iCSC International Cycling Safety Conference

6th Annual International Cycling Safety Conference
21-22 September 2017, Davis, California, USA

Safety in Numbers for walkers and bicyclists: Exploring the mechanisms

Peter L. Jacobsen*, David Ragland#

*827 Santa Paula Way
Davis, California, USA
email: jacobsen.peter@yahoo.com

#Safe Transportation Research & Education Center,
Institute of Transportation Studies
School of Public Health
University of California, Berkeley, California, USA
email: davidr@berkeley.edu

Keywords: traffic accidents/prevention & control, bicycling/injuries, bicycling/statistics & numerical data, humans, risk assessment/methods, safety.

1 INTRODUCTION

When more people walk and bicycle on a street, it lowers the risk of them being injured by a motorist. That is, while the absolute number of motorists who strike walkers or bicyclists may increase with more people walking or bicycling, the risk of such collisions decreases simply because the number of injuries increases much slower than the increase in number of people walking and bicycling. This phenomenon is known as Safety in Numbers.

In sharp contrast, when more people drive, the risk of colliding with another motorist remains nearly constant. The fact that the risk of a motorist striking pedestrians or bicyclists decreases with their rising numbers suggests that there are one or more special mechanisms influencing these collisions.

2 POSSIBLE HYPOTHESES TO EXPLAIN SAFETY IN NUMBERS

Several hypotheses have been presented for explaining the Safety in Numbers effect. Communities with varying amounts of walking or bicycling have injury risks that vary by nearly a factor of 10. Hence, the likely causative hypotheses need to show a similar sized effect.

Safer street designs and operations for people walking and bicycling attract more people to walk and bicycle, and consequently the correlation could merely be an artefact of these improvements. However, the population effect of these interventions is an order of magnitude less than observed in ecological comparisons, and hence would only explain some of the Safety in Numbers effect.

It seems unlikely that people walking or bicycling would obey traffic laws or defer to motorists more with greater walking and bicycling. Indeed it seems less likely. The role of self-selection in explaining Safety in Numbers is mixed and thus unlikely to qualify as a major factor. That pedestrians and bicycle riders may shy away from dangerous roads could also explain Safety in Numbers. However, there is no empirical evidence of this behavior with bicyclists. In most communities, pedestrian volume is concentrated on the busy commercial streets, which is contrary to this hypothesis.

Signal detection theory provides a possible framework for understanding the Safety in Numbers effect. It theorizes that probability of detection depends upon (1) how clearly the target can be detected, (2) the observer's relative frequency of experiencing the target, and (3) the consequences of detection. Unfortunately, motorists cannot always clearly detect people walking or bicycling. Over 90% of the information drivers receive is visual and driving demands a tremendous amount of visual and cognitive processing. Driving presents many situations in which motorists operate beyond their visual or perceptual capabilities. Consequently, motorists create mental models based on their expectations and experience, and hence people walking or bicycling may not be in that

model. Signal detection theory also shows the importance of the observer's relative frequency of experiencing the target. Rare targets are often missed, and very rare targets are highly likely to be missed. The rarity of people walking and bicycling makes them harder to detect and to require more response time than more common objects. This difficulty in detecting rare targets is consistent with the empirical results observed in Safety in Numbers.

3 DISCUSSION

An overall lesson of the Safety in Numbers effect is that interventions to reduce motor vehicle collisions with pedestrians and bicyclists are especially needed in areas with high numbers of injuries, and indeed individual risk is immaterial in this instance since the goal is to reduce the number of injuries. Similarly, safety infrastructure should be targeted to support interventions with the greatest potential to increase the number of people walking or bicycling—to maximize the health benefits from increased physical activity and to reduce risks.

Improving the detectability of people walking and bicycling is one strategy. Since perceived prevalence, rather than actual prevalence, is the issue, roads can be designed to 'remind' motorists of the possible presence of people walking and bicycling. Because driving taxes and sometimes exceeds motorists' visual processing ability, either motorized traffic needs to be separated from vulnerable road users, or the speeds of the motorized traffic need to be lowered so that motorists have more time to detect and perceive people walking and bicycling.

Increasing the frequency of motorist encounters with people walking and bicycling is the second approach to improve signal detection. Concentrating people walking and bicycling to fewer streets would make motorists more aware of them on those streets.

Addressing the consequences for failure to detect people walking and bicycling is the third approach to improve signal detection. One explanation for the much lower risk of walking and bicycling in Germany and the Netherlands is their laws protecting people walking and bicycling, and more severe punishment of motorists for traffic violations.

Safety in Numbers also means that injury prevention efforts that inadvertently reduce walking or bicycling may actually make walking and bicycling more dangerous for those who continue to walk or bicycle. This can present a serious ethical dilemma for policy makers. Furthermore, given the health benefits that accrue from regular physical activity, the reduced level of walking or bicycling may impose health costs that exceed the benefit from any reduction in injuries.

Increasing regular physical activity through more walking and bicycling is a key policy tool to address premature mortality and mitigate climate change. Understanding the Safety in Numbers effect and applying it in public policy determinations will help ensure that injury risks are not overstated and that physical activity is promoted to the full extent warranted by its potential benefits.