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Short communication

Risk compensation and bicycle helmets: A false conclusion and uncritical citations

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ABSTRACT

Some researchers and many anti-helmet advocates often state that when cyclists wear a helmet they feel safer and take more risks. This hypothesis – risk compensation – if true, would reduce, annul or even reverse the assumed benefits of helmets in reducing head injuries. Consequently, this hypothesis is often used to oppose mandatory helmet laws. In this article, we illustrate how one of the few studies that attempted to experimentally test the hypothesis in relation to bicycle helmets arrives at a false conclusion. As a result it is often cited as evidence of risk compensation. Given the lack of experimental studies in this research area, the impact of a single study in shaping the opinions of the general public and of policy makers can be significant.

1. Introduction

It has often been suggested that the effectiveness of bicycle helmets in reducing head injuries might be offset by risk compensation. This is a hypothesis that asserts that people have a homeostatic approach to risk taking such that any effort to improve safety is countered by greater risk taking (Wilde, 1998). In the case of cyclists it assumed that wearing a helmet would result in more risky riding (Robinson, 1996). Although there is no strong evidence supporting this hypothesis (Pless, 2016; Thompson, Thompson, & Rivara, 2001) it has become one of the most frequent and strongest 'arguments' anti-helmet advocates use when they oppose mandatory helmet laws or the widespread promotion of bicycle helmets (see, for example, Cyclists' Rights Action Group website, 2017).

A literature search conducted in 2014 with the phrases "risk compensation" and "bicycle helmet" produced one article in Medline, nine using Scopus and six for Web of Science (Olivier, Wang, Walter, & Grzebieta, 2014). The authors stressed that four of the nine articles identified in Scopus were opinion pieces, not empirical studies. Our own brief search in Scopus in April 2017 using the same phrases found only eleven articles. This lack of studies on the issue obviously leaves wide latitude for speculation without the need for cherry-picking, which is the typical strategy various advocates groups use in promoting their own views and interests.

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Such a lack of studies on an issue also means that the impact of a single study can be significant. How far this influence can go is illustrated by the case of a single-paragraph letter to the editor of the *New England Journal of Medicine* (NEJM) in 1980, which was "heavily and uncritically cited as evidence that addiction was rare with long-term opioid therapy" (Leung, Macdonald, Stanbrook, Dhalla, & Juurlink, 2017). This caused the authors of this recent analysis to believe that "this citation pattern contributed to the North American opioid crisis by helping to shape a narrative that allayed prescribers' concerns about the risk of addiction associated with long-term opioid therapy" (Leung et al., 2017).

In this paper, we demonstrate how one of the rare experimental studies aimed at studying risk compensation and bicycle helmets arrives at a false conclusion (Messiah, Constant, Contrand, Felonneau, & Lagarde, 2012). It is, nevertheless, cited as evidence that helmeted (male) cyclists take more risks while riding a bike compared with those who ride without a helmet. Although we focus on a single study whose conclusion is in our opinion incorrect, our aim is to elicit discussion regarding the quality of research evidence and the way the research community deals with questionable conclusions.

After describing the study we offer arguments why we believe its conclusion is false. We then examine studies that cite the study and analyze in what context these citations have been made. Finally, we offer some general remarks about the potential consequences of false conclusions and uncritical citations.

2. A critical analysis of Messiah et al. (2012)

2.1. Summary of the study

This study, "Risk Compensation: A Male Phenomenon? Results from a Controlled Intervention Trial Promoting Helmet Use Among Cyclists," argues that "risk compensation, observed only among male cyclists, was moderate, thus unlikely to offset helmet preventive efficacy" (Messiah et al., 2012, p. 204).

To fully understand the methods used in Messiah et al.'s study, it was necessary to consult another publication (Constant, Messiah, Felonneau, & Lagarde, 2012) from the same naturalistic experiment. In this randomized controlled study, the authors recruited 1798 participants in Bordeaux, France (June 2009 to August 2010) during a promotional campaign that allowed cyclists to borrow a bicycle for exclusively personal use for at least four months. The participants were randomly assigned to one of four groups. One group received only a brochure promoting helmet use, another received a free helmet, the third were given both the brochure and helmet, while the fourth did not receive anything and served as controls. Those who reported previous helmet use (n = 241) were excluded from further analysis.

The main focus in Messiah et al.'s study was on the relationship between helmet wearing and the speed of cyclists as recorded by pairs of cameras stationed in five sites in the urban center of Bordeaux. Altogether 587 cyclists were observed in 2621 situations. Identification was based on a unique color code placed on the bicycle's rear mudguard. The assumption was that only the recruited participants rode a given bicycle during the data collection period as only those who promised to use a bicycle for their own exclusive use were given a bike.

Helmets were observed in only 3.8% of the situations. Most helmet observations (84/99) came from the two groups that had received free helmets (Constant et al., 2012). Males rode slightly faster than females (16.9 km/h vs 16.1 km/h), while a difference between helmeted and unhelmeted cyclists was observed only among males (251 participants, 1,172 observations, a helmet used in 5.1% of observations). The helmeted male cyclists rode faster (19.2 km/h vs 16.8 km/h). Besides helmet wearing, factors associated with speed among men included the age of the cyclist, the observation site, and the interaction between helmet wearing and the observation site.

The article's main conclusions are: "risk compensation is a male behavior;" "risk compensation tended to vanish as objective risk of injury increased, suggesting that it is subject to a ceiling effect;" "helmet use did not result in increased risk-taking among female cyclists;" and "risk compensation is limited and unlikely to offset the protective effect of helmet use" (Messiah et al., 2012, p. 205).

These conclusions are surprising. In our view, the most troubling conclusion of this study is the attribution of the observed difference in speed between helmeted and unhelmeted male cyclists to (moderate) risk compensation. In the following section we address the shortcomings of the study and offer more general discussion about bicycle helmets and risk compensation.

2.2. Critical analysis

Three groups of cyclists were possibly observed in the study. (These numbers include both men and women)

1. **No helmet group.** These are cyclists only observed without a helmet: 548 (587-39) cyclists with an unknown (to us) number of observations, but up to 2522 (2621-99).
2. **Both helmet and no helmet group.** This group contains cyclists observed at least once with a helmet and once without a helmet: up to 39 cyclists with an unknown (to us) number of observations with a helmet, but up to 99, and an unknown (to us) number of observations without a helmet, but up to 1974 (2522-548).
3. **Only helmet group.** This group would represent those observed only with a helmet: up to 39 cyclists with an unknown (to us) number of observations, but up to 99.