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Fatigue and Sleepiness: Complex Bedfellows

24 April 2015



'Fatigue and Sleepiness: Complex Bedfellows', originally published in *Track & Signal April-June 2015*. Written by Dr Anjum Naweed, Principle Research Fellow at ACRI (*pictured*), and Dr Ashleigh Filtner, Research Fellow at the Queensland University of Technology.

Do you know how to drive a train? If you don't you probably believe that you have a fair idea of what it's all about. Forget what you know, or think you know. Trains are heavy and fast but they feel and handle like driving on ice so they take a long time to stop. The braking distances for a typical piece of track are unlike anything you will have experienced before.

With that in mind, imagine you were driving with a bit of dew, or grease, or millipede over the track. You would lose traction and slip everywhere. To avoid this, you would need a compensatory driving strategy. You could drive

more slowly, or brake sooner, or change how you brake. Your experience and intuition would lead the way. Folks, this is why it's called "driving by the seat of your pants".

In the train cab you live in the past, the present and the future, remaining perpetually aware of the track and its signals, where you have been, where you are now and where you will be in the next few kilometres. You have to connect with the train, become the machinery and bind with its body to become a single organism – if you want to drive it well, that is.

What we're trying to tell you is that driving a train is very demanding. It requires mental effort. It relies on you to raise your concentration to very high levels and then maintain that for long periods. All of this exploits a fundamental limitation that we all have in common. We get tired – very easily.

In early 2014 a national rail safety management project came to a close after researchers spent two years investigating the risk factors that moderate train driver behaviour. Under the aegis of the Cooperative Research Centre (CRC) CRC for Rail Innovation, the project looked beyond the confines of technology to the personal strategies that drivers adopted to drive safely. The CRC ended its program of research last year but we revisited this project with a view to delving deeper into the data and asking the question 'How much does fatigue contribute to the risk of driving past a danger signal?'

What we found was very telling. Almost every driver said that fatigue was an issue for them, but when they were asked about it further, the descriptions and examples given appeared to cover both "fatigue" and "sleepiness" and often in an intertwined manner. Let us examine these concepts.

Sleep is a natural thing. It is caused by something biological and the feeling of being sleepy is what happens when you don't get enough of it. The feeling of sleepiness is influenced by both how long it has been since you last slept and by your body clock. You see, your body clock has a natural rhythm throughout the day. This is why it is easier to fall asleep at midnight than midday; it is also responsible for the early afternoon (2pm) dip in alertness. Importantly the feeling of sleepiness can only be mitigated by sleeping or by changing your biology with a chemical compound such as caffeine that acts on the brain.

On the other hand, fatigue can have many causes. It is usually associated with having to sustain an activity for a long period of time. If you are fatigued at something, you can usually recover from that fatigue by stopping the activity that is causing it. If you have been playing sport and are physically fatigued, a rest will make you feel better but you don't need to sleep to recover from that fatigue. If you have been performing a monotonous task for a very long time and it is becoming boring and difficult to concentrate on, doing a different task often makes the fatigue go away. But if you were sleepy it would not matter if you changed the task because you would actually be carrying the sleepiness along with you.

Now, as far as tasks go, searching for signals and choosing speeds based on signal aspects and service delivery is very demanding, both in terms of managing many tasks in periods of high workload and also in sustaining attention when there isn't much to do. Consequently, prolonged activity on the task easily elevates fatigue simply from the amount of time being spent on it – but this is not sleepiness. So, talking about sleepiness and the body clock when being asked about how fatigue contributes to the risk of driving past a danger signal begs the question 'Why it is being understood this way?'. Is it simply a reflection of improper understanding, a part of the industry rhetoric, or something else?

When we examined actual industry literature we found that sleep was the strongest theme for rail operators and regulators alike. From a rail regulator safety bulletin in a section about fatigue, "Investigating fatigue factors requires thorough examination of individual circumstances... This should include detailed consideration of factors associated with roster patterns, commute times, sleep patterns, sleep deficits... Investigators should ascertain if there are procedures in place to risk-manage fatigued drivers and encourage drivers to self-declare if they have not received enough sleep."

Thus, much of the rhetoric appears to be funnelling downwards. The above description is heavily geared towards aspects relating to sleep. During the CRC project, many industry stakeholders indicated that fatigue management was one of the things they were not doing well. However, on deeper investigation this was not always the case.

First, train driving was identified as a very stressful and performance/time-pressured environment. The fear of driving past a danger signal increased anxiety and affected sleep quality, not just the opportunity to get sleep. Consequently, the driver would be more prone to feeling sleepy on the job, in addition to the general fatigue they would be likely to feel.

Second, rostering issues and fatigue were closely intertwined. Rosters were designed around the minimum and maximum amounts of time drivers needed between shifts for sleep recovery. They did not account for the various lifestyle factors that affect sleep quality (for example, pressure from friends and family to engage in social activity and not sleep during off-duty times) but most organisations also had cultures of shift-swapping and taking "catch" jobs. This was out of convenience, financial reward or a sense of obligation but in all cases it reduced the accuracy of the roster strategy. Consequently, it was perceptively easier for drivers to adopt the attitude that public safety was the responsibility of the organisation (which created the rosters and flexibility for shift swapping) than to view it as their own.

Thirdly, there was a culture of not wanting to be seen as fatigued on the job, mainly because it was viewed as counterpoint to driving skill (for example, being fatigued meant you were not a good driver). Consequently drivers pushed themselves to keep going when they were fatigued and even suggested they would take personal leave to manage it. This implied they needed to address sleepiness rather than fatigue and avoid attracting questions about fitness of duty. There was also a link between fatigue and happiness. In an activity that required drivers to think about an idyllic future rail system, there was a suggestion that less fatigue equated to more happiness.

Clearly, there is a lot of rigid thinking about fatigue, sleep and management of safety in rail, but also some confusion. This becomes important when considering an appropriate strategy to mitigate the situation. The mitigation strategy needs to match the problem, and sleep mitigation is different to fatigue. Ensuring that the fatigue and sleepiness concepts are understood properly in industry is an important first step to enhancing the content of fatigue management awareness literature and informing specific interventions to reduce driver fatigue. Basic understanding of the difference between these two concept by all involved is vital for developing best practice in fatigue and sleepiness management.

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