



## International Railway Safety Conference

19-21 October 2020 Webinar Series

# Caught between a rail and a hard place

## Factors impacting track worker safety in lookout-related incidents

Dr Anjum Naweed



Dr Mark Young











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## Singleton, Hunter Valley, NSW (AU) 2007



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- 2 track maintenance workers
- Malfunctioning points
- No Authority Required* – one of the workers required to keep lookout
- Conflicting protocols
- Compromised visual/auditory cues
- Ambiguous terminology
- Habituation/expectation bias

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# Hest Bank, near Lancaster (UK) 2014



- 9 track maintenance workers
- Measured shovel packing
- Radio-based Lookout Working
- Near-strike ~3s warning, 98mph train
- Lookout did not operate warning switches (though he believed otherwise)
- Continually working for ~2h

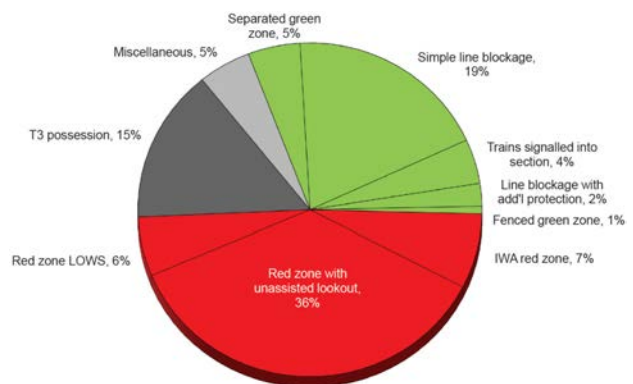
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# Track worker safety



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- Australia
  - Over 400 track working safety breaches notified to the regulator (between 2014-2015)
  - Findings ways of improving track worker competency and communication is a national priority
- UK
  - Class investigation by RAIB (2017)
  - Dozens of near miss incidents with track workers occur every year – 36% involve Lookouts
- Why is a Lookout required?
  - Many situations where not practicable to block a line in order to undertake track work
  - Track workers must carry out their tasks between passing trains (i.e. in the “Red Zone” or the “Danger Zone”)



Near misses recorded for work planned using different types of safe systems of work (2 years 2014/15 – 2015/15) source Network Rail

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## What does a *Lookout* do?


  
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- Watch for trains
  - Monitor and stay alert for long periods
- Warn fellow track workers of a train when it approaches their site of work
- Lookout is primary means of protection for a work group
- The Lookout sits in a wider sociotechnical system
  - Involves other track workers
  - People in charge of safety at the site of work
  - Trains drivers
  - Technologies and tools
- Protection Officer/Controller of Site Safety
  - Responsible for setting up the Safe System of Work
  - Places Lookouts, identifies and documents positions of safety, undertakes ongoing safety assessments and communication with the Network Controllers / signallers



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## What does a *Lookout* do?


  
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- Points of Failure in lookout working
  - Lookout fails to provide adequate warning
  - Lookout working used when it cannot provide sufficient warning
  - No suitable safeplace provided for all workers
  - Workers fail to move to a safeplace although a safeplace is available
  - Workers move out of a safeplace into path of approaching train
  - Workers move back on the track with a second train approaching

*Independent Transport Safety Regulator (Australia), 2012*

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## Research Question and Aims


  
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*What factors, if any, are particular to Lookout working that can compromise the safety of Track Workers?*

### Objectives

1. Review recent Lookout-related rail incidents in order to examine common underlying factors associated with the outcomes; and
2. Perform a qualitative meta-analysis of those incidents to examine the relevance of the Lookout task and assess its effectiveness as a safe system of work

### Aims

1. Extract sociotechnical systems factors that contribute or interact with unsafe outcomes in Lookout working
2. Derive common lessons and make recommendations

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## Methodology: Incident Selection


  
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### Inclusion Criteria

1. The material must have been reported by a formal rail investigation agency (in order to ensure rigorous data and analysis)
2. Released between 2006 and mid-2018
3. Reports from the national investigating bodies of Australia and the UK were used
4. Incident must have involved a *Lookout* in the causal chain.

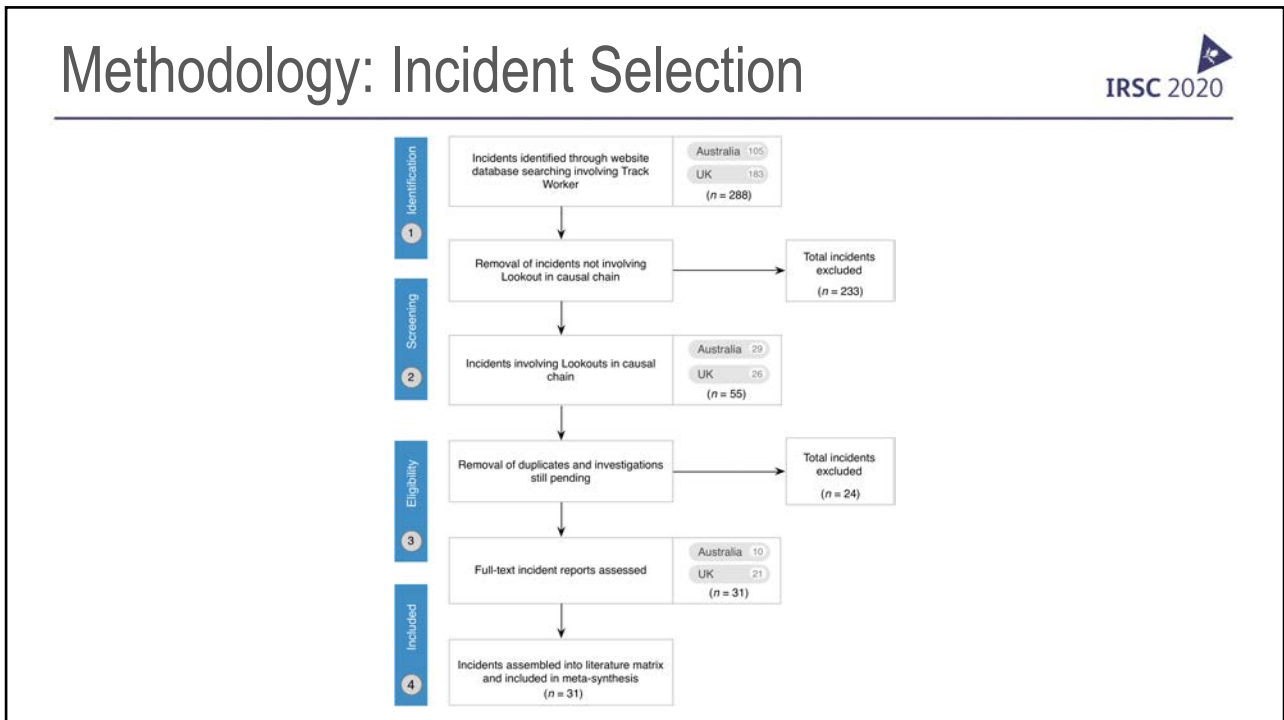
### Search Strategy

1. Publicly available reports from RAIB website
2. Mix of government websites in Australia given independent state regulation
3. Full incident reports, as well as comparatively shorter and more succinct bulletins, safety briefings and safety digest accounts of evidence, analysis and findings

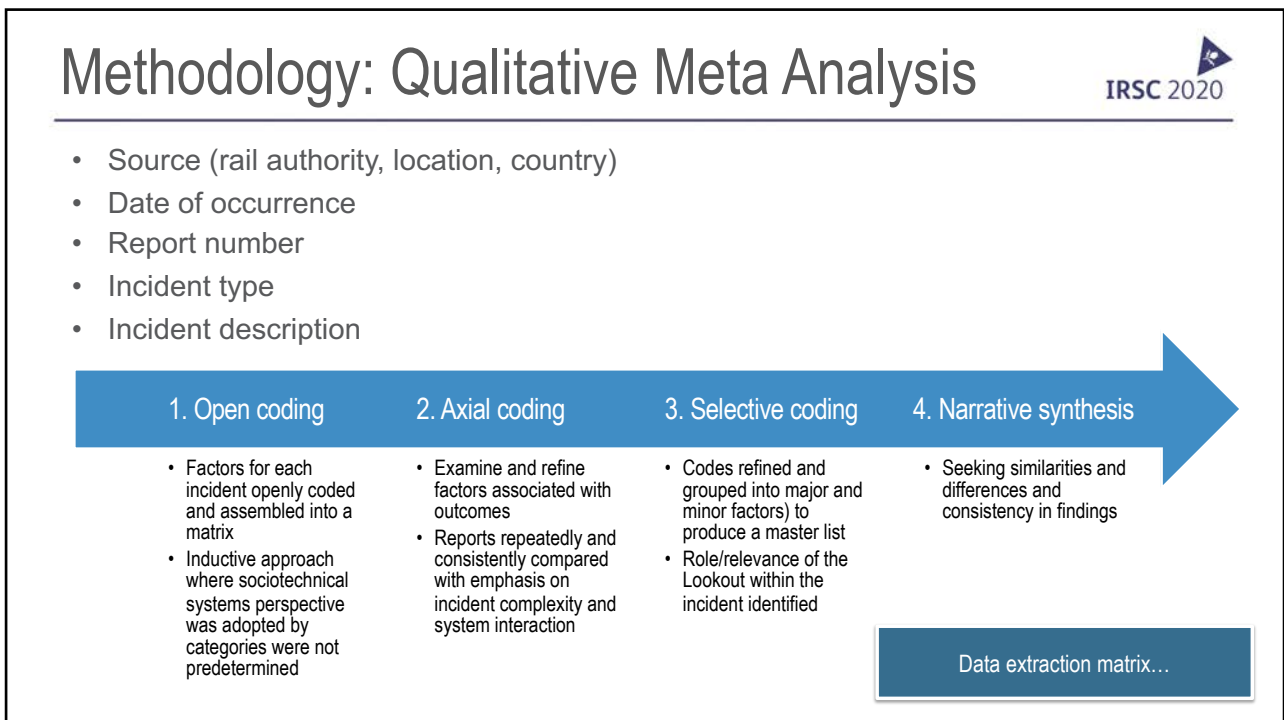
### Search terms

1. *Near miss, accident, collision, incident, fatality, fatalities, combined with rail/railway/track/infrastructure/maintenance worker/s, workgroup, workparty, or staff*
2. *Lookout, Track Worker, Welder, Patrolman, Signal Technician, Area Controller, Protection Officer, Controller of Site Safety, rail, train, tram, locomotive, killed, injuries, damage, struck, seriously/ly*

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# Methodology: Extraction Matrix Example

Location, authority, country	Occurrence date, report number	Incident type	Incident description	Role/relevance of Lookout	Identified factors
Peak Downs (QT 2007) QLD, AU	20/07/2007 QT2027	Near miss	A loaded coal train departed a coal loading facility and nearly struck Track Workers on the approach to Peak Downs yard.	One member of the workgroup was nominated as Lookout and was positioned to look for approaching trains under the No Authority Required method of protection.	<ul style="list-style-type: none"> <li>Lookout warning</li> <li>SSoW</li> <li>Information requirements</li> <li>Distraction</li> </ul>
Grosvenor Bridge (RAIB 2009c) UK	13/11/2007 R19/2009-090716	Accident involving Track Worker	A Track Worker engaged in a planned track inspection was struck by a passing train and suffered serious injuries.	The Injured Track Worker was walking behind the Lookout and did not communicate that he was moving towards an adjacent open line.	<ul style="list-style-type: none"> <li>Movement dynamics</li> <li>Group dynamics</li> <li>SSoW</li> </ul>
Kennington Junction (RAIB 2009b) UK	23/05/2008 R29/2009-091112	Accident involving Track Worker	A passenger train struck and seriously injured a signalling technician who was working on a set of points.	The technician did not move clear after a warning from the Lookout. The Lookout and others did not challenge the safety of work as daylight faded.	<ul style="list-style-type: none"> <li>Habitual responding</li> <li>SSoW</li> <li>Information requirements</li> <li>Knowledge and skills</li> <li>Group dynamics</li> </ul>
Dalston Junction (RAIB 2009a) UK	30/03/2009 R30/2009-091119	Accident involving Track Worker	A passenger train, travelling at about 15 mph (25 km/h), struck a railway worker. The Track Worker was struck on the head and thrown to the ground.	The Lookout was leading a moving work group when he was struck; he did not react to the train warning and was unfamiliar with the track layout in the area.	<ul style="list-style-type: none"> <li>Movement dynamics</li> <li>SSoW</li> <li>Habitual responding</li> <li>Knowledge and skills</li> </ul>
Whitehall West Junction (RAIB 2010) UK	02/12/2009 R15/2010-100902	Track Worker fatality	A train struck and killed a Track Worker as it passed Whitehall West junction. At the time of the accident the train was driven by a trainee in the presence of a supervisor driver whilst three more trainee drivers travelled in the rear vehicle.	The Lookout was standing too close to the line and was struck from behind, apparently unaware of the train's approach. There had been few trains during his shift and most had come from the other direction.	<ul style="list-style-type: none"> <li>Movement dynamics</li> <li>Task design</li> </ul>
Cheshunt Junction (RAIB 2011) UK	30/03/2010 R06/2011-110323	Accident involving Track Worker	A passenger train, travelling at about 30 mph (48 km/h), struck a Track Worker at Cheshunt Junction in Hertfordshire. The person who was struck was one of a team of eight people, and he was seriously injured.	The group did not move to a position of safety after the Lookout's warning as they did not expect the train to be routed towards them. The Lookout gave an early warning (because the train stopped in a station) but also gave a further warning when the train moved.	<ul style="list-style-type: none"> <li>Movement dynamics</li> <li>Habitual responding</li> <li>SSoW</li> <li>Distraction</li> <li>Knowledge and skills</li> <li>Information requirements</li> </ul>

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# Results

**Factors**

**Safe system of work (SSoW)** : reflecting inappropriate planning and/or implementation of a SSoW

**Movement dynamics** : reflecting sufficient and appropriate warning provision yet a failure to move to a safe place, or moving out of a safe place

**Group dynamics** : reflecting attitudinal or group cultural influences producing “at risk” behaviours within the workgroup

**Information requirements** : reflecting inadequate sighting, visual and/or auditory cues influencing effective communication of a warning

**Task design** : reflecting a variety of performance shaping factors associated with looking out

**Distraction** : reflecting task- and non-task-related distraction

**Knowledge and skills** : reflecting underlying issues with knowledge, experience, skills and training

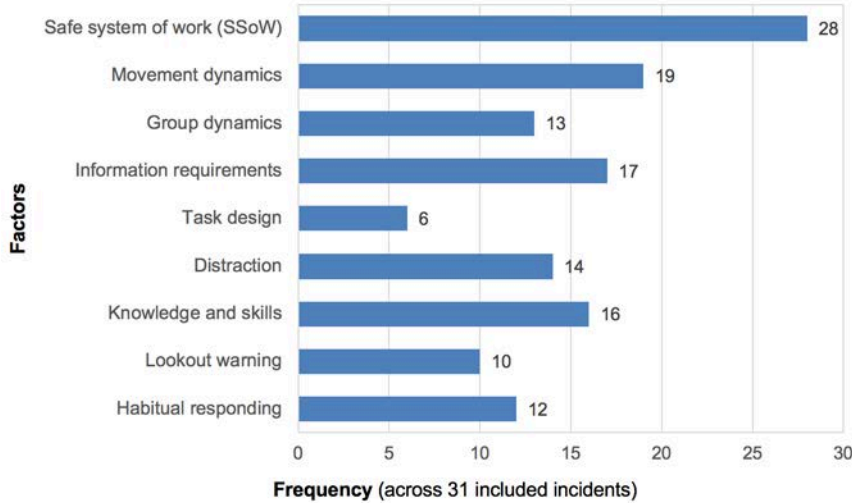
**Lookout warning** : reflecting an inappropriate, deficient or absent Lookout warning

**Habitual responding** : reflecting instances where behaviours and actions appeared to have become conditioned

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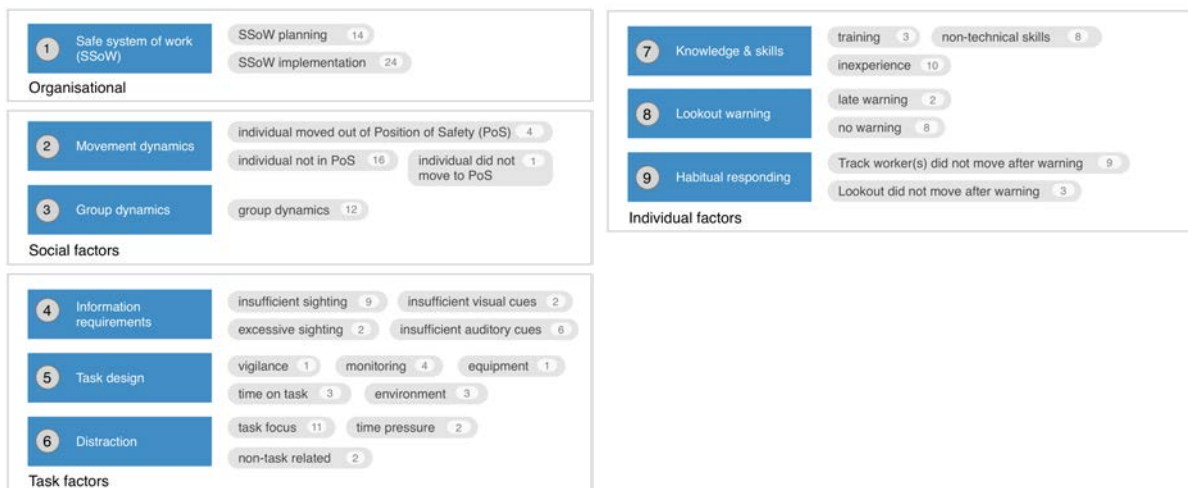
# Results

**Identified Factors in Incident Reports**



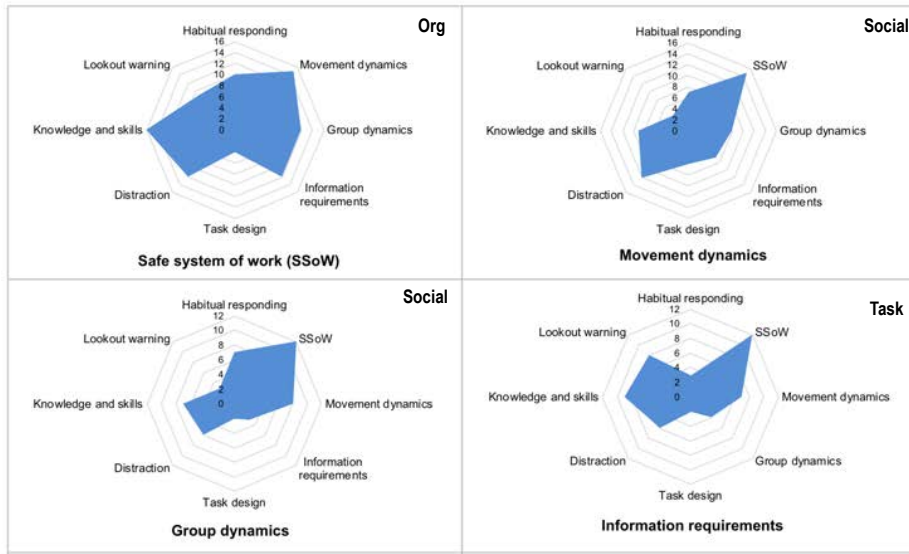
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# Results



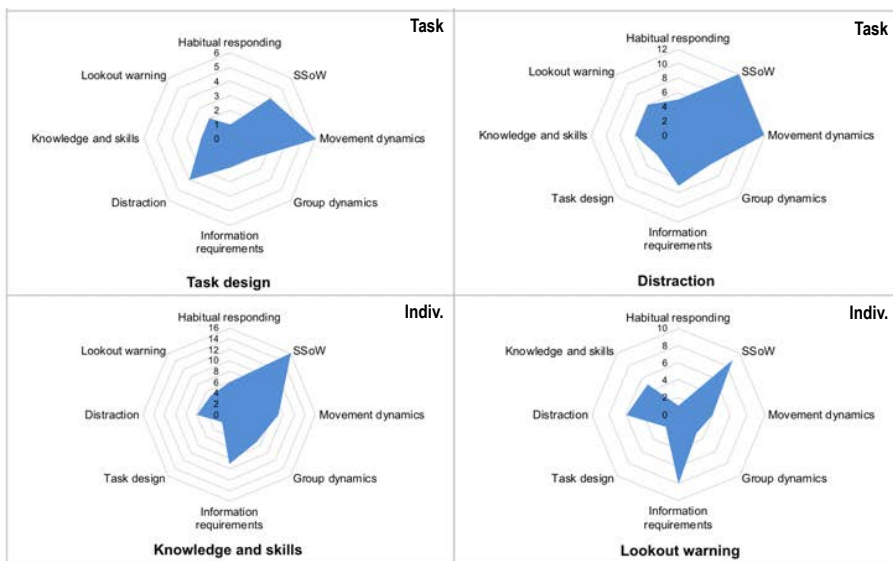
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# Results



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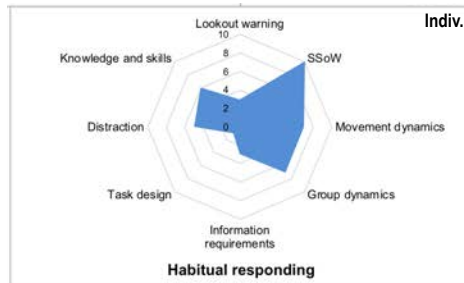
# Results



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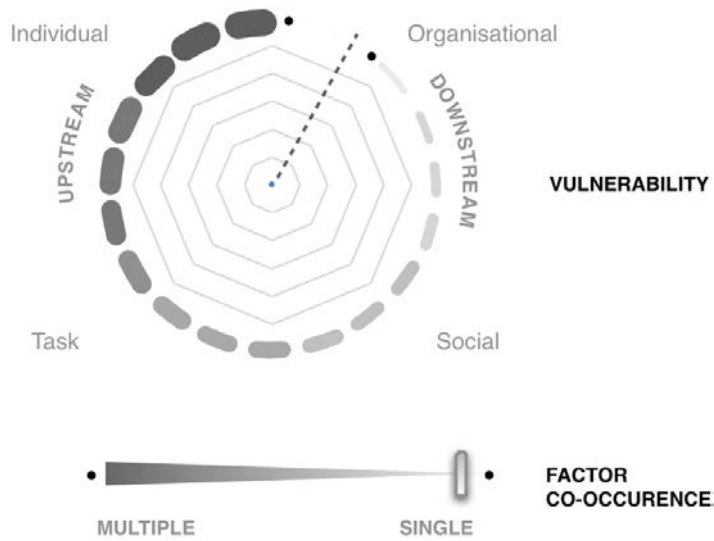


# Results



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# Discussion



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## Discussion



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- There is no pattern of factors specific to Lookout working; rather, there were multiple underlying, interacting systems factors associated with the set up and implementation of a SSoW, and with group dynamics.
  - Organisational and social factors were prevalent; these may interact with task- and individual-level factors
  - Reflects the complex sociotechnical system of track work
  - Non-technical skills could address the social dynamics, but they are not a panacea
- More research is needed in these aspects of track worker safety – it is an under-researched area

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## RAIB class investigation (2017)



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- Common causal factors:
  - COSS distraction (preoccupied with task)
  - Multiple locations / moving worksite in SSoW (SSoW not appropriate for location)
  - Cultural issues (lack of challenge – worksafe procedure)
  - Verbal communication
  - Over-familiarity (risk perception)
  - Unfamiliarity (inexperience / unfamiliar with location)
  - Circumstances changed from SSoW (eg changed access point, workgroup size)
  - Unauthorised downgrading of protection
  - Informal methods of working
  - Resource issues (access point provision, team size / composition)
  - Unclear SSoW (briefings)
  - Distraction (COSS, signaller)

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## Selected recommendations


  
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- Review working time limits of lookouts (Hest Bank)
- Review possession management process to reduce need for staff to be on track (Camden South)
- Strengthen safety leadership on site (Egmonton)
- Review / clarify standard 019 (South Hampstead)
- Improve location information in SSoWPs (South Hampstead)
- Reduce amount / exposure of lookout working (Peterborough)
- Understand 'work as done' by lookouts (Peterborough)
- Review risk management associated with zero hours workers (Stoats Nest)
- Improve local knowledge of track work leaders (class investigation)

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## Publication


  
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Journal: Theoretical Issues in Ergonomics Science  
Volume 20, 2019 - Issue 6

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Abstracts

Articles  
**Caught between a rail and a hard place: a two-country meta-analysis of factors that impact Track Worker safety in Lookout-related rail incidents**  
Anjum Naweed<sup>1</sup>, Mark S. Young<sup>2</sup> and Jeanette Aitken<sup>3</sup>  
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Full Article Figures & data References Citations Metrics Reprints & Permissions [Get access](#)

Naweed, A., Young, M. S., & Aitken, J. (2019). Caught between a rail and a hard place: A two-country meta-analysis of factors that impact Track Worker safety in Lookout-related rail incidents. *Theoretical Issues in Ergonomics Science*, 20(6), 731-762.



THEORETICAL ISSUES IN ERGONOMICS SCIENCE  
2019, Vol. 20, No. 6, 731-762  
<https://doi.org/10.1080/1463922X.2019.1605630>

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**Caught between a rail and a hard place: a two-country meta-analysis of factors that impact Track Worker safety in Lookout-related rail incidents**

Anjum Naweed<sup>1</sup>, Mark S. Young<sup>2</sup> and Jeanette Aitken<sup>3</sup>

<sup>1</sup>Applikon Institute for Behavioural Science, Central Queensland University, Weipalle, QLD, Australia; <sup>2</sup>Rail Accident Investigation Branch, Peterborough, UK; <sup>3</sup>Human Factors and Complex Systems Group, Loughborough Design School, Loughborough University, Loughborough, UK; <sup>4</sup>Competency Australia, Broadmeadow, NSW, Australia

**ABSTRACT**  
The last 15 years has witnessed a surge in rail-related human factors research but little has examined the Track Worker role. Track work often takes place whilst trains are running under the protection of Lookouts who provide warning of approaching trains. Despite—or perhaps because of—these measures, there is a notable prevalence of incidents involving Lookouts, warranting a closer look at the nature of their task and the wider socio-technical system (STS) to identify what may be learned for railway safety management. A systematic review of incident reports involving Lookouts was undertaken on Australian and UK rail incidents from 2006 to mid-2018 with a qualitative meta-analysis (n = 31) revealing nine factors corresponding with STS dimensions at the organisational, social, task and individual level. Much of the risk lay in the set up and implementation of Lookout working, and in Track Worker group dynamics—factors endemic to working whilst trains are running—rather than specific to the Lookout, with such factors arguably applicable across other Track Worker groups. Findings point to a need for more targeted research into the STS aspects of track working, as well as improving the training and/or procedures of those managing the Lookout protection system of work.

**ARTICLE HISTORY**  
Received 21 November 2018  
Accepted 7 April 2019

**KEYWORDS**  
Lookout working; rail accidents; rail systems; socio-technical systems

**Relevance to human factors/Relevance to ergonomics theory**  
Lookout working is one of the most vulnerable methods of work in rail today and a priority area of concern for many countries. Whilst the Lookout and nature of the task itself has been researched, few, if any, scientific investigations have analysed incidents involving the Lookout to discern what lessons can be drawn. This study, a meta-analysis of Lookout-related incidents in the UK and Australia over the last 12 years, suggests that much of the risk lies in areas other than the Lookout-task itself. Our paper examines how risk mitigation

**CONTACT** Anjum Naweed [anjum.naweed@cqu.edu.au](mailto:anjum.naweed@cqu.edu.au) Applikon Institute for Behavioural Science, Central Queensland University, 40 Connors Rd, Weipalle, QLD 4684, Australia  
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Jeanette Aitken  
**Competency Australia**

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## Contact

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A/Professor Anjum Naweed

 [au.linkedin.com/in/anjumnaweed](https://au.linkedin.com/in/anjumnaweed)

 [DrAnjumNaweed](https://twitter.com/DrAnjumNaweed)

 [researchgate.net/profile/anjum\\_naweed](https://researchgate.net/profile/anjum_naweed)

+61 (8) 8378 4520  
[anjum.naweed@cqu.edu.au](mailto:anjum.naweed@cqu.edu.au)

Dr Mark Young

 [www.linkedin.com/in/marksyong](https://www.linkedin.com/in/marksyong)

 [doctoryoung](https://twitter.com/doctoryoung)

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