Design induced non-compliance: influences on pedestrian and cyclist behaviour at level crossings

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SUMMARY

Collisions at rail level crossings remain a pressing concern, with the influences on user behaviour a critical area of research. This paper reports the findings of an observational study of pedestrian and cyclist non-compliant behaviours at 10 rail level crossing sites in Australia. The findings illustrate the diversity in crossing designs and how these differences may influence behaviour. General recommendations are provided, alongside the need to consider context-specific risk controls.

KEYWORDS

Rail level crossings, Pedestrians, Cyclists, Risk, Non-compliant behaviour

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Introduction

Rail level crossings (RLXs) pose a safety threat to road users in Australia, with 39 level crossing collisions involving a person or road vehicle and 725 near miss incidents since 2016 (ONRSR 2021). The key non-compliant behaviour of entering the RLX when gates/booms are closed, known as "bypassing", increases the risk of collision between trains and road users, including pedestrians and cyclists. However, the factors underpinning this behaviour are not clear. The aims of this study were to: (1) Improve our understanding of bypassing behaviour of pedestrians and cyclists at RLXs; and (2) Identify factors that influence bypassing behaviour and risk at RLXs.

Method

Data were collected using the Behavioural Assessment Tool for Rail Level Crossings (BAT-RLX; Read & Salmon, 2016). The BAT-RLX coding scheme was applied to analyse road user behaviour at 10 sites in Victoria, Australia. For each site, eight hours of video footage was analysed, generally over two weekdays, during peak periods (7:15 to 9:15 am and 3:30 to 5:30 pm). Coding was supported by the Noldus Observer XT software package.

Results & Discussion

A total of 201 bypasses were identified during the study period. The majority of bypassers were male (62%), were adults (91%), and the majority of bypass events involved a single user as opposed to bypassing in a group (68%). Just over half of bypassers did not check for trains prior to bypassing (55%) and the majority did not engage with technology (e.g., use a mobile phone / device or wear headphones) while bypassing (93%).

For each site, there was generally a clearly preferred method of bypassing (either via the pedestrian gates or via the road boom barriers), aligned to the differences in the physical design of the site, including desire lines. Most bypass events (58.2%) occurred during the morning peak period; however, this trend was more pronounced for some sites with adjacent train stations, indicating this behaviour may be attributed to time pressure associated with catching a train to reach work / school on time. However, at other sites with adjacent stations, less clear differences between the peak periods were observed suggesting that behaviours are driven by other factors at these sites. Where the destination of the bypasser could be determined at RLXs with an adjacent train station, just under half (48.39%) proceeded to the train station versus other destinations after bypassing. For some sites, a clear majority of bypassers were observed to continue to the railway station; however, at other sites there was a more even spread of those going to the station versus another destination. This suggests that while catching a train may be an influencing factor in some cases, it does not account for all bypasses at sites with an adjacent railway station.

Figure 1 shows the wait times of pedestrians and cyclists before bypassing. There is large variation in wait times, indicating potential contextual influences. However, over half of the sites had a median wait time of less than one minute before users bypassed, indicating a low tolerance to wait.

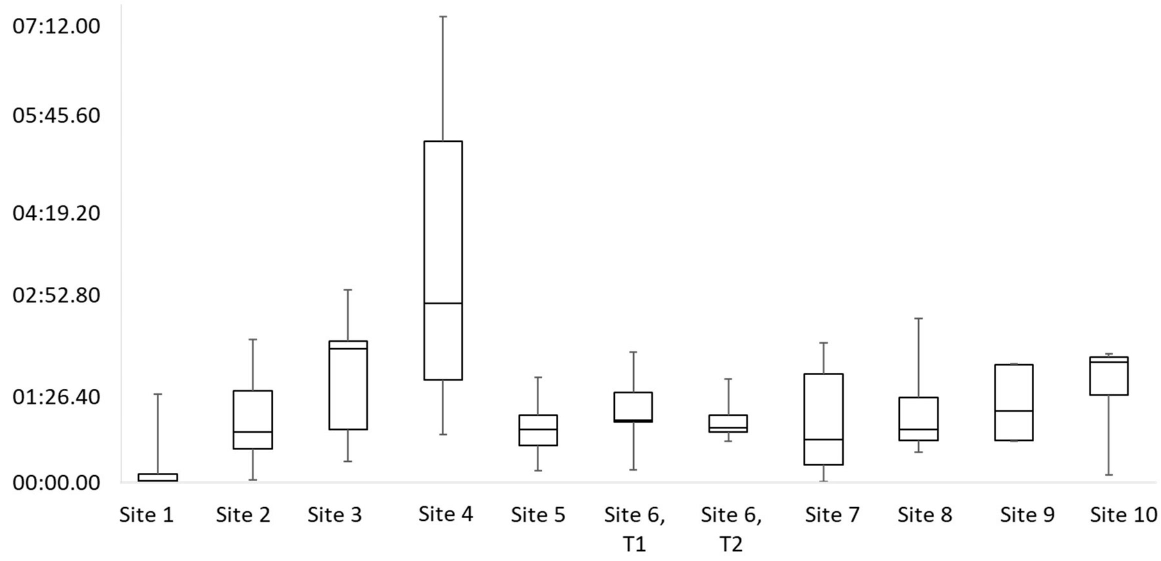

Figure 1: Wait times prior to bypassing

Conclusion

The findings provide in-depth data regarding the demographics and circumstances of bypass events involving pedestrians and cyclists at RLXs. They also highlight the diversity in RLX designs and how these may influence behaviour (i.e. desire lines) as well as the need to explore how to manage the conflict between user wait time tolerance and actual waits in a busy metro rail environment. General recommendations to improve safety include improving user information, improving design to guide users to preferred paths, and providing stronger physical barriers for pedestrians and cyclists. However, the findings regarding the influence of context mean that broad assumptions should not be used when assessing risks and determining risk controls for individual sites. Site-specific data collection and risk assessment are important inputs to RLX risk management.

Acknowledgements

This research is funded by the Victorian Railway Crossing Safety Steering Committee via Metro Trains. We thank Vanessa Beanland, Tony Carden, Leannda Read, Kerri Salmon and Kaytee Faulkner for their contributions to data collection.

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