Why women do not use the helmet when riding a bicycle

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Abstract

Women seem to use the helmet when riding a bicycle less frequently than men. Two possible explanations for this behavior are that 1) it is less appalling to them because of lack of comfort or other reasons, or 2) they use bicycles in a more cautious way than men so they feel that they do not need the helmet as much. The present paper explores these two explanations in 5,691 cyclists that responded to an online survey conducted in 17 countries as part of an EU COST project. Answers to questions related to the two aforementioned explanations were analyzed graphically and three questions that showed the most conspicuous differences between males and females were identified. These were: 'Helmets are a problem because they disturb your hair', 'I am a fast rider', and 'I am a skilled rider'. The responses to these three questions plus their interactions with the gender of the respondent were used as predictors of the proportion of helmet wear. The results showed that: 1) the three questions predicted the use of the helmet, 2) the interaction between gender and hair disturbance was not significant, and 3) the interactions between gender and being a fast cyclist and being a skilled rider were both statistically significant showing that women that regard themselves as slow riders or skillful riders use relatively less the helmet than men in similar conditions.

INTRODUCTION

A bicycle helmet is a primary safety device available to cyclists. Bicycle helmets have been shown to be effective at reducing the severity of injury, particularly brain injury, in the event of a crash (Attewell et. al, 2012). Bicycle helmet usage rates differ across ages, and among countries. The majority of research has examined helmet use by children, partly at least because of the introduction of mandatory helmet legislation for children only (Klein et al., 2005; Rodgers, G. B., 2002). The research identified large differences in children's riding rates and helmet wearing rates and a decrease in helmet wearing rates as children aged (Harlos et al., 1999; Gilchrist et al., 2000). Several studies have examined helmet use by adults. For Germans aged 17 years or older, the overall helmet wearing rate was 12%, with wearing rates being higher for men (18%) than women (10%), and higher among those who rode less frequently (Ritter and Vance, 2011). Other observational studies in countries without mandatory helmet legislation have shown wearing rates of less than 5% in Paris (Osberg et al., 1998), and in rural Georgia in the U.S. (Gilchrist et al., 2000), but 24% of adults in Winnipeg, Manitoba (Harlos et al., 1999) and 31.5% in Boston. In Australia, where helmet use has been mandatory for riders of all ages since about 1990, approximately 76% of cyclists were observed wearing helmets in Melbourne (Cameron et al., 1994), and more recent observations in Brisbane found 97% of cyclists were wearing helmets (Haworth & Schramm, 2011).

Women seem to use the helmet less frequently than men (Richard et al., 2013; Ritter and Vance, 2011). Reasons usually given for this difference are that helmets disturb their hair, are uncomfortable, are ugly, etc. (Amoros et al., 2009; 2010). On the other hand, an alternative expedient explanation is that women cycle less aggressively than men and consequently they do not need to compensate the risk of having a crash as much as men by wearing the helmet. Indeed, women are less involved in cycling crashes (Richard et al., 2013). This paper aims to test if there is actually a gap in the self-reported use of the helmet between male and female and which, if any, of the aforementioned explanations are supported by data from an international survey of cycling habits.

METHOD

A uniform questionnaire was administered to cyclists in 17 countries as part of EU COST Action 1101 "Towards safer bicycling through optimization of bicycle helmets and usage" (Shinar et al., 2015). The questionnaire was developed in English, and then presented in each country in its own language, after being validated with back-and-forth translations. Following a pilot survey in Israel, data collection was initiated in 18 June 2014. The questionnaire consists of 30 core items that were common to all countries. These items were represented by a total of 123 specific questions. Questionnaires were made available online, and their dissemination was promoted by different venues by the COST Action researchers in 17 countries. Prior to its general dissemination the questionnaire was pilot tested on 30 Israeli cyclists in face-to-face interviews. The complete questionnaire is available on the web at the COST T1101 website as part of the Final Report of Working Group 2 (Shinar et al., 2015).

A total of 9,248 answers to the survey were recorded, of which 8,609 responses were received by the cut-off date of 04 July 2015. Subsequently, 639 responses from Argentina, were added to this database. Debugging of the final database occurred in a step-wise manner. First, countries with less than 100 participants were excluded, resulting in the exclusion of 141 respondents (for example, 62 respondents from Belgium). Respondents who did not specify their country of residence were then excluded, followed by respondents who did not

provide their age and gender, followed by those who were under 18 years of age. Finally, respondents who provided no response, or reported "Never" to the question "During the last 12 months on average how often did you travel by cycling?" were also excluded. A more complete description of the process of cleaning the database can be found in Shinar et al. (2018). The final sample size for analysis was 7,015 but due to lack of response to some of the questions used in this paper, we only use 5691 of the total number of respondents. Of those, 3875 were men and 1922 female.

The question used as dependent variable was "What proportion of your riding do you wear a helmet?" This question had five categories of response, namely: Never, Almost never, Sometimes, Almost always and Always. Questions used as predictors of helmet usage fell in two groups: questions related to the comfort/aesthetics/convenience of the bicycle helmets, and questions related to risky/daring/aggressive cycling. These questions had seven categories of response ranging from strongly agree to strongly disagree with the statement. Table 1 lists the specific questions used.

Comfort/aesthetics/convenience of the bicycle helmet
Helmets are a problem because they disturb your hair
Helmets are hot and uncomfortable
Helmets don't suit my style (or are ugly)
Helmets get in the way of comfortable head movements
It is inconvenient to carry a helmet around
Risky/daring/aggressive cycling
Riding a bicycle is more risky than driving a car
Riding a bicycle is more risky than walking
I am a fast rider
I am a skilled rider
Skilled riders do not need to wear a helmet

Table 1. Questions used as predictors of helmet usage

The hypotheses of this study are: 1) women use the helmet less than men; 2) the perceived comfort of the bicycle helmet is lower among women than among men, and risky/daring/aggressive cycling is more frequent for men than for women; 3) lack of perceived comfort of the bicycle helmet will predict lower usage of the helmet in women than in men, and lack of risk/daring/aggressive cycling will predict lower usage of the helmet for women than for men.

RESULTS

The data are analyzed according to the following plan: first, proportion of use of the helmet isanalyzed by gender. Second, perceived comfort and risky/daring/aggressive questions is be analyzed by gender, and those variables (questions) that differentiate among men and women are selected for the third step. Third, models incorporating the interaction between gender and the variables selected in the previous step are tested using the proportion of helmet usage as outcome. The results of Steps 1 and 2 are presented graphically using diverging stacked bar charts, and the results of Step 3 are provided in the form of proportional odds models for computing the significance of the terms and plots of effects for interpreting the results.

Use of the helmet by Gender

Figure 1 displays the percentages of response to the categories of use of the helmet when riding a bicycle by gender. The percentages on the right and on the left of the two bars are the cumulative values for the positive and negative categories in the scale. It is easy to see that in general men report using bicycles' helmets more often than women. So, the sum of the Almost Always and Always categories is 61% for men and 51% for women.

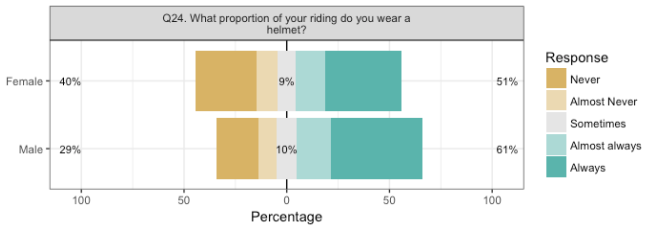

Figure 1. Proportion of use of the helmet by Gender

The comfort, esthetics, and convenience of the helmet ¡Error! No se encuentra el origen de la referencia. shows the level of agreement with questions related to comfort, aesthetics and convenience of the helmet.

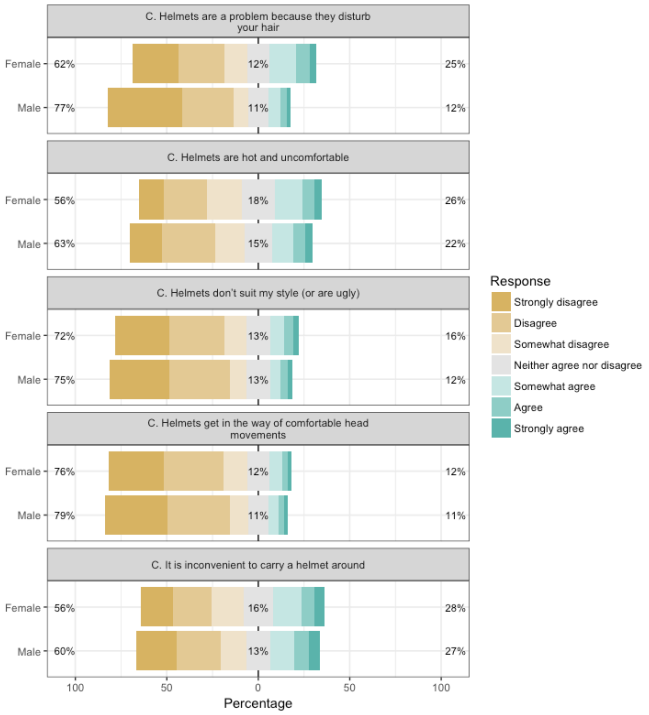

Figure 2. Comfort questions by Gender

Examination of this plot shows that the greatest disparity in answers between men and women occurs in the question about whether helmets disturb the hair of the respondents. While 25% of the women express some degree of discomfort with hair and helmets, only 12% of men make the same complaint. Notice that the differences between males and females are rather small for the other questions, so, for the purpose of this

paper, this question is the only one tested as predictor of helmet use in the remainder of this paper.

Risky/daring/aggressive cycling

Responses to questions related to risky/daring/aggressive cycling as a function of the gender of the respondent are displayed in Figure 3.

The two questions that show significant discrepancies between men and women are those related to the respondent perceiving himself as fast or skillful. Interestingly, slightly more men than women affirm that cycling is riskier than walking or driving a car. Finally, the majority of both men and women agree that helmets should be worn even by skilled riders (82% and 87%, respectively). Consequently, questions about the respondent perceiving him/herself as a fast or skillful rider are the only ones used on the subsequent sections of this paper.

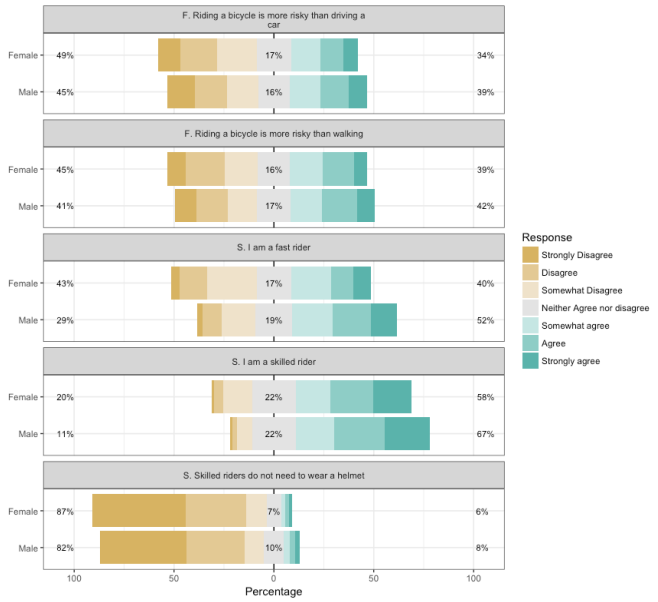

Figure 3. Skill of the cyclist and perceived risk

Gender interaction with predictors of helmet's use

This section examines which of the interactions of gender with the questions previously identified as reflecting differences between men and women, are able to predict helmet wearing. These tests use proportional odds models (pom) (Agresti, 2010).

Disturb your hair. Table 2 shows the Anova decomposition (Fox & Weisberg, 2011) of a pom model with the question about disturbing the hair and gender as predictors of the frequency of use of the helmet. We see that both main effects are significant, but the interaction is not.

	LR Chisq	Df	Pr(>Chisqu)
Gender	28.87	1	<0.001
Disturb	269.12	6	<0.001
Gender*Disturb	7.39	6	0.28

Table 2. Model for Gender and Helmets disturb your hair

This result can be interpreted using an effects plot (Fox & Hong, 2009) of the latent variable predicted by the model as displayed in Figure 4.

Note that the horizontal dotted lines indicate the limits of the predicted categories, so that, for example, points between S-Aa (Sometimes-Almost Always) and Aa-A (Almost Always-Always) are predicted to use the helmet Always. So, for instance, it can be seen in Figure 4 that men who strongly disagree with the statement "Helmets disturb your hair" are predicted to wear the helmet always, while those that strongly agree with it are predicted to wear it almost always.

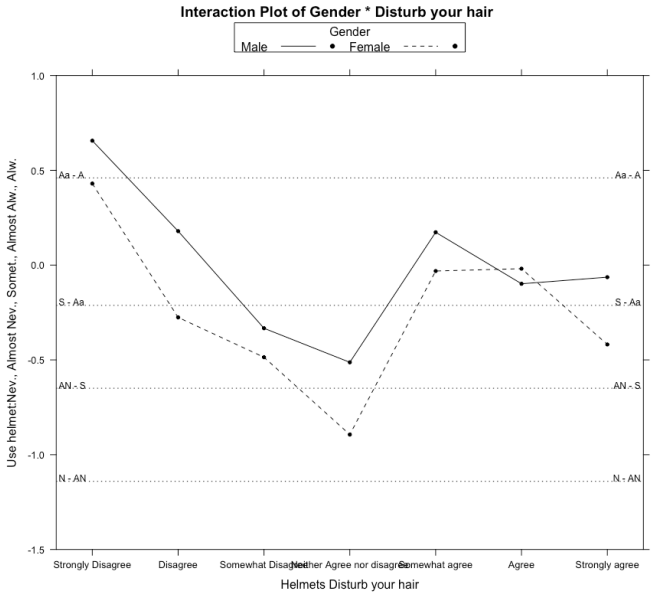

Figure 4. Effects plot of helmets disturb your hair and gender as predictors of the use of helmet

The absence of a significant interaction is reflected in the two lines in Figure 4 for men and women are nearly parallel for all the categories of agreement. Notice also that men are almost always predicted to use the helmet more frequently than women. Interestingly, people who neither agree nor disagree with the question are those with the lowest use of the helmet—a possible explanation being that they have not been able to make their opinion as they never wear it.

Being a fast rider. Table 3 shows the Anova decomposition of a pom model with the question about being a fast rider and gender as predictors of the frequency of use of the helmet, and the interaction between them. We see that both main effects are significant, and so it is their interaction.

	LR Chisq	Df	Pr(>Chisqu)
Gender	39.90	1	<0.001
Fast rider	186.39	6	<0.001
Gender*Fast rider	17.68	6	<0.01

Table 3. Model for Gender and question "I am a fast rider"

The effects plot in Figure 5 shows that greater agreement with being a fast rider generally predicts more use of the helmet for both genders. However, there is a clear divergence

for the category Strongly Disagree: males that regard themselves as not fast are predicted to use the helmet almost always, while females are predicted the opposite–almost never. Not only that, the three disagreement categories for females predict a low use of the helmet in general. On the other hand, women that perceive themselves as fast riders are predicted to use the helmet always or almost always, similarly to what is predicted for men.

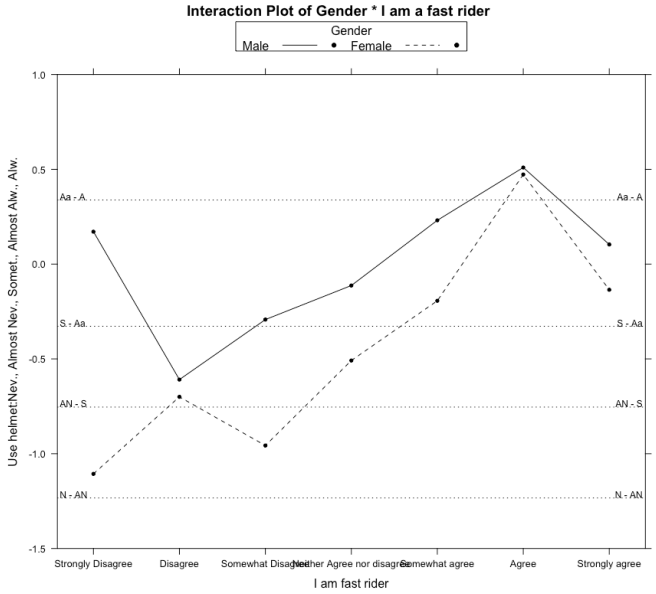

Figure 5. Effects plot of "I am a fast rider" and gender as predictors of the use of helmet

Being a skillful rider. Table 3 shows the Anova decomposition of a pom model with the question about being a skillful rider and gender as predictors of the frequency of use of the helmet, and the interaction between them. We see that the main effects and the interaction term are all significant in this model.

	LR Chisq	Df	Pr(>Chisqu)
Gender	38.23	1	<0.001
Skillful rider	105.20	6	<0.001
Gender*Skillful rider	14.77	6	<0.05

Table 4. Model for Gender and question "I am a skillful rider"

Figure 6 displays the effects of the model. As can be seen, higher agreement with being a skillful rider steadily predicts higher frequency of the use of the helmet in men, but not in women, as the line for them remains flat along the last three categories of agreement. Again, the difference in frequency of use between genders is conspicuous.

DISCUSSION

The results of our analyses confirm the gap between men and women in their use of the bicycle helmet, according to their own self reports. Although the absolute levels of helmet use reported here may not reflect true use rates, the differences between men and women are likely to be valid, and are in general around 10%.

The comfort of the helmet for women is lower than for men in several aspects, but the one related to the hair is the one that stands out the most. Thus, aspects such as the helmet being hot and uncomfortable, ugly, obstructing movements, or being cumbersome to carry around do not differ much between men and women. This suggests that some of the motives often mentioned to explain why women use helmets less than men might be unfounded in reality.

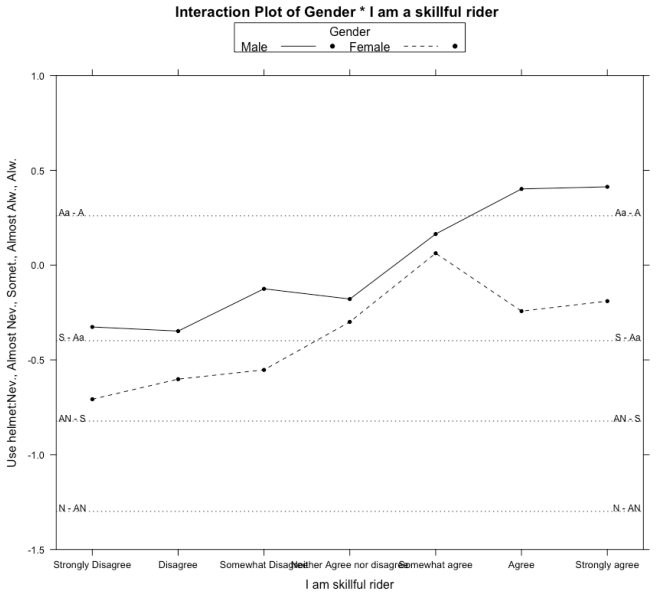

Figure 6. Effects plot of "I am a skillful rider" and gender as predictors of the use of helmet

Men regard cycling as an activity somewhat riskier than women when comparing it with walking or driving a car. Also, they regard themselves as fast and skillful riders more often than women. Putting all together, an explanation would be that men are more prone to seek sensations when cycling than women, which in turn implies taking higher risks and then using the helmet for compensating them.

We saw at the results section that the interaction between the question about hair disturbance and gender was not significant, implying that the effect of discomfort with hair is the same for both genders in general. However, more women express discomfort, so consequently the total effect of this issue is higher for them than for men. Nonetheless, a correct interpretation of this result should notice that a sufficiently long hair in a man would refrain him from using the helmet the same as in a woman—irrespectively of the fact that this problem is less frequent among men than among women.

The interaction between gender of the respondent and his/her self-perception of being a fast rider for predicting the proportion of use of the helmet was significant. In particular, the largest differences were for the disagreement categories, which implies the respondents regarding themselves as not fast. So, "slow" women would be predicted a very low usage of the helmet, while "slow" men would be predicted a fairly

frequent usage of it. These differences however disappear for male and female "fast" riders, as they are predicted to use the helmet about the same and quite often in both cases. These results are compatible with the explanation that women use low speed for reducing risk, and, as a consequence, they regard the use of a helmet rather unnecessary. Men, however, still use the helmet even if they perceive themselves as slow riders. This points to that the characteristics of slow riders can be different across genders.

Finally, good riding skills do not increase the use of the helmet in women in the same amount as in men. It looks that if women regard themselves as skillful they feel they do not need the additional protection of the helmet as much as men do.

In summary, as we have seen, the explanations of the lack of use of the helmet by women founded on issues such as comfort or convenience are only partially supported in our study so we recommend not to overemphasize them until more research is performed. On the other hand, the risk compensation theory–or more specifically in this case, the lack of risk compensation–seems to fit well with the differences found between men and women regarding the speed and skill questions as predictors of the use of the helmet. So, women seem to use low speed and skill for keeping the risk low and consequently they probably feel that they do not need to use the helmet as much as men do.

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