



Risk factors moderating driver-related distraction & inattention in the natural rail environment



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railcrc.net.au



An Australian Government Initiative



The train driver and the railway




Traction

Weight

Speed

Gradients

Curvature



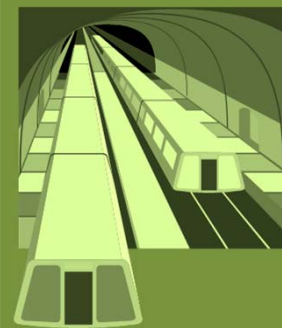
Fatigue

Shift work

Sustained attention

Vigilance

Reaction time




Signals

Crossings

Point switching

Traffic flow

Movement authority



Schedule

Time keeping

Train control

Service delivery

Fuel consumption



Visibility

Railhead condition

Adhesion

Temperature

'Open' system

The train driver and the railway

The train driving task is not unlike driving a semi-trailer on ice while blindfolded.

Primary task is speed/throttle regulation.

Requires the driver to process a variety of vestibular, kinaesthetic, acoustic and peripheral visual information sources.

Naweed, A., Hockey, G.R.J., & Clarke, S.D. (2013). Designing simulator tools for rail research: The case study of a train driving microworld. *Applied Ergonomics*, 44(3), 445-454.

Naweed, A. (2013). Investigations into the skills of modern and traditional train driving. *Applied Ergonomics*. doi: 10.1016/j.apergo.2013.06.006



Presentation Overview

- Rail Collision Avoidance: The 'SPAD'
- Risk Mitigation
- Data collection Framework
- Analysis
- Findings
- SPAD-risk model
- Implications & future research



What is a SPAD?



DDI Göteborg | 6th Sept 2013 | Anjum Naweed | Risk Factors Moderating DDI in Rail

The SPAD failure mode



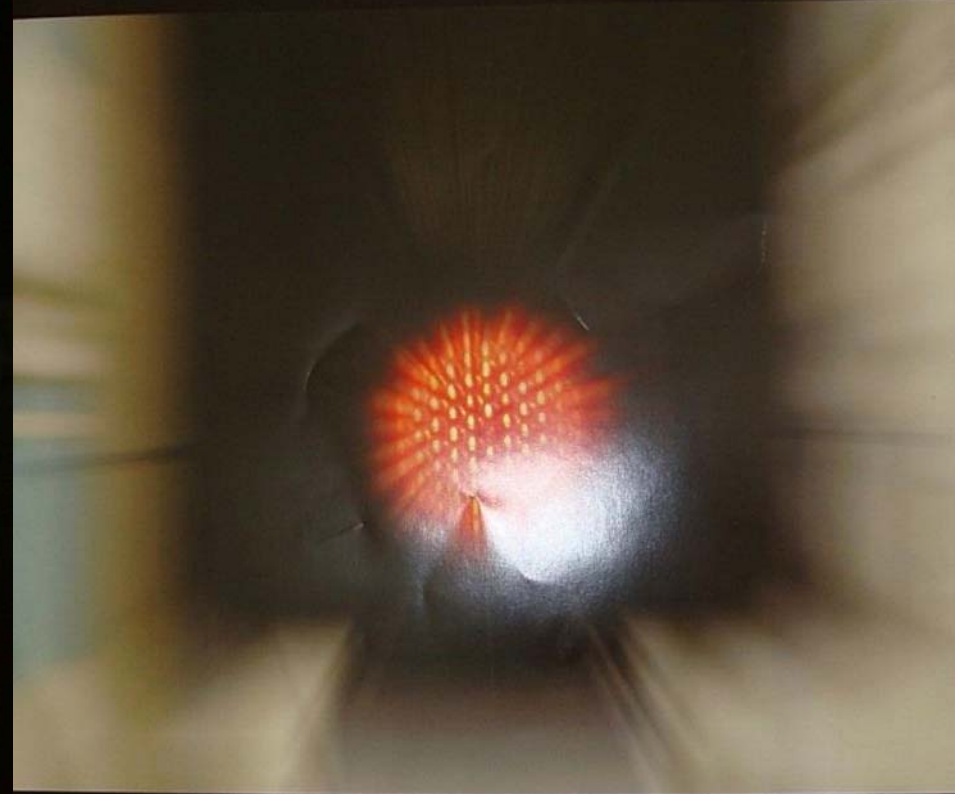


**Distractions, Complacency,
Assumptions – Don't let
these culprits cause SPADs**



**Your Professional
Approach Does Count**

BE ALERT



**LOSE ATTENTION...
GAIN A SPAD**



DON'T LOSE
YOUR FOCUS
KNOW WHERE
TO LOOK

Watch out for a FOCUS
briefing near you soon


Rail Safety & Standards Board

FOCUS

CHICKEN CURRY FOR DINNER?

How do you stay in focus?

Talk to your manager if you haven't had a presentation
about maintaining your FOCUS when driving

FOCUS top tips

- Scan the track
- Talk aloud to yourself
- Use all your senses

•
•
•

Tip of the Month


Rail Safety & Standards Board

FOCUS

SPAD-Risk Mitigation

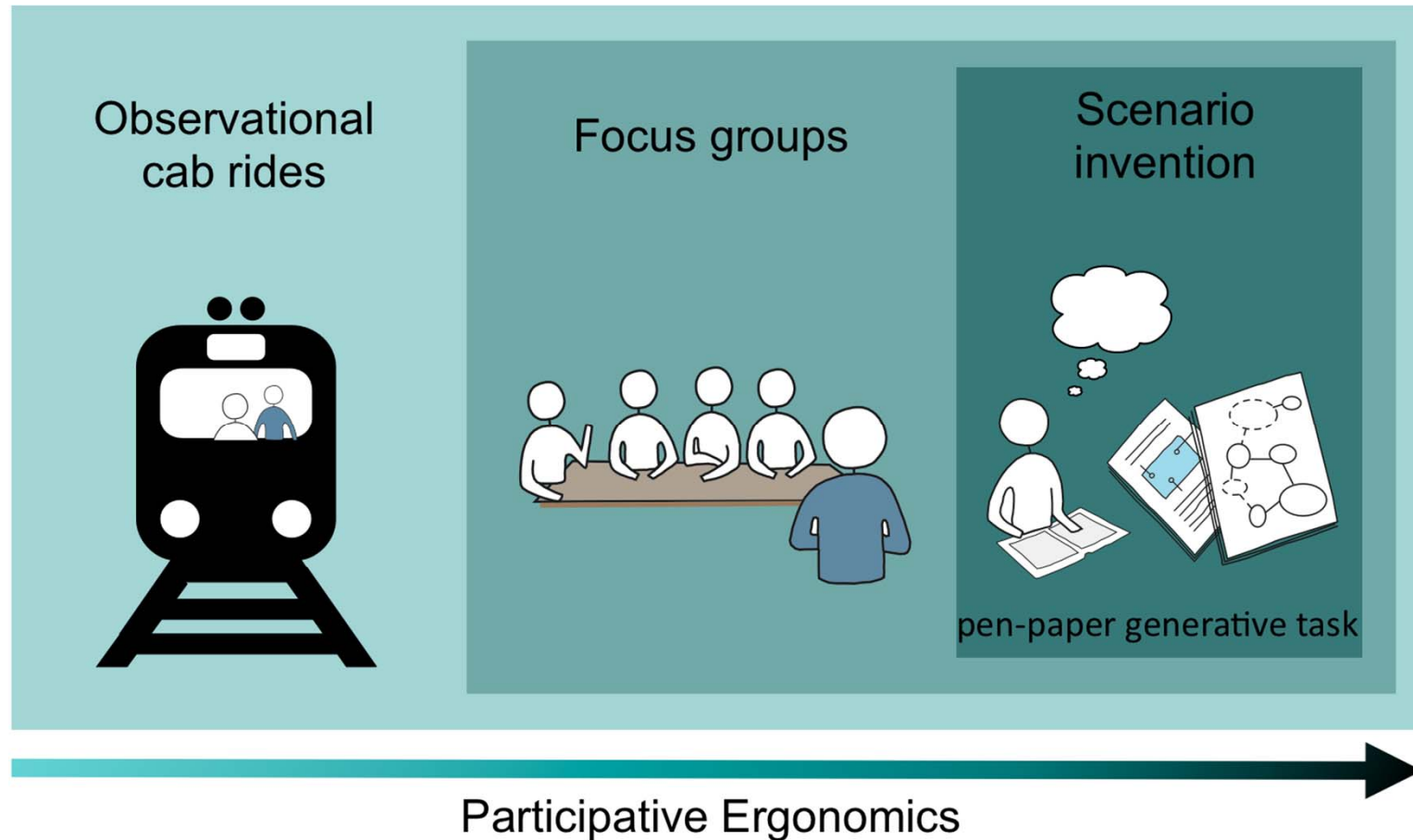
- Key risk factors
- SPAD causation
- Driving-related tasks/competing activities
- Risk mitigation strategies
- *‘Unpublished countermeasures’*
- Inform development of national safety guideline



Industry Participants



Research Framework

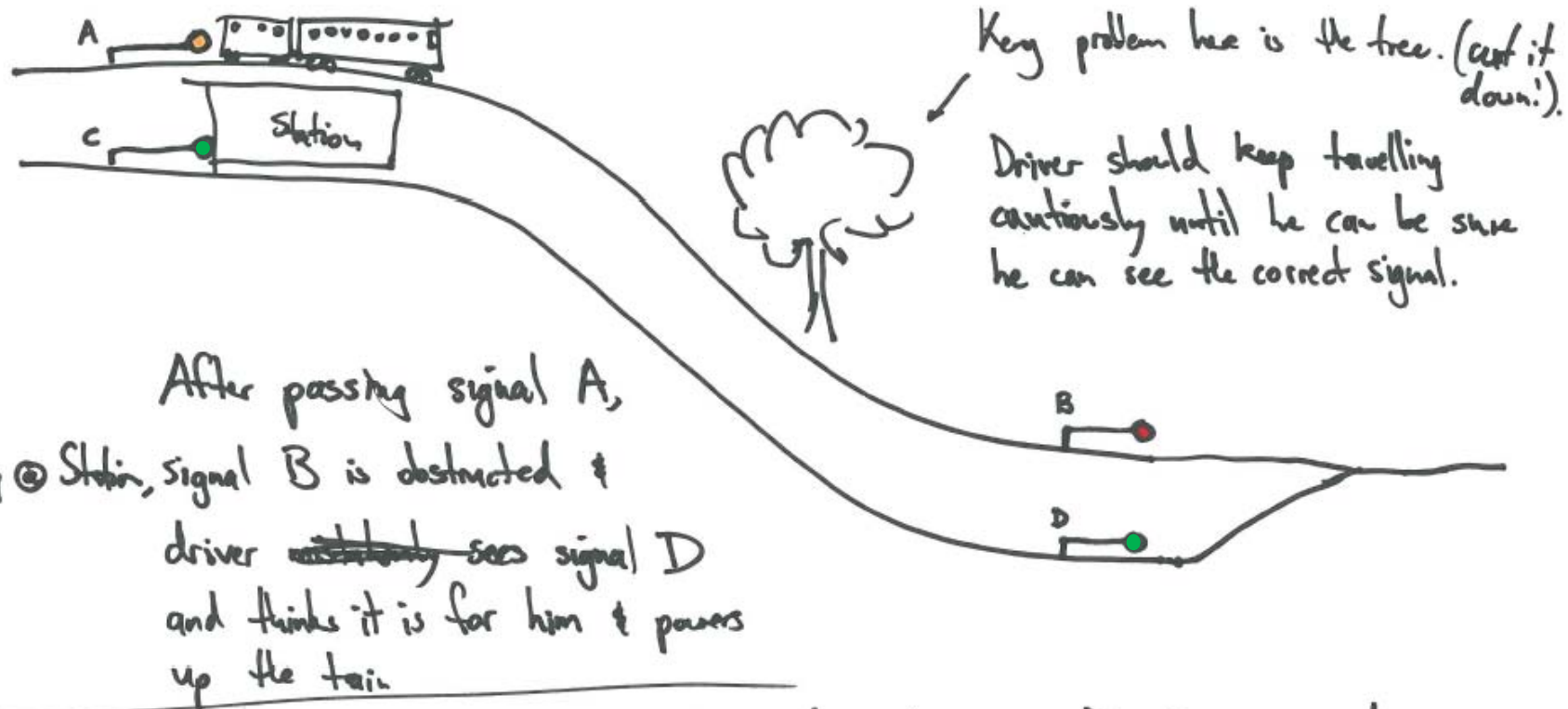


Naweed, A., & Balakrishnan, G. (*in press*). Understanding the Visual Skills and Strategies of Train Drivers in the Urban Rail Environment. *WORK: A Journal of Prevention, Assessment & Rehabilitation - Visual Ergonomics Special Edition*. doi: 10.3233/WOR-131705

Research Framework

- Qualitative methodology
- Focus group content

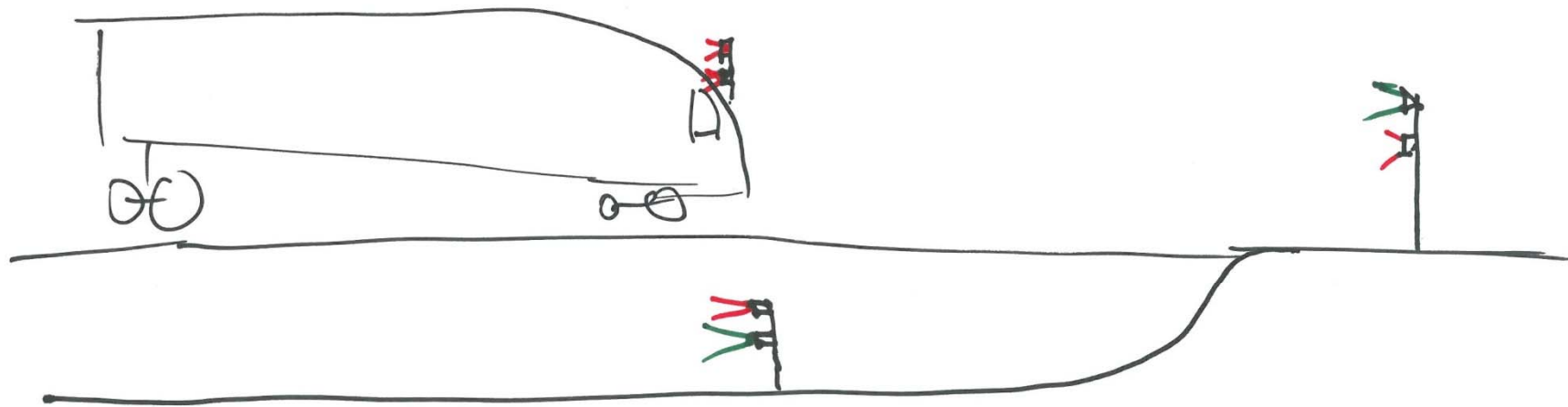
Class of question	Typical content
General experience	Background, organisation
Impressions of SPAD categorisation	Management, classes of SPAD
Prospective SPAD causation	Situation awareness, fatigue, etc.
Task Influence	Service delivery, sustained attention
Scenario invention task	Scenario drawings & walkthrough
SPAD mitigation	Personalised strategies
Signal relationship question	“Describe relationship with signal”



Driver is distracted @ station, then once back in the cab sees D @ green and assumes he is looking @ B signal which has been cleared to green

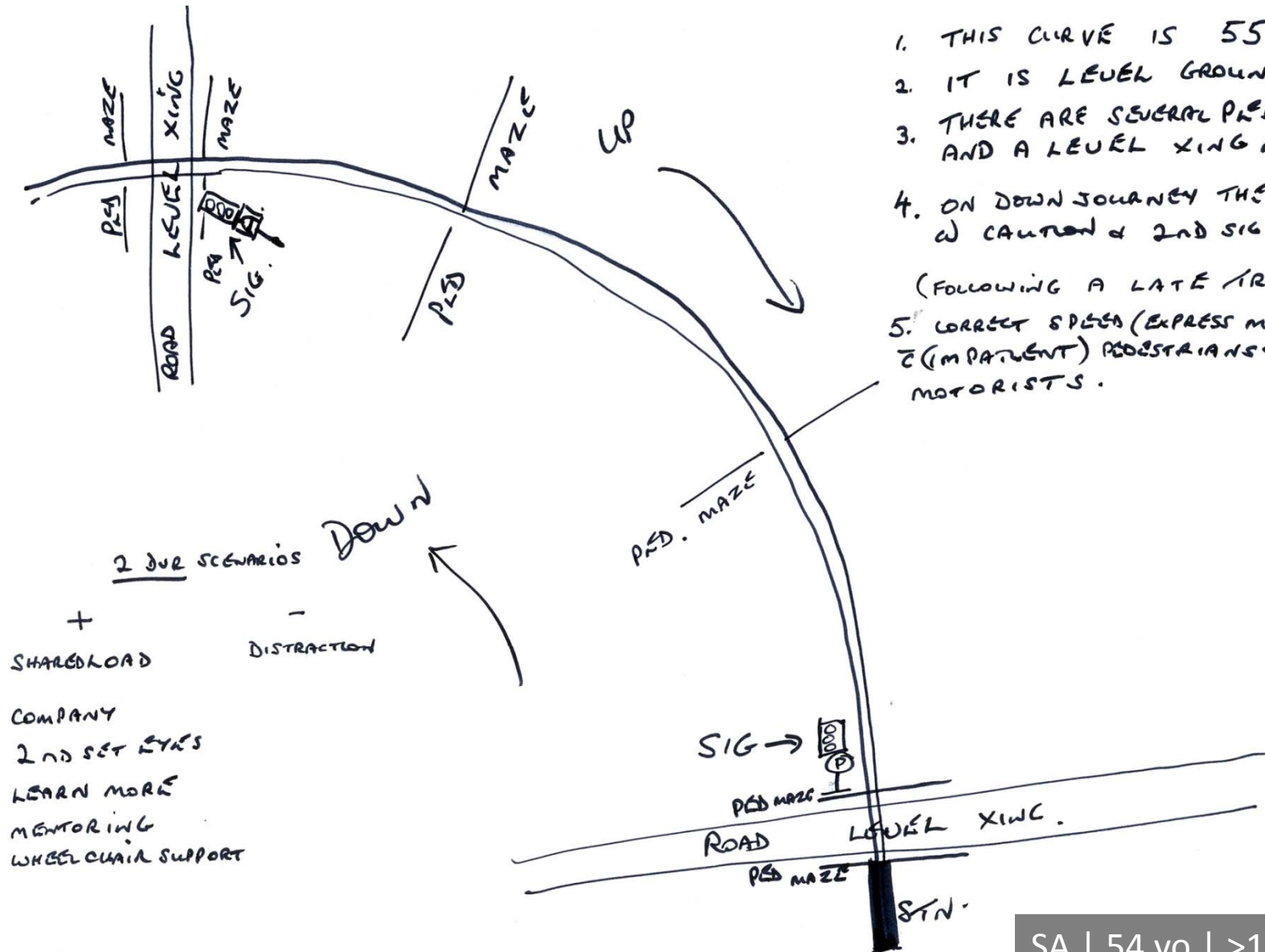
NZ | 41 yo | 5-10 y driving
Surface-map | xy

Station stop on passenger train
Signal at Red and not in DV view
Driver Can see next signal at proceed
Driver reads next signal & SPAD at
Platform



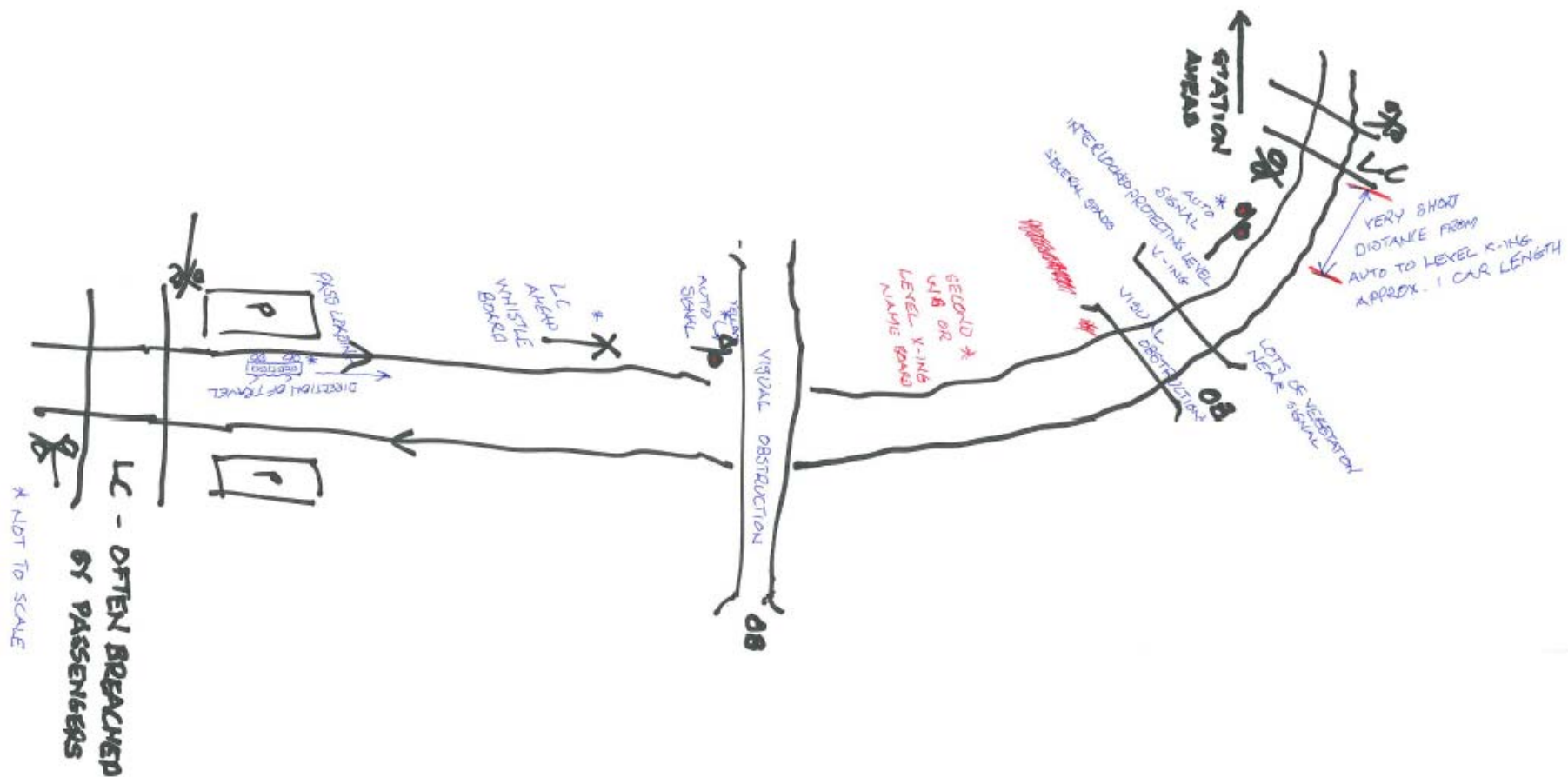
Route for train on second track
to proceed to Junction .

VIC | 48 yo | >10 y driving
Gradient profile | z



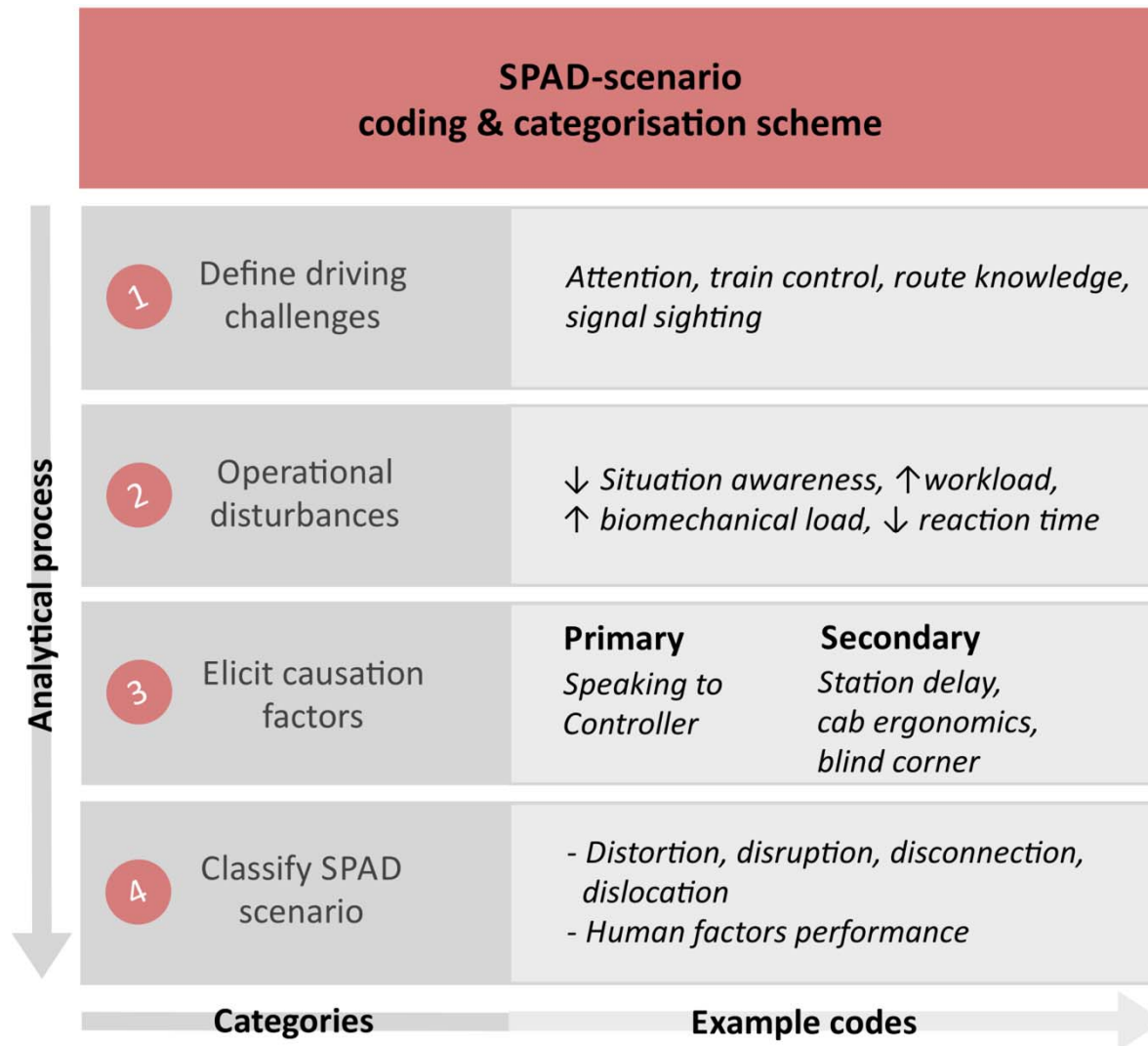
1. THIS CURVE IS 55 K.P.H.
2. IT IS LEVEL GROUND
3. THERE ARE SEVERAL PED. MAZES AND A LEVEL XING EACH END
4. ON DOWN JOURNEY THE SIG. W CAUTION & 2ND SIG RED
(FOLLOWING A LATE TRAIN)
5. CORRECT SPEED (EXPRESS MODE) & BRAKING
(IMPATIENT) RESTRAINTS & POSSIBLY MOTORISTS.

SA | 54 yo | >10 y driving
Surface-map | xy



VIC | 41 yo | 5-10 y driving
Surface-map | xy

Data Analysis



DDI Coding & Classification

- Distortion

Distraction arose from deformation in driving goals (e.g. assigning urgency to activity/goal not critical for safe driving)

- Disruption

Distraction arose from a new and competing activity that disrupted the driving task (e.g. an incoming call from the network control officer)

DDI Coding & Classification

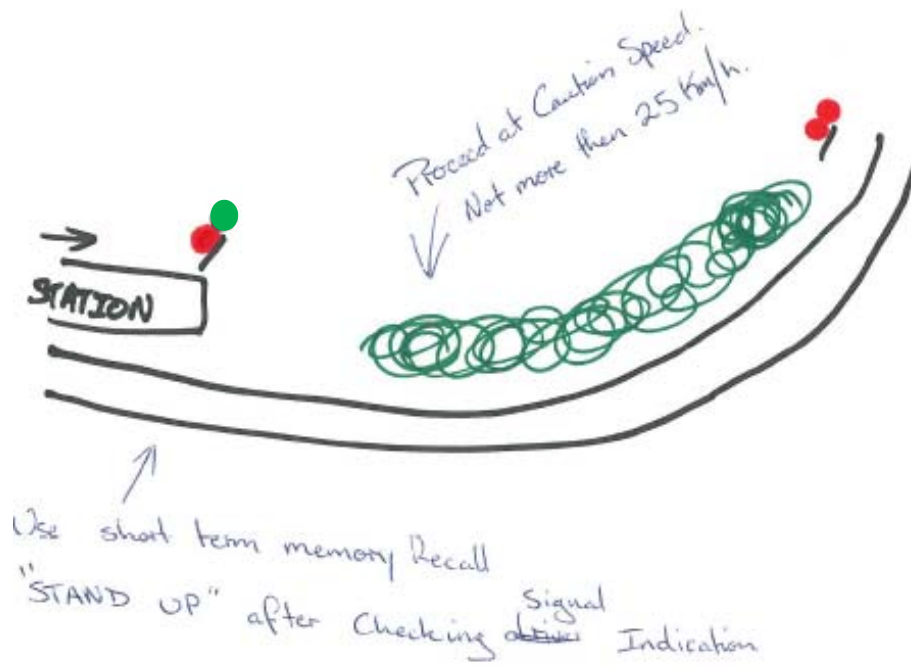
- Disconnection

Distraction appeared to manifest from a broken link or gap in working memory though the physical driving task remained uninterrupted (e.g. forgetting the colour aspect of the previous signal)

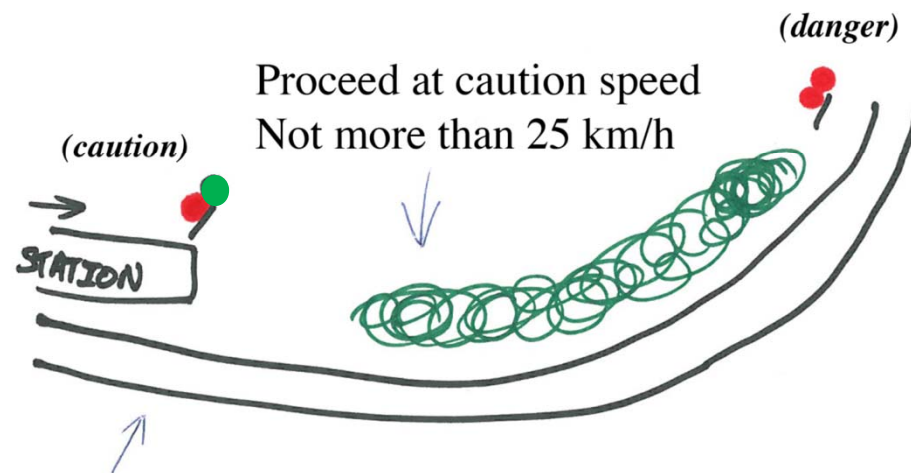
- Dislocation

Inattention and distraction arose from a complete separation of a fundamental driving cue and/or a replacement of one cue with another (e.g. forgetting the location of a signal; misreading one signal for another signal)

1. Driver Stops at Platform
2. Issue occurs on train involving Driver
3. Driver Departs while Communicating with guard.
4. Driver Contacts & Communicates with NCO
5. while talking Driver has SPAD



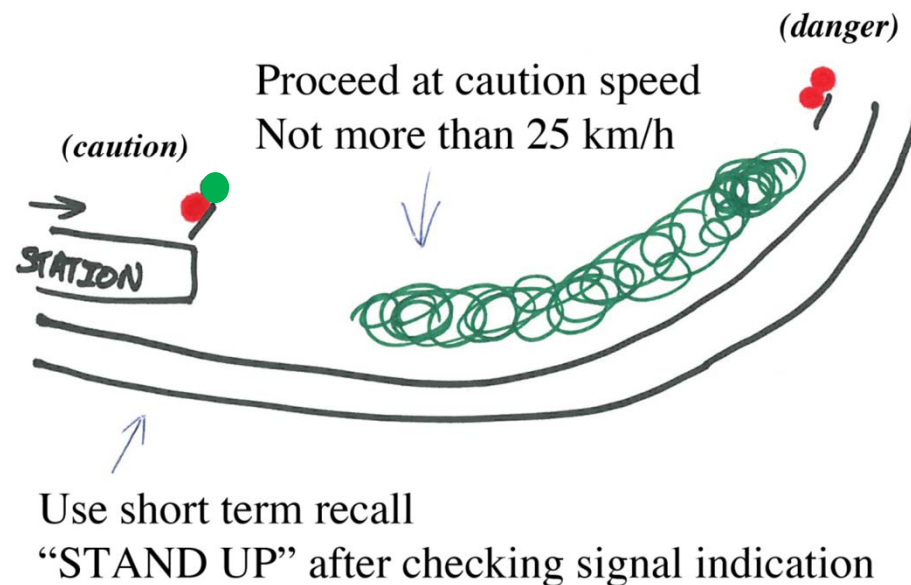
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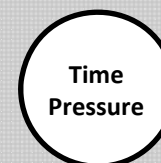
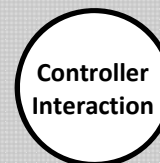
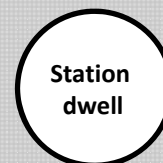
Use short term recall

“STAND UP” after checking signal indication

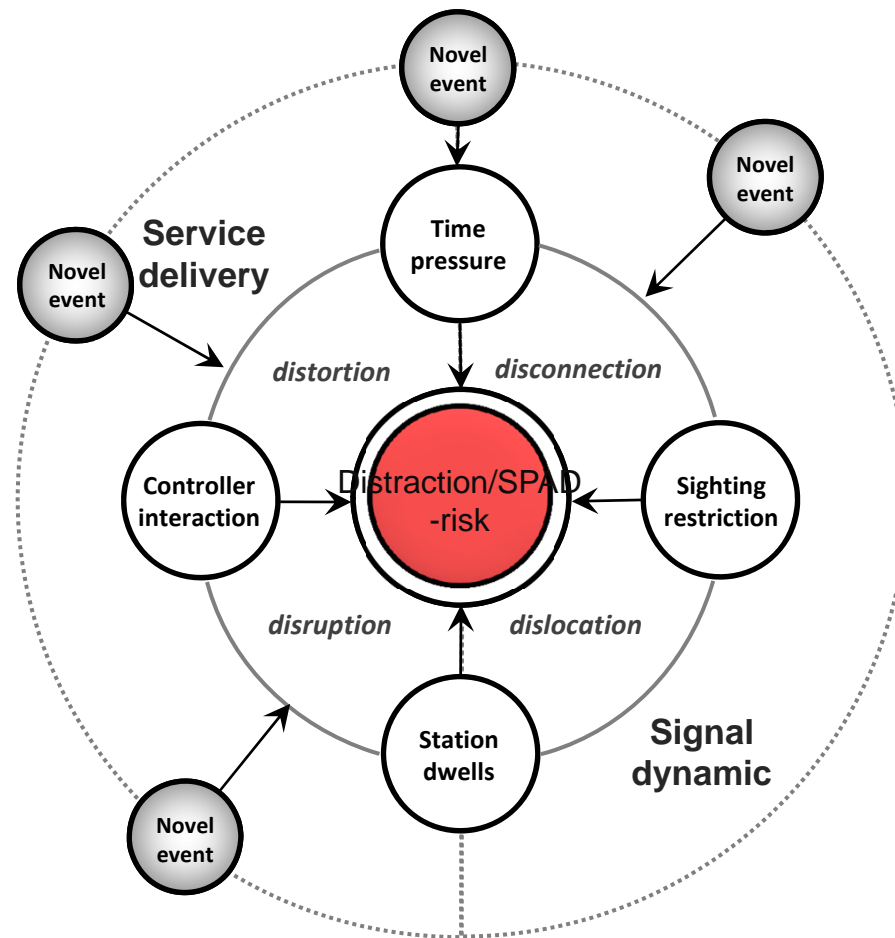
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Driver disengaged – task disrupted
 Controller interaction - Time pressure/ task distorted
 Sighting restriction / task disconnected
 DD Station dwell / task dislocated



Findings



Naweed, A. (2013). Psychological factors for driver distraction and inattention in the Australian and New Zealand rail industry. *Accident Analysis and Prevention*. doi: 10.1016/j.aap.2013.08.022

Summary of Key findings

- Near-unanimous indication of task-related inattention/distraction for challenging SPADs
 - Driving related/task-related thoughts
 - Extreme problems with self-regulation
- Model of distraction-based SPAD-risk
 - Multifactorial/Convergent
- Misprioritisation or Misappropriation?
 - Systems perspective
 - Driver distraction in passenger road transport modalities...
- Compulsive behavioural traits



Future Research

- Inform National Safety Standard
- Quantification of SPAD-risk/distraction model
 - Error producing conditions
 - Simulator experiments
- Compile intervention strategies
 - Countermeasures
 - Risk mitigation
- Future Inquiry Workshop





Thank you



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