Understanding slips, trips, and falls among older rail passengers: Future-proofing risk

Dr Victoria Kendrick[a], Dr Patrick Waterson[a], Dr Brendan Ryan[b], Dr Thomas Jun[a], and Professor Roger Haslam[a]

[a]*Human Factors and Complex Systems Group, Design School, Loughborough University, UK;* [b]*Human Factors Research Group, Nottingham University, UK*

1. Introduction

The On average 30% of adults over the age of 65 years fall each year, with 1 in 5 of those falls requiring medical attention (Gillespie et al, 2012). With an ageing population across parts of the world (e.g. United Kingdom, Australia, and the United States of America), the number of older passengers (over the age of 65 years) using public transport (i.e. railways) is likely to increase, with implications for the design and use of train stations (Currie and Delbosc, 2010; DTI, 2000; Palacin, 2011; RSSB, 2008, 2011).

2. Method

A systems based approach was used to identify factors that contribute to slips, trips, and falls (STF) in older rail passengers. The research consisted of stakeholder interviews (n=44) with experts from within rail and across other industries (i.e. healthcare, aviation), station observations (n=11); older passenger interviews (n=18, aged 67-94 years, 8 females: 10 males); and a survey of station managers (n=66). Participants were recruited on a structured convenience basis, sampling participants from the chosen sample groups most likely to be able to provide useful insights into the problem under investigation. Data were analysed iteratively using hybrid thematic analysis, with data driven codes developed, and emergent overarching themes identified (Bryman, 2004).

3. Results

Factors that impact STF in older rail passengers were categorised into organisational influences, influences within the station environment, and individual influences (based on previous models by Haslam and Stubbs, 2006; Bearfield et al., 2013; and Rasmussen and Svedung, 2000). Issues were then classified as high, medium and low priorities for reducing older rail passenger STF in the future (2014-2050). High priorities included:

- Organisational influences: the provision of assistance services (understanding and improving the service offered to meet the requirements of vulnerable passengers, staff awareness).
- Environmental influences: the impacts of weather (enhancing stations to combat changes in weather), sensory distractions (dealing with advances in technology that may impact the awareness of passengers, including wearing headphones or using mobile social media), escalator safety (understanding and reducing the dangers, appropriate signage, alternative lifts, passenger awareness), and considerations surrounding crowding (population increase, pedestrian flow, fire safety and evacuation).
- Individual influences: issues surrounding mental health (likely to rise with the ageing population, requiring staff and passenger awareness).

Issues highlighted as areas of high priority should be the focus of research and interventions to reduce STF among older passengers in the future (2014 to 2050), based on our findings.

4. Discussion

Our research used the Haslam and Stubbs (2006), model of STF, along with the Bearfield et al (2013) Bayesian model of STF that occur at the train platform interface specifically, to enhance understanding

surrounding STF of older passenger at train stations across Great Britain. Our findings provide insight into priority areas to target future rail safety interventions, with the aim of improving the experience (safety, comfort, satisfaction and performance) of older rail passengers, and ultimately reducing STF. Findings will be used to develop a systems model of factors (including those of high, medium, and low priority) that contribute to STF among older passengers.

Acknowledgements

The authors of this paper would like to thank the UK Rail Safety and Standards Board for their support throughout this project.

References

Bearfield, G., Holloway, A., Marsh, W. 2013. "Change and safety: decision-making from data". *Proceedings of the institution of mechanical engineers part F-journal of rail and rapid transit* 227(6): 704-714.

Bryman, A. 2004. *Social Research Methods* (3rd Ed.). Oxford: Oxford University Press.

Currie, G., Delbosc, A. 2010. "Exploring public transport usage trends in an aging population". *Transportation* 37:151–164.

DTI. 2000. *Design for Living Taskforce Report*, DTI Foresight Ageing Population Panel, London: Department of Trade and Industry, UK.

Gillespie, L.D., Robertson, M.C., Gillespie, W.J., Sherrington. C., Gates, S., Clemson, L.M., & Lamb, S.E. 2012. "Interventions for preventing falls in older people living in the community (Review)." *The Cochrane Library*, 9.

Haslam, R., Stubbs, D. (Eds.). 2006. "*Understanding and Preventing Falls*". London: Taylor & Francis.

Palacin, R. 2011. "Ageing and mobility: challenges for a sustainable future". *World Congress on Railway Research*, Lille, France.

Rasmussen, J. 1997. "Risk management in a dynamic society: A modelling problem". *Safety Science* 27: 183–213.

RSSB. 2008. "The effects of an ageing population on rail travel". S065, Rail Safety Standards Board, UK.

RSSB. 2011. "The implications of an ageing population for the railway". T661, Rail Safety Standards Board, UK.