Research article

Sleepy driving in truck drivers: Insights from a self-report survey

Raymond Misa[1], Russell Conduit[2] and Grahame Coleman[2]

[1] *Transport Safety Victoria, Australia*
[2] *Monash University, Australia*

Abstract

Background: There is increasingly more evidence to indicate that many Australian truck drivers may be working while sleepy. However, relatively little is known about their sleepiness-related experiences or why sleepy drivers continue to drive. Aims: This study examined the subjective experience of sleepiness and the motivation of truck drivers at work, with particular focus on the behaviour of persevering with driving despite being sleepy. **Method:** Two hundred and fifty-five Australian professional truck drivers (245 males, 10 females, mean age of 43.60 years, average of 19.11 years experience) completed a self-report survey that was distributed at Australian truck stops and transport organisations. Drivers were asked to report on a variety of sleepiness-related experiences during the previous three months of their work. **Results:** The results revealed that 49% of drivers felt too sleepy to drive on at least half of their trips, while 40% reported falling asleep while driving at least once in the previous three months of work. A regression analysis indicated that several psychosocial factors were related to sleepy driving behaviour (i.e. continuing to drive when sleepy). These included impaired judgement, perceived work and social pressures, driver attitudes, and, most notably, perceived lack of control over work schedule. The frequency of sleepy driving was also associated with reported occurrences of impaired driving performance, dozing off whilst driving, near misses, and perceived accident risk. **Conclusions:** These findings provide new direction for further investigations of truck driver attitudes and behaviour, as well as the management of driver sleepiness.

Background

While the concepts of fatigue and sleepiness are often deemed to be closely related in both research and practice, fatigue has been more extensively researched in safety critical industries and is widely recognised as a major contributor to road transport accidents [1-3]. Indeed, it would be difficult to determine which fatigue-related incidents can be attributed to sleepiness, and much of the available research on fatigue is relevant to this study. With this in mind, the inquiry of the present study focused on drivers being sleepy or in a (subjective) state of needing sleep [4], which is likely to pose a significant threat to truck driver error or incapacitation on a public road.

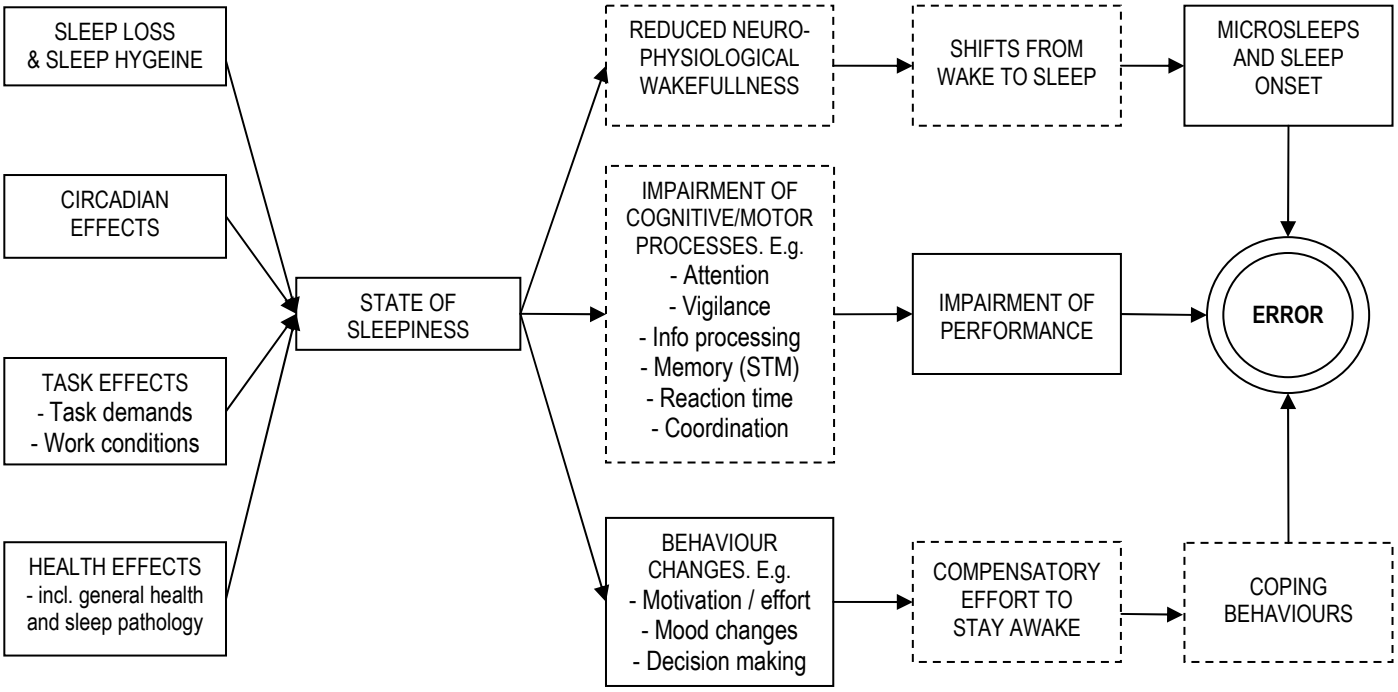
Investigations of sleepiness have typically involved laboratory studies using objective neurophysiological measures (e.g. polysomnography) and simulated driving tasks [5-7]. These studies have found falling asleep to be a gradual process that is preceded by a series of reliable physiological events [5,8-10]. As an individual becomes increasingly sleepy, intrusions of drowsiness give way to fluctuations between wake and the initial stages of sleep. During this period, arousal markedly decreases and compensatory effort to remain awake must be increased to fight sleep onset. As such efforts fail, the individual eventually succumbs to longer and more intense periods of sleep.

Studies that have used self-reports as subjective estimates of sleepiness suggest that drivers are able to gauge sleepiness levels reasonably accurately. Drivers' ratings on measures, such as the Karolinska Sleepiness Scale and the Epworth Sleepiness Scale, have been found to be closely related to objective indicators of sleepiness such as electroencephalography [11,12]. Moreover, drivers have been found to recognise a precursory state of feeling sleepy, but may underestimate the likelihood of falling asleep in such a state [13].

There is overwhelming empirical evidence that sleepiness is deleterious to cognitive performance [14], although these performance effects depend on the nature of the task and factors such as the level of novelty, complexity, uncertainty, knowledge, and experience [4]. Sleepiness has been found to have adverse effects on attention, vigilance, information processing, strategy, and decision making [15,16]. Sleepiness-induced impairment of driving has been demonstrated convincingly in laboratory studies, and increasingly worse performance on driving simulator tasks (in terms of slower reaction, speed deviation, lapses, and lane drifting) has been found to occur with extended periods of being awake [11,17]. While the effects of sleepiness on on-road driving have been more difficult to quantify, self-reports from drivers have confirmed such sleepiness-related impairment [18-20].

There are numerous factors that may contribute to sleepiness. Lack of sleep (also referred to as sleep loss, deprivation or curtailment) is an obvious contributor, and has been extensively researched. Shiftwork features have been identified as common causes of sleep loss [21,22], while time of day (i.e.

Corresponding author: Raymond Misa. Email – Raymond.misa@transportsafety.vic.gov.au



Note. The dashed boxes indicate those that were not examined in the present study.

Figure 1. *An overview of truck driver sleepiness in regards to its potential causes and effects on sleep onset and performance impairment as precursors to error based on previous research.*

circadian effects) has been found to have a profound effect on sleepiness. Numerous studies [19,20,23] have found the experience of fatigue, sleepiness, and incidents related to these to be most frequently reported for times of circadian lows, that is, between midnight and 6am as well as (to a lesser extent) between 2pm to 4pm.

Based on the above research, the potential causes of truck driver sleepiness are summarised in Figure 1. Also summarised are the effects of sleepiness on a driver's physiological wakefulness, cognitive and motor performance, behaviour, and subsequently, error.

Note. The dashed boxes indicate those that were not examined in the present study.

For professional truck drivers, sleep loss and chronic sleepiness is likely to result from a combination of work-related disruption, poor sleep hygiene, lifestyle and health. Indeed, the work and lifestyle of these individuals make them susceptible to sleepiness. Most drivers work alone with very little or no supervision. They drive considerable distances with trips lasting many hours to numerous days, a considerable proportion of which may be under monotonous conditions. They may also regularly work at times of the day when the biological need for sleep is at its greatest, and may be required to vary the timing of their sleep to accommodate schedules and work demands.

Despite relatively low admission of sleepiness as a problem by heavy vehicle drivers [24], there is some evidence that a considerable proportion of Australian truck drivers may regularly drive in a sleepy state. In a national study of heavy vehicle drivers (n=613), 36% of drivers reported 'nodding off for a moment' on some occasion in the previous 12 months of work [24]. In another study of 1,249 truck drivers, approximately 14% admitted to falling asleep at least occasionally whilst driving for work [25], while another survey of 1,007 truck drivers found that nearly half reported that they had dozed off in the previous year [20].

While sleepy driving may be related to driver attitudes toward break-taking [18], pressures from managing organisations and other parties in the supply chain may have substantial influence on a driver's perceived need to continue driving [26]. Many drivers have reported that the schedules imposed by management made it difficult to take breaks when sleepy [18]. Another study found that a considerable proportion (57%) of drivers regularly exceeded regulated maximum hours, with "tight schedules" as the most common reason cited, followed by "in order to return home" and "to do enough trips to earn a living" [20]. Moreover, drivers reported engaging in risky driving behaviours to the point of breaking road rules in order to meet delivery deadlines [20]. Hence, many professional truck drivers may lack sufficient control in determining when they work.

The present study examined the self-reported experience of sleepiness in Australian truck drivers as well as potential contributors to sleepiness. The behaviour of persevering with driving despite being sleepy (referred to in this study as *sleepy driving behaviour*) was of particular interest, as were the psychosocial and work-related factors that influenced this behaviour. Potential consequences for safety were also examined.

Method

Participants

The sample consisted of 255 (245 males, 10 females) Australian professional truck drivers, with a mean age of 43.60 (SD=9.80) years and a mean of 19.11 (SD=10.75) years experience in driving trucks. A summary of their driving operations is provided in Table 1.

Table 1. *Summary of Operation Type, Vehicle Type and Method of Payment of the Driver Sample: Percentages of Drivers in Each Category*

Type of driver	**%**
Employee drivers	80.0
Owner-drivers	15.3
Owner-operators	3.9
Unreported	0.8
Predominant driving operation	**%**
Single driver for entire shift	91.4
Two-up driving	3.9
Staged /changeover driving	3.5
Unreported	1.2
Vehicle type	**%**
Rigid – 2 axle	3.1
Rigid – 3 axle	1.6
Rigid – 4 axle	0
Articulated – 3axle	3.5
Articulated – 4 axle	2.0
Articulated – 5 axle	6.3
Articulated – 6 axle	31.4
B-Double – 5 axle	34.5
Road train double/triple	15.3
Other	2.3
Method of payment	**%**
Hourly rate	16.6
Flat day rate	1.6
Day rate with overtime	1.6
Weekly rate w/ overtime	1.2
Flat rate per load	10.2
Based on kms and/or tonnage carried	61.2
Other	7.6

N = 255

Measures

This study was part of a larger self-report survey study, for which initial interviews with seven experienced long-distance drivers were undertaken in developing the survey. The survey inquired about a variety of sleepiness-related experiences during the previous three months of a driver's work, including: demographics, job characteristics and work demands (some of which were adapted from Williamson and colleagues' survey [20]); the frequency with which sleepiness was experienced; various contributors and symptoms of sleepiness; sleepiness-induced impairment of performance; management of sleepiness; and continuing to drive when sleepy, as well as psychosocial and work-related precursors of this behaviour.

While the larger survey consisted of 195 items, a number of scales were constructed from survey items using Principal Components Analysis (PCA) (see [27]). These are listed in Table 2 along with their respective reliability coefficients, component loadings, and item-total correlations. Further key measures are described in text following Table 2.

Table 2. *Scales and Items Following Principal Components Analysis and Respective Cronbach's Alpha Reliability Coefficients, Component Loadings, and Item-Total Correlation Coefficients*

Scales and items (with Cronbach's alpha coefficients)	**Component loading**	**Item-total correlation**
Driver Sleepiness (alpha = .75)		
How often did you become sleepy while driving for work?	.85	.62
How often did you feel that you were too sleepy to drive?	.82	.60
How often was sleepiness a problem for you personally in your work?	.78	.52
Sleepy Driving Behaviour (alpha = .85)		
How often did you continue driving when you were experiencing sleepiness instead of taking a break?	0.92	0.80
How often did you continue driving even when you felt that you may have been too sleepy to drive safely?	0.90	0.75
I tended keep driving even when I was fighting sleep.	0.81	0.62
Recognition of sleepy state (alpha = .68)		
How often were you able to tell or recognise when you were sleepy?	.87	.52
How often were you able to tell or recognise when you were too sleepy to drive safely for work?	.87	.52
Attitudes towards sleepy driving (alpha = .84)		
A driver should try not to drive when he or she is sleepy.	0.81	0.63
A driver should rest if he or she is fighting sleep.	0.82	0.65
Driving when sleepy is dangerous for drivers.	0.87	0.78
Driving when sleepy is dangerous for others on the road.	0.83	0.79
Perceived behavioural control (alpha = .88)		
I believe that I was able to stop driving when I was sleepy.	0.92	0.80
I decided when I needed to stop driving when sleepy.	0.90	0.75
I was confident that I could take rest breaks when I needed.	0.81	0.62
Continuing to drive or stopping for rest was beyond my control. (Reverse-scored)	0.92	0.80
How I drove was totally determined by me.	0.90	0.75

For the above (and the majority of) survey items, drivers were asked to report the frequency in relation to each item or statement based on their experiences and behaviours during the previous three months of work. These were rated on a 5-point Likert scale where 0=Never (I have not experienced this while driving for work before), 1=Rarely (I have experienced this only a few times while driving for work), 2=Sometimes (I have experienced this on about half of my driving trips for work), 3=Often (I have experienced this on more than half of my driving trips for work), and 4=Very Often (I have experienced this on almost all of my driving trips for work). Attitudes and Perceived Behavioural Control items were rated on another 5-point Likert scale, from 1=Strongly Disagree to 5=Strongly Agree. An overall score for each scale was obtained by computing the mean frequency rating for the respective items. Principal components analyses indicated the scales as single components (i.e. eigenvalue $>$ 1.0), while Pearson's correlations between the items did not indicate multicolinearity (see [27]).

Contributors to driver sleepiness and sleepy driving behaviour. Drivers were asked to report on the contribution of a number of factors on a 4-point Likert scale (0=No contribution, 1=Slight, 2=Moderate, 3=Strong). Contributors to sleepiness levels that drivers identified included: accumulated sleep loss (sleep debt), work activities, time spent waiting (e.g. for loading, unloading, checks, queuing, etc.), time of day, weather, quality/ergonomics of vehicle, roster/shiftwork, traffic conditions, route variability, and fatigue management education/training. Contributors to continuing to drive when sleepy included: delivering time-sensitive loads, schedules/deadlines, roster/shiftwork, employer/management pressures, work regulations, social/family commitments, road safety regulations, confidence in one's own driving ability, financial incentives, and peers/other drivers.

Time of day effects on sleepiness. Adapted from Williamson and colleagues' fatigue survey [20], drivers were asked to report whether they experienced sleepiness (i.e. 'felt quite sleepy') during the various times of the day, using a typical trip as a guide.

Epworth Sleepiness Scale (ESS). The ESS, developed by Dr Murray Johns, is a self-report questionnaire used to identifying excessive daytime sleepiness. Respondents were asked to specify the likelihood of falling asleep across eight situations using on a 4-point Likert scale (i.e. 0=would never dose, 1=slight chance of dozing, 2=moderate chance of dozing, 3=high chance of dozing). A total ESS score (calculated by summing the ratings) of 11 or more suggests that the individual may need further evaluation to determine the risk of excessive daytime sleepiness and any underlying sleep disorder. The ESS has been demonstrated to have internal consistency as well as construct validity with other indices of sleep propensity [6].

Body Mass Index (BMI). BMI (calculated by dividing weight by height squared, or kg/m^2) is a widely used and validated index to classify underweight, overweight, and obesity in adults. While BMI should be interpreted according to population-specific norms, the following grading has been issued as the general standard by the World Health Organization [28]: underweight$<$18.50, normal range=18.50 to 24.99, overweight$\geq$25.00, and obese$\geq$30.00. Health risks are generally believed to increase when BMI is outside the normal range.

Impairment of driving performance. Drivers were asked to report how often they believed driving was impaired by sleepiness on the abovementioned 5-point Likert scale from Never to Very Often. Level of impairment of driving tasks was also indicated on a 4-point Likert scale (0=Not affected, or same; 1=Slightly worse, or barely noticeable; 2=Moderately worse, or noticeable; 3=A lot worse, or very obvious).

Impaired judgement. Drivers were asked to report how often they believed their judgement was impaired by sleepiness on the abovementioned 5-point Likert scale from Never to Very Often. Level of impairment was also indicated on a 4-point Likert scale (0=Not affected, or same; 1=Slightly worse, or barely noticeable; 2=Moderately worse, or noticeable; 3=A lot worse, or very obvious).

Perceived pressure to continue driving. The item 'to what extent did you feel that you had to continue driving despite being sleepy?' was rated on a 5-point Likert scale (0=No extent, 1=Small extent, 2=Some extent, 3=Great extent, 4=Unavoidable).

Near-misses. Given that actual accidents, such as collisions, are relatively infrequent, drivers were asked to report any near-misses while driving for work in the previous three months as *'yes'*, *'no'*, or *'prefer not to say'*.

Worried about having an accident due to sleepiness. Drivers were asked *'how often have you been worried that you might have an accident because you were sleepy while driving for work?'*, responding on the 5-point Likert scale (Never to Very Often).

Procedure

Between April 2007 and August 2007, a total of 1,100 surveys were distributed to 55 truck stops throughout Australia. Operators of these sites were instructed to place the surveys in locations frequented by drivers (e.g. drivers' lounge, dining area). To alert drivers to the study, advertisements were placed on community radio programs and posters displayed on truck stop noticeboards. The survey was expected to take approximately 45 minutes to complete and participants were instructed to return the completed survey to the researcher anonymously using the enclosed reply-paid envelop. Of the surveys distributed at truck stops, a stocktake indicated that approximately 600 surveys were collected, while only 220 surveys (37%) of these were completed and returned by mail. Twelve drivers opted to participate in the survey via the telephone. Due to the relatively low response rate at truck stops, transport organisations within the Melbourne metropolitan area were approached, with 11 organisations agreeing to forward the survey to employee drivers. Out of 80 surveys distributed to drivers at companies, 41 surveys (51%) were completed and returned by mail. Overall, out of a total of 273 surveys returned, 18 were largely incomplete and were excluded from the sample, resulting in a sample of 255.

Results

Correlations among scores for *Driver Sleepiness*, *Sleepy Driving Behaviour*, and other key variables were examined. These are presented in Table 3, which also indicates sample means and standard deviations for a number of shift features and demographic variables.

Table 3. *Pearson's r correlations among Driver Sleepiness (DS), Sleepy Driving Behaviour (SDB), and other key variables, with sample means and standard deviations indicated where applicable.*

No.	Variable	Pearson's *r* with 1. DS	Pearson's *r* with 2. SDB	Mean (SD) (if applicable)
Sleepy driving				
1	Driver Sleepiness (DS)	-	0.52***	
2	Sleepy Driving Behaviour (SDB)	.52***	-	
Shift features				
3	Total hours worked per week	.16**	.15*	70.60 (18.18)
4	Total hours worked at night per week	.16**	.11	37.75 (19.25)
5	Average shift length (hrs)	.11	.11	13.23 (3.97)
6	Average distance per shift (kms)	.20**	.06	884.59 (290.69)
7	Ave. time spent awake before shift (hrs)	.15**	.08	4.09 (3.04)
Demographics				
8	Daytime sleepiness (measured by ESS)	.32***	.31***	9.20 (4.50)
9	Body Mass Index (BMI)	-.01	-.09	29.93 (5.28)
10	Experience in driving trucks (years)	-.12	-.20**	19.11 (10.75)
Performance and safety				
11	Impaired driving performance	.66***	.64***	
12	Drifting out of lanes	.46***	.41***	
13	Dozing off (falling asleep while driving)	.47***	.41***	
14	Worried about having accident	.57***	.38***	
15	Reports of near-misses	.18**	.22***	
Psychosocial factors				
16	Recognition of sleepiness		.06	
17	Impaired judgement		.38***	
18	Perceived pressure to continue driving		.65***	
19	Attitudes towards sleepy driving		-.29***	
20	Perceived behavioural control		-.58***	

**p < .05, **p < .01, ***p < .001.*

A multiple regression analysis ($F(5,253)=66.46$, $p<0.001$) indicated a significant link between *Sleepy Driving Behaviour* and the psychosocial variables listed in Table 3. These variables accounted for 57% of the variance (i.e. adjusted $R^2=.57$) in *Sleepy Driving Behaviour*. *Perceived Pressure to Continue Driving* ($\beta=.44$, $p<0.001$, part correlation=.34) was the strongest predictor. This was followed by *Perceived Behavioural Control* ($\beta=-.23$, $p<0.001$, part correlation=-.17), then Attitudes ($\beta=-.22$, $p<0.01$, part correlation=-.21), then *Impaired Judgement* ($\beta=.20$, $p<0.01$, part correlation=.18). *Recognition of sleepiness* was not predictive of *Sleepy Driving Behaviour* ($p>0.05$).

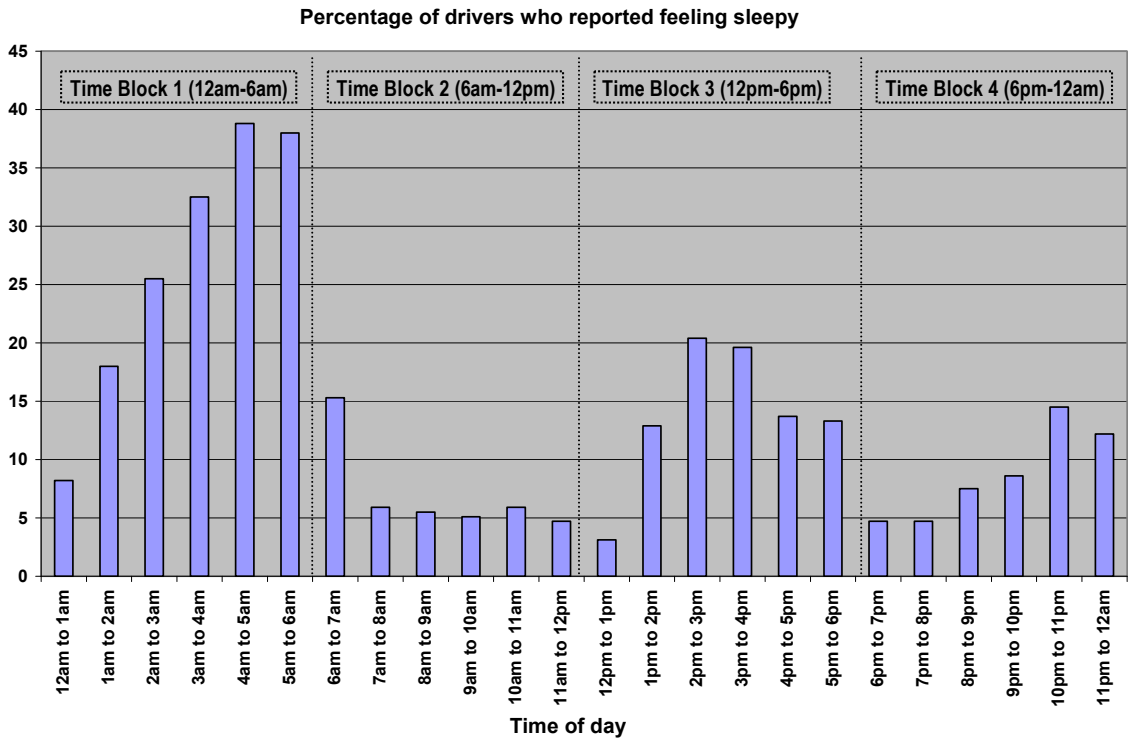


Figure 2. *The percentages of drivers who reported experiencing sleepiness at various times throughout the 24-hour period.*

To illustrate the propensity for sleepiness throughout the 24-hour period, the graph in Figure 2 presents the percentages of drivers who reported being sleepy at various times.

A non-parametric Friedman test was used to test for variability in reported sleepiness at various periods of the day, that is: (1) 12am-6am, (2) 6am-12pm, (3) 12pm-6pm, and (4) 6pm-12am. This test revealed an overall time of day effect in reported sleepiness (Friedman X^{23}=167.91, p<0.001), while Wilcoxon Signed Ranks post hoc tests indicated that sleepiness was more frequently reported (p<0.001) in time block 1 (12am-6am) than in time blocks 2, 3, and 4 (Wilcoxon Z= 9.03, 6.81, and 9.05, respectively).

Discussion and conclusion

Drivers reported experiencing sleepiness at work relatively frequently. On average, sleepiness was reported on approximately half of trips. Approximately 23% of drivers reported experiencing sleepiness *often* (i.e. on more than half of their trips). On average, drivers reported beginning to feel sleepy approximately 7 hours (SD=3.55) into the driving trip. The results also revealed that 49% of drivers felt too sleepy to drive on at least half of their trips, while 40% reported falling asleep while driving at least once in the previous three months of work.

The frequency with which drivers reported sleepiness was also positively correlated with a number of shift features including average total hours worked per week, total hours worked at night, average distance driven per shift, and average time spent awake before commencing shift. In identifying specific contributors to sleepiness levels, drivers rated accumulated sleep loss (or sleep debt) as having the greatest contribution (46.5% of the drivers rated this to strongly contribute to sleepiness). This was closely followed by waiting (e.g. for loading and unloading of goods, queuing, etc.) and work activities (e.g. driving and other work tasks).

Time of day was also reported as a major contributor. Drivers reported propensity for sleepiness to be greatest between 12am and 6am. A Friedman test confirmed that significantly more drivers reported feeling sleepy during this period than other times of the day. Reported sleepiness was also elevated between 2pm and 4pm, although to a lesser extent. Research has consistently found the biological need for sleep to be greatest during these periods [19,22]. Moreover, these findings are consistent with truck drivers' reports of fatigue [20], and lend further support to already substantial evidence that circadian effects play a central role in sleepiness and sleepiness-related accident risk.

As expected, driver sleepiness ratings were also found to be moderately correlated ($r = .52$, $p < 0.001$) with reported instances of *sleepy driving behaviour*. The results indicated that a considerable proportion of drivers persevered with driving despite being sleepy on a regular basis. On average, drivers reported continuing to drive rather taking a break on about half of their trips. Approximately 26% of drivers reported continuing to drive despite being sleepy on more than half of their trips. Interestingly, continuing to drive when sleepy was not correlated with shift features with the exception of total hours worked per week.

It was found that more experienced drivers tended not to persevere with driving when sleepy ($r = -.20$, $p < 0.01$). Drivers who tended to persevere with driving on a regular basis also tended to be more prone to daytime sleepiness as measured by the ESS ($r = .31$, $p < 0.001$). A sample mean of 9.20 was found for ESS scores, for which a score of 11 or more suggests that the individual may need further evaluation to determine the risk of excessive daytime sleepiness and any underlying sleep disorder.

A regression analysis identified a number of psychosocial predictors of sleepy driving behaviour. Most notable of these were perceived pressures and a perceived lack of control over driving schedules. Indeed, these findings provide additional evidence that pressures and schedules imposed by management and other parties in the supply chain have a considerable impact a driver's decision to persevere with driving and can make it difficult to take breaks when needed [18,20,26].

Drivers' attitudes towards sleepy driving also predicted sleepy driving behaviour. Drivers who agreed that driving while sleepy was undesirable and dangerous were also less likely to persevere with driving. Impaired judgement was also a predictor, as drivers who reported more frequent instances of impaired judgement also tended to continue driving. Impaired judgement was also associated with frequency ratings for sleepiness. This may suggest that sleepiness may impair a driver's decision making, for instance, when deciding to continue or cease driving. However, this cannot be known without further analysis.

Despite some early research suggesting that a sleepy driver may continue driving because he or she cannot recognise the state of being sleepy (see [13]), 64% of drivers reported that they were *often* able to tell or recognise when they were 'too sleepy to drive safely for work'. Such self-reported ability to recognise a sleepy state, however, did not predict sleepy driving behaviour in the present study. Previous studies have found that sleepy drivers tend to underestimate the likelihood of falling asleep (rather than just being sleepy) [13], and the effect of this underestimation on a driver's decision to continue driving also requires further examination.

A number of factors were noted to have at least moderate contribution to continuing to drive when sleepy by at least half of the drivers. These included schedules/deadlines, work regulations (e.g. logbooks, other work-related requirements), confidence in one's driving ability, and time-sensitive loads.

Sleepy driving may also have a considerable impact on driving safety. The frequency of which drivers reported continuing to drive when sleepy was positively correlated with measures of perceived performance and safety. This included reported occurrences of: impaired driving performance (r=.66); drifting out of lanes (r=.41); difficulties staying alert (r=.50); dozing off whilst driving (r=.41); and near misses (r=.22). Drivers who persevered with sleepy driving more often were also more likely to report being worried about having an accident (r=.38). Similarly, drivers' ratings of sleepiness at work were also positively related with reported occurrences of these events.

These findings may provide further insight into the contributors and consequences of sleepy driving. However, a

number of methodological issues need to be acknowledged. Like most surveys of truck driver behaviour, the data in this study were based on self reports which rely on participants' willingness to report accurately as well as accurate recollection of events. Therefore, the data was susceptible to self-presentation and response biases. Moreover, sleepiness was measured subjectively using rating scales which are considered to be less precise than objective measures such as polysomnography.

Nonetheless, the results may have implications for the management of driver sleepiness and safety in the trucking industry. Education strategies that increase drivers' awareness of the risks associated with driving in a sleepy state, as well as promote attitudes favouring break taking, are expected to be useful. The results also suggest that targeting drivers' perceived (or better yet, actual) control is likely to have the greatest impact on discouraging sleepy driving. While there is no substantial evidence that greater control over driving schedules would translate to safer trucking practices [29], greater flexibility in break-taking is expected to, at the very least, encourage drivers to rest when needed. Indeed, the present study has found perceptions of work pressures and decreased control to also correspond with self-reports of increased accident risk. With this in mind, drivers reported a number of specific constraints and incentives to have had considerable contribution to their sleepy driving behaviour, including work, regulatory, social, and financial factors.

In regards to future research, these findings suggest that sleepy driving involves a conscious voluntary decision to engage in risky behaviour. If this is indeed the case, arguably, sleepy driving behaviour can be accounted for by an appropriate decision making or behavioural model. The above findings suggest that the Theory of Planned Behaviour [30] may be such a model. The applicability of this model to sleepy driving behaviour in professional truck drivers will be explored as an extension of the present study.

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