

Is There Evidence to Support the Risk Compensation Hypothesis for Bicycle Helmet Use?

Mahsa Esmailikia^a, Igor Radun^b, Raphael Grzebieta^c, Jake Olivier^a

^a School of Mathematics and Statistics, UNSW Sydney, Australia ^b Department of Psychology and Logopedics, University of Helsinki, Helsinki, Finland ^c Transport and Road Safety (TARS) Research, UNSW Sydney, Australia

Abstract

A long-standing argument against bicycle helmet use is the risk compensation hypothesis. Multiple studies have examined the effect of bicycle helmet use on risky behaviour showing mixed findings. There have been no systematic reviews on bicycle helmet use and risky compensation to date. The current systematic review includes peer-reviewed literature studies conducted across eight countries. The findings of this study shed light on the potential association between bicycle helmet wearing and risky behaviour.

Background, Method, Results and Conclusions

To date, 272 jurisdictions worldwide have enacted bicycle helmet legislation to increase helmet wearing, and consequently decrease bicycle-related head injury and fatality (Esmailikia et al., 2017). Critics of bicycle helmet use, however, argue that increase feelings of safety caused by wearing a helmet results in cyclists exhibiting more risky behaviour (Walker, 2007; Phillips, Fyhri & Sagberg, 2011; Messiah et al., 2012; Gamble & Walker, 2016).

On the other hand, a large body of research has shown that bicycle helmet wearing is not associated with riskier behaviour. For example, some studies found that committing a traffic violation was positively associated with a lower frequency of helmet use (e.g., Lardelli-Claret et al., 2003; Fyhri et al., 2012; Martinez-Ruis et al., 2013). Other studies have found that alcohol use is negatively correlated with helmet use (e.g., Crocker et al., 2012; Orsi et al., 2014).

There is a lack of consensus in the research literature regarding bicycle helmet use and the risk compensation hypothesis, and this gap in knowledge was identified at least 17 years ago (Thompson, Thompson & Rivara, 2001). This study aims to shed light on the potential association between bicycle helmet and risk compensation by systematically reviewing the peer-reviewed literature on bicycle helmet wearing and risky behaviour. The review adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher et al., 2009).

A systematic review of the peer-reviewed literature using five research databases (EMBASE, MEDLINE, COMPENDEX, SCOPUS, and WEB OF SCIENCE) was performed on 17 May 2017. The search criteria used identified articles with bicycle helmet content.

A search of the peer-reviewed literature resulted in 190 articles, out of which 49 were duplicates and were removed from the list. Three other articles from other sources were added into the list resulting in 144 unique records. After a title and abstract screening, and performing a full-length assessment, 22 studies were included in the current systematic review. In compliance with PRISMA, two reviewers independently searched and assessed documents against inclusion criteria as well as information extracted from articles included for a full length read.

This systematic review found little to no support for hypothesis bicycle helmet use is associated with engaging in risky behaviour. Sixteen studies found no supportive evidence while four studies provided mixed findings, i.e., results for and against the hypothesis. For many of these studies, bicycle helmet wearing was associated with safer cycling behaviour. Only two studies conducted in the

United Kingdom provided evidence to support the risk compensation hypothesis. These two studies reported motor vehicles passing at closer distance when a researcher wore a helmet on his commute to work (Walker, 2007) and the other found participants had higher risk-taking scores when wearing a helmet versus a baseball cap

in a laboratory environment (Gamble & Walker, 2016). However, the external validity of both studies is questionable due to one participant in the former study and a non-cycling environment for the latter.

There are several limitations to this systematic review. First, risk compensation has not been directly measured in the literature which may provide inaccurate results. Second, most articles identified in our search were commentaries regarding other studies without providing any data on the association between bicycle helmet wearing and risky behaviour. Third, due to ethical issues, the causal relationship between helmet use and risky behaviour is difficult to establish since participants cannot be randomised to wear or not wear a helmet.

References

- Crocker, P., King, B., Cooper, H., & Milling, T. J. (2012). Self-reported alcohol use is an independent risk factor for head and brain injury among cyclists but does not confound helmets' protective effect. *Journal of emergency medicine*, 43(2), 244-250.
- Esmaeilikia, M., Grzebieta, R., & Olivier, J. (2017). A systematic Review on the Effects of Bicycle Helmet Legislation on Cycling. *International Cycling Safety Conference Proceedings*. Davis, USA.
- Fyhri, A., Bjørnskau, T., & Backer-Grøndahl, A. (2012). Bicycle helmets—A case of risk compensation?. *Transportation research part F: traffic psychology and behaviour*, 15(5), 612-624.
- Gamble, T., & Walker, I. (2016). Wearing a bicycle helmet can increase risk taking and sensation seeking in adults. *Psychological science*, 27(2), 289-294.
- Lardelli-Claret, P., de Dios Luna-del-Castillo, J., Jimenez-Moleon, J. J., Garcia-Martin, M., Bueno-Cavanillas, A., & Galvez-Vargas, R. (2003). Risk compensation theory and voluntary helmet use by cyclists in Spain. *Injury Prevention*, 9(2), 128-132.
- Martínez-Ruiz, V., Lardelli-Claret, P., Jiménez-Mejías, E., Amezcua-Prieto, C., Jimenez-Moleon, J. J., & del Castillo, J. D. D. L. (2013). Risk factors for causing road crashes involving cyclists: An application of a quasi-induced exposure method. *Accident Analysis & Prevention*, 51, 228-237.
- Messiah, A., Constant, A., Contrand, B., Felonneau, M. L., & Lagarde, E. (2012). Risk compensation: a male phenomenon? Results from a controlled intervention trial promoting helmet use among cyclists. *American journal of public health*, 102(S2), S204-S206.
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & Prisma Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS medicine*, 6(7), e1000097.
- Orsi, C., Ferraro, O. E., Montomoli, C., Otte, D., & Morandi, A. (2014). Alcohol consumption, helmet use and head trauma in cycling collisions in Germany. *Accident Analysis & Prevention*, 65, 97-104.
- Phillips, R. O., Fyhri, A., & Sagberg, F. (2011). Risk compensation and bicycle helmets. *Risk analysis*, 31(8), 1187-1195.
- Thompson, D. C., Thompson, R. S., & Rivara, F. P. (2001). Risk compensation theory should be subject to systematic reviews of the scientific evidence. *Injury prevention*, 7(2), 86-88.

Walker, I. (2007). Drivers overtaking bicyclists: Objective data on the effects of riding position, helmet use, vehicle type and apparent gender. *Accident Analysis & Prevention*, 39(2), 417-425.