The Bicycle Helmet Attitudes Scale: Using the Health Belief Model to Predict Helmet Use Among Undergraduates

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Abstract. Objective: This study examined bicycle helmet attitudes and practices of college undergraduates and developed the Bicycle Helmet Attitudes Scale, which was guided by the Health Belief Model (HBM; Rosenstock, 1974, in Becker MH, ed. *The Health Belief Model and Personal Health Behavior*. Thorofare, NJ: Charles B. Slack; 1974:328–335) to predict reported helmet use. **Participants**: Students ($N = 337$) from a mid-sized university in the southeast completed a survey between November 2006 and November 2007. **Methods**: Participants completed a comprehensive survey on attitudes and behaviors relevant to bicycle helmet use. **Results**: The resulting Bicycle Helmet Attitudes Scale contains 57 items and represents 10 reliable subscales that reflect the HBM. Only 12% of students were self-reported helmet users. Bicycle Helmet Attitudes Scale scores captured 52% of the variance associated with helmet use; each subscale differentiated wearers from nonwearers. Men reported more media influences than did women. **Conclusions**: The utility of the HBM to predicted bicycle helmet use was supported. Implications for promoting cycling safety are discussed.

Keywords: bicycle helmet, bicycling, health belief model, safety

Riding a bicycle is a popular form of recreation, an environmentally conscious form of transportation, and a low-cost means of exercise. Approximately 30% of Americans own a bicycle.[1] Approximately half of adult cyclists bicycle for functional reasons (eg, commuting, running errands), as opposed to health (25%) or recreational purposes (29%).[2] Thus, cycling is a common aspect of modern culture, although it can be dangerous. The National Highway Transportation Safety Administration reported that 44,000 bicyclists were injured in 2006; 773 of these injuries resulted in death, accounting for 2% of all traffic fatalities that year.[3] Head trauma is a particular problem with bicycling injuries; in 2004, for example, 10,769 bicyclists were hospitalized for head injuries.[4] McCoy suggested that accident and fatality statistics warrant better psychosocial evaluation of helmet use and nonuse in adult riders.[5]

Bicycle helmet use can effectively reduce injury in the event of an accident.[6–8] In one study of undergraduates, for example, no student wearing a helmet at the time of his/her bicycling accident required hospitalization for a head injury.[6] Conversely, in a study of patients warranting emergency room care for a serious bicycle-related head injury, only 4% of patients had been wearing helmets.[7] Helmets significantly decrease severe mid-face, nose, and eye lacerations or fractures as well as brain injuries.[8]

Despite the protection that helmets provide, most bicyclists do not wear one. The rates of helmet use among college students are consistently below 25%.[6,9–12] This lack of helmet use is of great concern for health educators and practitioners. Understanding the factors that predict helmet use is essential for developing effective helmet promotion programs to decrease cycling injuries.

Researchers have explored potential helmet use barriers to better understand low usage rates. The Centers for Disease Control and Prevention (CDC) note several barriers to helmet use, including cost, comfort, lack of knowledge regarding helmet efficacy, and negative peer pressure.[13] Others note environmental barriers, including availability and cost.[14] Among college students in particular, barriers to helmet use include the physical discomfort of helmet wearing, cost, biking short distances, inconvenience, disruption of physical appearance, concerns about ridicule, and the vision impairment associated with helmet wearing.[6,11,12] In contrast, positive

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correlates of undergraduates' helmet use include past personal injury or hospitalization due to a bicycling accident, long distance bike travels, helmet ownership, being Caucasian, a history of a cycling-related injury to a close friend, perceived vulnerability to injury, perceived ability of helmets to prevent head injury, and having peers who routinely wear bicycle helmets.[6,11]

There was a 24% decline in cycling deaths in the United States during 1994–2001 when several new helmet use laws were introduced[15]; however, helmet laws do not exist in many states and can be difficult to enforce. Therefore, helmet-wearing practices likely reflect a person's internal beliefs more so than external forces, such as laws. Rosenstock's Heath Belief Model (HBM) provides a useful framework for conceptualizing personal attitudes that predict preventative health behaviors.[16] The model's components are organized into those that provide the force or "readiness to act," those that provide a "preferred path of action," and those that serve as "cues to action." An individual's readiness to act is a function of his/her perceptions of his/her own *vulnerability* to the health threat (eg, the chances of being injured while bicycling) and the *severity* of consequences (eg, the extent to which a bicycle-related injury would impair one's physical, social, and occupational functioning). The preferred path of action includes the perceived *benefits* and *barriers* factors, and beliefs about *benefits* gained must outweigh the cost or *barriers* to action. Finally, *cues to action* (eg, media influences, knowing someone affected by the health threat) may trigger the behavior in question. An individual primed for action may not engage in the healthful behavior without an adequate cue to incite the desired behavior.[16]

The HBM has been applied to a wide range of health behaviors (eg, seatbelt use, getting a vaccine) and several studies support the major premises of the model.[17,18] However, there are controversies and limitations that arise when social cognition models (such as the HBM) are used to predict health behaviors.[19–21] Most notably, the HBM lacks clear operational definitions for the proposed constructs, and does not specify how variables should be combined (ie, in an additive or multiplicative fashion) to predict behavior.[20,22] Accordingly, the number and type of constructs included across studies varies greatly, which prohibits cross-study comparisons.

Few studies have used the HBM to predict bicycle helmet use. A large study of Finnish adolescent cyclists ($N = 424$) included 11 HBM items and found only 4 significantly correlated with behavioral intention: barriers, cues to action, perceived severity of a cycling accident, and health motivation.[23] A smaller study among British adolescent schoolboys ($N = 105$) investigated which HBM subscales best predicted bicycle helmet use four weeks later.[24] This survey included 25 items total that reflected perceived susceptibility, perceived severity, benefits and barriers of helmet use, and cues to action. The cues to action item was the strongest predictor, as 74% of respondents who had experienced a cycling accident wore helmets, whereas only 32% of those who had *not* had a personal accident utilized helmets.[24] Other significant predictors were perceived barriers, perceived benefits, and perceived susceptibility. The complete model accounted for 53% of the helmet use variance, highlighting the ability of the HBM to predict helmet usage.[24] One final study in California administered a telephone survey to parent-child pairs ($N = 497$); parents who recalled exposure to different types of cues to action (eg, media announcements) reported more perceived threat, which was associated with helmet use among their children.[25]

Prior studies examining college students' helmet use have methodological limitations. The few studies assess usage rates and attitudes, but are not guided by a model such as the HBM. Furthermore, prior studies guided by the HBM typically include few items for each subscale (rather than representing the model adequately), and provide limited reliability and factor structure data.[23–25] To date, no studies have applied the HBM to college students' bicycle helmet use in the United States. Therefore, new research is necessary to target predictors of bicycle helmet attitudes and use among college students in a theory-driven manner.

Given the limitations of prior research, the present study sought to create a psychometrically sound scale with meaningful and reliable subscales to measure bicycle helmet use attitudes and motives operationalized by the HBM. In addition, this study examined reported rates of helmet use. As predicted by the Health Belief Model, the hypotheses were as follows:

1. that bicycle helmet wearers would report significantly more *Perceived Vulnerability*, *Benefits*, and *Cues to Action* than helmet nonwearers;
2. that bicycle helmet wearers would report significantly higher regard for *Severity of Consequences* than nonwearers; and
3. that bicycle helmet wearers would report significantly fewer *Barriers* than nonwearers.

METHODS

Students ($N = 337$) at a medium-sized public college in the Southeast participated. The majority of the participants were female (78%). Most (87%) of the participants identified themselves as Caucasian, 6% African American, 3% Asian/Pacific Islander, and 4% reported other ethnic identities. Most participants (94%) were between the ages 18 and 21 (mean age 19.5 years). Participants received either research credit (if they were in an Introductory Psychology class) or extra credit (if they were in an upper-level psychology class) for their participation. Thus, this was a self-selected convenience sample.

During the informed-consent procedure, students were assured that their participation in the study was confidential. Once all surveys were completed, participants were read a debriefing statement and questions were answered. The protocol used in this study was approved by the college's Institutional Review Board.

Participants responded to questions about demographic information, bicycle riding, attitudes toward helmet laws, and wearing a bicycle helmet. Respondents were asked, "If I had to classify myself, I would say. . .," and then they chose one of the following: "I'm not a helmet wearer and I do not intend to use one"; "I'm not a helmet wearer, but I intend to obtain and use a helmet"; "I am a helmet wearer, but just recently (ie, less than 1 year ago) started wearing one"; or "I am a helmet wearer, and I have worn one for a long time (ie, more than 1 year)."

Based on a careful review of the literature, the Principal Investigators selected and generated 127 potential HBM items for the survey. As recommended by DeVellis,[26] the initial item pool was much larger than the number of items intended for the final scale. When selecting relevant items from the existing literature and generating new ones, the Principle Investigators made judgments (ie, rationally derived decisions) based on our (and other researchers') interpretation of the HBM. Items were inspected for clarity and grammar. Following this process, factor analysis was used to select a subset of items that best measured the domains of interest for final inclusion in the scale. For these questions, responses were indicated on a 6-point Likert-type scale ranging from 1 = "Strongly Disagree" to 6 = "Strongly Agree." Therefore, higher values indicate greater agreement with the statement expressed in each item. Sample items include "My parents made me wear a helmet as a child" and "Wearing a helmet is too hot."

At the end of the survey, open-ended questions were employed to assess students' top reasons for not wearing a helmet and the circumstance under which they are most likely to wear one. Five students completed the survey and provided feedback regarding item clarity, flow, and the length of time required to complete it prior to group administration. Data were entered and analyzed using SPSS version 14.0 for Windows.

RESULTS

Bicycle Helmet Use and Attitudes

Just over half of the sample (53%) stated they ride a few times per year, as opposed to monthly (15%), a few times per month (14%), once or twice per week (5%), or more often (12%). One third of the students agreed (slightly, moderately, or strongly) that they bike primarily for transportation reasons, whereas 75% agreed to some extent that they bike for recreational reasons. Over half (60%) knew someone who has been in an accident, and 6% personally knew someone who was killed in a bicycle accident. A majority of the students (75%) stated that they themselves have been injured while riding, whereas fewer (12%) reported that their injury required medical attention.

Less than half of the students (46%) reported owning a bicycle helmet. Only 12% were self-reported helmet users; the majority (72%) reported not wearing a helmet and having no intention to do so in the future. When asked the top reason for not wearing a helmet, the most common reasons were that they don't ride often enough (24%), they don't own one (12%), they just don't want to (8%), or they are too uncomfortable (7%). When asked under what circumstances they are more likely to wear a helmet, the top reasons were riding in urban or high traffic areas (21%), riding in dangerous or mountain biking terrain (17%), riding long distances (13%), riding in organized races (9%), and if it was a law (9%).

Seventy-eight percent of students agreed (slightly, moderately, or strongly) that mandatory helmet laws would reduce injuries and fatalities, and a majority (77%) indicated they would be more likely to wear a helmet if required by law. However, students' support of mandatory helmet laws depended on the age of those subject to such laws. Combining across the 3 levels of agreement, most students (89%) favored a mandatory law for children 12 and under, fewer (56%) favored such a law for individuals 16 and under, and just over one third (35%) favored such a law for all individuals regardless of age.

Scale Development

Surveys from students for whom data were complete on the 127 items were included in the data set for scale development. Principal components analysis with Verimax rotations was employed to create factors for each of the 5 proposed HBM dimensions, and Cronbach's alpha values were used to verify the internal consistency. Whenever possible, items were deleted to shorten the subscales if the factor structure and reasonable reliability ($\alpha \geq .80$) could be maintained. For each factor analysis, all final items had a high primary loading (typically .50 or higher) without a secondary loading (.29 or less). The final 57-item Bicycle Helmet Attitude Scale (BHAS), including all subscales, items, factor loadings, alphas, means, and standard deviations is presented in Table 1.

Perceived Vulnerability items yielded 2 subscales. The first perceived vulnerability subscale was named *Perceived Exemption from Harm*. Higher scores on these 6 items indicate more agreement with reasons for not needing to wear a helmet. The second perceived vulnerability subscale, also 6 items, was named *Perceived Danger of Cycling.* Higher scores reflect stronger agreement that riding a bicycle can be dangerous.

Perceived Severity of Harm consisted of 4 items and was deemed one factor. Higher scores reflect more awareness regarding the potential seriousness of consequences associated with a bicycling injury.

Perceived Benefits items yielded 2 subscales. The first was titled *Emotional Benefits.* Higher scores on these 7 items reflect more agreement about how helmet use can make one feel better. On the second perceived benefit subscale, named *Safety Benefits* (5 items), higher scores reflect stronger agreement that helmets can protect people from harm in an accident.

Perceived Barriers yielded 2 subscales. The first 7-item subscale was titled *Cost Barriers*. Higher scores suggest economic reasons for not wearing a helmet. The second perceived barrier subscale, also 7 items, was named *Personal*

TABLE 1. Health Belief Model Subscales: Bicycle Helmet Attitude Items and Factor Loadings

	F 1	F 2
Personal Vulnerability		
Perceived Exemption From Harm ($\alpha = .79$, $M = 3.2$, $SD = 1.0$)		
1. I do not go fast enough to need head protection in a crash.	.62	
2. I feel that helmets are unnecessary for very short rides.	.74	
3. Being an adult who has been riding for years, I can easily avoid an accident when riding.	.59	
4. Bicycle helmets are less important for those who ride their bikes infrequently.	.71	
5. Bicycle helmets are more important for those who ride their bikes long distances.	.75	
6. Since I'm not racing or doing any bike stunts, I don't really need a helmet.	.73	
Perceived Danger of Cycling ($\alpha = .80$, $M = 4.3$, $SD = .84$)		
1. When I'm bicycling, I am at risk of being injured by other bicyclists.		.69
2. When I'm bicycling, I am at risk of being injured by motor vehicles.		.73
3. If I had an accident while riding to school or work and hit my head, I would be likely to suffer brain damage.		.60
4. Bicycling is dangerous on slippery/wet roads.		.65
5. There is a good chance that I could get hurt while riding my bicycle.		.62
6. Generally speaking, I believe that bicycling in the street is a dangerous activity.		.62
Eigen values	3.83	1.92
Perceived Severity of Harm ($\alpha = .80$, $M = 4.7$, $SD = .99$)	F 1	
1. If I injured my head while riding my bike, it could seriously affect my social life with my friends.	.66	
2. If I injured my head while riding my bike, it could seriously affect my relationships with my family members.	.69	
3. If I injured my head while riding my bike, it could seriously affect my ability to function at school.	.79	
4. If I injured my head while riding my bike, it could seriously affect my ability to function at work.	.83	
Perceived Benefits	F 1	F 2
Emotional Benefits ($\alpha = .86$, $M = 3.0$, $SD = 1.06$)		
1. I feel unsafe bicycling without a helmet.	.80	
2. I feel guilty bicycling without a helmet.	.77	
3. Wearing a helmet would make me feel less anxious when I ride a bike.	.74	
4. I think it is my obligation to keep myself safe for the people who care about me by wearing a helmet when I ride.	.73	
5. Wearing a helmet while bicycling makes me feel safer.	.69	
6. When I wear helmets I feel more aware of the potential dangers of bicycling.	.63	
7. Wearing a helmet makes me more likely to "take care" when I ride.	.68	
Safety Benefits ($\alpha = .84$, $M = 4.9$, $SD = .89$)		
1. I general, I think people who choose to wear helmets are being safe and responsible.		.65
2. Helmets are effective at reducing my risk of injury during a bicycle-related accident.		.78
3. The event of an accident, a helmet would protect my head.		.82
4. I believe that wearing a helmet can prevent a serious head injury if I have a bicycle accident.		.82
5. In the event of an accident, wearing a helmet could save me money by avoiding expensive medical treatment.		.76
Eigen values	4.62	2.30
Perceived Barriers	F 1	F 2
Personal Vanity and Discomfort Barriers ($\alpha = .87$, $M = 3.8$, $SD = 1.15$)		
1. I would feel embarrassed wearing a bicycle helmet.	.80	
2. As an adult, I feel foolish wearing a helmet just to ride around town.	.83	
3. Wearing a helmet makes me look foolish if no one else is wearing one.	.84	
4. Quite frankly, wearing a helmet looks stupid.	.86	
5. Wearing a helmet is too hot.	.56	.32
6. Wearing a bike helmet strap pinches/would pinch my neck or sometimes irritates my skin.	.52	
7. A bike helmet strap is uncomfortable, and it feels like I'm being choked.	.65	
Cost Barriers ($\alpha = .75$, $M = 2.9$, $SD = .90$)		
1. The cost of helmets is generally more than they are worth.		.60
2. The cost of buying a helmet would affect whether I wore one or not.		.59
3. The best helmets (that look the coolest and are most comfortable) are too expensive for me to buy.		.55
4. I would not want to spend money to buy a bicycle helmet.		.61
5. A helmet is not a worthwhile way to spend my money.	.35	.59
6. A bicycle helmet is not worth the cost.		.63
7. I believe that bicycle helmets are over priced.		.71
Eigen values	5.07	1.92

(Continued)

TABLE 1. Health Belief Model Subscales: Bicycle Helmet Attitude Items and Factor Loadings *(Continued)*

	F 1	F 2	F 3
Cues To Action			
Friends and Family ($\alpha = .80$, $M = 1.7$, $SD = .99$)			
1. I have several friends that routinely wear helmets when they ride.		.66	
2. I keep my helmet in a visible place so I won't forget to wear it.*		.74	
3. I usually keep my helmet on or near my bike.*		.72	
4. I know that I will feel bad if I don't wear a helmet, because my parents or somebody that cares about me wants me to wear it.		.57	
5. My friends think I should wear a helmet when riding my bike.		.69	.32
6. My close friends think I should wear a helmet when I ride my bike.		.66	
Parent Rules in Childhood ($\alpha = .90$, $M = 4.4$, $SD = 1.60$)			
1. My parents made me wear a helmet when I was a child.	.92		
2. My parents never insisted I wear a helmet. (recoded)	.80		
3. My parents used to make me wear a helmet when I use a child.	.91		
4. My parents encouraged me to wear a helmet during adolescence.	.81		
Media ($\alpha = .70$, $M = 1.7$, $SD = .77$)			
1. I recall seeing TV commercials, billboard ads or posters about the importance of wearing a helmet while bicycling during the past year.			.73
2. During the past year, I have received advice from my doctor about wearing a helmet while bicycling.			.64
3. During the past year, I have received a post card or other form of reminder in the mail from my doctor advising me to wear a helmet while bicycling.			.61
4. During the past year, I recall seeing magazine ads or newspaper flyers from sporting goods stores or bike shops advertising helmet sales/discounts.			.63
5. During the past year, I recall some form of helmet use promotion event on campus or in the community.			.71
Eigen values	4.38	2.73	1.53

Note. If you do not own a helmet or ride a bike, circle zero for nonapplicable.

Vanity and Discomfort Barriers. Higher scores indicate agreement that helmets are unattractive and uncomfortable.

Finally, Cues To Action analyses yielded 3 subscales. The first was named *Friends and Family.* Higher scores on these 6 items reflected stronger agreement that participants experience encouragement from loved ones to wear a helmet. The second cues to action subscale was named *Parental Rules in Childhood* (4 items). Higher scores reflect agreement that their parents had rules about helmet use while respondents were growing up. The third cues to action subscale consisted of 5 items and was named *Media Influences*. Higher scores indicate more exposure to media and community messages encouraging helmet use.

Sex Differences on the BHAS

A multivariate analysis of variance (MANOVA) was used to examine whether BHAS scores differed for men ($n = 68$) and women ($n = 233$). The Omnibus F indicated an overall sex difference (*Pillais* $F[10, 290] = 2.937$, $p = .002$, $\eta^2 = .092$). Follow-up ANOVAs indicated this effect was driven by only one variable, *Media Influences* ($F[1, 300] = 17.793$, $p = .001$, $\eta^2 = .056$). Men recalled seeing or hearing more prohelmet messages in the recent past ($M = 2.0$, $SD = .90$) than did women ($M = 1.6$, $SD = .70$).

Examining Helmet Group Differences on the BHAS

A MANOVA was used to determine whether helmet wearers and nonwearers differed on the Bicycle Helmet Attitudes Scale. For these analyses, only nonwearers who indicated they did not intend to obtain and wear a helmet in the near future ($n = 203$) were included in the nonwearing group. The helmet-wearing group included students who reporting having worn a helmet for a long time and those who began wearing them recently ($n = 34$). The Omnibus F showed a significant overall difference (*Pillais* $F[10, 197] = 20.638$, $p < .001$, $\eta^2 = 0.512$).

A series of multivariate analyses of variance were performed to examine whether each subscale differentiated helmet wearers and nonwearers. The means and standard deviations for these comparisons are summarized in Table 2, as are the details of each follow-up ANOVA. As compared to nonwearers, helmet wearers reported significantly less *Perceived Exemption from Harm* and greater *Perceived Danger of Cycling*. Helmet wearers reported significantly greater *Perceived Severity of Harm* than nonwearer participants. Helmet wearers reported greater or more *Emotional Benefits* and *Safety Benefits* than nonwearers. As compared to nonwearers, helmet wearers reported significantly fewer or less *Cost Barriers* and *Personal Vanity and Discomfort Barriers*. Lastly, helmet wearers reported significantly more cues to action

TABLE 2. Descriptive Statistics for Helmet Wearers (n = 203) and Nonwearers (n = 34) on the Bicycle Helmet Attitudes Subscales

	Helmet wearers		Helmet nonwearers		$ANOVA_{(1, 207)}$		
Subscale	*Mean*	SD	*Mean*	*SD*	*F*	*p* <	η^2
Perceived Exemption From Harm	2.270	0.908	3.339	0.942	32.46	.001	.136
Perceived Danger of Cycling	4.655	0.673	4.229	0.810	7.20	.008	.034
Perceived Severity	5.267	0.903	4.655	0.969	10.13	.002	.047
Emotional Benefits	4.344	0.909	2.677	0.876	89.41	.001	.303
Safety Benefits	5.324	0.795	4.873	0.869	6.84	.010	.032
Cost Barriers	2.487	0.768	3.026	0.902	9.24	.003	.043
Personal Vanity and Discomfort Barriers	2.936	1.249	3.980	1.066	22.81	.001	.100
Friends and Family	3.367	1.126	1.430	0.711	153.72	.001	.427
Parental Rules in Childhood	5.362	1.318	4.318	1.558	11.63	.001	.053
Media Influences	2.020	0.968	1.662	0.748	5.23	.023	.025

pertaining to *Friends and Family*, *Parental Rules in Childhood*, and *Media Influences* than did nonwearers.

COMMENT

The primary goals of the present study were met. A psychometrically sound scale containing subscales relevant to the HBM was developed and preliminary support regarding the reliability and validity of the scale was established. The BHAS differentiated wearers from nonwearers, thus supporting the hypotheses that wearers would report more *Perceived Vulnerability*, *Benefits*, and *Cues to Action*, higher regard for *Severity of Consequences*, and fewer *Barriers* than nonwearers. These findings extend prior work by sampling young adults rather than children, and methodologically these results provide extensive reliability and factor structure data compared to previous studies.[23–25]

Only 12% of the participants were self-reported helmet users, whereas the vast majority reported not wearing a helmet. The results of this study are consistent with past research on the helmet-wearing practices of undergraduates, indicating low helmet usage ranging from 4.4% to 24%.[6,9–12] The present study is the first in over 12 years to examine the rates of helmet use among college students in the United States.

Hypotheses regarding the predictive nature of the HBM were supported. All HBM dimensions showed excellent predictive value for helmet-wearing behavior, and each of the 10 Bicycle Helmet Attitudes Scale subscales showed significant differentiation between helmet users and nonusers. Four subscales were particularly salient. *Friends and Family* cues to action was the most important predictor of helmet use, followed by *Emotional Benefits*, *Perceived Exemption from Harm*, and *Personal Discomfort and Vanity Barriers*. The remaining subscales (*Media Influences*, *Safety Benefits*, and *Perceived Danger of Cycling*) appeared relatively less influential, yet each significantly differed between helmet use and nonuse groups. Men reported more exposure to prohelmet media exposure, so perhaps they are more likely to be cycling fans or participate in cycling sports, and therefore be in an environment promoting such messages.

Previous studies have consistently noted that *Friends and Family* play a role in whether an individual will choose to wear a helmet; this component relates to positive and negative peer pressure and personal or close friend injury, all of which are particularly relevant to helmet use.[6,10–12] The present findings also are consistent with prior studies reporting *Perceived Vulnerability* and *Perceived Exemption from Harm* play a significant role in helmet attitudes.[11,12]

In addition, the present findings contradict prior research on undergraduate students' helmet use in some ways. Others[6,11] have found that *Personal Vanity and Discomfort* played little to no role in the decision to use a helmet; the current study, however, found *Personal Vanity and Discomfort* to be highly predictive of helmet use or nonuse. Perhaps the fact that this sample was predominantly female elevated the importance of vanity for predicting helmet nonusage. Another inconsistency has to do with *Safety Benefits*. Although others found helmet use was best predicted by the individual's perception of helmet efficiency at reducing harm,[11] it was not among the most predictive components in the present study. It is important to mention, however, that all disparities between current and past research must be compared indirectly, as the nature, location, and date are dissimilar. Moreover, the aforementioned researchers did not examine directly the constructs of the HBM using empirically derived scales, as was done in the present study.

The need for campus outreach and peer education programs among college undergraduates is obvious.[11] Promoting the protective capacity or economical pricing of helmets alone will not prove effective in changing the way that students think about bicycle helmets.[24] Researchers highlight the importance of peer pressure and discuss how social cues can genuinely induce intention, citing a need for more campus outreach by organizations and individuals to recommend bicycle helmets.[11] These methods can also fortify the emotional benefits to helmet use by reinforcing a sense of responsibility and conscientiousness among cyclists. Bicycle helmet promotion campaigns should target the perceived invincibility prevalent among the young adult population in order to address their perceived exemption from harm. Lastly, attempts should be made to decrease the cost of helmets and increase the comfort of bicycle helmets by providing novel designs that allow for more freedom of sensation and less physical disturbance. Preventative health leaders have developed programs with varying levels of authoritative control to address the low proportion of helmet use with varying degrees of success. One particularly successful campus study nearly doubled bicycle helmet use rates using a combination of free helmets, safety information, peer agents, and pledge cards.[27]

Limitations

As with all research, the present study had some limitations. One problem inherent to most cycling research is the lack of representative sampling. Like many studies, especially those conducted at a university, convenience samples may not contain a large number of cyclists, let alone helmet users. In the present study, we did not attempt to increase the number of helmet wearers by specifically recruiting such persons. Although the percentage of helmet wearers was low (12%), we believe that our sampling method approximates the actual proportion of helmet users on our campus. However, future investigators may wish to oversample helmet wearers to investigate the ways they differ from their peers who do not wear a helmet.

Another limitation of the present study was that the sample was overrepresented by females and Caucasians, as the campus is comprised of 65% women and 83% Caucasians. More importantly, whether these results reflect processes in young adults from a variety of ethnic backgrounds is not known. Additionally, further research is needed with larger samples to replicate the factor structures found here separately for men and women. Thus, the findings must be considered preliminary, especially the sex difference pertaining to media exposure, which was based on such a small subsample of men.

Conclusions

The present study builds upon prior helmet research using the HBM by providing thorough and rigorous analyses of a wide variety of items to obtain a survey that is parsimonious, psychometrically sound, and theory relevant. The final product is a 57-item scale representing the proposed HBM factors. These results have critical implications for preventative health campaigns to increase bicycle helmet use. Primarily, parents must encourage helmet use even after their children are proficient cyclists, and friends are encouraged to promote helmet use among their peers.

Research is underway to analyze the utility of the Health Belief Model to predict helmet use among a variety of frequent bicycle riders (club enthusiasts, racing teams, etc) and investigate their motives for wearing or not wearing a helmet. With a larger group of helmet wearers, more sophisticated predictive analyses will be conducted to test which model (eg, meditational, additive) best predicts reported helmet use.[20] In addition, future studies should employ this scale and/or other empirically derived surveys to examine whether an additive model or some other method of combining variables best predicts bicycle helmet use in a larger sample with a greater percentage of helmet wearers. Ultimately, future findings using the scale developed in the present study may provide critical insight into helmet use promotion strategies for a college student population.

NOTE

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