic characteristics, driving exposure, problem substance use, alcohol- and drug-impaired driving, symptoms of attention deficit hyperactivity disorder, and childhood (before age 15) symptoms of CD.

RESULTS:

When entered with demographic characteristics, driving exposure, and other potential confounders, childhood symptoms of CD increased the odds of reporting driver aggression more than two-fold (adjusted OR=2.12). Exploratory analyses of the interaction between childhood symptoms of CD and age was not a significant predictor of driver aggression.

CONCLUSIONS:

Results suggest that symptoms of CD during childhood are associated with significantly increased odds of self-reported driver aggression during adulthood. Limitations and future directions of the research are discussed.

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9. **Kingery KM, Narad M, Garner AA, Antonini TN, Tamm L, Epstein JN. EXTENDED VISUAL GLANCES AWAY FROM THE ROADWAY ARE ASSOCIATED WITH ADHD AND TEXTING RELATED. *J Abnorm Child Psychol.* 2015 Aug;43(6):1175-86. doi: 10.1007/s10802-014-9954-x.**

The purpose of the research study was to determine whether ADHD- and texting-related driving impairments are mediated by extended visual glances away from the roadway. Sixty-one adolescents (ADHD =28, non-ADHD =33; 62% male; 11% minority) aged 16-17 with a valid driver's license were videotaped while engaging in a driving simulation that included a No Distraction, Hands-Free Phone Conversation, and Texting condition. Two indicators of

visual inattention were coded: 1) percentage of time with eyes diverted from the roadway; and 2) number of extended (greater than 2 s) visual glances away from the roadway. Adolescents with ADHD displayed significantly more visual inattention to the roadway on both visual inattention measures. Increased lane position variability among adolescents with ADHD compared to those without ADHD during the Hands-Free Phone Conversation and Texting conditions was mediated by an increased number of extended glances away from the roadway. Similarly, texting resulted in decreased visual attention to the roadway. Finally, increased lane position variability during texting was also mediated by the number of extended glances away from the roadway. Both ADHD and texting impair visual attention to the roadway and the consequence of this visual inattention is increased lane position variability. Visual inattention is implicated as a possible mechanism for ADHD- and texting-related deficits and suggests that driving interventions designed to address ADHD- or texting-related deficits in adolescents need to focus on decreasing extended glances away from the roadway.

Drug and Alcohol misuse and dependence

1. **Strand MC(1), Gjerde H(1), Mørland J(1). DRIVING UNDER THE INFLUENCE OF NON-ALCOHOL DRUGS – AN UPDATE. PART II: EXPERIMENTALSTUDIES *Forensic Sci Rev.* 2016 Jul;28(2):79-101.**

Experimental studies on the impairing effects of drugs of relevance to driving-related performance published between 1998 and 2015 were reviewed. Studies with on-the-road driving, driving simulators, and performance tests were included for benzodiazepines and related drugs, cannabis, opioids, stimulants, GHB, ketamine, antihistamines, and antidepressants. The findings in these experimental studies were briefly discussed in relation to a review of epidemiological studies published recently. The studies mainly concluded that there may be a significant psychomotor impairment after using benzodiazepines or related drugs, cannabis, opioids, GHB, or ketamine. Low doses of central stimulants did not seem to cause impairment of driving behavior.

10. **Kaufman EJ, Wiebe DJ. IMPACT OF STATE IGNITION INTERLOCK LAWS ON ALCOHOL-INVOLVED CRASH DEATHS IN THE UNITED STATES. *Am J Public Health.* 2016 May;106(5):865-71. doi: 10.2105/AJPH.2016.303058. Epub 2016 Mar 17.**

OBJECTIVES:

To investigate the impact on alcohol-involved crash deaths of universal ignition interlock requirements, which aim to prevent people convicted of driving under the influence of alcohol from driving while intoxicated.

METHODS:

We used data from the National Highway Traffic Safety Administration for 1999 to 2013. From 2004 to 2013, 18 states made interlocks mandatory for all drunk-driving convictions. We compared alcohol-involved crash deaths between 18 states with and 32 states without universal interlock requirements, accounting for state and year effects, and for clustering within states.

RESULTS:

Policy impact was apparent 3 years after implementation. The adjusted rate of alcohol-involved crash deaths was 4.7 (95% confidence interval [CI] = 4.0, 5.4) per 100,000 in states with the universal interlock requirement, compared with 5.5 (95% CI = 5.48, 5.53) in states without, an absolute reduction of 0.8 (95% CI = 0.1, 1.5) deaths per 100,000 per year.

CONCLUSIONS:

Requiring ignition interlocks for all drunk-driving convictions was associated with 15% fewer alcohol-involved crash deaths, compared with states with less-stringent requirements. Interlocks are a life-saving technology that merit wider use.

3. **Kahn CA. NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION (NHTSA) NOTES. RESULTS OF THE 2013-2014 NATIONAL ROADSIDE SURVEY OF ALCOHOL AND DRUG USE BY DRIVERS. *Ann Emerg Med.* 2015 Dec;66(6):669-672**
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4. **Esser MB, Bao J, Jernigan DH, Hyder AA. EVALUATION OF THE EVIDENCE BASE FOR THE ALCOHOL INDUSTRY'S ACTIONS TO REDUCE DRINK DRIVING GLOBALLY. *Am J Public Health.* 2016 Apr;106(4):707-13. doi: 10.2105/AJPH.2015.303026. Epub 2016 Feb 18.**

OBJECTIVES:

To evaluate the evidence base for the content of initiatives that the alcohol industry implemented to reduce drink driving from 1982 to May 2015.

METHODS:

We systematically analyzed the content of 266 global initiatives that the alcohol industry has categorized as actions to reduce drink driving.

RESULTS:

Social aspects public relations organizations (i.e., organizations funded by the alcohol industry to handle issues that may be damaging to the business) sponsored the greatest proportion of the actions. Only 0.8% (n = 2) of the sampled industry actions were consistent with public health evidence of effectiveness for reducing drink driving.

CONCLUSIONS: The vast majority of the alcohol industry's actions to reduce drink driving does not reflect public health evidenced-based recommendations, even though effective drink-driving countermeasures exist, such as a maximum blood alcohol concentration limit of 0.05 grams per deciliter for drivers and widespread use of sobriety checkpoints.

5. **Christophersen AS, Mørland J, Stewart K, Gjerde H. INTERNATIONAL TRENDS IN ALCOHOL AND DRUG USE AMONG VEHICLE DRIVERS. *Forensic Sci Rev.* 2016 Jan;28(1):37-66.**

Trends in the use of alcohol and drugs among motor vehicle drivers in Australia, Brazil, Norway, Spain, and the United States have been reviewed. Laws, regulations, enforcement, and studies on alcohol and drugs in biological samples from motor vehicle drivers in general road traffic and fatal road traffic crashes (RTCs) are discussed. Roadside surveys showed a reduction of drunk driving over time in the studied countries; however, the pattern varied within and between different countries. The reduction of alcohol use may be related to changes in road traffic laws, public information campaigns, and enforcement, including implementation of random breath testing or sobriety checkpoints. For non-alcohol drugs, the trend in general road traffic is an increase in use. However, drugs were not included in

older studies; it is therefore impossible to assess the trends over longer time periods. Data from the studied countries, except Brazil, have shown a significant decrease in fatal RTCs per 100,000 inhabitants over the last decades; from 18.6 to 4.9 in Australia, 14.5 to 2.9 in Norway, 11.1 to 3.6 in Spain, and 19.3 to 10.3 in the United States. The number of alcohol-related fatal RTCs also decreased during the same time period. The proportion of fatal RTCs related to non-alcohol drugs increased, particularly for cannabis and stimulants. A general challenge when comparing alcohol and drug findings in biological samples from several countries is connected to differences in study design, particularly the time period for performing roadside surveys, biological matrix types, drugs included in the analytical program, and the cutoff limits used for evaluation of results. For RTC fatalities, the cases included are based on the police requests for legal autopsy or drug testing, which may introduce a significant selection bias. General comparisons between high-income countries and low- and middle-income countries as well as a discussion of possible future trends are included.

6. Hartman RL, Brown TL, Milavetz G, Spurgin A, Gorelick DA, Gaffney GR, Huestis MA. EFFECT OF BLOOD COLLECTION TIME ON MEASURED Δ 9-TETRAHYDROCANNABINOL CONCENTRATIONS: IMPLICATIONS FRO DRIVING INTERPRETATION AND DRUG POLICY. *Clin Chem.* 2016 Feb;62(2):367-77. doi: 10.1373/clinchem.2015.248492.

BACKGROUND:

In driving-under-the-influence cases, blood typically is collected approximately 1.5-4 h after an incident, with unknown last intake time. This complicates blood Δ (9)-tetrahydrocannabinol (THC) interpretation, owing to rapidly decreasing concentrations immediately after inhalation. We evaluated how decreases in blood THC concentration before collection may affect interpretation of toxicological results.

METHODS:

Adult cannabis smokers ($\geq 1 \times / 3$ months, ≤ 3 days/week) drank placebo or low-dose alcohol (approximately 0.065% peak breath alcohol concentration) 10 min before inhaling 500 mg placebo, 2.9%, or 6.7% vaporized THC (within-individuals), then took simulated drives 0.5-1.3 h postdose. Blood THC concentrations were determined before and up to 8.3 h postdose (limit of quantification 1 μ g/L).

RESULTS:

In 18 participants, observed C_{max} (at 0.17 h) for active (2.9 or 6.7% THC) cannabis were [median (range)] 38.2 μ g/L (11.4-137) without alcohol and 47.9 μ g/L (13.0-210) with alcohol. THC C_{max} concentration decreased 73.5% (3.3%-89.5%) without alcohol and 75.1% (11.5%-85.4%) with alcohol in the first half-hour after active cannabis and 90.3% (76.1%-100%) and 91.3% (53.8%-97.0%), respectively, by 1.4 h postdose. When residual THC (from previous self-administration) was present, concentrations rapidly decreased to preinhalation baselines and fluctuated around them. During-drive THC concentrations previously associated with impairment (≥ 8.2 μ g/L) decreased to median < 5 μ g/L by 3.3 h postdose and < 2 μ g/L by 4.8 h postdose; only 1 participant had THC ≥ 5 μ g/L after 3.3 h.

CONCLUSIONS:

Forensic blood THC concentrations may be lower than common per se cutoffs despite greatly exceeding them while driving. Concentrations during driving cannot be back-extrapolated because of unknown time after intake and interindividual variability in rates of decrease.

7. **Davis KC, Allen J, Duke J, Nonnemaker J, Bradfield B, Farrelly MC, Shafer P, Novak S. CORRELATES OF MARIJUANA DRUGGED DRIVING AND OPENESS TO DRIVING WHILE HIGH: EVIDENCE FREOM COLORADO AND WASHINGTON. PLoS One. 2016 Jan 22;11(1):e0146853. doi: 10.1371/journal.pone.0146853. eCollection 2016.**

AIMS:

A potential unintended consequence of legalizing recreational marijuana is increased marijuana-related driving impairment. Some states where recreational marijuana is legal have begun implementing interventions to mitigate driving under the influence (DUI) of marijuana, including media campaigns to increase knowledge about DUI laws. However, little is known about the associations between knowledge of DUI laws and marijuana DUI behavior. In this study, we provide new data from a survey of marijuana users in Colorado and Washington to examine associations between marijuana drugged driving and two potential behavioral precursors of marijuana DUI. We also explore other factors that may influence marijuana DUI.

METHODS:

Data are from an online survey of marijuana users in Colorado and Washington. Respondents who reported any marijuana use in the past 30 days (n =865) served as the analytic sample. We examined prevalence of two behavioral outcomes: (1) any driving of a motor vehicle while high in the past year and (2) driving a motor vehicle within 1 hour of using marijuana 5 or more times in the past month. Additional outcomes measuring willingness to drive while high were also assessed. Logistic regressions were used to estimate each outcome as a function of two multi-item scales measuring knowledge of the legal consequences of driving high and perceptions that driving while high is not safe. Additional covariates for potential confounders were included in each model.

RESULTS:

Prevalence of past-year driving while under the influence of marijuana was 43.6% among respondents. The prevalence of driving within 1 hour of using marijuana at least 5 times in the past month was 23.9%. Increased perception that driving high is unsafe was associated with lower odds of past-year marijuana DUI (OR = 0.31, P < 0.01) and lower past-month odds of driving 5 or more times within 1 hour of using marijuana (OR = 0.26, P < 0.01). Increased knowledge of marijuana DUI laws was also associated with lower odds of each of these outcomes (OR =0.63, P < 0.01, OR = 0.69, P = 0.02, respectively). Post-estimation Wald tests confirmed the negative associations with marijuana DUI were greater in magnitude for safety perceptions than knowledge of DUI laws. Increased perceptions that driving while high is unsafe was associated with significantly lower willingness to drive after using

marijuana while increased knowledge of marijuana DUI laws was not associated with these outcomes.

CONCLUSIONS:

Despite recent interventions targeting public awareness of the legal consequences of marijuana DUI, our results suggest that knowledge of these laws is a weaker predictor of DUI behavior than perceptions that driving high is unsafe. In addition, safety perceptions predict decreased openness to driving high while knowledge of DUI laws was not associated with openness. These findings suggest that interventions for reducing the incidence of marijuana DUI are likely to be more successful by targeting safety perceptions related to marijuana DUI rather than knowledge of DUI laws. We caution that because these data are limited to an online convenience sample, results may not be generalizable beyond our sample.

8. Vaca FE, Li K, Hingson R, Simons-Morton BG. TRANSITIONS IN RIDING WITH AN ALCOHOL/DRUG-IMPAIRED DRIVER FROM ADOLESCENCE TO EMERGING ADULTHOOD IN THE UNITED STATES. *J Stud Alcohol Drugs*. 2016 Jan;77(1):77-85.

OBJECTIVE:

The purpose of this study was to examine changes and predictors of changes in riding with an alcohol/drug-impaired driver (RWI) from 10th grade through the first post-high school year.

METHOD:

Transition models were used to estimate the association of four waves (W1-W4) of RWI with W4 environmental-status variables and time-varying covariates in the NEXT Generation Health Study, a nationally representative cohort of U.S. 10th graders (N = 2,785).

RESULTS:

Overall, 33% (weighted) of adolescents reported RWI in the past 12 months in W1, and slightly declined in W2 (24%), W3 (27%), and W4 (26%). Across time, transition models with generalized estimating equations showed that RWI was more likely among those who previously reported RWI (ORs from 3.62 to 3.66, $p < .001$), substance use (ORs from 1.81 to 1.82, $p < .001$), and heavy episodic drinking (ORs from 1.85 to 1.86, $p < .001$). Those living on college campuses were somewhat more likely to engage in RWI (OR = 1.38, $.05 < p < .10$) than those living at home. The effects of parental monitoring knowledge and peer alcohol/substance use on RWI were suppressed when individual substance use and heavy episodic drinking were taken into consideration.

CONCLUSIONS:

Substance use and heavy episodic drinking in previous waves and the history of RWI were persistent factors of RWI in a dynamic pattern. The setting in which emerging adults live during their first post-high school year could affect their engagement in RWI. The findings suggest that harm-reduction strategies should focus on the identification of early RWI coupled with reduction of substance use and heavy episodic drinking.

9. *Romano E, Scherer M, Fell J., Taylor E. A COMPREHENSIVE EXAMINATION OF U.S. LAWS ENACTED TO REDUCE ALCOHOL-RELATED CRASHES AMONG UNDERAGE DRIVERS. J Safety Res. 2015 Dec;55:213-21. doi: 10.1016/j.jsr.2015.08.001. Epub 2015 Aug 28.*

INTRODUCTION:

To effectively address concerns associated with alcohol-related traffic laws, communities must apply comprehensive and well-coordinated interventions that account for as many factors as possible. The goal of the current research article is to examine and evaluate the simultaneous contribution of 20 underage drinking laws and 3 general driving safety laws, while accounting for demographic, economic, and environmental variables.

METHODS:

Annual fatal crash data (1982 to 2010), policies, and demographic, economic, and environmental information were collected and applied to each of the 51 jurisdictions (50 states and the District of Columbia). A structural equation model was fit to estimate the relative contribution of the variables of interest to alcohol-related crashes.

RESULTS:

As expected, economic factors (e.g., unemployment rate, cost of alcohol) and alcohol outlet density were found highly relevant to the amount of alcohol teens consume and therefore to teens' impaired driving. Policies such as those regulating the age of bartenders, sellers, or servers; social host civil liability laws; dram shop laws; internal possession of alcohol laws; and fake identification laws do not appear to have the same impact on teens' alcohol-related crash ratios as other types of policies such as those regulating alcohol consumption or alcohol outlet density.

CONCLUSIONS:

This effort illustrates the need for comprehensive models of teens' impaired driving. After simultaneously accounting for as many factors as possible, we found that in general (for most communities) further reductions in alcohol-related crashes among teens might be more rapidly achieved from efforts focused on reducing teens' drinking rather than on reducing teens' driving. Future efforts should be made to develop models that represent specific communities.

PRACTICAL APPLICATIONS:

Based on this and community-specific models, simulation programs can be developed to help communities understand and visualize the impact of various policy alternatives.

10. Azofeifa A, Mattson ME, Lyerla R. DRIVING UNDER THE INFLUENCE OF ALCOHOL, MARIJUANA, AND ALCOHOL AND MARIJUANA COMBINED AMONG PERSONS AGED 16-25 YEARS - UNITED STATES, 2002-2014. *MMWR Morb Mortal Wkly Rep.* 2015 Dec 11;64(48):1325-9. doi: 10.15585/mmwr.mm6448a1.

Motor vehicle accidents are the leading cause of death among youths and young adults aged 16-25 years in the United States (1). The prevalence of drinking and driving among high school students aged 16-19 years has declined by 54%, from 22.3% in 1991 to 10.3% in 2011 (2). However, the prevalence of weekend nighttime driving under the influence of marijuana (based on biochemical assays) among drivers aged ≥ 16 years has increased by 48%, from 8.6% in 2007 to 12.6% in 2013-2014 (3). Use of marijuana alone and in combination with alcohol has been shown to impair driving abilities (4-9). This report provides the most recent self-reported national estimates of driving under the influence of alcohol, marijuana, and alcohol and marijuana combined among persons aged 16-25 years, using data from the Substance Abuse and Mental Health Services Administration (SAMHSA) National Survey on Drug Use and Health (NSDUH) from 2002-2014. Prevalence data on driving under the influence of both substances were examined for two age groups (16-20 years and 21-25 years) and by sex and race/ethnicity. During 2002-2014, the prevalence of driving under the influence of alcohol alone significantly declined by 59% among persons aged 16-20 years (from 16.2% in 2002 to 6.6% in 2014; $p < 0.001$) and 38% among persons 21-25 years (from 29.1% in 2002 to 18.1% in 2014; $p < 0.001$). In addition, the prevalence of driving under the influence of alcohol and marijuana combined significantly declined by 39%, from 2.3% in 2002 to 1.4% in 2014 ($p < 0.001$) among persons aged 16-20 years and from 3.1% in 2002 to 1.9% in 2014 ($p < 0.001$) among persons aged 21-25 years. The prevalence of driving under the influence of marijuana alone declined 18%, from 3.8% in 2002 to 3.1% in 2014 ($p = 0.05$) only among persons aged 16-20 years. Effective public safety interventions,* such as minimum legal drinking age laws, prohibition of driving with any alcohol level > 0 for persons aged < 21 years, targeted mass media campaigns, roadside testing (e.g., sobriety checkpoints), and graduated driver licensing programs (10) have contributed to the decline in driving under the influence of alcohol in this population. These or similar interventions might be useful to prevent driving under the influence of other substances, such as marijuana alone or combined with other substances.

11. Kahn CA(1). Commentary: DRUGS AND DRIVING. *Ann Emerg Med.* 2015 Dec;66(6):670-2. doi: 10.1016/j.annemergmed.2015.10.002.

12. **Scherer M, Harrell P, Romano E. MARIJUANA AND OTHER SUBSTANCE USE AMONG MOTOR VEHICLE OPERATORS: A LATENT CLASS ANALYSIS. *J Stud Alcohol Drugs*. 2015 Nov;76(6):916-23.**

OBJECTIVE:

The deleterious effect of multiple-substance use on driving performance is well established, but relatively little research has examined the patterns of drug use among multiple-substance users and its relationship to both alcohol use and adverse driving outcomes.

METHOD:

The current study used latent class analysis to examine subgroups of substance users among a population of drivers who screened positively for 2 or more of 13 substances other than alcohol (N = 250). A series of logistic regression analyses was conducted to examine demographic predictors of latent class assignment and class association with adverse driving outcomes.

RESULTS:

Four distinct subclasses of users were identified among multiple-substance-using drivers: Class 1 consisted of individuals who demonstrated high levels of all substances indicators (5%). The second class demonstrated high levels of marijuana and cocaine use and lower levels of all other substances (27%). The third class screened high for marijuana and nonmedical prescription opiate analgesics use (36%), whereas the last class demonstrated high nonmedical prescription opiate analgesics and benzodiazepine use (32%). Drivers in Class 2 (marijuana and cocaine users) were more likely to be younger and have a positive breath alcohol concentration than drivers in any other class.

CONCLUSIONS:

Because multidrug users show dissimilar characteristics, the propensity of researchers to lump all multiple-substance users together may either erroneously attribute the potentially profound impact of those in the marijuana and cocaine use class to all multiple-substance users or dilute their specific contribution to crash risk.

13. **Mullen J, Ryan SR, Mathias CW, Dougherty DM. FEASIBILITY OF A COMPUTER-ASSISTED ALCOHOL SCREENING, BRIEF INTERVENTION AND REFERRAL TO TREATMENT PROGRAM FOR DWI OFFENDERS. *Addict Sci Clin Pract*. 2015 Nov 9;10:25. doi: 10.1186/s13722-015-0046-1.**

BACKGROUND:

Alcohol use patterns that are hazardous for one's health is prevalent among DWI (driving while intoxicated) offenders and is a key predictor of recidivism. The aim of this program evaluation was to determine the feasibility and usability of implementing a computer-assisted screening, brief intervention and referral to treatment (SBIRT) program for DWI offenders to enable the identification of those in need of treatment services soon after arrest. Our treatment program consisted of a web-based, self-guided screening tool for

assessing alcohol use patterns and generating a personalized feedback report that is then used to deliver a brief motivational intervention and if needed, a referral to treatment.

METHODS:

Between August and November 2014, all DWI offenders attending orientation for pre-trial supervision were assessed for eligibility. Of the 129 eligible offenders, 53.5 percent enrolled and the first 50 were asked to complete a usability and satisfaction questionnaire.

RESULTS:

The results demonstrated that the majority of those screened reported at-risk alcohol use patterns requiring referral to treatment. Clients reported high ratings of usability and satisfaction with the screening tool and personalized feedback report, which did not significantly differ depending on alcohol use patterns. There were relatively few technical difficulties, and the majority of clients reported high levels of satisfaction with the overall SBIRT program.

CONCLUSION:

Results of this program evaluation suggest that computer-assisted SBIRT may be successfully implemented within the criminal justice system to DWI offenders soon after arrest; however, further research is required to examine its effects on treatment utilization and recidivism.

14. Ewing BA, Tucker JS, Miles JN, Shih RA, Kulesza M, Pedersen ER, D'Amico EJ. EARLY SUBSTANCE USE AND SUBSEQUENT DUI IN ADOLESCENTS. *Pediatrics*. 2015 Nov;136(5):868-75. doi: 10.1542/peds.2015-1143. Epub 2015 Oct 5.

OBJECTIVE:

Little is known about risk factors in early adolescence that lead to driving under the influence (DUI) and riding with a drinking driver (RWDD). In a diverse group of adolescents, we longitudinally explored the influence of alcohol and marijuana (AM) use, AM beliefs, and peer and family factors (including familism) on DUI/RWDD in high school.

METHODS:

We conducted 3 surveys 2 years apart of 1189 students recruited from 16 middle schools in Southern California. We used multivariable models to evaluate the effects of AM use, AM beliefs, and peer and family factors at ages 12 and 14 on DUI/RWDD at age 16.

RESULTS: At age 12, adolescents with more positive beliefs about marijuana (odds ratio [OR] = 1.63, 95% confidence interval [CI]: 1.20-2.20) and more ability to resist marijuana offers (OR = 1.89, 95% CI: 1.22-2.92) had significantly higher risk of DUI/RWDD 4 years later. At age 14, youth with more past month alcohol use (OR = 2.10, 95% CI: 1.07-4.11), positive beliefs about marijuana (OR = 1.67, 95% CI: 1.31-2.13), exposure to peer AM use (alcohol: OR = 1.01, 95% CI: 1.00-1.02; marijuana: OR = 2.41, 95% CI: 1.28-4.53), and family marijuana use (OR = 1.54, 95% CI: 1.12-2.11) had higher risk of DUI/RWDD at age 16.

CONCLUSIONS:

Findings indicate a need to target adolescents as young as sixth grade at multiple levels to help prevent DUI/RWDD in high school. Given recent changes in legislation in several states, research should begin to focus on the distinction between DUI/RWDD of AM.

15. *Scherer M, Fell JC, Thomas S, Voas RB. EFFECTS OF DRAM SHOP, RESPONSIBLE BEVERAGE SERVICE TRAINING, AND STATE ALCOHOL CONTROL LAWS ON UNDERAGE DRINKING DRIVER FATAL CRASH RATIOS. Traffic Inj Prev. 2015;16 Suppl 2:S59-65. doi:0.1080/15389588.2015.1064909.*

OBJECTIVES:

In this study, we aimed to determine whether three minimum legal drinking age 21 (MLDA-21) laws-dram shop liability, responsible beverage service (RBS) training, and state control of alcohol sales-have had an impact on underage drinking and driving fatal crashes using annual state-level data, and compared states with strong laws to those with weak laws to examine their effect on beer consumption and fatal crash ratios.

METHODS:

Using the Fatality Analysis Reporting System, we calculated the ratio of drinking to nondrinking drivers under age 21 involved in fatal crashes as our key outcome measure. We used structural equation modeling to evaluate the three MLDA-21 laws. We controlled for covariates known to impact fatal crashes including: 17 additional MLDA-21 laws; administrative license revocation; blood alcohol concentration limits of .08 and .10 for driving; seat belt laws; sobriety checkpoint frequency; unemployment rates; and vehicle miles traveled. Outcome variables, in addition to the fatal crash ratios of drinking to nondrinking drivers under age 21 included state per capita beer consumption.

RESULTS:

Dram shop liability laws were associated with a 2.4% total effect decrease (direct effects: $\beta = .019$, $p = .018$). Similarly, RBS training laws were associated with a 3.6% total effect decrease (direct effect: $\beta = .048$, $p = .001$) in the ratio of drinking to nondrinking drivers under age 21 involved in fatal crashes. There was a significant relationship between dram shop liability law strength and per capita beer consumption, $F(4, 1528) = 24.32$, $p < .001$, partial $\eta^2(2) = .016$, showing states with strong dram shop liability laws (Mean (M) = 1.276) averaging significantly lower per capita beer consumption than states with weak laws (M = 1.340).

CONCLUSIONS:

Dram shop liability laws and RBS laws were both associated with significantly reduced per capita beer consumption and fatal crash ratios. In practical terms, this means that dram shop liability laws are currently associated with saving an estimated 64 lives in the 45 jurisdictions that currently have the law. If the remaining 6 states adopted the dram shop law, an additional 9 lives could potentially be saved annually. Similarly, RBS training laws are associated with saving an estimated 83 lives in the 37 jurisdictions that currently have the

laws. If the remaining 14 states adopted these RBS training laws, we estimate that an additional 28 lives could potentially be saved.

- 16. Elayeh E, Bulatova N, Basheti I, Abu Farha R, Al-Rawi N, Abu Snaineh A, Alahwal I. THE USE AND SAFETY OF MEDICATIONS KNOWN TO AFFECT DRIVING IN JORDAN: A CROSS-SECTIONAL STUDY. *Traffic Inj Prev.* 2016;17(3):238-44. doi: 10.1080/15389588.2015.1065543. Epub 2015 Sep 30.**

OBJECTIVES:

The aim of this study was to estimate the main driving-impairing medications used by drivers in Jordan, the reported frequency of medication side effects, the frequency of motor vehicle crashes (MVCs) while using driving-impairing medicines, as well as factors associated with MVCs. **METHODS:** A cross-sectional study involving 1,049 individuals (age 18-75 years) who are actively driving vehicles and taking at least one medication known to affect driving (anxiolytics, antidepressants, hypnotics, antiepileptics, opioids, sedating antihistamines, hypoglycemic agents, antihypertensives, central nervous system [CNS] stimulants, and herbals with CNS-related effects) was conducted in Amman, Jordan, over a period of 8 months (September 2013-May 2014) using a structured validated questionnaire.

RESULTS:

Sixty-three percent of participants noticed a link between a medicine taken and feeling sleepy and 57% stated that they experience at least one adverse effect other than sleepiness from their medication. About 22% of the participants reported having a MVC while on medication. Multiple logistic regression analysis showed that among the participants who reported having a crash while taking a driving-impairing medication, the odds ratios were significantly higher for the use of inhalant substance (odds ratio [OR] = 2.787, P = .014), having chronic conditions (OR = 1.869, P = .001), and use of antiepileptic medications (OR =2.348, P = .008) and significantly lower for the use of antihypertensives (OR =0.533, P = .008).

CONCLUSION:

The study results show high prevalence of adverse effects of medications with potential for driving impairment, including involvement in MVCs. Our findings highlight the types of patient-related and medication-related factors associated with MVCs in Jordan, such as inhalant use, presence of chronic conditions, and use of antiepileptics.

- 17. Li Z, Jin X, Zhao X. DRUNK DRIVING DETECTION BASED ON CLASSIFICATION OF MULTIVARIATE TIME SERIES. *J Safety Res.* 2015 Sep;54:61-4. doi:10.1016/j.jsr.2015.06.007. Epub 2015 Jul 29**

INTRODUCTION:

This paper addresses the problem of detecting drunk driving based on classification of multivariate time series.

METHODS:

First, driving performance measures were collected from a test in a driving simulator located in the Traffic Research Center, Beijing University of Technology. Lateral position and steering angle were used to detect drunk driving. Second, multivariate time series analysis was performed to extract the features. A piecewise linear representation was used to represent multivariate time series. A bottom-up algorithm was then employed to separate multivariate time series. The slope and time interval of each segment were extracted as the features for classification. Third, a support vector machine classifier was used to classify driver's state into two classes (normal or drunk) according to the extracted features.

RESULTS:

The proposed approach achieved an accuracy of 80.0%.

CONCLUSIONS AND PRACTICAL APPLICATIONS:

Drunk driving detection based on the analysis of multivariate time series is feasible and effective. The approach has implications for drunk driving detection.

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- 18. Teeters JB, Borsari B, Martens MP, Murphy JG. BRIEF MOTIVATIONAL INTERVENTIONS ARE ASSOCIATED WITH REDUCTIONS IN ALCOHOL-IMPAIRED DRIVING AMONG COLLEGE DRINKERS. *J Stud Alcohol Drugs.* 2015 Sep;76(5):700-9.**

OBJECTIVE:

Alcohol-impaired (AI) driving among college students remains a significant public health concern and may be the single most risky drinking outcome among young adults. Brief motivational interventions (BMIs) have been shown to reduce alcohol use and problems, but their specific efficacy for decreasing AI driving among college students is unknown. The present study analyzed data from three randomized controlled trials of BMI (Murphy et al., 2010: n = 74; Borsari et al., 2012: n = 530; and Martens et al., 2013: n = 365) to evaluate whether BMIs are associated with reductions in AI driving among college student drinkers.

METHOD:

Participants in all three studies were randomized to BMI or control conditions. Participants reported whether they had driven under the influence (yes/no) following the BMI over the follow-up period.

RESULTS:

Separate binary logistic regression analyses were conducted for each study. For Studies 1 and 2, these analyses revealed that a BMI was significantly associated with reductions in AI driving at the final (6-month and 9-month, respectively) follow-up compared with the control condition. For Study 3, analyses revealed that a single-component BMI focused on the correction of misperceptions of descriptive norms was significantly associated with reductions in AI driving compared with the control group at the final (6-month) followup, whereas a single-component BMI focused on the use of protective behavioral strategies was not. Change in drinking level did not mediate the relationship between the condition and the change in AI driving.

CONCLUSIONS:

Counselor-administered BMIs that include descriptive normative feedback are associated with significant reductions in AI driving compared with control.

19. de Oliveira LG, de Souza LM, Barroso LP, Gouvêa MJ, de Almeida CV, Muñoz DR, Leyton V. OCCUPATIONAL CONDITIONS AND THE RISK OF THE USE OF AMPHETAMINES BY TRUCK DRIVERS. *Rev Saude Publica*. 2015;49:61. doi: 10.1590/S0034-8910.2015049005944. Epub 2015 Sep 18.

OBJECTIVE:

To test whether the occupational conditions of professional truck drivers are associated with amphetamine use after demographic characteristics and ones regarding mental health and drug use are controlled for.

METHODS:

Cross-sectional study, with a non-probabilistic sample of 684 male truck drivers, which was collected in three highways in Sao Paulo between years 2012 and 2013. Demographic and occupational information was collected, as well as data on drug use and mental health (sleep quality, emotional stress, and psychiatric disorders). A logistic regression model was developed to identify factors associated with amphetamine use. Odds ratio (OR; 95%CI) was defined as the measure for association. The significance level was established as $p < 0.05$. RESULTS The studied sample was found to have an average age of 36.7 (SD = 7.8) years, as well as low education (8.6 [SD = 2.3] years); 29.0% of drivers reported having used amphetamines within the twelve months prior to their interviews. After demographic and occupational variables had been controlled for, the factors which indicated amphetamine use among truck drivers were the following: being younger than 38 years (OR = 3.69), having spent less than nine years at school (OR = 1.76), being autonomous (OR = 1.65), working night shifts or irregular schedules (OR = 2.05), working over 12 hours daily (OR = 2.14), and drinking alcohol (OR = 1.74).

CONCLUSIONS:

Occupational aspects are closely related to amphetamine use among truck drivers, which reinforces the importance of closely following the application of law (Resting Act ("Lei do Descanso"); Law 12,619/2012) which regulates the workload and hours of those professionals. Our results show the need for increased strictness on the trade and prescription of amphetamines in Brazil.

- 20. Van Dyke NA, Fillmore MT. DISTRACTION PRODUCES OVER-ADDITIVE INCREASES IN THE DEGREE TO WHICH ALCOHOL IMPAIRS DRIVING PERFORMANCE. *Psychopharmacology (Berl)*. 2015 Dec;232(23):4277-84. doi:10.1007/s00213-015-4055-2. Epub 2015 Sep 9.**

RATIONALE:

Research indicates that alcohol intoxication and increased demands on drivers' attention from distractions (e.g., passengers and cell phones) contribute to poor driving performance and increased rates of traffic accidents and fatalities.

OBJECTIVES:

The present study examined the separate and combined effects of alcohol and distraction on simulated driving performance at blood alcohol concentrations (BrACs) below the legal driving limit in the USA (i.e., 0.08 %).

METHODS:

Fifty healthy adult drivers (36 men and 14 women) were tested in a driving simulator following a 0.65-g/kg dose of alcohol and a placebo. Drivers completed two drive tests: a distracted drive, which included a two-choice detection task, and an undistracted control drive. Multiple indicators of driving performance, such as drive speed, within-lane deviation, steering rate, and lane exceedances were measured.

RESULTS:

Alcohol and distraction each impaired measures of driving performance. Moreover, the magnitude of alcohol impairment was increased by at least twofold when tested under the distracting versus the undistracted condition.

CONCLUSIONS: The findings highlight the need for a clearer understanding of how common distractions impact intoxicated drivers, especially at BrACs that are currently legal for driving in the USA.

21. Voas RB. ENHANCING THE USE OF VEHICLE ALCOHOL INTERLOCKS WITH EMERGING TECHNOLOGY. *Alcohol Res.* 2014;36(1):81-9.

Among the earliest applications of health technologies to a safety program was the development of blood alcohol content (BAC) tests for use in impaired-driving enforcement. This led to the development of miniature, highly accurate devices that officers could carry in their pockets. A natural extension of this technology was the vehicle alcohol interlock, which is used to reduce recidivism among drivers convicted of driving under the influence (DUI) by requiring them to install the devices (which will not allow someone with a positive BAC to drive) on their vehicles. While on the vehicle, interlocks have been shown to reduce recidivism by two-thirds. Use of these devices has been growing at the rate of 10 to 15 percent a year, and there currently are more than 300,000 units in use. This expansion in the application of interlocks has benefited from the integration of other emerging technologies into interlock systems. Such technologies include data systems that record both driver actions and vehicle responses, miniature cameras and face recognition to identify the user, Wi-Fi systems to provide rapid reporting on offender performance and any attempt to circumvent the device, GPS tracking of the vehicle, and more rapid means for monitoring the integrity of the interlock system. This article describes how these health technologies are being applied in interlock programs and the outlook for new technologies and new court sanctioning programs that may influence the growth in the use of interlocks in the future.

22. Møller M(1), Haustein S(2), Prato CG(2). PROFILING DRUNK DRIVING RECIDIVISTS IN DENMARK. *Accid Anal Prev.* 2015 Oct;83:125-31. doi: 10.1016/j.aap.2015.07.015. Epub 2015 Aug 4.

Drunk drivers are a menace to themselves and to other road users, as drunk driving significantly increases the risk of involvement in road accidents and the probability of severe or fatal injuries. Although injuries and fatalities related to road accidents have decreased in recent decades, the prevalence of drunk driving among drivers killed in road accidents has remained stable, at around 25% or more during the past 10 years. Understanding drunk driving, and in particular, recidivism, is essential for designing effective countermeasures, and accordingly, the present study aims at identifying the differences between non-drunk drivers, drunk driving non-recidivists and drunk driving recidivists with respect to their demographic and socio-economic characteristics, road accident involvement and other traffic and non-traffic-related law violations.

This study is based on register-data from Statistics Denmark and includes information from 2008 to 2012 for the entire population, aged 18 or older, of Denmark. The results from univariate and multivariate statistical analyses reveal a five year prevalence of 17% for drunk driving recidivism, and a significant relation between recidivism and the drunk drivers' gender, age, income, education, receipt of an early retirement pension, household type, and residential area. Moreover, recidivists are found to have a higher involvement in alcohol-related road accidents, as well as other traffic and, in particular, non-traffic-related offences. These findings indicate that drunk driving recidivism is more likely to occur among persons

who are in situations of socio-economic disadvantage and marginalisation. Thus, to increase their effectiveness, preventive measures aiming to reduce drunk driving should also address issues related to the general life situations of the drunk driving recidivists that contribute to an increased risk of drunk driving recidivism.

23. Laude JR, Fillmore MT. SIMULATED DRIVING PERFORMANCE UNDER ALCOHOL: EFFECTS ON DRIVER-RISK VERSUS DRIVER-SKILL. *Drug Alcohol Depend.* 2015 Sep 1;154:271-7. doi: 10.1016/j.drugalcdep.2015.07.012. Epub 2015 Jul 17.

BACKGROUND:

Those who place their vehicles closer to others on the roadway are said to have high risk acceptance, and this contributes to motor vehicle crashes. However, the effect of alcohol on this risky driving behavior is understudied. Behavioral mechanisms that contribute to risky driving are also not well understood. Further, whether increased risk-taking behavior in a driver co-occurs with pronounced impairment in the driver's skill is unknown.

METHODS:

The study examined the effect of alcohol on driver risk and skill and whether riskier drivers were also those who showed high skill impairment. The relationship between driving behavior and inhibitory control was also tested. Participants completed two driving simulations. In the first drive test, risky driving was encouraged and in the second test, skill-based performance was emphasized. The cued go/no-go task provided a measure inhibitory control. Tests were completed under a 0.65g/kg alcohol and 0.0g/kg (placebo) dose of alcohol.

RESULTS:

Alcohol impaired a measure of driving skill and increased driver risk taking. It was also found that riskier drivers were not necessarily those who showed the greatest impairments in skill. Poorer inhibitory control was associated with greater driver risk in the sober state.

CONCLUSIONS:

Alcohol-induced risk-taking behaviors can be dissociable from impairing effects on driver skill and poor inhibitory control is selectively related to risky driving. As such, a distinction between driver risk and driver skill needs to be made in the investigation of problems concerning DUI-related accidents and fatalities in future research.

24. Gjerde H, Strand MC, Mørland J. DRIVING UNDER THE INFLUENCE OF NON-ALCOHOL DRUGS--AN UPDATE PART I:EPIDEMIOLOGICAL STUDIES. *Forensic Sci Rev.* 2015 Jul;27(2):89-113.

Epidemiological studies of the association between drug use and involvement in road traffic crashes (RTCs) published from January 1998 to February 2015 have been reviewed. Cohort and population studies compared RTC involvement among drug users and non-drug users, case-control studies compared drug use among RTC-involved and non-RTC-involved drivers, and responsibility studies and case-crossover studies were performed for RTC-involved drivers. Difficulties associated with the types of studies are discussed with a special focus on case-control studies. Statistically significant associations between drug use and RTC involvement were found for benzodiazepines and z-hypnotics in 25 out of 28 studies, for cannabis in 23 out of 36 studies, for opioids in 17 out of 25 studies, for amphetamines in 8 out of 10 studies, for cocaine in 5 out of 9 studies, and for antidepressants in 9 out of 13 studies. It was a general trend among studies that did not report significant associations between the use of these drugs and increased RTC risk that they often had either poor statistical power or poor study design compared to studies that found an association. Simultaneous use of two or more psychoactive drugs was associated with higher RTC risk. Studies on the combination of alcohol and drugs have not been reviewed in this article even though this combination is known to be associated with the highest RTC risk.

- 25. Leporati M, Salvo RA, Pirro V, Salomone A. DRIVING UNDER THE INFLUENCE OF ALCOHOL. A 5-YEAR OVERVIEW IN PIEDMONT, ITALY. *J Forensic Leg Med.* 2015 Aug;34:104-8. doi: 10.1016/j.jflm.2015.05.017. Epub 2015 Jun 9.**

Alcohol consumption represents a major health issue worldwide and a crucial factor in road accidents. This study provides information on the prevalence of alcohol in blood testing performed on 2752 subjects involved in vehicle accidents, which occurred in Piedmont (northern Italy) between 2008 and 2013. Blood alcohol concentration (BAC) was determined by an ISO 17025 accredited GC/MS procedure. Fifty-one % of positive samples showed BAC concentrations above 1.5 g/L, with a legal cut-off fixed at 0.5 g/L (and 0 g/L for specified categories such as novice and professional drivers). BAC values proved statistically different regarding the day of sampling (week or weekend days), age and gender, with a prevalence of positive results that reflects different drinking habits of a multifaceted population of alcohol consumers.

- 26. Heaton K, Griffin R. THE EFFECTS OF CAFFEINE USE ON DRIVING SAFETY AMONG TRUCK DRIVERS WHO ARE HABITUAL CAFFEINE USERS. *Workplace Health Saf.* 2015 Aug;63(8):333-41. doi: 10.1177/2165079915579561. Epub 2015 Jul 8.**

The purpose of this study was to describe caffeine use among a group of habitual caffeine users, truck drivers, and to explore the associations between caffeine use and critical safety events by age in the naturalistic work setting. A secondary analysis of existing data from the Naturalistic Truck Driving Study was conducted. Analyses focused on the association

between sleep and caffeine consumption by duty status, comparisons of sleep and caffeine use by age, and the associations between caffeine use and safety-critical events (SCEs). Findings indicated differences in caffeine use by duty status. However, no difference in sleep time by duty status, or between sleep time and caffeine use was found regardless of when the caffeine was consumed during the 5 hours prior to sleep. Sleep time did not vary significantly by age, although increasing age was associated with decreased caffeine use. Overall, a 6% reduction in the rate of SCEs per eight ounces of caffeinated beverage consumed was found. This study makes a unique scientific contribution because it uses real-time observations of truckers in the naturalistic work setting. It also does not involve caffeine withdrawal but rather an investigation of the effects of the naturalistic consumption of caffeine on sleep and driving performance. Findings suggest that caffeine use among habitual users offers a protective effect for safety-critical driving events. Occupational health nurses may use this information to counsel workers in the use of caffeine to enhance driving safety.

27. Damsere-Derry J, Palk G., King M. PREVALENCE OF ALCOHOL-IMPAIRED DRIVING AND RIDING IN NORTHERN GHANA. *Traffic Inj Prev.* 2016;17(3):226-32. doi: 10.1080/15389588.2015.1066499. Epub 2015 Jul 6.

OBJECTIVE:

The objective of this study was to determine the roadside prevalence of alcohol-impaired driving among drivers and riders in northern Ghana. The study also verifies motorists' perceptions of their own alcohol use and knowledge of the legal blood alcohol concentration (BAC) limit in Ghana.

METHOD:

With the assistance of police, systematic random sampling was used to collect data at roadblocks using a cross-sectional study design. Breathalyzers were used to screen whether motorists had detectable alcohol in their breath and follow-up breath tests were conducted to measure the actual breath alcohol levels among positive participants.

RESULTS:

In all, 9.7% of the 789 participants had detectable alcohol, among whom 6% exceeded the legal BAC limit of 0.08%. The prevalence of alcohol-impaired driving/riding was highest among cyclists (10% of all cyclists breath-tested) followed by truck drivers (9%) and motorcyclists (7% of all motorcyclists breath-tested). The occurrence of a positive BAC among cyclists was about 8 times higher (odds ratio [OR] = 7.73; $P < .001$) and it was 2 times higher among motorcyclists (OR = 2.30; $P = .039$) compared to private car drivers. The likelihood for detecting a positive BAC among male motorists/riders was higher than that among females (OR = 1.67; $P = .354$). The odds for detecting a positive BAC among weekend motorists/riders was significantly higher than on weekdays (OR = 2.62; $P = .001$).

CONCLUSION:

Alcohol-impaired driving/riding in Ghana is high by international standards. In order to attenuate the harmful effects of alcohol misuse such as alcohol-impaired driving/riding, there is the need to educate road users about how much alcohol they can consume and stay below the legal limit. The police should also initiate random breath testing to instill the deterrence of detection, certainty of apprehension and punishment, and severity and celerity of punishment among drink-driving motorists and riders.

28. Rossheim ME, Weiler RM, Barnett TE, Suzuki S, Walters ST, Barry AE, Cannell B, Pealer LN, Moorhouse MD, Zhang Q, Thombs DL. SELF-EFFICACY TO DRIVE WHILE INTOXICATED: INSIGHTS INTO THE PERSISTENCE OF ALCOHOL-IMPAIRED DRIVING. *Alcohol Clin Exp Res.* 2015 Aug;39(8):1547-54. doi: 10.1111/acer.12795. Epub 2015 Jul 4.

BACKGROUND:

Scant research has examined event-level risk factors for impaired driving in natural drinking settings. This study assessed driving self-efficacy among intoxicated individuals to better understand decision-making about alcohol-impaired driving at night after exiting on-premise drinking establishments.

METHODS:

Interview and breath test data were collected from bar patrons (n = 512) exiting 2 college bar districts in Florida and Texas.

RESULTS:

Results from a multivariable linear regression model indicated that self-efficacy to drive while intoxicated was more strongly associated with situational variables, that is, perceived drunkenness and self-estimated blood alcohol concentration than patron traits, that is, past-year history of drinking, risk proneness, and sex. A large proportion of bar patrons, particularly men, expressed confidence in their ability to drive, despite being highly intoxicated. Moreover, the majority of legally intoxicated patrons who were confident in their ability to drive were aware of their high level of intoxication.

CONCLUSIONS:

Emphasis should be placed on the enactment and enforcement of policies and laws to prevent alcohol-impaired driving.

- 29. Espada JP Griffin KW, González MT, Orgilés M. PREDICTING ALCOHOL-IMPAIRED DRIVING AMONG SPANISH YOUTH WITH THE THEORY OF REASONED ACTION. *Span J Psychol.* 2015 Jun 19;18:E43. doi: 10.1017/sjp.2015.44.**

Alcohol consumption is a risk factor for motor vehicle accidents in young drivers. Crashes associated with alcohol consumption typically have greater severity. This study examines the prevalence of driving under the influence among Spanish youth and tests the theory of reasoned action as a model for predicting driving under the influence. Participants included 478 Spanish university students aged 17-26 years. Findings indicated that alcohol was the substance most associated with impaired driving, and was involved in more traffic crashes. Men engage in higher levels of alcohol and other drug use, and perceived less risk in drunk driving ($p < .01$). The study confirms that alcohol use and driving under the influence of alcohol are highly prevalent in Spanish young people, and some gender differences exist in these behaviors ($p < .01$). Furthermore, the study confirms the validity of theory of reasoned action as a predictive model of driving under the influence of alcohol among youth in Spain ($p < .001$) and can help in the design of prevention programs.

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- 30. D Jerome L. DRUGGED DRIVING. *CMAJ.* 2015 Jun 16;187(9):681.doi:10.1503/cmaj.1150041. Comment on *CMAJ.* 2015 Mar 17;187(5):315.**

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- 31. Wood E, Brooks-Russell A, Drum P. DELAYS IN DUI BLOOD TESTING: IMPACT ON CANNABIS DUI ASSESSMENTS. *Traffic Inj Prev.* 2016;17(2):105-8. doi: 10.1080/15389588.2015.1052421. Epub 2015 Jun 11.**

OBJECTIVE:

This study examined the time from law enforcement dispatch to the first blood draw in cases of driving under the influence (DUI) vehicular homicide and a subset of DUI vehicular assault cases in Colorado in 2012. Laboratory toxicology results were also examined to understand the implications of delays in blood draws in cases of driving while under the influence of marijuana's delta-9-tetrahydrocannabinol (THC).

METHODS:

Colorado court records were reviewed and information regarding charges, presence of alcohol and/or drugs, time of law enforcement contact and blood draw, crash location, and other contextual factors were identified. The distributions of first blood draw times were studied by charge and by responding law enforcement agency. Toxicology data from a different cohort of DUI traffic arrests in Colorado and Washington were examined to determine the proportion of blood tests for THC that were above specified legal limits in those states.

RESULTS:

The average time from law enforcement dispatch to blood draw in cases of vehicular homicide and vehicular assault was 2.32 h (SD \pm 1.31 h), with a range of 0.83 to 8.0 h and a median of 2.0 h. Data from DUI traffic arrests found that between 42 and 70% of all cannabinoid-positive traffic arrests tested below 5 ng/ml THC in blood, which is the legal limit in Colorado and Washington.

CONCLUSION:

Given the current delays to blood testing in cases of arrests for vehicular homicide and vehicular assault in Colorado, many blood tests are unlikely to confirm that drivers who are impaired from smoking marijuana have THC levels above established legal limits.

32. Malek-Ahmadi M, Degiorgio L. RISK OF ALCOHOL ABUSE IN URBAN VERSUS RURAL DUI OFFENDERS. *Am J Drug Alcohol Abuse*. 2015;41(4):353-7. doi: 10.3109/00952990.2015.1043436. Epub 2015 Jun 9.

BACKGROUND:

Research concerning driving under the influence (DUI) offenses in rural populations is scarce and has often been carried out in the context of substance abuse and illicit drug use. Although previous studies have suggested that rural individuals are more likely to abstain from alcohol use, recent trends suggest that alcohol and substance abuse problems in rural areas are occurring at rates similar to urban areas. It is possible that urban and rural DUI offenders may differ on psychological and behavioral characteristics associated with heavy alcohol consumption.

OBJECTIVE:

The aim of this study was to examine alcohol use differences between urban and rural DUI offenders. **METHODS:** Data from 11 066 DUI offenders in a Midwestern state were used for this study. The Alcohol subscale of the Driver Risk Inventory II was used to assess the risk of problem alcohol use.

RESULTS:

Higher levels of alcohol risk were associated with rural DUI offenders after adjusting for several demographic variables and blood-alcohol content level at time of arrest [Medium Risk OR = 1.43, 95% CI: (1.20, 1.71); Problem Risk OR = 1.43, 95% CI: (1.19, 1.72); Severe Risk OR = 1.38, 95% CI: (1.14, 1.67)].

CONCLUSIONS:

The results of this study indicate that rural DUI offenders have a significantly greater risk of heavy alcohol use when compared to urban DUI offenders. Practical implications of these results suggest that evaluators and assessors should be aware of an increased likelihood of alcohol problems in rural DUI individuals relative to those in urban areas.

Visual disorders

1. Schneebeli M. FITNESS TO DRIVE UNDER TRAFFIC OPHTHALMOLOGICAL ASPECTS IN ELDERLY DRIVERS. *Ther Umsch.* 2016;73(2):91-7. doi: 10.1024/0040-5930/a000762.

The Federal Roads Office (FEDRO), Switzerland's federal authority carries responsibility for the action program "Via Sicura" in order to reduce drastically the number of road traffic fatalities and serious injuries on Swiss roads. The revision of the VZV (Verkehrszulassungsverordnung) included in this program will come in to force on 1 July 2016. On that account the legal medical requirements for driver will be renewed. In particular, the requirements for vision (visual acuity, visual field) will be adjusted to international standards. Due to demographic changes the number of elderly drivers with old age (85 – 90+) with eye associated diseases increases. Therefore, questions concerning traffic ophthalmological problems have to be increasingly considered within traffic medical assessments. The driver's vision in traffic's safety must enable him to perceive relevant information, process information quickly and perform an adequate reaction in time, even if visibility is limited (e. g. due to rain, night, darkness) or in the presence of physical or psychical constraints.

2. Jackson ML, Kennedy GA, Clarke C, Gullo M, Swann P, Downey LA, Hayley AC, Pierce RJ, Howard ME. *Accid Anal Prev.* 2016 Feb;87:127-33. doi: 10.1016/j.aap.2015.11.033. Epub 2015 Dec 10.

The utility of automated measures of ocular metrics for detecting driver drowsiness during extended wakefulness.

Slowed eyelid closure coupled with increased duration and frequency of closure is associated with drowsiness. This study assessed the utility of two devices for automated measurement of slow eyelid closure in a standard poor performance condition (alcohol) and following 12-h sleep deprivation. Twenty-two healthy participants (mean age=20.8 (SD 1.9) years) with no history of sleep disorders participated in the study. Participants underwent one baseline and one counterbalanced session each over two weeks; one 24-hour period of sleep deprivation, and one daytime session during which alcohol was consumed after a normal night of sleep. Participants completed a test battery consisting of a 30-min simulated driving task, a 10-min Psychomotor Vigilance Task (PVT) and the Karolinska Sleepiness Scale (KSS) each in two baseline sessions, and in two randomised, counterbalanced experimental sessions; following sleep deprivation and following alcohol consumption. Eyelid closure was measured during both tasks using two automated devices (Copilot and Optalert™). There was an increase in the proportion of time with eyelids closed and the Johns Drowsiness Score (incorporating relative velocity of eyelid movements) following sleep deprivation using Optalert ($p < 0.05$ for both). These measures correlated significantly with crashes, PVT lapses and subjective sleepiness (r -values 0.46-0.69, $p < 0.05$). No difference between the two sessions for PERCLOS recorded during the PVT or the driving task as measured by the Copilot. The duration of eyelid closure predicted frequent lapses following sleep deprivation (which were equivalent to the average lapses at a blood alcohol concentration of 0.05% - area under curve for ROC curve

0.87, $p < 0.01$). The duration of time with slow eyelid closure, assessed by the automated devices, increased following sleep deprivation and was associated with deterioration in psychomotor performance and subjective sleepiness. Comprehensive algorithms inclusive of ocular parameters may be a better indicator of performance impairment following sleep loss.

3. Bressler NM, Varma R, Mitchell P, Suñer IJ, Dolan C, Ward J, Ferreira A, Ehrlich JS, Turpcu A. EFFECT OF RANIBIZUMAB ON THE DECISION TO DRIVE AND VISION FUNCTION RELEVANT TO DRIVING IN PATIENTS WITH DIABETIC MACULAR EDEMA: REPORT FROM RESTORE, RIDE, AND RISE TRIALS. JAMA Ophthalmol. 2016 Feb;134(2):160-6. doi: 10.1001/jamaophthalmol.2015.4636.

IMPORTANCE:

The potential effect of treatments for diabetic macular edema (DME) on driving should be of value to patients and clinicians, such as ophthalmologists and other physicians, who treat patients with diabetes mellitus.

OBJECTIVE:

To determine the effect of ranibizumab on driving and patient-reported vision function relevant to driving among patients with DME.

DESIGN, SETTING, AND PARTICIPANTS:

This exploratory post hoc analysis was conducted between October 1, 2011, and July 25, 2015, based on deidentified data from phase 3, multicenter, randomized clinical trials (RIDE, RISE, and RESTORE trials). Individuals assigned randomly to monthly sham, 0.3-mg ranibizumab, or 0.5-mg ranibizumab in RIDE and RISE or to macular laser, macular laser plus 0.5-mg ranibizumab (3-monthly doses, then as needed), or 0.5-mg (3-monthly doses, then as needed) in RESTORE.

MAIN OUTCOMES AND MEASURES:

Driving items from the National Eye Institute (NEI) Visual Function Questionnaire-25 (VFQ-25) at baseline through 24 months in RIDE/RISE (pooled) and through 12 months in RESTORE.

RESULTS:

A total of 71.2% of 753 patients in RIDE/RISE and 50.4% of 345 patients in RESTORE reported driving at baseline; at least 55% reported still driving at follow-up. Among those not driving at baseline in RIDE/RISE, at 12 months, 7.0% (95% CI, -5.0 to 19.0) more in the 0.3-mg group and 14.4% (95% CI, 1.1 to 27.7) more in the 0.5-mg group vs the sham group reported driving. Among those not driving at baseline in RESTORE, at 12 months, 4.2% (95% CI, -7.7 to 16.1) more in the laser plus 0.5-mg group and 0.9% (95% CI, -10.3 to 12.1) more in the 0.5-mg group vs the laser group reported driving. Although balanced at baseline across treatment groups for RESTORE and RIDE/RISE, the proportion of patients with best-corrected visual acuity typically required for an unrestricted license (20/40 or

better in at least 1 eye) appeared greater at month 12 in the ranibizumab groups (77 of 80 [96.3%] for 0.5 mg + laser and 91 of 93 [97.8%] for 0.5 mg vs laser (71 of 79 [89.9%]) in RESTORE, and at months 12 (112 of 123 [91.1%] and 136 of 137 [99.3%] in 0.3- and 0.5-mg groups, respectively) and 24 (113 of 123 [91.9%] and 135 of 137 [98.5%] in the 0.3- and 0.5-mg groups, respectively) vs sham (121 of 147 [82.3%] and 122 of 147 [83.0%]) in RIDE/RISE.

CONCLUSIONS AND RELEVANCE:

These results suggest that 12 months after initiating ranibizumab for vision impairment from center-involved DME, patients not driving at initiation of treatment are more likely to report driving and have driving-eligible visual acuity of 20/40 or better in the better-seeing eye than those treated with sham or laser.

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- 4. Young KL, Stephens AN, Stephan KL, Stuart GW. IN THE EYE OF THE BEHOLDER: A SIMULATOR STUDY OF THE IMPACT OF GOOGLE GLASS ON DRIVING PERFORMANCE. *Accid Anal Prev.* 2016 Jan;86:68-75. doi: 10.1016/j.aap.2015.10.010. Epub 2015 Nov 10.**

This study examined whether, and to what extent, driving is affected by reading text on Google Glass. Reading text requires a high level of visual resources and can interfere with safe driving. However, it is currently unclear if the impact of reading text on a head-mounted display, such as Google Glass (Glass), will differ from that found with more traditional head-down electronic devices, such as a dash-mounted smartphone. A total of 20 drivers (22-48 years) completed the Lane Change Test while driving undistracted and while reading text on Glass and on a smartphone. Measures of lateral vehicle control and event detection were examined along with subjective workload and secondary task performance. Results revealed that drivers' lane keeping ability was significantly impaired by reading text on both Glass and the smartphone. When using Glass, drivers also failed to detect a greater number of lane change signs compared to when using the phone or driving undistracted. In terms of subjective workload, drivers rated reading on Glass as subjectively easier than on the smartphone, which may possibly encourage greater use of this device while driving. Overall, the results suggest that, despite Glass allowing drivers to better maintain their visual attention on the forward scene, drivers are still not able to effectively divide their cognitive attention across the Glass display and the road environment, resulting in impaired driving performance.

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- 5. Schmitt KU, Seeger R, Fischer H, Lanz C, Muser M, Walz F, Schwarz U. *Swiss Med Wkly.* 2015 Oct 27;145:w14195. doi: 10.4414/smw.2015.14195. eCollection 2015. REPLY TO: TECHNICAL COMMENT ON "SACCADIC EYE MOVEMENT PERFORMANCE AS AN INDICATOR OF DRIVING ABILITY IN ELDERLY DRIVERS".**

6. **Vaucher P, Pasche C, Favrat B. TECHNICAL COMMENT ON "SACCADIC EYE MOVEMENT PERFORMANCE AS AN INDICATOR OF DRIVING ABILITY IN ELDERLY DRIVERS". *Swiss Med Wkly*. 2015 Oct 27;145:w14194. doi: 10.4414/smw.2015.14194. eCollection 2015.**
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7. **Kübler TC, Kasneci E, Rosenstiel W, Heister M, Aehling K, Nagel K, Schiefer U, Papageorgiou E. DRIVING WITH GLAUCOMA: TASK PERFORMANCE AND GAZE MOVEMENTS. *Optom Vis Sci*. 2015 Nov;92(11):1037-46. doi: 10.1097/OPX.0000000000000702.**

PURPOSE:

The aim of this pilot study was to assess the driving performance and the visual search behavior, that is, eye and head movements, of patients with glaucoma in comparison to healthy-sighted subjects during a simulated driving test.

METHODS:

Driving performance and gaze behavior of six glaucoma patients and eight healthy-sighted age- and sex-matched control subjects were compared in an advanced driving simulator. All subjects underwent a 40-minute driving test including nine hazardous situations on city and rural roads. Fitness to drive was assessed by a masked driving instructor according to the requirements of the official German driving test. Several driving performance measures were investigated: lane position, time to line crossing, and speed. Additionally, eye and head movements were tracked and analyzed.

RESULTS:

Three out of six glaucoma patients passed the driving test and their driving performance was indistinguishable from that of the control group. Patients who passed the test showed an increased visual exploration in comparison to patients who failed; that is, they showed increased number of head and gaze movements toward eccentric regions. Furthermore, patients who failed the test showed a rightward bias in average lane position, probably in an attempt to maximize the safety margin to oncoming traffic.

CONCLUSIONS:

Our study suggests that a considerable subgroup of subjects with binocular glaucomatous visual field loss shows a safe driving behavior in a virtual reality environment, because they adapt their viewing behavior by increasing their visual scanning. Hence, binocular visual field loss does not necessarily influence driving safety. We recommend that more individualized driving assessments, which will take into account the patient's ability to compensate, are required.

8. Rae S, Latham K, Katsou MF. MEETING THE UK DRIVING VISION STANDARDS WITH REDUCED CONTRAST SENSITIVITY. *Eye (Lond)*. 2016 Jan;30(1):89-94. doi: 10.1038/eye.2015.188. Epub 2015 Oct 16.

Purpose:

The visual standard to hold a UK driver's license since 2012 includes visual acuity (VA) measured indoors and the ability to read a car numberplate outdoors. Individuals with reduced contrast sensitivity may have greater visual difficulties outdoors. The agreement between the two tests in the presence of combined reduction in contrast sensitivity and VA was investigated.

Methods:

Simulation glasses ('sim-specs') were used to reduce both high-contrast VA and contrast sensitivity (CS). Following evaluation of the influence of sim-specs on VA and CS, levels 2 to 4 were chosen to give a range of VAs on either side of the driving standard of 6/12. Sixty-two participants wearing sim-specs then had VA tested with Snellen and ETDRS charts indoors, and ability to read a numberplate assessed outdoors as per DVLA regulations. Results Sim-specs reduced VA and CS by ~0.10 logMAR VA per 0.10 logCS. The sensitivity of test chart VA <6/12 to correctly predict failure on the numberplate was 61% for Snellen and 56% for ETDRS. Conclusion False-negative and -positive rates were higher than in a previous study with uncorrected refractive error only. Reduced CS increased the lack of agreement between the two driving vision standards, which likely occurs as the VA test is performed indoors and the numberplate test outdoors. The increased likelihood of failing the numberplate test even though VA is 6/12 or better needs to be considered when advising patients on fitness to drive who have ocular disease such as cataract.

9. Kwon M, Huisinigh C, Rhodes LA, McGwin G Jr, Wood JM, Owsley C. ASSOCIATION BETWEEN GLAUCOMA AND AT-FAULT MOTOR VEHICLE COLLISION INVOLVEMENT AMONG OLDER DRIVERS: A POPULATION-BASED STUDY. *Ophthalmology*. 2016 Jan;123(1):109-16. doi: 10.1016/j.ophtha.2015.08.043. Epub 2015 Oct 14.

OBJECTIVE:

To examine the association between glaucoma and motor vehicle collision (MVC) involvement among older drivers, including the role of visual field impairment that may underlie any association found.

DESIGN:

A retrospective, population-based study.

PARTICIPANTS:

A sample of 2000 licensed drivers aged ≥70 years who reside in north central Alabama.

METHODS:

At-fault MVC involvement over the 5 years before enrollment was obtained from state records. Three aspects of visual function were measured: habitual binocular distance visual acuity, binocular contrast sensitivity (CS), and the binocular driving visual field constructed from combining the monocular visual fields of each eye. Poisson regression was used to calculate crude and adjusted rate ratios (RRs) and 95% confidence intervals (CIs).

MAIN OUTCOMES MEASURES:

At-fault MVC involvement over the 5 years before enrollment.

RESULTS:

Drivers with glaucoma (n = 206) had a 1.65 times higher MVC rate (95% CI, 1.20-2.28; P = 0.002) compared with those without glaucoma after adjusting for age, and mental status. Among those with glaucoma, drivers with severe visual field loss had higher MVC rates (RR, 2.11; 95% CI, 1.09-4.09; P = 0.027), whereas no association was found among those with impaired visual acuity and CS. When the visual field was subdivided into 6 regions (upper, lower, left, and right visual fields; horizontal and vertical meridians), we found that impairment in the left, upper, or lower visual field was associated with higher MVC rates, and an impaired left visual field showed the highest RR (3.16; P = 0.001) compared with other regions. However, no association was found in deficits in the right side or along the horizontal or vertical meridian.

CONCLUSIONS:

A population-based study suggests that older drivers with glaucoma are more likely to have a history of at-fault MVC involvement than those without glaucoma. Impairment in the driving visual field in drivers with glaucoma seems to have an independent association with at-fault MVC involvement, whereas visual acuity and CS impairments do not.

10. Dougherty BE, Flom RE, Bullimore MA, Raasch TW. PREVIOUS DRIVING EXPERIENCE, BUT NOT VISION, IS ASSOCIATED WITH MOTOR VEHICLE COLLISION RATE IN BIOPTIC DRIVERS. *Invest Ophthalmol Vis Sci.* 2015 Oct;56(11):6326-32. doi: 10.1167/iovs.15-16882.

PURPOSE:

Bioptic telescopic spectacles (BTS) consist of a small telescope (or telescopes) mounted high in a pair of spectacle lenses. More than 40 states allow for some form of bioptic driving licensure for people with decreased central vision. The purpose of this study was to determine significant associations among previous driving experience, vision, and motor vehicle collisions (MVCs) for bioptic drivers in Ohio.

METHODS:

We conducted a retrospective study of patients who received a vision examination and subsequently obtained bioptic licensure. We obtained driving records from the Ohio Bureau of Motor Vehicles in order to determine MVC involvement. Relationships among vision measures, age, sex, previous experience, and MVCs were investigated using time-to-event analysis and the Cox proportional hazards regression model.

RESULTS:

We identified 237 bioptic drivers (65% male). Age at initial exam ranged from 16 to 81 years, and mean visual acuity was approximately 20/120. The number of MVCs per driver ranged from 0 to 11, with 124 (52%) drivers having had at least one MVC. Visual acuity and contrast sensitivity were not significant predictors of MVC. Drivers without previous driving experience were significantly more likely to have been involved in an MVC ($P < 0.001$), and this association remained significant after adjusting for age and sex ($P = 0.01$). The rate of MVC per year decreased steadily over a 10-year period for drivers without previous experience.

CONCLUSIONS:

Previous nonbioptic driving experience, but not visual acuity or contrast sensitivity, was associated with yearly MVC rate in bioptic drivers.

11. *Gracitelli CP, Tatham AJ, Boer ER, Abe RY, Diniz-Filho A, Rosen PN, Medeiros FA. PREDICTING RISK OF MOTOR VEHICLE COLLISIONS IN PATIENTS WITH GLAUCOMA: A LONGITUDINAL STUDY. PLoS One. 2015 Oct 1;10(10):e0138288. doi: 10.1371/journal.pone.0138288. eCollection 2015.*

PURPOSE:

To evaluate the ability of longitudinal Useful Field of View (UFOV) and simulated driving measurements to predict future occurrence of motor vehicle collision (MVC) in drivers with glaucoma.

DESIGN:

Prospective observational cohort study.

PARTICIPANTS:

117 drivers with glaucoma followed for an average of 2.1 ± 0.5 years.

METHODS:

All subjects had standard automated perimetry (SAP), UFOV, driving simulator, and cognitive assessment obtained at baseline and every 6 months during follow-up. The driving simulator evaluated reaction times to high and low contrast peripheral divided attention stimuli presented while negotiating a winding country road, with central driving

task performance assessed as "curve coherence". Drivers with MVC during follow-up were identified from Department of Motor Vehicle records.

MAIN OUTCOME MEASURES:

Survival models were used to evaluate the ability of driving simulator and UFOV to predict MVC over time, adjusting for potential confounding factors.

RESULTS:

Mean age at baseline was 64.5 ± 12.6 years. 11 of 117 (9.4%) drivers had a MVC during follow-up. In the multivariable models, low contrast reaction time was significantly predictive of MVC, with a hazard ratio (HR) of 2.19 per 1 SD slower reaction time (95% CI, 1.30 to 3.69; $P = 0.003$). UFOV divided attention was also significantly predictive of MVC with a HR of 1.98 per 1 SD worse (95% CI, 1.10 to 3.57; $P = 0.022$). Global SAP visual field indices in the better or worse eye were not predictive of MVC. The longitudinal model including driving simulator performance was a better predictor of MVC compared to UFOV ($R^2 = 0.41$ vs $R^2 = 0.18$).

CONCLUSIONS:

Longitudinal divided attention metrics on the UFOV test and during simulated driving were significantly predictive of risk of MVC in glaucoma patients. These findings may help improve the understanding of factors associated with driving impairment related to glaucoma.

12 Lin L, Huang C, Ni X, Wang J, Zhang H, Li X, Qian Z. DRIVER FATIGUE DETECTION BASED ON EYE STATE. *Technol Health Care*. 2015;23 Suppl 2:S453-63. doi: 10.3233/THC-150982.

BACKGROUND:

Nowadays, more and more traffic accidents occur because of driver fatigue.

OBJECTIVE:

In order to reduce and prevent it, in this study, a calculation method using PERCLOS (percentage of eye closure time) parameter characteristics based on machine vision was developed. It determined whether a driver's eyes were in a fatigue state according to the PERCLOS value.

METHODS:

The overall workflow solutions included face detection and tracking, detection and location of the human eye, human eye tracking, eye state recognition, and driver fatigue testing. The key aspects of the detection system incorporated the detection and location of human eyes and driver fatigue testing. The simplified method of measuring the PERCLOS value of the driver was to calculate the ratio of the eyes being open and closed with the total number of frames for a given period.

RESULTS:

If the eyes were closed more than the set threshold in the total number of frames, the system would alert the driver.

CONCLUSION:

Through many experiments, it was shown that besides the simple detection algorithm, the rapid computing speed, and the high detection and recognition accuracies of the system, the system was demonstrated to be in accord with the real-time requirements of a driver fatigue detection system.

13. Rae S, Latham K, Katsou MF. DISTANCE WORD ACUITY, CRITICAL PRINT SIZE AND DRIVING VISION STANDARDS. *Clin Exp Optom.* 2015 Sep;98(5):459-63. doi: 10.1111/cxo.12292.

BACKGROUND:

A comparison was made between letter visual acuity and word acuity at distance and between letter acuity and the minimum word size allowing maximum and fluent reading speeds.

METHODS:

Visual acuities were measured at six metres for 120 participants. Letter acuity was assessed with a logMAR layout chart with Sloan letters displayed with Thomson XPert software. A logMAR layout lowercase word chart was created in PowerPoint using the format of the MNRead near chart, with the font and colours found on United Kingdom motorway signs. Distance letter and word acuity, maximum reading speed, critical print size (CPS) and minimum print size for fluent reading were calculated.

RESULTS:

Word and letter acuities were significantly correlated ($p < 0.001$) and showed a statistically ($p = 0.049$) but not clinically significant mean difference of 0.02 ± 0.09 logMAR. Bland-Altman analysis showed that agreement between charts varied depending on acuity level with word acuity better than letter acuity at levels closer to the driving standard of +0.30 logMAR (6/12). Maximum reading speed was achieved from print sizes 1.5 logMAR lines larger than the letter acuity and fluent reading at 80 words per minute from print sizes 0.06 logMAR larger than the letter acuity.

CONCLUSION:

These results allow equivalent lowercase print sizes supporting either functional reading or maximum reading speeds to be calculated based on letter chart acuities at distance. Minimum print sizes allowing either functional or maximum reading speeds are more appropriate than threshold word acuities, where groups of words or short phrases need to be identified, such as when driving. Where a driving vision standard of +0.30 logMAR (6/12) exists, a person just meeting the driving standard should be able to read fluently words on signage in lowercase x-heights equivalent to between +0.29 and +0.30 logMAR.

- 14. Fisher C, Chekaluk E, Irwin J. IMPAIRED DRIVING PERFORMANCE AS EVIDENCE OF A MAGNOCELLULAR DEFICIT IN DYSLEXIA AND VISUAL STRESS. *Dyslexia*. 2015 Nov;21(4):350-60. doi: 10.1002/dys.1504. Epub 2015 Sep 3.**

Self-report measures assessed dyslexia and visual stress symptomology as well as participant IQ. Participants completed a drive simulation in which errors in response to road signs were measured.

Bivariate correlations revealed significant associations between scores on measures of dyslexia and visual stress. Results also demonstrated that self-reported symptomology predicts magnocellular impairment as measured by performance on a driving task. Results from this study suggest that a magnocellular deficit offers a likely explanation for individuals who report high symptomology across both conditions. While conclusions about the impact of these disorders on driving performance should not be derived from this research alone, this study provides a platform for the development of future research, utilizing a clinical population and on-road driving assessment techniques.

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- 15. Bronstad PM, Albu A, Bowers AR, Goldstein R, Peli E. DRIVING WITH CENTRAL VISUAL FIELD LOSS II: HOW SCOTOMAS ABOVE OR BELOW THE PREFERRED RETINAL LOCUS (PRL) AFFECT HAZARD DETECTION IN A DRIVING SIMULATOR. *PLoS One*. 2015 Sep 2;10(9):e0136517. doi: 10.1371/journal.pone.0136517.eCollection 2015.**

We determined whether binocular central scotomas above or below the preferred retinal locus affect detection of hazards (pedestrians) approaching from the side. Seven participants with central field loss (CFL), and seven age- and sex-matched controls with normal vision (NV), each completed two sessions of 5 test drives (each approximately 10 minutes long) in a driving simulator. Participants pressed the horn when detecting pedestrians that appeared at one of four eccentricities (-14°, -4°, left, 4°, or 14°, right, relative to car heading). Pedestrians walked or ran towards the travel lane on a collision course with the participant's vehicle, thus remaining in the same area of the visual field, assuming participant's steady forward gaze down the travel lane. Detection rates were nearly 100% for all participants. CFL participant reaction times were longer (median 2.27s, 95% CI 2.13 to 2.47) than NVs (median 1.17s, 95%CI 1.10 to 2.13; difference $p < 0.01$), and CFL participants would have been unable to stop for 21% of pedestrians, compared with 3% for NV, $p < 0.001$. Although the scotomas were not expected to obscure pedestrian hazards, gaze tracking revealed that scotomas did sometimes interfere with detection; late reactions usually occurred when pedestrians were entirely or partially obscured by the scotoma (time obscured correlated with reaction times, $r = 0.57$, $p < 0.001$). We previously showed that scotomas lateral to the preferred retinal locus delay reaction times to a greater extent; however, taken together, the results of our studies suggest that any binocular CFL might negatively impact timely hazard detection while driving and should be a consideration when evaluating vision for driving.

16. Gilad I, Byran E. QUANTIFYING DRIVER'S FIELD-OF-VIEW IN TRACTORS: METHODOLOGY AND CASE STUDY. *Int J Occup Saf Ergon.* 2015;21(1):20-9. doi: 10.1080/10803548.2015.1017942.

When driving a car, the visual awareness is important for operating and controlling the vehicle. When operating a tractor, it is even more complex. This is because the driving is always accompanied with another task (e.g., plough) that demands constant changes of body postures, to achieve the needed Field-of-View (FoV). Therefore, the cockpit must be well designed to provide best FoV. Today, the driver's FoV is analyzed mostly by computer simulations of a cockpit model and a Digital Human Model (DHM) positioned inside. The outcome is an 'Eye view' that displays what the DHM 'sees'. This paper suggests a new approach that adds quantitative information to the current display; presented on three tractor models as case studies. Based on the results, the design can be modified. This may assist the engineer, to analyze, compare and improve the design, for better addressing the driver needs.

17. Doherty AL, Peli E, Luo G. HAZARD DETECTION WITH A MONOCULAR BIOPTIC TELESCOPE. *Ophthalmic Physiol Opt.* 2015 Sep;35(5):530-9. doi:10.1111/opo.12232

PURPOSE:

The safety of bioptic telescopes for driving remains controversial. The ring scotoma, an area to the telescope eye due to the telescope magnification, has been the main cause of concern. This study evaluates whether bioptic users can use the fellow eye to detect in hazards driving videos that fall in the ring scotoma area.

METHODS:

Twelve visually impaired bioptic users watched a series of driving hazard perception training videos and responded as soon as they detected a hazard while reading aloud letters presented on the screen. The letters were placed such that when reading them through the telescope the hazard fell in the ring scotoma area. Four conditions were tested: no bioptic and no reading, reading without bioptic, reading with a bioptic that did not occlude the fellow eye (non-occluding bioptic), and reading with a bioptic that partially-occluded the fellow eye. Eight normally sighted subjects performed the same task with the partially occluding bioptic detecting lateral hazards (blocked by the device scotoma) and vertical hazards (outside the scotoma) to further determine the cause-and-effect relationship between hazard detection and the fellow eye.

RESULTS:

There were significant differences in performance between conditions: 83% of hazards were detected with no reading task, dropping to 67% in the reading task with no bioptic, to 50% while reading with the non-occluding bioptic, and 34% while reading with the partially

occluding bioptic. For normally sighted, detection of vertical hazards (53%) was significantly higher than lateral hazards (38%) with the partially occluding bioptic.

CONCLUSIONS:

Detection of driving hazards is impaired by the addition of a secondary reading like task. Detection is further impaired when reading through a monocular telescope. The effect of the partially-occluding bioptic supports the role of the non-occluded fellow eye in compensating for the ring scotoma.

18. Itkonen T, Pekkanen J, Lappi O. DRIVER GAZE BEHAVIOR IS DIFFERENT IN NORMAL CURVE DRIVING AND WHEN LOOKING AT THE TANGENT POINT. *PLoS One*. 2015 Aug 19;10(8):e0135505. doi: 10.1371/journal.pone.0135505. eCollection 2015.

Several steering models in the visual science literature attempt to capture the visual strategies in curve driving. Some of them are based on steering points on the future path (FP), others on tangent points (TP). It is, however, challenging to differentiate between the models' predictions in real-world contexts. Analysis of optokinetic nystagmus (OKN) parameters is one useful measure, as the different strategies predict measurably different OKN patterns. Here, we directly test this prediction by asking drivers to either a) "drive as they normally would" or b) to "look at the TP". The design of the experiment is similar to a previous study by Kandil et al., but uses more sophisticated methods of eye-movement analysis. We find that the eye-movement patterns in the "normal" condition are indeed markedly different from the "tp" condition, and consistent with drivers looking at waypoints on the future path. This is the case for both overall fixation distribution, as well as the more informative fixation-by-fixation analysis of OKN. We find that the horizontal gaze speed during OKN corresponds well to the quantitative prediction of the future path models. The results also definitively rule out the alternative explanation that the OKN is produced by an involuntary reflex even while the driver is "trying" to look at the TP. The results are discussed in terms of the sequential organization of curve driving.

19. Carkeet A. BEING CONSPICUOUS AT NIGHT ON A BLURRED ROAD. *Invest Ophthalmol Vis Sci*. 2015 Jul;56(8):4486. doi: 10.1167/iovs.15-17358.

20. Lee SS, Wood JM, Black AA. BLUR, EYE MOVEMENTS AND PERFORMANCE ON A DRIVING VISUAL RECOGNITION SLIDE TEST. *Ophthalmic Physiol Opt.* 2015 Sep;35(5):522-9. doi: 10.1111/opo.12230. Epub 2015 Jul 17.

PURPOSE:

Optical blur and ageing are known to affect driving performance but their effects on drivers' eye movements are poorly understood. This study examined the effects of optical blur and age on eye movement patterns and performance on the DriveSafe slide recognition test which is purported to predict fitness to drive.

METHODS:

Twenty young (27.1 ± 4.6 years) and 20 older (73.3 ± 5.7 years) visually normal drivers performed the DriveSafe under two visual conditions: best-corrected vision and with +2.00 DS blur. The DriveSafe is a Visual Recognition Slide Test that consists of brief presentations of static, real-world driving scenes containing different road users (pedestrians, bicycles and vehicles). Participants reported the types, relative positions and direction of travel of the road users in each image; the score was the number of correctly reported items (maximum score of 128). Eye movements were recorded while participants performed the DriveSafe test using a Tobii TX300 eye tracking system.

RESULTS:

There was a significant main effect of blur on DriveSafe scores (best-corrected: 114.9 vs blur: 93.2; $p < 0.001$). There was also a significant age and blur interaction on the DriveSafe scores ($p < 0.001$) such that the young drivers were more negatively affected by blur than the older drivers (reductions of 22% and 13% respectively; $p < 0.001$): with best-corrected vision, the young drivers performed better than the older drivers (DriveSafe scores: 118.4 vs 111.5; $p = 0.001$), while with blur, the young drivers performed worse than the older drivers (88.6 vs 95.9; $p = 0.009$). For the eye movement patterns, blur significantly reduced the number of fixations on road users (best-corrected: 5.1 vs blur: 4.5; $p < 0.001$), fixation duration on road users (2.0 s vs 1.8 s; $p < 0.001$) and saccade amplitudes (7.4° vs 6.7° ; $p < 0.001$). A main effect of age on eye movements was also found where older drivers made smaller saccades than the young drivers (6.7° vs 7.4° ; $p < 0.001$).

CONCLUSIONS:

Blur reduced DriveSafe scores for both age groups and this effect was greater for the young drivers. The decrease in number of fixations and fixation duration on road users, as well as the reduction in saccade amplitudes under the blurred condition, highlight the difficulty experienced in performing the task in the presence of optical blur, which suggests that uncorrected refractive errors may have a detrimental impact on aspects of driving performance.

Sleep disorders

1. **Szakács Z, Ádám Á, Annus JK, Csatlós D, László A, Kalabay L, Torzsa P, Orv Hetil. HUNGARIAN SOCIETY FOR SLEEP MEDICINE GUIDELINE FOR DETECTING DRIVERS WITH OBSTRUCTIVE SLEEP APNEA SYNDROME. 2016 Jun 5;157(23):892-900. doi: 10.1556/650.2016.30451.**

Obstructive sleep apnea is the most frequent sleep-disordered breathing. The prevalence of sleep apnea in the general population is 2-4% and the main characteristics of the disease are the intermittent cessation or substantial reduction of airflow during sleep, which is caused by complete, or near complete upper airway obstruction. Decreased airflow is followed by oxygen desaturation and intermittent arousals. Untreated patients are 4-6 times more likely to cause traffic accidents than their healthy counterparts. The aims of the obstructive sleep apnea screening are to prevent and reduce the incidence of serious car accidents, which are often caused by one of the most dangerous sleep disorders. Since April 1, 2015 a modification of the 13/1992 regulation has been in force in Hungary which orders screening of obstructive sleep apnea during medical checkup of drivers. The Hungarian Society for Sleep Medicine made a guideline according to the regulation which was adapted to national circumstances and family doctors, occupational health specialists can more easily screen obstructive sleep apnea in suspected patients. In sleep ambulances the disease can be diagnosed and effective treatment can be started. Patients receiving appropriate treatment and with appropriate compliance can get their driving licence under regular care and control.

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2. **Partinen M, Huutoniemi A, Kajaste S, Lagerstedt R, Markkula J, Mäkinen E, Paakkari I, Partonen T, Polo P, Saarenpää-Heikkilä O, Seppälä M, Kukkonen-Harjula, K, Tuunainen A. UPDATE ON CURRENT CARE GUIDELINE: INSOMNIA. Duodecim. 2016;132(3):277-8.**

Insomnia symptoms must be differentiated from insomnia disorder. The correct diagnosis or insomnia disorder is important, as insomnia may also be a symptom of many other diseases. Cognitive behavioral methods are recommended as first-line treatment options. Treatment of acute insomnia with hypnotics should not exceed two weeks. In elderly persons adverse effects of hypnotics may exceed their beneficial effects in long-term use. Antidepressive medications acting on the histamine-1 system may be used in very small doses. The new guideline includes e.g. insomnia in pregnant and menopausal women and in cancer patients, and driving issues.

3. **Gurubhagavatula I, Patil S, Meoli A, Olson R, Sullivan S, Berneking M, Watson NF; SLEEP APNEA EVALUATION OF COMMERCIAL MOTOR VEHICLE OPERATORS. *J Clin Sleep Med.* 2015 Mar 15;12(3):285-6. doi: 10.5664/jcsm.5560**
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4. **Lee ML, Howard ME, Horrey WJ, Liang Y, Anderson C, Shreeve MS, O'Brien CS, Czeisler CA. HIGH RISK OF NEAR-CRASH DRIVING EVENTS FOLLOWING NIGHT-SHIFT WORK. *Proc Natl Acad Sci U S A.* 2016 Jan 5;113(1):176-81. doi: 10.1073/pnas.1510383112. Epub 2015 Dec 22.**

Night-shift workers are at high risk of drowsiness-related motor vehicle crashes as a result of circadian disruption and sleep restriction. However, the impact of actual night-shift work on measures of drowsiness and driving performance while operating a real motor vehicle remains unknown. Sixteen night-shift workers completed two 2-h daytime driving sessions on a closed driving track at the Liberty Mutual Research Institute for Safety: (i) a postsleep baseline driving session after an average of 7.6 ± 2.4 h sleep the previous night with no night-shift work, and (ii) a postnight-shift driving session following night-shift work. Physiological measures of drowsiness were collected, including infrared reflectance oculography, electroencephalography, and electrooculography. Driving performance measures included lane excursions, near-crash events, and drives terminated because of failure to maintain control of the vehicle. Eleven near-crashes occurred in 6 of 16 postnight-shift drives (37.5%), and 7 of 16 postnight-shift drives (43.8%) were terminated early for safety reasons, compared with zero near-crashes or early drive terminations during 16 postsleep drives (Fishers exact: $P = 0.0088$ and $P = 0.0034$, respectively). Participants had a significantly higher rate of lane excursions, average Johns Drowsiness Scale, blink duration, and number of slow eye movements during postnight-shift drives compared with postsleep drives (3.09/min vs. 1.49/min; 1.71 vs. 0.97; 125 ms vs. 100 ms; 35.8 vs. 19.1; respectively, $P < 0.05$ for all). Night-shift work increases driver drowsiness, degrading driving performance and increasing the risk of near-crash drive events. With more than 9.5 million Americans working overnight or rotating shifts and one-third of United States commutes exceeding 30 min, these results have implications for traffic and occupational safety.

5. **Léger D, Ement P. SLEEPINESS AND ACCIDENTAL RISK. *Presse Med.* 2015 Oct;44(10):1022-8. doi: 10.1016/j.lpm.2015.04.002.**

Sleepiness while driving is both a very common phenomena regarding 10 to 15% of drivers and one of the main causes of death on highways (one third of fatal accidents). Sleepiness results mainly from behavioural causes: sleep deficit or irregular work schedules. However, many sleep diseases and hypnotics may also induce sleepiness at the wheel. Several objective and subjective measures have been validated to assess sleepiness. Road safety and information to the drivers have now to focus on better informing drivers on the rules of

preventing sleepiness at the wheel in order to avoiding undred of accidents in the next future.

6. **van Loon RJ, Brouwer RF, Martens MH. DROWSY DRIVERS' UNDER-PERFORMANCE IN LATERAL CONTROL: HOW MUCH IS TOO MUCH? USING AN INTEGRATED MEASURE OF LATERAL CONTROL TO QUANTIFY SAFE LATERAL DRIVING. *Accid Anal Prev.* 2015 Nov;84:134-43. doi: 10.1016/j.aap.2015.08.012. Epub 2015 Sep 10.**

Internationally, drowsy driving is associated with around 20% of all crashes. Despite the development of different detection methods, driver drowsiness remains a disconcerting public health issue. Detection methods can estimate drowsiness by directly measuring the physiology of the driver, or they can measure the effect that drowsiness has on the state of the vehicle due to the behavioural changes that drowsiness elicits in the driver. The latter has the benefit that it could measure the net effect that drowsiness has on driving performance which links to the actual safety risk. Fusing multiple sources of driving performance indicators like lane position and steering wheel metrics in order to detect drowsiness has recently gained increased attention. However, not much research has been conducted with regard to using integrated measures to detect increased drowsiness within an individual driver. Different levels of drowsiness are also rarely classified in terms of safe or unsafe. In the present study, we attempt to slowly induce drowsiness using a monotonous driving task in a simulator, and fuse lane position and steering wheel angle data into a single measure for lateral control performance. We argue that this measure is applicable in real-time detection systems, and quantitatively link it to different levels of drowsiness by validating it to two established drowsiness metrics (KSS and PERCLOS). Using level of drowsiness as a surrogate for safety we are then able to set simple criteria for safe and unsafe lateral control performance, based on individual driving behaviour.

7. **Lin L, Huang C, Ni X, Wang J, Zhang H, Li X, Qian Z. DRIVER FATIGUE DETECTION BASED ON EYE STATE. *Technol Health Care.* 2015;23 Suppl 2:S453-63. doi: 10.3233/THC-150982.**

BACKGROUND:

Nowadays, more and more traffic accidents occur because of driver fatigue.

OBJECTIVE:

In order to reduce and prevent it, in this study, a calculation method using PERCLOS (percentage of eye closure time) parameter characteristics based on machine vision was developed. It determined whether a driver's eyes were in a fatigue state according to the PERCLOS value.

METHODS:

The overall workflow solutions included face detection and tracking, detection and location of the human eye, human eye tracking, eye state recognition, and driver fatigue testing. The key aspects of the detection system incorporated the detection and location of human eyes and driver fatigue testing. The simplified method of measuring the PERCLOS value of the driver was to calculate the ratio of the eyes being open and closed with the total number of frames for a given period.

RESULTS:

If the eyes were closed more than the set threshold in the total number of frames, the system would alert the driver.

CONCLUSION:

Through many experiments, it was shown that besides the simple detection algorithm, the rapid computing speed, and the high detection and recognition accuracies of the system, the system was demonstrated to be in accord with the real-time requirements of a driver fatigue detection system.

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8. *Philip P, Micoulaud-Franchi JA, Lagarde E, Taillard J, Canel A, Sagaspe P, Bioulac S. ATTENTION DEFICIT HYPERACTIVITY DISORDER SYMPTOMS, SLEEPINESS AND ACCIDENTAL RISK IN 36140 REGULARLY REGISTERED HIGHWAY DRIVERS. PLoS One. 2015 Sep 16;10(9):e0138004. doi: 10.1371/journal.pone.0138004.eCollection 2015.*

BACKGROUND:

Attention Deficit Hyperactivity Disorder (ADHD) is a frequent neurodevelopmental disorder that increases accidental risk. Recent studies show that some patients with ADHD can also suffer from excessive daytime sleepiness but there are no data assessing the role of sleepiness in road safety in patients with ADHD. We conducted an epidemiological study to explore sleep complaints, inattention and driving risks among automobile drivers.

METHODS AND FINDINGS:

From August to September 2014, 491186 regular highway users were invited to participate in an Internet survey on driving habits. 36140 drivers answered a questionnaire exploring driving risks, sleep complaints, sleepiness at the wheel, ADHD symptoms (Adult ADHD Self-Report Scale) and distraction at the wheel. 1.7% of all drivers reported inattention-related driving accidents and 0.3% sleep-related driving accidents in the previous year. 1543 drivers (4.3%) reported ADHD symptoms and were more likely to report accidents than drivers without ADHD symptoms (adjusted OR = 1.24, [1.03-1.51], $p < .021$). 14.2% of drivers with ADHD symptoms reported severe excessive daytime sleepiness (Epworth Sleepiness Scale >15) versus 3.2% of drivers without ADHD symptoms and 20.5% reported severe sleepiness at the wheel versus 7.3%. Drivers with ADHD symptoms reported significantly more sleep-related (adjusted OR = 1.4, [1.21-1.60], $p < .0001$) and inattention-related (adjusted OR = 1.9, [1.71-2.14], $p < .0001$) near misses than drivers without ADHD symptoms. The fraction of

near-misses attributable to severe sleepiness at the wheel was 4.24% for drivers without ADHD symptoms versus 10,35% for drivers with ADHD symptoms.

CONCLUSION:

Our study shows that drivers with ADHD symptoms have more accidents and a higher level of sleepiness at the wheel than drivers without ADHD symptoms. Drivers with ADHD symptoms report more sleep-related and inattention-related near misses, thus confirming the clinical importance of exploring both attentional deficits and sleepiness at the wheel in these drivers. Road safety campaigns should be improved to better inform drivers of these accidental risks.

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9. ***Watling CN, Armstrong KA, Radun I. EXAMINING SIGNS OF DRIVER SLEEPINESS, USAGE OF SLEEPINESS COUNTERMEASURES AND THE ASSOCIATIONS WITH SLEEPY DRIVING BEHAVIOURS AND INDIVIDUAL FACTORS. *Accid Anal Prev.* 2015 Dec;85:22-9. doi: 10.1016/j.aap.2015.08.022. Epub 2015 Sep 10.***

The impairing effect from sleepiness is a major contributor to road crashes. The ability of a sleepy driver to perceive their level of sleepiness is an important consideration for road safety as well as the type of sleepiness countermeasure used by drivers as some sleepiness countermeasures are more effective than others. The aims of the current study were to determine the extent that the signs of driver sleepiness were associated with sleepy driving behaviours, as well as determining which individual factors (demographic, work, driving, and sleep-related factors) were associated with using a roadside or in-vehicle sleepiness countermeasure. A sample of 1518 Australian drivers from the Australian State of New South Wales and the neighbouring Australian Capital Territory took part in the study. The participants' experiences with the signs of sleepiness were reasonably extensive. A number of the early signs of sleepiness (e.g., yawning, frequent eye blinks) were related with continuing to drive while sleepy, with the more advanced signs of sleepiness (e.g., difficulty keeping eyes open, dreamlike state of consciousness) associated with having a sleep-related close call. The individual factors associated with using a roadside sleepiness countermeasure included age (being older), education (tertiary level), difficulties getting to sleep, not continuing to drive while sleepy, and having experienced many signs of sleepiness. The results suggest that these participants have a reasonable awareness and experience with the signs of driver sleepiness. Factors related to previous experiences with sleepiness were associated with Implementing a roadside countermeasure. Nonetheless, the high proportions of drivers performing sleepy driving behaviours suggest that concerted efforts are needed with road safety campaigns regarding the dangers of driving while sleepy.

10. Thiese MS, Moffitt G, Hanowski RJ, Kales SN, Porter RJ, Hegmann KT. REPEATED CROSS-SECTIONAL ASSESSMENT OF COMMERCIAL TRUCK DRIVER HEALTH. *J Occup Environ Med.* 2015 Sep;57(9):1022-7. doi: 0.1097/JOM.0000000000000522.

OBJECTIVE:

To assess relationships and trends over time in individual conditions and multiple conditions among a large sample of independent, nonoverlapping truck drivers using a repeated cross-sectional study design.

METHODS:

Commercial driver medical examinations were conducted on 95,567 commercial drivers between January 1, 2005, and October 31, 2012. Specific medical conditions that have been identified by the Federal Motor Carrier Safety Administration's Medical Review Board as possibly increasing crash risk were examined. Prevalence and trends over time were analyzed.

RESULTS:

A total of 8 of the 13 conditions significantly increased from 2005 to 2012. Prevalence of multiple concomitant conditions also increased, with prevalence odds ratios as high as 7.39 (95% confidence interval, 3.92 to 13.98) for four or more conditions in 2012 as compared with 2005.

CONCLUSIONS:

Individual and multiple conditions thought to be associated with increased crash risk significantly increased between 2005 and 2012.

11. Li G, Chung WY. A CONTEXT-AWARE EEG HEADSET SYSTEM FOR EARLY DETECTION OF DRIVER DROWSINESS. *Sensors (Basel).* 2015 Aug 21;15(8):20873-93. doi: 10.3390/s150820873.

Driver drowsiness is a major cause of mortality in traffic accidents worldwide. Electroencephalographic (EEG) signal, which reflects the brain activities, is more directly related to drowsiness. Thus, many Brain-Machine-Interface (BMI) systems have been proposed to detect driver drowsiness. However, detecting driver drowsiness at its early stage poses a major practical hurdle when using existing BMI systems. This study proposes a context-aware BMI system aimed to detect driver drowsiness at its early stage by enriching the EEG data with the intensity of head-movements. The proposed system is carefully designed for low-power consumption with on-chip feature extraction and low energy Bluetooth connection. Also, the proposed system is implemented using JAVA programming language as a mobile application for on-line analysis. In total, 266 datasets obtained from six subjects who participated in a one-hour monotonous driving simulation experiment were used to evaluate this system. According to a video-based reference, the proposed system obtained an overall detection accuracy of 82.71% for classifying alert and slightly drowsy events by using EEG data alone and 96.24% by using the hybrid data of head-movement and

EEG. These results indicate that the combination of EEG data and head-movement contextual information constitutes a robust solution for the early detection of driver drowsiness.

- 12. Jackson ML, Raj S, Croft RJ, Hayley AC, Downey LA, Kennedy GA, Howard ME. SLOW EYELID CLOSURE AS A MEASURE OF DRIVER DROWSINESS AND ITS RELATIONSHIP TO PERFORMANCE. *Traffic Inj Prev.*2016;17(3):251-7.doi: 10.1080/15389588.2015.1055327. Epub 2015 Jun 11**

OBJECTIVE:

Slow eyelid closure is recognized as an indicator of sleepiness in sleep-deprived individuals, although automated ocular devices are not well validated. This study aimed to determine whether changes in eyelid closure are evident following acute sleep deprivation as assessed by an automated device and how ocular parameters relate to performance after sleep deprivation.

METHODS:

Twelve healthy professional drivers (45.58 ± 10.93 years) completed 2 randomized sessions: After a normal night of sleep and after 24 h of total sleep deprivation. Slow eye closure (PERCLOS) was measured while drivers performed a simulated driving task.

RESULTS:

Following sleep deprivation, drivers displayed significantly more eyelid closure ($P < .05$), greater variation in lane position ($P < .01$) and more attentional lapses ($P < .05$) compared to after normal sleep. PERCLOS was moderately associated with variability in both vigilance performance ($r = 0.68$, $P < .05$) and variation in lane position on the driving task ($r = 0.61$, $P < .05$).

CONCLUSIONS:

Automated ocular measurement appears to be an effective means of detecting impairment due to sleep loss in the laboratory.

- 13. Pizza F, Jaussent I, Lopez R, Pesenti C, Plazzi G, Drouot X, Leu-Semenescu S, Beziat S, Arnulf I, Dauvilliers Y. CAR CRASHES AND CENTRAL DISORDERS OF HYPERSOMNOLENCE: A FRENCH STUDY. *PLoS One.* 2015 Jun 8;10(6):e0129386. doi: 10.1371/journal.pone.0129386. eCollection 2015.**

BACKGROUND:

Drowsiness compromises driving ability by reducing alertness and attentiveness, and delayed reaction times. Sleep-related car crashes account for a considerable proportion of

accident at the wheel. Narcolepsy type 1 (NT1), narcolepsy type 2 (NT2) and idiopathic hypersomnia (IH) are rare central disorders of hypersomnolence, the most severe causes of sleepiness thus being potential dangerous conditions for both personal and public safety with increasing scientific, social, and political attention. Our main objective was to assess the frequency of recent car crashes in a large cohort of patients affected with well-defined central disorders of hypersomnolence versus subjects from the general population.

METHODS:

We performed a cross-sectional study in French reference centres for rare hypersomnia diseases and included 527 patients and 781 healthy subjects. All participants included needed to have a driving license, information available on potential accident events during the last 5 years, and on potential confounders; thus analyses were performed on 282 cases (71 IH, 82 NT2, 129 NT1) and 470 healthy subjects.

RESULTS:

Patients reported more frequently than healthy subjects the occurrence of recent car crashes (in the previous five years), a risk that was confirmed in both treated and untreated subjects at study inclusion (Untreated, OR = 2.21 95%CI = [1.30-3.76], Treated OR = 2.04 95%CI = [1.26-3.30]), as well as in all disease categories, and was modulated by subjective sleepiness level (Epworth scale and naps). Conversely, the risk of car accidents of patients treated for at least 5 years was not different to healthy subjects (OR = 1.23 95%CI = [0.56-2.69]). Main risk factors were analogous in patients and healthy subjects.

CONCLUSION:

Patients affected with central disorders of hypersomnolence had increased risk of recent car crashes compared to subjects from the general population, a finding potentially reversed by long-term treatment.

14. **Dijk DJ. FALLING ASLEEP AT THE WHEEL ACROSS EUROPE. *J Sleep Res.* 2015 Jun;24(3):241. doi: 10.1111/jsr.12310.**

Miscellaneous disorders – Older drivers

1. **RESEARCH OPPORTUNITIES IN THE AREA OF DRIVING AND COMMUNITY MOBILITY FOR OLDER ADULTS.** *Am J Occup Ther.* 2016 Jul-Aug;70(4):7004400010p1-2. doi:10.5014/ajot.2016.704001.

The American Occupational Therapy Association (AOTA) Evidence-Based Practice Project has developed a table summarizing the research opportunities in the area of driving and community mobility for older adults. The table provides an overview of the state of current available evidence on interventions within the scope of occupational therapy practice and is based on the systematic reviews from the AOTA Practice Guidelines Series. Researchers, students, and clinicians can use this information in developing innovative research to answer important questions within the occupational therapy field.

2. **Schneebeli M. FITNESS TO DRIVE UNDER TRAFFIC OPHTHALMOLOGICAL ASPECTS IN ELDERLY DRIVERS.** *Ther Umsch.* 2016;73(2):91-7. doi: 10.1024/0040-5930/a000762.

The Federal Roads Office (FEDRO), Switzerland's federal authority carries responsibility for the action program "Via Sicura" in order to reduce drastically the number of road traffic fatalities and serious injuries on Swiss roads. The revision of the VZV (Verkehrszulassungsverordnung) included in this program will come in to force on 1. July 2016. On that account the legal medical requirements for driver will be renewed. In particular, the requirements for vision (visual acuity, visual field) will be adjusted to international standards. Due to demographic changes the number of elderly drivers with old age (85 – 90+) with eye associated diseases increases. Therefore, questions concerning traffic ophthalmological problems have to be increasingly considered within traffic medical assessments. The driver's vision in traffic's safety must enable him to perceive relevant information, process information quickly and perform an adequate reaction in time, even if visibility is limited (e. g. due to rain, night, darkness) or in the presence of physical or psychical constraints.

15. **Chihuri S, Mielenz TJ, DiMaggio CJ, Betz ME, DiGuseppi C, Jones VC, Li G. DRIVING CESSATION AND HEALTH OUTCOMES IN OLDER ADULTS.** *J Am Geriatr Soc.* 2016 Feb;64(2):332-41. doi: 10.1111/jgs.13931. Epub 2016 Jan 19.

OBJECTIVES:

To determine what effect driving cessation may have on subsequent health and well-being in older adults.

DESIGN:

Systematic review of the evidence in the research literature on the consequences of driving cessation in older adults.

SETTING:

Community.

PARTICIPANTS:

Drivers aged 55 and older.

MEASUREMENTS:

Studies pertinent to the health consequences of driving cessation were identified through a comprehensive search of bibliographic databases. Studies that presented quantitative data for drivers aged 55 and older; used a cross-sectional, cohort, or case-control design; and had a comparison group of current drivers were included in the review.

RESULTS:

Sixteen studies met the inclusion criteria. Driving cessation was reported to be associated with declines in general health and physical, social, and cognitive function and with greater risks of admission to long-term care facilities and mortality. A meta-analysis based on pooled data from five studies examining the association between driving cessation and depression revealed that driving cessation almost doubled the risk of depressive symptoms in older adults (summary odds ratio = 1.91, 95% confidence interval = 1.61-2.27).

CONCLUSION:

Driving cessation in older adults appears to contribute to a variety of health problems, particularly depression. These adverse health consequences should be considered in making the decision to cease driving. Intervention programs ensuring mobility and social functions may be needed to mitigate the potential adverse effects of driving cessation on health and well-being in older adults.

4. Davis J, Conlon E, Ownsworth T, Morrissey S. MEASURING SITUATIONAL AVOIDANCE IN OLDER DRIVERS: AN APPLICATION OF RASCH ANALYSIS. *Accid Anal Prev.* 2016 Feb;87:68-77. doi: 10.1016/j.aap.2015.11.018. Epub 2015 Nov 29.

Situational avoidance is a form of driving self-regulation at the strategic level of driving behaviour. It has typically been defined as the purposeful avoidance of driving situations perceived as challenging or potentially hazardous. To date, assessment of the psychometric properties of existing scales that measure situational avoidance has been sparse. This study examined the contribution of Rasch analysis to the situational avoidance construct. Three hundred and ninety-nine Australian drivers (M=66.75, SD=10.14, range: 48-91 years) completed the Situational Avoidance Questionnaire (SAQ). Following removal of the item Parallel Parking, the scale conformed to a Rasch model, showing good person separation, sufficient reliability, little disordering of thresholds, and no evidence of differential item functioning by age or gender. The residuals were independent supporting the assumption of unidimensionality and in conforming to a Rasch model, SAQ items were found to be hierarchical or cumulative. Increased avoidance was associated with factors known to be related to driving self-regulation more broadly, including older age, female

gender, reduced driving space and frequency, reporting a change in driving in the past five years and poorer indices of health (i.e., self-rated mood, vision and cognitive function). Overall, these results support the use of the SAQ as a psychometrically sound measure of situational avoidance. Application of Rasch analysis to this area of research advances understanding of the driving self-regulation construct and its practice by drivers in baby boomer and older adult generations.

5. Vaucher P, Pasche C, Favrat B. TECHNICAL COMMENT ON "SACCADIC EYE MOVEMENT PERFORMANCE AS AN INDICATOR OF DRIVING ABILITY IN ELDERLY DRIVERS". *Swiss Med Wkly.* 2015 Oct 27;145:w14194. doi: 10.4414/smw.2015.14194. eCollection 2015.

6. Schmitt KU, Seeger R, Fischer H, Lanz C, Muser M, Walz F, Schwarz U. Reply to: Technical Comment on "Saccadic eye movement performance as an indicator of driving ability in elderly drivers". *Swiss Med Wkly.* 2015 Oct 27;145:w14195. doi: 10.4414/smw.2015.14195. eCollection 2015.

7. Papandonatos GD, Ott BR, Davis JD, Barco PP, Carr DB. CLINICAL UTILITY OF THE TRAIL-MAKING TEST AS A PREDICTOR OF DRIVING PERFORMANCE IN OLDER ADULTS. *J Am Geriatr Soc.* 2015 Nov;63(11):2358-64. doi: 10.1111/jgs.13776. Epub 2015 Oct 27.

OBJECTIVES:

To assess the clinical utility of the Trail-Making Tests (TMTs) as screens for impaired road-test performance.

DESIGN:

Secondary analyses of three data sets from previously published studies of impaired driving in older adults

SETTING:

Two academic driving specialty clinics.

PARTICIPANTS:

Older drivers (N = 392; 303 with cognitive impairment, 89 controls) from Rhode Island and Missouri.

MEASUREMENTS:

Standard operating characteristics were evaluated for the TMT Part A (TMT-A) and Part B (TMT-B), as well as optimal upper and lower test cut-points that could be useful in defining groups of drivers with indeterminate likelihood of impaired driving who would most benefit from further screening or on-road testing.

RESULTS:

Discrimination remained high (>70%) when cut-points for the TMTs derived from Rhode Island data were applied to Missouri data, but calibration was poor (all $P < .01$). TMT-A provided the best utility for determining a range of scores (68-90 seconds) for which additional road testing would be indicated in general practice settings. A high frequency of cognitively impaired participants unable to perform the TMT-B test within the allotted time limited the utility of the test (>25%). Mere inability to complete the test in a reasonable time frame (e.g., TMT-A > 48 seconds or TMT-B > 108 seconds) may still be a useful tool in separating unsafe from safe or marginal drivers in such samples.

CONCLUSION:

The TMTs (particularly TMT-A) may be useful as screens for driving impairment in older drivers in general practice settings, where most people are still safe drivers, but more-precise screening measures need to be analyzed critically in a variety of clinical settings for testing cognitively impaired older drivers.

8. Jones Ross RW, Scialfa CT, Cordazzo ST. PREDICTING ON-ROAD DRIVING PERFORMANCE AND SAFETY IN COGNITIVELY IMPAIRED OLDER ADULTS. *J Am Geriatr Soc.* 2015 Nov;63(11):2365-9. doi: 10.1111/jgs.13712. Epub 2015 Oct 27.

OBJECTIVES:

To evaluate the ability to predict on-road driving in cognitively impaired older drivers.

DESIGN:

Cross-sectional observational study.

SETTING:

Laboratory tests and on-road assessment.

PARTICIPANTS:

Drivers with cognitive impairment (Mini-Mental State Examination score < 26, N = 43, mean age 74).

MEASUREMENTS:

The Roadwise Review, a hazard perception test (HPT), several vision tests, and a standardized 18-km driving assessment.

RESULTS:

The best prediction of passing or failing the on-road test was a combination of the HPT, leg strength, visual acuity, visual search and working memory, and number of medications taken (Nagelkerke coefficient of determination = 0.40). The sensitivity of the model was 71%, and the specificity was 75%.

CONCLUSION:

Further research is required to determine how these tests may be used or combined with other data (e.g., medical history) to assess fitness to drive of cognitively impaired older drivers.

9. ***Kwon M, Huisinigh C, Rhodes LA, McGwin G Jr, Wood JM, Owsley C. ASSOCIATION BETWEEN GLAUCOMA AND AT-FAULT MOTOR VEHICLE COLLISION INVOLVEMENT AMONG OLDER DRIVERS: A POPULATION-BASED STUDY. Ophthalmology. 2016 Jan;123(1):109-16. doi:0.1016/j.ophtha.2015.08.043. Epub 2015 Oct 14.***

OBJECTIVE:

To examine the association between glaucoma and motor vehicle collision (MVC) involvement among older drivers, including the role of visual field impairment that may underlie any association found.

DESIGN:

A retrospective, population-based study.

PARTICIPANTS:

A sample of 2000 licensed drivers aged ≥ 70 years who reside in north central Alabama.

METHODS:

At-fault MVC involvement over the 5 years before enrollment was obtained from state records. Three aspects of visual function were measured: habitual binocular distance visual acuity, binocular contrast sensitivity (CS), and the binocular driving visual field constructed from combining the monocular visual fields of each eye. Poisson regression was used to calculate crude and adjusted rate ratios (RRs) and 95% confidence intervals (CIs).

MAIN OUTCOMES MEASURES:

At-fault MVC involvement over the 5 years before enrollment.

RESULTS:

Drivers with glaucoma (n = 206) had a 1.65 times higher MVC rate (95% CI, 1.20-2.28; P = 0.002) compared with those without glaucoma after adjusting for age, and mental status. Among those with glaucoma, drivers with severe visual field loss had higher MVC rates (RR, 2.11; 95% CI, 1.09-4.09; P = 0.027), whereas no association was found among those with impaired visual acuity and CS. When the visual field was subdivided into 6 regions (upper, lower, left, and right visual fields; horizontal and vertical meridians), we found that

impairment in the left, upper, or lower visual field was associated with higher MVC rates, and an impaired left visual field showed the highest RR (3.16; P = 0.001) compared with other regions. However, no association was found in deficits in the right side or along the horizontal or vertical meridian.

CONCLUSIONS:

A population-based study suggests that older drivers with glaucoma are more likely to have a history of at-fault MVC involvement than those without glaucoma. Impairment in the driving visual field in drivers with glaucoma seems to have an independent association with at-fault MVC involvement, whereas visual acuity and CS impairments do not.

10. Chen KB, Xu X, Lin JH, Radwin RG. EVALUATION OF OLDER DRIVER HEAD FUNCTIONAL RANGE OF MOTION USING PORTABLE IMMERSIVE VIRTUAL REALITY. *Exp Gerontol.* 2015 Oct;70:150-6. doi: 10.1016/j.exger.2015.08.010. Epub 2015 Aug 24.

BACKGROUND:

The number of drivers over 65 years of age continues to increase. Although neck rotation range has been identified as a factor associated with self-reported crash history in older drivers, it was not consistently reported as indicators of older driver performance or crashes across previous studies. It is likely that drivers use neck and trunk rotation when driving, and therefore the functional range of motion (ROM) (i.e. overall rotation used during a task) of older drivers should be further examined.

OBJECTIVE:

Evaluate older driver performance in an immersive virtual reality, simulated, dynamic driving blind spot target detection task.

METHODS:

A cross-sectional laboratory study recruited twenty-six licensed drivers (14 young between 18 and 35 years, and 12 older between 65 to 75 years) from the local community. Participants were asked to detect targets by performing blind spot check movements while neck and trunk rotation was tracked. Functional ROM, target detection success, and time to detection were analyzed.

RESULTS:

In addition to neck rotation, older and younger drivers on average rotated their trunks 9.96° and 18.04°, respectively. The younger drivers generally demonstrated 15.6° greater functional ROM ($p < .001$), were nearly twice as successful in target detection due to target location ($p = .008$), and had 0.46 s less target detection time ($p = .016$) than the older drivers.

CONCLUSION:

Assessing older driver functional ROM may provide more comprehensive assessment of driving ability than neck ROM. Target detection success and time to detection may also be part of the aging process as these measures differed between driver groups.

- 11. Cicchino JB. WHY HAVE FATALITY RATES AMONG OLDER DRIVERS DECLINED? THE RELATIVE CONTRIBUTIONS OF CHANGES IN SURVIVABILITY AND CRASH INVOLVEMENT. *Accid Anal Prev.* 2015 Oct;83:67-73. doi: 10.1016/j.aap.2015.06.012. Epub 2015 Jul 26.**

OBJECTIVES:

This study examined the trend in fatality rates per vehicle miles traveled (VMT) among older drivers relative to middle-aged drivers and quantified the contributions of changes in crash involvement and survivability to this trend.

METHODS:

Using U.S. national databases, changes in driver deaths per crash involvement (marker of death risk when involved in a crash) and crash involvements per VMT (marker of crash risk) from 1995-1998 to 2005-2008 among older drivers aged 70 and over relative to changes among middle-aged drivers aged 35-54 were computed. The contributions of these components to the relative changes in older drivers' fatality rates per VMT were calculated using the decomposition methodology.

RESULTS:

Fatality rates per VMT declined more among older drivers than among middle-aged drivers over the study period. Relative to middle-aged drivers, drivers aged 75 and older experienced large declines in crash risk and modest declines in death risk. Relative declines in crash risk accounted for 68-74% of the larger decline in fatalities per VMT among drivers aged 75 and older compared with middle-aged drivers. Drivers aged 70-74 experienced modest relative declines in crash risk and death risk. Declines in death risk among drivers aged 75 and older relative to middle-aged drivers were much larger in side-impact crashes; improvements in crash survivability accounted for nearly half of the relative decline in fatality rates in these crashes. Relative survivability did not change significantly in frontal impacts. Higher death risk was more important than higher crash risk in explaining older drivers' elevated fatality rates per VMT relative to middle-aged drivers during 1995-1998, and the contribution of heightened death risk was even greater during 2005-2008.

CONCLUSIONS:

Many factors may have reduced crash involvements among drivers 75 and older, including changes in travel patterns, health, and roadway design. In side impacts, side airbags and reduced passenger vehicle incompatibility may have improved survivability for older drivers. Because excess fragility now makes an even larger contribution to older drivers' elevated fatality rates, future countermeasures that improve survivability can likely provide large benefits.

12. **Nozawa T, Taki Y, Kanno A, Akimoto Y, Ihara M, Yokoyama R, Kotozaki Y, Nouchi R, Sekiguchi A, Takeuchi H, Miyauchi CM, Ogawa T, Goto T, Sunda T, Shimizu T, Tozuka E, Hirose S, Nanbu T, Kawashima R. EFFECTS OF DIFFERENT TYPES OF COGNITIVE TRAINING ON COGNITIVE FUNCTION, BRAIN STRUCTURE, AND DRIVING SAFETY IN SENIOR DAILY DRIVERS: A PILOT STUDY. *Behav Neurol.* 2015;2015:525901. doi: 10.1155/2015/525901. Epub 2015 Jun 16.**

BACKGROUND:

Increasing proportion of the elderly in the driving population raises the importance of assuring their safety. We explored the effects of three different types of cognitive training on the cognitive function, brain structure, and driving safety of the elderly.

METHODS:

Thirty-seven healthy elderly daily drivers were randomly assigned to one of three training groups: Group V trained in a vehicle with a newly developed onboard cognitive training program, Group P trained with a similar program but on a personal computer, and Group C trained to solve a crossword puzzle. Before and after the 8-week training period, they underwent neuropsychological tests, structural brain magnetic resonance imaging, and driving safety tests.

RESULTS:

For cognitive function, only Group V showed significant improvements in processing speed and working memory. For driving safety, Group V showed significant improvements both in the driving aptitude test and in the on-road evaluations. Group P showed no significant improvements in either test, and Group C showed significant improvements in the driving aptitude but not in the on-road evaluations.

CONCLUSION:

The results support the effectiveness of the onboard training program in enhancing the elderly's abilities to drive safely and the potential advantages of a multimodal training approach.

13. **Vernon EK, Babulal GM, Head D, Carr D, Ghoshal N, Barco PP, Morris JC, Roe CM. ADULTS AGED 65 AND OLDER USE POTENTIALLY DISTRACTING ELECTRONIC DEVICES WHILE DRIVING. *J Am Geriatr Soc.* 2015 Jun;63(6):1251-4. doi: 10.1111/jgs.13499.**

14. **Stowe JD, Cooney TM, Bonne S, Meuser TM, Berg-Weger M, Schmidt N, Coughenour J. A RANDOMIZED CRASH INJURY PREVENTION TRIAL OF TRANSITIONING HIGH-RISK ELDERS FROM DRIVING. *J Trauma Acute Care Surg.* 2015 Jul;79(1):132-7; discussion 137. doi: 10.1097/TA.0000000000000690.**

BACKGROUND:

Older adults with medical conditions that impair function are at risk for experiencing a motor vehicle crash. This randomized controlled trial tested an intervention to reduce crash-related risk among older patients.

METHODS:

A 2-to-1 allocation ratio resulted in comparisons between 26 intervention and 13 attention control (n = 39) group members who were recruited from inpatient and outpatient settings. The intervention consisted of two sessions of facilitated planning in which participants' health, transportation alternatives, attitudes/emotions regarding a change in mobility, and actions to ensure continued safe mobility were discussed. Moreover, all participants received supportive telephone calls during the 6-month intervention period.

RESULTS:

Results showed that when compared with the control group, the intervention group had significantly better subjective health, had fewer high-risk driving behaviors, and drove less distance on excursions from home at follow-up. Yet, simple repeated-measures analyses were not significant.

CONCLUSION:

Results suggest that facilitated planning may help ease the transition to driving retirement among some high-risk older patients. Larger samples and longer study duration are needed to confirm these effects and to measure direct crash and injury outcomes. A significant proportion of high-risk patients do not plan for driving retirement and remain a crash risk.

LEVEL OF EVIDENCE:

Therapeutic/care management study, level III.

15. **Crandall M, Streams J, Duncan T, Mallat A, Greene W, Violano P, Christmas AB, Barraco R; MOTOR VEHICLE COLLISION-RELATED INJURIES IN THE ELDERLY: AN EASTERN ASSOCIATION FOR THE SURGERY OF TRAUMA EVIDENCE-BASED REVIEW OF RISK FACTORS AND PREVENTION. EASTERN ASSOCIATION FOR THE SURGERY OF TRAUMA INJURY CONTROL AND VIOLENCE PREVENTION COMMITTEE. *J Trauma Acute Care Surg.* 2015 Jul;79(1):152-8. doi: 10.1097/TA.0000000000000677.**

16. *Uribe-Leitz T, Barmak LA, Park A, Howland J, Lee V, Lodato E, Driscoll C, Dechert T, Burke PA. Trauma Acute Care Surg. 2015 Jul;79(1):125-31. doi:10.1097/TA.0000000000000695.*

Evaluating three methods to encourage mentally competent older adults to assess their driving behavior.

BACKGROUND:

Fourteen percent (43.1 million) of the population in the United States was 65 years and older in 2012. This population is projected to reach 20% (88.5 million) by 2050. Older adults accounted for 17% of all traffic fatalities and 9% of all vehicle occupant injuries in 2012. We explored the effectiveness of three interventions to help older adults assess their current driving behaviors at a Level 1 trauma center.

METHODS:

During 2010 to 2012, 1,216 inpatients 70 years and older admitted for surgical and medical services were screened for eligibility, and 120 were enrolled. Participants completed a driving assessment and preintervention questionnaires and were subsequently randomized to one of the following interventions: (1) brief negotiated interview plus an educational kit by the American Automobile Association about older driving plus an accompanying list of Web-based resources for older adult drivers; (2) American Automobile Association document and a list of Web-based resources; (3) online referral sheet of the list of Web-based resources only. A 3-month postintervention follow-up questionnaire was administered over the telephone to measure changes in (1) driving-related knowledge, attitudes, and beliefs as well as (2) driving-related behaviors and intended behaviors.

RESULTS:

A total of 113 randomized patients were included in the analysis. The mean (SD) age was 76.8 (5.23) years; majority of patients were white (64%), followed by black African American (33%); and 51% were males and 49% were females. Multivariate analysis showed that older adults' driving knowledge, attitudes, and beliefs ($p < 0.0001$, $R = 0.37$) as well as behaviors and intentions ($p < 0.0001$, $R = 0.27$) toward driving were positively correlated, controlling for other predictors in the model. Intervention assignment did not affect changes in outcomes, although outcomes improved across experimental conditions.

CONCLUSION:

Our pilot study suggests that older adults are likely to make changes in their driving behavior on the basis of minimal hospital-based intervention.

- 17. Casey CM, Salinas K, Eckstrom E. ELECTRONIC HEALTH RECORD TOOLS TO CARE FOR AT-RISK OLDER DRIVERS: A QUALITY IMPROVEMENT PROJECT. *Gerontologist*. 2015 Jun;55 Suppl 1:S128-39. doi: 10.1093/geront/gnv021.**

PURPOSE OF THE STUDY:

Evaluating driving safety of older adults is an important health topic, but primary care providers (PCP) face multiple barriers in addressing this issue. The study's objectives were to develop an electronic health record (EHR)-based Driving Clinical Support Tool, train PCPs to perform driving assessments utilizing the tool, and systematize documentation of assessment and management of driving safety issues via the tool.

DESIGN AND METHODS:

The intervention included development of an evidence-based Driving Clinical Support Tool within the EHR, followed by training of internal medicine providers in the tool's content and use. Pre- and postintervention provider surveys and chart review of driving-related patient visits were conducted. Surveys included self-report of preparedness and knowledge to evaluate at-risk older drivers and were analyzed using paired t-test. A chart review of driving-related office visits compared documentation pre- and postintervention including: completeness of appropriate focused history and exam, identification of deficits, patient education, and reporting to appropriate authorities when indicated.

RESULTS:

Data from 86 providers were analyzed. Pre- and postintervention surveys showed significantly increased self-assessed preparedness ($p < .001$) and increased driving-related knowledge ($p < .001$). Postintervention charts showed improved documentation of correct cognitive testing, more referrals/consults, increased patient education about community resources, and appropriate regulatory reporting when deficits were identified.

IMPLICATIONS:

Focused training and an EHR-based clinical support tool improved provider self-reported preparedness and knowledge of how to evaluate at-risk older drivers. The tool improved documentation of driving-related issues and led to improved access to interdisciplinary care coordination.

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- 18. Coxon K, Chevalier A, Lo S, Ivers R, Brown J, Keay L.. J BEHIND THE WHEEL: PREDICTORS OF DRIVING EXPOSURE IN OLDER DRIVERS. *Am Geriatr Soc*. 2015 Jun;63(6):1137-45. doi: 10.1111/jgs.13440. Epub 2015 Jun 1.**

OBJECTIVES:

To explore and deepen understanding of factors influencing driving exposure for older drivers.

DESIGN:

Cross-sectional.

SETTING:

Baseline data on function and driving exposure from 1 week of driving were evaluated.

PARTICIPANTS:

A convenience sample of 380 drivers aged 75 and older, residing in northwest Sydney, was recruited. Participants were required to be the primary drivers of their own vehicle.

MEASUREMENTS:

Driver function was evaluated using the DriveSafe and DriveAware clinic-based assessments to measure visual attention to the driving environment and awareness of driving ability. Demographic information was obtained through interview. An in-vehicle monitoring device with data logger and GPS receiver, was used to measure driving exposure in 362 of 380 participants' vehicles. Driving exposure outcomes were total distance driven, furthest distance traveled from home, and average trip length. Factors influencing these exposure outcomes were analyzed using generalized linear regression.

RESULTS:

Drivers typically drove 100 km in local and surrounding areas during the week. Function was predictive of all driving exposure outcomes. Drivers with lower levels of function drove fewer kilometers and took shorter trips closer to home. Age, health status, and personal circumstance (e.g., rural residence) also influenced exposure, but sex did not.

CONCLUSION:

Using objective measures, this study provides evidence that function, age, health status, and personal circumstance influence driving exposure of older drivers. Understanding how older people use driving to preserve their independence is important for exploring safe driving strategies for older people.

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19. ***Ichikawa M, Nakahara S, Taniguchi A. OLDER DRIVERS' RISKS OF AT-FAULT MOTOR VEHICLE COLLISIONS. *Accid Anal Prev.* 2015 Aug;81:120-3. doi: 10.1016/j.aap.2015.05.004. Epub 2015 May 14.***

In aging societies, increasing numbers of older drivers are involved in motor vehicle collisions (MVCs), and preserving their safety is a growing concern. In this study, we focused on whether older drivers were more likely to cause MVCs and injuries than drivers in other age groups. To do so we compared at-fault MVC incidence and resulting injury risks by drivers' ages, using data from Japan, a country with a rapidly aging population. The at-fault MVC incidence was calculated based on distance traveled made for non-commercial purposes, and the injury risks posed to at-fault drivers and other road users per at-fault MVCs. We used MVC data for 2010 from the National Police Agency of Japan and driving exposure data from the Nationwide Person Trip Survey conducted by a Japanese governmental ministry in 2010. The at-fault MVC incidence showed a U-shaped curve across the drivers' ages, where teenage and the oldest drivers appeared to be the highest risk groups in terms of causing MVCs, and the incidence was higher for female

drivers after age 25. The injury risk older drivers posed to other vehicle occupants because of their at-fault MVCs was lower than for drivers in other age groups, while their own injury risk appeared much higher. As the number of older drivers is increasing, efforts to reduce their at-fault MVCs appear justified.

20. Nef T, Bieri R, Müri RM, Mosimann UP. NON-ILLNESS-RELATED FACTORS CONTRIBUTING TO TRAFFIC SAFETY IN OLDER DRIVERS: A LITERATURE REVIEW. *Exp Aging Res.* 2015;41(3):325-60. doi: 10.1080/0361073X.2015.1021650.

BACKGROUND/STUDY CONTEXT:

Older drivers are at increased risk of becoming involved in car crashes. Contrary to well-studied illness-related factors contributing to crash risk, the non-illness-related factors that can influence safety of older drivers are underresearched.

METHODS:

Here, the authors review the literature on non-illness-related factors influencing driving in people over age 60. We identified six safety-relevant factors: road infrastructure, vehicle characteristics, traffic-related knowledge, accuracy of self-awareness, personality traits, and self-restricted driving.

RESULTS:

The literature suggests that vehicle preference, the quality of traffic-related knowledge, the location and time of traffic exposure, and personality traits should all be taken into account when assessing fitness-to-drive in older drivers. Studies indicate that self-rating of driving skills does not reliably predict fitness-to-drive.

CONCLUSIONS:

Most factors discussed are adaptable or accessible to training and collectively may have the potential to increase traffic safety for older drivers and other road users.

21. Youngquist ST, Liao M, Hartsell S, Walker M, Kartchner NJ, Nirula R. ACUTE MEDICAL IMPAIRMENT AMONG ELDERLY PATIENTS INVOLVED IN MOTOR VEHICLE COLLISIONS. *Injury.* 2015 Aug;46(8):1497-502. doi: 10.1016/j.injury.2015.04.012. Epub 2015 Apr 28.

BACKGROUND:

The association between acute medical illness and motor vehicle collisions (MVCs) among elderly emergency department patients is unclear. We sought to determine the prevalence of acute medical conditions that might impair driving ability among the elderly involved in

MVCs and determine if there was an increased risk of the driver having an acute medical condition compared to similarly aged passengers.

METHODS:

We reviewed charts of patients aged 65 years or older whose emergency department visit was prompted by a motor vehicle collision between 1 July 2000 and 30 June 2010 at two Level 1 trauma centres. The exposure of interest was occupancy status (driver vs. passenger), and the outcome measure was the presence of any predefined acute medical illness that might impair driving ability.

RESULTS:

Final analysis included 871 drivers (cases) and 307 passengers (controls). An acute medical illness was recorded in 107 patients (9%): 97 drivers (11%) and 10 passengers (3%). Compared to passengers, drivers had significantly higher odds of presenting with acute medical illness (OR 3.7, 95% CI 1.9-7.2). After controlling for potential confounders, the adjusted odds ratio was 5.5 (95% CI 2.3-13.0).

CONCLUSION:

Acute medical conditions are a moderately common diagnosis among elderly drivers, presenting in about one in ten patients. A difference in the risk of finding an acute medical illness when comparing elderly drivers and passengers evaluated in the emergency department after a collision suggests the need for considering additional diagnostic investigation and post-discharge surveillance in this population.

22. Clarke PJ, Yan T, Keusch F, Gallagher NA. THE IMPACT OF WEATHER ON MOBILITY AND PARTICIPATION IN OLDER U.S. ADULTS. *Am J Public Health.* 2015 Jul;105(7):1489-94. doi: 10.2105/AJPH.2015.302582. Epub 2015 May 14.

OBJECTIVES:

We examined the impact of weather on the daily lives of US adults to understand which populations are most vulnerable to various weather conditions.

METHODS:

Data came from a 2013 supplement to the University of Michigan-Thomson Reuters Surveys of Consumers, a nationally representative telephone survey of 502 adults in the contiguous United States. We used logistic regressions to assess the odds of mobility difficulty and participation restriction during different weather conditions, as well as age group differences.

RESULTS:

Ice was most likely to change the way respondents got around (reported by 47%). In icy conditions, participants had difficulty leaving home (40%) and driving (35%). Facing ice, older adults (≥ 65 years) had twice the odds of having great difficulty leaving home (odds ratio [OR] = 2.22; 95% confidence interval [CI] = 1.12, 4.42) and curtailing work or volunteer

activities (OR = 2.01; 95% CI = 1.01, 4.06), and 3 times the odds of difficulty driving (OR = 3.33; 95% CI = 1.62, 6.86) as younger respondents. We also found significant differences in mobility and participation by gender and region of residence.

CONCLUSIONS:

Weather can affect social isolation, health, well-being, and mortality among older US adults.

Miscellaneous conditions - Orthopedics

1. *DiSilvestro KJ, Santoro AJ, Tjoumakaris FP, Levicoff EA, Freedman KB. WHEN CAN I DRIVE AFTER ORTHOPAEDIC SURGERY? A SYSTEMATIC REVIEW. Clin Orthop Relat Res. 2016 Aug 4. Epub ahead of print*

BACKGROUND:

Patients often ask their doctors when they can safely return to driving after orthopaedic injuries and procedures, but the data regarding this topic are diverse and sometimes conflicting. Some studies provide observer-reported outcome measures, such as brake response time or simulators, to estimate when patients can safely resume driving after surgery, and patient survey data describing when patients report a return to driving, but they do not all agree. We performed a systematic review and quality appraisal for available data regarding when patients are safe to resume driving after common orthopaedic surgeries and injuries affecting the ability to drive.

QUESTIONS/PURPOSES:

Based on the available evidence, we sought to determine when patients can safely return to driving after (1) lower extremity orthopaedic surgery and injuries; (2) upper extremity orthopaedic surgery and injuries; and (3) spine surgery.

METHODS:

A search was performed using PubMed and EMBASE[®], with a list of 20 common orthopaedic procedures and the words "driving" and "brake". Selection criteria included any article that evaluated driver safety or time to driving after major orthopaedic surgery or immobilization using observer-reported outcome measures or survey data. A total of 446 articles were identified from the initial search, 48 of which met inclusion criteria; abstract-only publications and non-English-language articles were not included. The evidence base includes data for driving safety on foot, ankle, spine, and leg injuries, knee and shoulder arthroscopy, hip and knee arthroplasty, carpal tunnel surgery, and extremity immobilization. Thirty-four of the articles used observer-reported outcome measures such as total brake time, brake response time, driving simulator, and standardized driving track results, whereas the remaining 14 used survey data.

RESULTS:

Observer-reported outcome measures of total brake time, brake response time, and brake force postoperatively suggested patients reached presurgical norms 4 weeks after right-sided procedures such as TKA, THA, and ACL reconstruction and approximately 1 week after left-sided TKA and THA. The collected survey data suggest patients resumed driving 1 month after right-sided and left-sided TKAs. Patients who had THA reported returning to driving between 6 days and 3 months postoperatively. Observer-reported outcome measures showed that patients' driving abilities often are impaired when wearing an immobilizing cast above or below the elbow or a shoulder sling on their dominant arm. Patients reported a return to driving on average 2 months after rotator cuff repair procedures and approximately 1-3 months postoperatively for total shoulder arthroplasties. Most patients with spine surgery had normal brake response times at the time of hospital discharge. Patients reported driving 6 weeks after total disc arthroplasty and anterior cervical discectomy and fusion procedures.

CONCLUSIONS:

The available evidence provides a best-case scenario for when patients can return to driving. It is important for observer-reported outcome measures to have normalized before a patient can consider driving, but other factors such as strength, ROM, and use of opioid analgesics need to be considered. This review can provide a guideline for when physicians can begin to consider evaluating these other factors and discussing a return to driving with patients. Survey data suggest that patients are returning to driving before observer-reported outcome measures have normalized, indicating that physicians should tell patients to wait longer before driving. Further research is needed to correlate observer-reported outcome measures with adverse events, such as motor vehicle accidents, and clinical tests that can be performed in the office.

LEVEL OF EVIDENCE:

Level III, therapeutic study.

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- Jordan M, Hofmann UK, Rondak I, Götze M, Kluba T, Ipach I. BRAKE RESPONSE TIME IS SIGNIFICANTLY IMPAIRED AFTER TOTAL KNEE ARTHROPLASTY: INVESTIGATION OF PERFORMING AN EMERGENCY STOP WHILE DRIVING A CAR. Am J Phys Med Rehabil. 2015 Sep;94(9):665-76. doi: 10.1097/PHM.0000000000000342.***

OBJECTIVE:

The objective of this study was to investigate whether total knee arthroplasty (TKA) impairs the ability to perform an emergency stop.

DESIGN:

An automatic transmission brake simulator was developed to evaluate total brake response time. A prospective repeated-measures design was used. Forty patients (20 left/20 right) were measured 8 days and 6, 12, and 52 wks after surgery.

RESULTS:

Eight days postoperative total brake response time increased significantly by 30% in right TKA and insignificantly by 2% in left TKA. Brake force significantly decreased by 35% in right TKA and by 25% in left TKA during this period. Baseline values were reached at week 12 in right TKA; the impairment of outcome measures, however, was no longer significant at week 6 compared with preoperative values. Total brake response time and brake force in left TKA fell below baseline values at weeks 6 and 12. Brake force in left TKA was the only outcome measure significantly impaired 8 days postoperatively.

CONCLUSION:

This study highlights that categorical statements cannot be provided. This study's findings on automatic transmission driving suggest that right TKA patients may resume driving 6 wks postoperatively. Fitness to drive in left TKA is not fully recovered 8 days postoperatively. If testing is not available, patients should refrain from driving until they return from rehabilitation.