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An analysis of differences in driver speed and lane position for experienced and inexperienced drivers through high and low risk rural curves

by

Blair Matthew Turner

Thesis submitted to The University of Adelaide, Centre for Automotive Safety Research
in fulfilment of the requirements for the degree of
Doctor of Philosophy

Submitted October 2017

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ABSTRACT

Road crashes at rural curves result in a high number of deaths and serious injuries. Speed has been identified as a significant contributor to such crashes, but some researchers have suggested that an understanding of other elements is also required. This study was designed to broaden the understanding of the mechanisms that lead to elevated crash risk at curves. A better understanding of these issues might provide insight into methods for improving safety at curves. This study included an assessment of the elements of curve design that are linked to side force and crash risk, including speed, curve radius and driver lane position. These issues were assessed for high risk and low risk curves. Differences between inexperienced and experienced drivers were also compared.

40 male drivers (20 inexperienced and 20 experienced) drove a set rural route in a test vehicle which was instrumented to collect data. Measures of speed, side force and lane position were taken on a continuous basis for each curve on the route. Information regarding the design elements for each curve was also collected, including curve radius, curve direction (left or right) and curve risk (calculated based on the difference between curve approach speed and minimum curve speed). Based on the calculation of curve risk 20 high risk curves, and 20 low risk curves were identified and data for each included in the study.

Differences in speed, side force and lane position through high and low risk curves were assessed, as were the differences between inexperienced and experienced groups of drivers on these same measures. This information was collected at key points on approach and through curves.

Results indicated that when comparing high risk curves with low risk curves speeds were lower for high risk curves; acceleration and deceleration levels were greater; side force was greater; and variance between drivers was greater. Deceleration continued through and beyond the curve mid-point for high risk curves. Given this is a high risk point within a curve (i.e. where the side force is greatest, and the chance to lose control highest) it is highly desirable that drivers will have already fully decelerated by this point.

There were substantial differences in lane position on approach and through high risk compared to low risk curves. Lane position was also statistically and substantively different for inexperienced compared with experienced drivers. For high risk curves, experienced drivers ‘cut the corner’, reducing side force to a greater degree than inexperienced drivers.

These results relating to speed (particularly the need to reduce speed at or before the curve mid-point) and lane position provide useful information on possible sources of risk to drivers through curves. The findings support the hypothesis that in order to understand risk at curves, factors such as speed and lane position should be considered in combination. The results presented provide additional opportunities to help improve safety. Earlier deceleration coupled with more appropriate lane position would act to reduce side force through curves, and therefore lead to improved safety outcomes.

THESIS DECLARATION

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

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I acknowledge the support I have received for my research through the provision of an Australian Government Research Training Program Scholarship.

Signed

ACKNOWLEDGEMENTS

I would like to thank my supervisors, Jeremy Woolley, Mary Lydon, Peter Cairney and Chris Stokes. Each brings an incredible amount of knowledge and common sense that has helped me bring this work to completion. I appreciate the help that they have provided, and count myself as fortunate that each has played a part. Similarly, I would like to thank other staff at CASR for their help, including feedback during presentations. Particular acknowledgement goes to Paul Hutchinson for his input at critical stages.

I have been lucky to have had strong support from my employer and colleagues at the Australian Road Research Board (ARRB). This included provision of the data collection vehicle and collection equipment and for vouchers to help compensate subjects for their time. Particular thanks to Mike Shackleton for support in providing encouragement and resources; the Systems staff for installing equipment and software plus providing advice; and other PhD students for sharing experiences and providing support. Thank you to Bill Young for useful comments on the early draft. Thanks also to my direct colleagues for their help and support, including Michael Tziotis, for allowing time to complete the study; John Catchpole for discussions of ideas during many lunchtime walks, and other teammates for advice and help carrying the load for my 'day job' when I was busy at critical stages of study. Thanks also to Peter Milne who proof read the final draft and helped whittle out the typos.

I was very fortunate to have the help of a talented vacation student, Thomas Keating, who assisted with the installation of equipment for data collection, programing for data extractions, and in administration of the subjects. This assistance was greatly appreciated.

I would like to thank all of the subjects who gave up their time to be involved in the trial. This included ARRB staff, friends and complete strangers. Thank you also to those who helped promote the trial, including VicRoads and RACV for advertising for subjects.

Thanks to other friends and family who have provided support and encouragement. I was lucky to select a topic that many people could relate to, and enjoyed thoughts and comments from all who provided them. Particular thanks to my dad, Brian, who always seemed genuinely interested to hear what was happening with the study.

Lastly, and most importantly, I would like to thank my wife Kate, and children Alice and Lucy. A part time PhD takes a very long time, and intrudes on family time to a large

extent. The huge amount of support provided made this possible. You will all be very pleased to hear that my work in the evenings and weekends has now finally finished.