Fatigue and drowsiness on short commuter trips

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Fatigue concept

- Fatigue: a biological drive for recuperative rest. To the extent that this drive remains unsatisfied, performance is impaired, and may influence the occurrence of an accident.
- Fatigue is affected by features of the task, the time of day, and the amount of time the person has spent awake.
- See Williamson et al, 2011
Drowsiness

- Drowsiness is the aspect of fatigue most akin to sleepiness: feelings of tiredness and that one is about to fall asleep. It can be measured as one index of a fatigued state.
Safety is safety is safety..?

• Tendency to fracture safety into sub types across many domains
• Workplace safety, passenger/client/ public safety, transport modes, infrastructure safety, public safety, road safety etc
• Share common background, and often interface with one another

At the crossroads

• Our project sits at the nexus of road and workplace safety
• Fatigue on commuter trips
  – Contributed to by work tasks, work hours
  – While undertaking work, or going to and from work
  – However, note changes to workers’ compensation in NSW regarding journey claims
Fatigued commuting in Aviation

• Contrasting views on responsibilities
  • Own responsibility to ensure fitness for duty, compared to
  • Colgan Crash 2009
    • NTSB: “Operators have a responsibility to identify risks associated with commuting, implementing strategies to mitigate these risks and ensure that their commuting pilots are fit for duty”

• Nat. Acad Sciences 2011: not enough evidence on role of commuting on fatigue or whether commuting should be regulated

• Inspector General Audit report Sept 2011
  – FAA should collect and analyse data on commuting to determine if any changes are needed to fatigue risk management systems
Background to our study

• Long trips have traditionally been the focus of fatigue interventions/education

• Evidence to suggest that a high proportion of fatigue accidents occur
  • on trips of a short planned duration
  • in cities rather than long regional drives (about 36%) (Fell & Black, 1997)

• Contributing factors: Long work hours, after work events, sleep debt

Occupational groups

• Several studies highlight particular occupational groups who experience drowsy driving episodes on short trips

• Eg. Nurses (66% have a drowsy episode in a two week study period; mean trip length 27min; Scott et al 2007)

• See also Dorrian et al 2008; Barger et al., 2005 (medical interns)
Road accidents at work

- Vehicle accidents accounted for 36% of compensated workplace fatalities in Australia in 2008-9 (Safe Work Australia, 2011).
- Vehicle accidents at work also resulted in the second highest amount of time off work, and the third highest median compensation payment, compared to other mechanisms of injury (Safe Work Australia, 2011).

Driver fatigue is a workplace concern also
- Professional drivers and commuters
- Short haul truckers: 38% experienced fatigue at least once a week; 45% had nodded off while driving in the last 12 months (Friswell & Williamson, 2008)
Work related fatigue accidents

- Williamson & Boufous, 2007: matching workplace injury and road injury datasets
- 13,124 work-related road fatalities in NSW from 1998-2002
  - 6.3% of these were fatigue related
  - But there are major limitations in how fatigue is assigned as a cause: essentially, the absence of other factors

- Work-related fatigue crashes more costly, and more serious, than non-fatigue work crashes
- Best measurement/classification of a fatigue related crash is an ongoing issue
Research gaps

- Reliance on self-reported fatigue
  - Doubt as to whether people can reliably notice and respond to fatigue levels and take action before adverse event (Kaplan et al 2008)
  - Need more objective measures
- Lack of measurement of the impact of fatigue on performance on short trips

Approach

- Driving simulator work
- Short trips (45min) to mimic commuter trips, early in the morning and in the early evening
- Participants who drive about 45minutes each way to work regularly
- Taxi vouchers and $50 shopping voucher
Indexing drowsiness: Optalert

- Device to measure drowsiness by detecting eyeblinks
- Converted using algorithm to give a score on the Johns Drowsiness Scale
- Can give visual and audio warnings when in drowsiness threshold (5 on JDS; warnings from 4.5).
- Currently used in trucking and mining industries
• N = 14 rested participants
• Morning and evening commute, counterbalanced order
• Practice session to account for learning effects
• Medium to high effect sizes (lowest Cohen’s $d = 0.63$)

• Not overly drowsy, as expected for rested participants
• Time on task effects, increased JDS and decreased performance over time
• Possible sleep inertia effects in impairing performance early in morning sessions
• Increased drowsiness on short trips associated with performance deficits – speed exceedances and lane crossings
Future conditions...

• Sleep deprived participants
• On-road instrumented car
• “Natural” sleep deprivation (shift workers), in instrumented car
• Switching from Optalert to Smarteye System
• Measurement of task performance between commutes

References

• Office of Inspector General (2011). FAA and industry are taking action to address pilot fatigue but more information on pilot commuting is needed. FAA AV-2011-176.
• Kaplan, KA., Itoi, A., & Dement, WC. (2008) Awareness of sleepiness and ability to predict sleep onset: Can drivers avoid falling asleep at the wheel? Sleep Medicine, 9, 71-79.