OVER THE PAST DECADE OR MORE, THERE HAS BEEN INCREASING AWARENESS ABOUT THE EFFECTS OF ALERTNESS ON PUBLIC SAFETY; MANY LARGE disasters having their origins in part due to sleepiness (3 Mile Island, Exxon Valdez, Challenger shuttle, etc). 

Both the lay press and the scientific literature are replete with reports about the importance of recognizing, treating and preventing excessive daytime sleepiness, all in the interests of improved public safety.

Reduced alertness, vigilance and sleepiness have been implicated in increased errors, mishaps and accidents in many settings, including industrial workplaces, on the roads and other transportation areas and most recently in hospitals and intensive care units. The problem of motor vehicle collisions in sleepy patients has been an active area of research since the late 1980s when reports of increased motor vehicle collisions in sleep apnea patients were first highlighted. Subsequent research has focused on various measures in an effort to characterize and quantify impairments as a means to predict (and thereby hopefully prevent) motor vehicle collisions. The use of driving simulators as an assessment tool has become popular because they provide a safe, controllable and low cost environment in which to assess effects of sleepiness on driving. While data show a consistent effect of sleepiness on driving and simulated driving performance, the role of these simulators in day-to-day clinical practice is still evolving. It may, therefore, be argued that measuring sleepiness proximal to the driving task (using the Multiple Sleep Latency Test [MSLT] or the Maintenance of Wakefulness Test [MWT]) could provide a suitable, easier and more widely available means to determine risk in a vigilance-sensitive situation.

The paper by Banks et al in the issue examines this notion, in part, by examining the ability of the MWT to predict driving-simulator performance in healthy individuals. Twenty subjects completed a driving simulation task (at 0100 hours) and 2 40-minute MWT trials, 1 before and 1 after the driving task. Subjects were examined under conditions of partial sleep deprivation and a combination of partial sleep deprivation and alcohol consumption, 1 week apart.

In the sleep-deprived condition, the sleep latency on the first MWT was inversely correlated with braking reaction time while during the partial sleep deprivation plus alcohol condition, the number of microsleeps during the driving task, steering deviation, braking reaction time and crashes all negatively correlated with the first MWT sleep latency. Using a receiver-operator characteristic curve, the authors found that first MWT sleep latency in the partial sleep deprivation plus alcohol condition significantly discriminated subjects who had a crash from those who did not. They conclude that sleep latency on the MWT is a reasonable predictor of driving simulator performance at least in sleepy, alcohol-impaired, normal subjects.

While it is reassuring that impairment due to combined effects of sleepiness and alcohol can be detected by their driving simulator and that MWT tracks this impairment reasonably well, the applicability of these results is far from clear. Only 1 (albeit fairly important) driving simulator measure (braking reaction time) was significantly correlated with MWT whereas many more were brought out by the additive (and/or synergistic) effect of alcohol. It is already established that mild sleepiness is exaggerated by low dose alcohol and while the results may then apply to cases where both condition apply, many motor vehicle collisions occur without any alcohol involved. Moreover, peak accident frequencies usually occur much later than 0100 hours, the time tested in this paradigm.

Like most studies, these results provide as many questions as answers. In particular, what is the MWT actually measuring and, more importantly, what is the relationship between off-road (e.g., simulator) performance or its correlates and on-road real world collisions. Even though there are many studies demonstrating that simulators can detect impairment in ostensibly sleepy patients, there is really no good data showing that such performance is predictive of real world driving performance.

According to the recent American Academy of Sleep Medicine practice parameter report, “The MWT 40 minute protocol may be used to assess an individual’s ability to remain awake when his or her inability to remain awake constitutes a public or personal safety issue.[6.2.6; 7.0] (Option).” However, there is little hard evidence for this is. Even if the MWT was positively correlated with simulator performance at any time of the day (not just at 0100h as in this paper), could we use this to assess driving risk? We need to remember that motor vehicle collisions are multifactorial and that subjects/patients need not fall asleep to have a mishap. More importantly, determining ability to stay awake at the time of the test may have little or no relationship to when the subject will actually be driving. In other words, sleepiness may not be consistent hour to hour or day to day and can be influenced by multiple factors including prior sleep, shift work, medications, and compliance with medical treatments (including CPAP). Finally, while the MWT typically shows a high sensitivity to acute sleep, severe sleep loss, its relationship to less severe or chronic sleep loss may not be as predictable.

Disclosure Statement
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Even though the predictive value of MWT mean sleep latency for assessing accident risk and safety in real world circumstances has not yet been established, the efforts of Banks et al are noteworthy because they highlight an area that still requires much more attention. The data on sleepiness and transportation accidents is overwhelming and despite ongoing education efforts by groups such as the National Sleep Foundation, many continue to ignore (or not recognize) their sleepiness and take to the roads nonetheless. Determining real-time sleepiness and the ability to stay awake and safely operate a motor vehicle must remain a priority for sleep and transportation researchers.

REFERENCES