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ONLINE MOTORCYCLE SAFETY INFORMATION SEEKING AND ITS RELATIONSHIP TO RISK TAKING AND PROTECTIVE BEHAVIORS

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ABSTRACT

Objective: Although substantial research examines motorcycle accidents after they happen, less is known about how motorcycle riders obtain safety information and how this relates to risk taking and protective behaviors. Rather than taking a reactive approach (i.e., investigating accidents after they happen), this study takes a proactive approach by investigating riders' reports of their behaviors in relation to motorcycle riding and related activities. The goal is to determine models predictive of risk taking and protective behaviors among motorcycle riders. **Methods:** A web-based survey was used to collect data from 269 participants who belong to an online motorcycle community in Alabama. The data were used to examine the relationship between use of the website for information seeking and two outcomes: frequency of risky riding behaviors and frequency of wearing protective gear. Analyses used multivariate ordinary least squares regression models, adding variables to the model in the following order: (1) use of the website for information seeking, (2) risk perception, (3) cues to action, and (4) control variables accounting for motorcycle riding experience, skills, and socio-demographic factors. **Conclusions:** Searching for safety information was associated with less risky riding behavior and greater use of protective gear. However, general use of the community website was associated with greater risk taking. This study advances prior work by examining predictors of risky riding behavior and wearing of protective gear, rather than reactively examining determinants of motorcycle crashes.

1. INTRODUCTION

The U.S. traffic safety community is concerned about the continuing increase in motorcycle crashes, in spite of the fact that all traffic crashes are in decline. Based on Fatality Analysis Reporting System (FARS) records maintained by the National Highway Traffic Safety Administration (NHTSA) a significant increase in the number for motorcycle fatalities took place in the 1997 to 2011 time period (Table 1).

Table 1 Number of Fatalities, 1997 and 2011

Year	Motorcyclists	Vehicle Fatalities other Than Motorcyclists
1997	2,116	33,609
2011	4,612	27,755
% Change (1997–2011)	+117.9	-17.4

Source: Fatality Analysis Reporting System (FARS), National Highway Transportation Safety Administration, 2013.

To account for exposure, Table 2 provides a comparison of occupant fatality rates by vehicle type from 1997 to 2011. While a significant decrease in fatality rates occurred for passenger cars and light trucks over the 14 year reference period, a dramatic increase in motorcycle fatality rates took place over the same reference period. It should be noted that the figures which account for exposure related to vehicle miles traveled (VMT) are not necessarily as valid for motorcycles as for passenger vehicles due to inconsistencies in the collection of VMT data for motorcycles. Still the overrepresentation of motorcycle crashes is undeniable.

Table 2 Fatality Rates by Vehicle Type, 1997 and 2011

Year	Fatality Rate	Motorcycles	Passenger Cars	Light Trucks
1997	Per 100,000 Registered Vehicles	55.30	17.81	15.23
2011		54.66	8.90	8.95
% Change (1997–2011)		-1.0	-50.0	-41.2
1997	Per 100 Million Vehicle Miles Traveled	20.99	1.45	1.24
2011		24.93	0.8	0.81
% Change (1997–2011)		+18.8	-44.8	-34.7

Source: Fatality Analysis Reporting System (FARS), National Highway Transportation Safety Administration, 2013.

More specifically, in 2011 alone, 4,612 motorcyclists were killed and 81,000 motorcyclists injured in the US (National Highway Traffic Safety Administration, 2011). In 2011, motorcyclists accounted for 14 percent of total traffic fatalities, 17 percent of all occupant fatalities, and 4 percent of all occupants injured. The National Highway Traffic Safety Administration (NHTSA) reports that per vehicle mile traveled in 2011, motorcyclists were about 30 times more likely than passenger car occupants to die in a motor vehicle traffic crash and 5 times more likely to be injured (National Highway Traffic Safety Administration, 2011).

The Federal Highway Administration (FHWA) recognizes that motorcycle riders face more risks of crashing and being injured than passengers in four-wheeled vehicles. Two-wheeled motorcycles are more difficult to operate and more unstable than four-wheeled cars and trucks. Some roadway design and maintenance features add additional risks. Other vehicle drivers may not expect to see motorcycles on the road, may not watch for them, and may not know how to accommodate them in traffic. When motorcycles get involved in crashes, they provide almost no protection to their riders (Federal Highway Administration, 2010b).

In the state of Alabama, the use of motorcycles has grown steadily over the last decade, and so have crashes related to motorcycles. In 2011, 122,793 motorcycle registrations were reported in the state of Alabama, an increase of 32% compared to 2005 (Federal Highway Administration, 2010a). During the same time period, fatalities involving motorcycle users in Alabama increased from 62 in 2005 to 95 in 2011, or nearly 53%, whereas the total number of fatalities in Alabama for other modes combined dropped from 1,086 in 2005 to 799 in 2011.

These statistics clearly demonstrate that severe motorcycle crashes are overrepresented in the state of Alabama, compared to other traffic crashes. One strategy to reduce the number and severity of motorcycle crashes is to improve the training and education of Alabama motorcycle drivers on safe riding practices. Although the effectiveness of rider training courses is inconclusive (Daniello, Gabler, & Mehta, 2009; Kardamanidis, Martiniuk, Ivers, Stevenson, & Thistlethwaite, 2010) it is generally assumed that efforts directed at training and educating motorcyclists on safe riding practices improves skills and promotes protective behaviors (Daniello et al., 2009; Savolainen & Mannering, 2007). The traditional approach to motorcycle riders' safety education is

through training courses. In fact, the state of Alabama has its own Alabama Motorcycle Safety Program that is nationally recognized by the Motorcycle Safety Foundation. The program is facilitated by the University of Montevallo and provides motorcycle rider training for beginners and experienced riders.

While training courses such as those offered through the Alabama Motorcycle Safety Program support safe motorcycle practices some limitations exist that hinder the widespread dissemination of motorcycle safety information. First and foremost, such training programs are offered on specific dates and locations and may not be convenient to a broad base of motorcycle users. Another shortcoming is that the user must actively enroll in the training course and pay a registration fee to attend, a fact that may discourage many motorcyclists to participate.

An alternative to site-specific motorcycle training courses for dissemination of motorcycle riding safety information is through the use of Internet websites. To date, very little is known about safety information seeking among motorcyclists, and especially their use of the Internet as a source of safety information or participation in online websites devoted to motorcycling. The purpose of this study is to examine how members of an online motorcycle community use the group website to look for safety information and the relationship of this and general Internet use to risk taking and protective behaviors.

2. BACKGROUND

The study focused on an online community of motorcycle riders that we call the 'Ride Safe' website (name changed to protect anonymity), as research indicates that the majority of adults in the United States (77% in 2011) now use the Internet to find information, including on hobbies and interests such as motorcycle riding (Pew Internet & American Life Project, 2011). For many people, the Internet has become ubiquitous and central to carrying out a range of daily activities (Fuchs, 2008; Hargittai, 2008). The majority of Internet users have at one time sent or received email (92%), looked for health or medical information (83%), looked for information on a hobby or interest (83%), looked for information about a product or service (78%), or used a social network site (61%) (Pew Internet & American Life Project, 2011). A good deal of research is accumulating showing that the information people find online contributes to their effort to reduce health risks. More frequent online searches for health information have been found to be associated with participating in healthier behaviors (Pandey, Hart, & Tiwary, 2003) and a greater likelihood of making healthy behavioral change (Ayers & Kronenfeld, 2007).

Despite the potential of the Internet as a source of rider safety and training information, we could not find a published study conducted in the U. S. on this topic and only a few studies that have been conducted in Australia. de Rome, Stanford, and Wood (2004) surveyed 796 Australian riders and found that 60% had used the Internet to find motorcycle related information. Unfortunately, de Rome et al. did not investigate how seeking information online was related to safety and protective behaviors. In a later study of novice Australian riders, de Rome et al. (2011) found that riders who searched for information about protective clothing were more likely to wear protective clothing while riding. In addition, riders who sought information were more likely to ride in groups or be a member of a rider organization. Although it's likely that a large proportion or riders used the Internet to seek information, the study investigators did not examine outcomes by information source. Chapman, Buckley, and Sheehan (2009) found that teen motor vehicle drivers in Australia are receptive to the idea of using the Internet to distribute motor vehicle training and education. A follow-up study found that 30% of teens in Australia had ever searched for "road safety information" online, and that of six information seeking strategies, Google was the most common (Buckley, Chapman, & Sheehan, 2011).

The Ride Safe website is likely to be an important source of information for the motorcycle community members and facilitate the socialization of new bikers. Although people first engage in high-risk leisure activities (e.g., skydiving, motorcycle riding) for a variety of reasons including "curiosity, thrill seeking, social compliance, and a desire for adventure" the motivation to continue is influenced by "efficacy motives, the creation of a new self-identity, group camaraderie, and heightened experience" (Celsi, Rose, & Leigh, 1993:10). This takes place through a process of socialization in which a new rider experiments with the biker identity, begins to conform and identify with group norms, develops mastery in riding skills needed to attain status, and internalize a sense of self-identity as a biker (Jderu, 2013; Schouten & McAlexander, 1995). The Ride Safe website was created by community members to promote rider safety, provide information about motorcycle training courses, and share information and experiences to develop better riding skills. The Ride Safe website may provide community members with an important source of information and communication that may reinforce a group norm that promotes safety and protective behaviors.

In addition to the use of the Ride Safe website, many other factors are likely to influence people's participation in risk taking and protective behaviors. Drawing from the health belief model (HBM), these factors can be classified as one of two types, risk perception and cues to action. The HBM is one of the most influential and widely used models used to understand the factors related to protective health behaviors (Cockerham, 2004;

Rimer & Glanz, 2005). Risk perception is understood to consist of the perception of susceptibility or chance of an event occurring if protective behavior is not taken, and the severity of the event if it occurs (Rimer & Glanz, 2005). Cues to action include previous experiences and exposure to media that may influence a person's perception of risks and subsequent behaviors (Rimer & Glanz, 2005). In general, the HBM predicts that people with a greater sense of risk will adopt protective behaviors to reduce threats to their health.

Individuals' perceptions of risk and previous crash experiences have been found to predict subsequent risky riding and protective behaviors. Rutter, Quine, and Albery (1998) found that previous crash experiences were associated with greater perceived risk, and that perceived risk was *positively* associated with risky riding behaviors. Although Rutter et al. (1998) did not examine changes in riders' use of protective gear following a crash, they did find that motorcyclists who had been in a crash during the previous year were more likely to begin wearing brightly colored clothing. Other studies, however, find there is no significant effect of a previous crash or related injury on the risky riding behaviors of younger riders (Lin, Huang, Hwang, Wu, & Yen, 2004).

Rider training courses are commonly assumed to develop riding skills crucial to improving riding safety (Daniello et al., 2009; Savolainen & Mannering, 2007) and may contribute to greater awareness of the risks associated with motorcycle riding and the benefits of wearing protective gear to reduce risk and severity of injuries. However, research on the effectiveness of rider training courses is mixed (Daniello et al., 2009), finding that trained riders are both less likely (Mortimer, 1988) and more likely (Savolainen & Mannering, 2007) to be in an accident. Studies have found that rider training is associated with wearing protective gear (Mortimer, 1988; Savolainen & Mannering, 2007) but suggest that there is no significant change in risky riding behavior (Savolainen & Mannering, 2007). In sum, the results are inconclusive due to the poor quality of studies that have been conducted (Daniello et al., 2009; Kardamanidis et al., 2010).

Motorcycle riding experience and skills are other factors that may be related to risk taking and protective behavior. A riding simulation study found that novice riders were more confident of their riding skills, were less likely to perceive hazardous road situations as risky, and approached hazards at higher speeds than more experienced riders (Liu, Hosking, & Lenné, 2009). People who perceive themselves as having better riding skills may underestimate their probability of being in an accident and/or injured and engage in more risk taking (Savolainen & Mannering, 2007). Style of bike and type of riding (i.e., on/off road, commuting, recreation) are other factors related to risk taking and protective behaviors. Death rates in 2005 per 10,000 registered motorcycles were much higher among riders of super sport (22.5) and sport bikes (10.5) than touring (6.5) or cruiser (5.7) motorcycles (Insurance Institute for Highway Safety, 2007). In addition, speeding and driver error were more likely to be contributing factors of fatalities in crashes among super sport and sport bike riders than riders of other types of motorcycles (Insurance Institute for Highway Safety, 2007). deRome et al. (2004) found that use of protective gear varies by type of motorcycle ridden. Riders of scooters or light commuter bikes were most likely to wear only a helmet and gloves and that sports bike riders made the most extensive use of protective gear (de Rome et al., 2004).

Socio-demographic factors are also known to be related to risk taking and protective behaviors among motorcyclists. Younger riders tend to engage in a greater number of risky riding behaviors (Rutter et al., 1998). de Rome et al. (2011) found that older riders were more likely to wear protective gear, but that this usage was not associated with other risk taking behaviors. Men are more likely to be at fault in motorcycle-motor vehicle collisions than women riders (Kim & Boski, 2001).

Based on this review of the literature, we expect that use of the Ride Safe website for safety information seeking will be negatively associated with risk taking and positively associated with protective behavior. Perception of risk and past experiences of accidents, injuries, general Internet and Ride Safe website use, and taking rider training courses are expected to be important cues to action associated with reduced risk taking and increased protective behaviors. Perception of riding skills is expected to be positively associated with risk taking and negatively associated with protective behavior.

3. METHODS

3.1. Sample

The sample comes from a loosely organized group of motorcyclists living in Alabama, who gather to socialize and participate in group rides. This group makes use of the Ride Safe website as an online gathering place to read user-contributed articles on motorcycle-related topics; participate in online discussions on a range of issues; find and share information on equipment, repairs, and riding skills; and learn of upcoming events and rider training courses. The site is also used to organize group rides and social activities. There is no official membership

requirement to view the site, although registration is required to post to the discussion boards. At the beginning of the study in August 2009 there were 966 registered site members.

3.2. Survey Design and Administration

To collect data, a survey was designed to cover seven topic areas: (1) motorcycle experience, riding patterns, and type of motorcycle; (2) motorcycle riding skills and training; (3) motorcycle crashes; (4) risk perception and protective gear; (5) general Internet use and health information seeking; (6) Ride Safe membership, use of the Ride Safe website, and seeking motorcycle safety information; and (7) health status and demographics. The survey is roughly structured following the conceptual model of the National Cancer Institute, Health Information National Trends Survey (Nelson et al., 2004). Additional survey items were drawn from previous surveys found during an extensive literature review.

The survey was pilot tested by five Ride Safe members, selected by the site administrator, and one motorcyclist known to the research staff who has never visited the Ride Safe website. Minor changes were suggested and were incorporated in the final survey. Participants in the pilot survey were offered as an incentive a $20 debit card. A $10 debit card was offered as an incentive to participants who completed the regular survey and provided a mailing address. The survey instrument and contact materials were approved by the University of Alabama at Birmingham Institutional Review Board.

The survey was administered as an online survey and as a paper and pencil survey during August and September 2010. Participants for the online survey were recruited using a message posted on the front page of the Ride Safe website and a second message in the discussion forum. Two email reminders were sent by the site administrator to people registered to use the site. Recruitment messages provided a brief overview of the purpose of the study, the incentive, and a link to the survey.

The paper and pencil survey consisted of the same questions and incentive as the online survey and was administered once during a local meet-up of motorcycle riders that included both people who had visited the Ride Safe website and other motorcycle riders. Ten people agreed to participate and completed the survey during the meet-up.

A total of 269 participants, or 27.8% of registered users, completed the survey. Case wise deletion for cases with missing data on variables of interest yielded an analytic sample of 192.

3.3. Measures

3.3.1. Dependent Variables

Two scales have been constructed to measure frequency of risky riding behaviors and wearing protective gear. The distribution of responses to items used in the scales is presented in Table 3. Risky riding behavior is constructed from five items that assess the frequency of risky behaviors while riding a motorcycle. Responses are coded on a five-point Likert scale ranging from 0 = never to 4 = always. The five items are: (1) drive faster than most other vehicles on the road; (2) drive faster than the posted speed limit; (3) race another driver or motorcyclist; (4) drive through traffic by switching lanes or driving between lanes; and (5) make a U-turn where a sign says not to. Factor analysis indicates that all items positively load on a single factor that explains 57% of the variance. Chronbach's alpha is .810, indicating excellent internal reliability.

The protective gear scale is constructed from seven items that measure the frequency of wearing types of protective gear. Responses are coded on a five-point Likert scale ranging from 0 = never to 4 = always. The seven items are: (1) head protection, helmet; (2) eye protection, goggles or face shield; (3) hand protection, gloves; (4) foot protection, boots; (5) leg protection, riding pants or chaps; (6) upper body protection, jacket; and (7) riding suit. Factor analysis indicates a single factor that explains 40% of the variance. Chronbach's alpha is 0.792.

Table 3 Percentages of Responses to Frequency of Risky Riding Behaviors and Use of Protective Gear (N = 192)

	Never	Rarely	Sometimes	Often	Always
Risky riding behavior items					
Drive faster than others	7.81%	34.90%	34.46%	18.75%	2.08%
Exceed speed limit	6.81%	24.61%	41.36%	24.08%	3.14%
Race another vehicle	71.73%	22.51%	3.66%	1.57%	0.52%
Driving between lanes	58.85%	25.52%	9.90%	5.21%	0.52%
U-turn where not allowed	67.19%	21.88%	9.38%	1.04%	0.52%
Protective gear items					
Head protection	0.00%	0.00%	0.00%	3.12%	96.88%
Eye protection	1.04%	1.04%	2.60%	5.73%	89.58%
Hand protection	2.62%	4.19%	23.04%	14.66%	55.50%
Foot protection	2.60%	1.56%	13.54%	18.75%	63.54%
Leg protection	16.67%	15.10%	29.69%	18.79%	19.79%
Upper body protection	4.21%	7.89%	31.58%	23.16%	33.16%
Riding suit	75.94%	6.42%	10.16%	4.28%	3.21%

3.3.2. Information Seeking Using the Ride Safe Website

Three questions ask about the frequency participants used the website to look for information (1) "to improve your motorcycle riding skills," (2) "about upcoming rider education training courses," and (3) "about protective gear." Responses are coded on a Likert scale from 0 = never to 5 = several times a day.

3.3.3. Risk Perception

Two variables are used to assess perception of risk and worry of injury. Perception of risk is measured using the question, "How likely do you think it is that you will be injured in an accident or crash during the next year?" Responses are coded on a Likert scale from 1 = very unlikely to 4 = very likely. Worry of injury is measured using the question, "How often do you worry about being injured in a crash?" Responses are coded on a Likert scale from 0 = never to 4 = always.

3.3.4. Cues to Action

Two variables are included to assess the effect of the general use of the Ride Safe website and general Internet usage. How often participants visit the Ride Safe website is measured by a single question coded on a Likert scale from 0 = never to 6 = several times a day. Frequency of general Internet usage is a scale constructed from 4 items that measure the frequency of common Internet activities: (1) send or read email, (2) use a social networking site, (3) look for information about health, and (4) share something online that you created. Factor analysis indicates that all items positively load on a single factor that explains 52% of the variance. Chronbach's alpha is 0.624.

Three variables are included to assess the effect of previous motorcycle crashes, injuries, and rider training that might influence risk taking and protective behaviors. Crash during the last year and injury during the most recent crash are both measured by single questions. Crash is measured by asking participants how many crashes they had been involved during the past year and was recoded to create a dichotomous measure (0 = no accident, 1 = yes, accident). Injury during the most recent accident is measured by a question asking, "Were there any injuries or fatalities due to the [most recent] crash?" Responses were recoded to 0 = no and 1 = injury. Having taken a rider course is a dichotomous measure of whether participants have every taken a rider training course and is coded 0 = no and 1 = yes.

3.3.5 Controls

Differences in participants' motorcycle riding experience and riding skills are controlled using four variables. First, a variable measuring total miles ridden on motorcycles last year. Second, motorcycle riding skills is measured using a single item, "How would you rate your motorcycle riding skills?" Responses are coded using a Likert-type scale from 0 = not skilled, novice to 4 = highly skilled, expert. Third, a variable measuring years of riding experience. Fourth, motorcycle type is measured using five dichotomous variables that indicate the type of motorcycle a participant most frequently rides: (1) scooter or light commuter, (2) dirt bike or dual purpose, (3)

sport bike, (4) cruiser, or (5) touring. Cruiser is the most frequently reported type of bike and is used as the reference category.

Several standard socio-demographic factors are included to assess how behavioral outcomes vary by age (in years), sex (1 = male), marital status (1 = married), education level (1 = high school graduate or less to 5 = postgraduate) and household income (1 = $35,000 or less to 5 = $100,000 or more).

3.4. Analytic Strategy

The primary goal of this paper is to examine the relationship between use of the Ride Safe website for information seeking and the two dependent variables: frequency of risky riding behaviors and frequency wearing protective gear. Analyses used multivariate ordinary least squares regression models adding variables to the model in the following order: (1) use of the Ride Safe website for information seeking, (2) risk perception, (3) cues to action, and (4) control variables measuring motorcycle riding experience, skills, and socio-demographic factors. Because this is an exploratory study using a relatively small sample, the level of statistical significance is set to $p < .10$.

4. RESULTS

4.1. Sample Characteristics

4.1.1. Dependent Variables

Sample characteristics are presented in Table 4. The mean for risky riding behavior is 5.099 on a scale from 0 to 20. The mean protective gear value is 11.771 on a scale of 0 to 20.

4.1.2. Information Seeking Using the Ride Safe Website

Participants use the website to look for information on riding skills, rider training, and protective gear about once a year or less (M = 1.844, 1.339, and 1.385; category 1 = once a year or less). However, a sizeable proportion of participants make more frequent use of the website to seek information. About 60% look once a month or more often for information about riding skills, 43% rider training, and 45% protective gear (results not shown in Table 4).

Table 4 Sample Characteristics (N = 192)

Variable	Mean or %	SD or N	Min	Max
Dependent Variables				
Risky riding behavior	5.099	3.217	0	20
Protective gear	11.771	4.362	0	20
Information seeking using the Ride Safe website				
Information about riding skills	1.844	1.430	0	5
Information about rider training	1.339	1.272	0	5
Information about protective gear	1.385	1.248	0	5
Risk Perception				
How likely injured in crash	1.984	0.727	1	4
How often worry about injury	2.432	1.151	0	4
Cues to Action				
How often visit Ride Safe website	3.380	1.954	0	6
Frequency general Internet usage	14.708	4.603	0	24
Crash during previous year	22.92%	44	0	1
Injury during most recent crash	30.21%	58	0	1
Taken rider training	44.27%	85	0	1
Motorcycle Riding Experience and Skills				
Miles ride per year, thousands	7.437	6.473	0	40
Years riding	15.131	12.841	.333	53
Riding skills, high	43.75%	84	0	1

Light commuter, scooter, or other bike	10.94%	21	0	1
Dirt or dual purpose bike	8.85%	17	0	1
Sport bike	11.98%	23	0	1
Cruiser bike	53.12%	102	0	1
Touring bike	15.10%	29	0	1
Socio-demographics				
Age, years	44.724	10.935	20	65
Sex, male	80.21%	154	0	1
Marital status, married	66.67%	128	0	1
Education (5 levels)	3.145	1.202	1	5
Household Income (5 levels)	3.172	1.301	1	5

4.1.3. Risk Perception

On average, participants do not perceive they are likely to be injured in a motorcycle crash during the next year (M = 1.984; category 2 = somewhat unlikely) with 78% saying that it is very or somewhat unlikely they will be injured. Despite the perceived low likelihood of being injured, participants report relatively high levels of worry about being injured in a crash. On average, participants report they 'sometimes' worry about being injured (M = 2.432; category 2 = sometimes), but 49% report they 'often' or 'always' worry about possible injuries.

4.1.4. Cues to Action

On average, participants visit the Ride Safe website about once a week (M = 3.380; category 3 = once a week). General Internet usage has a mean of 14.708 on a scale of 0 to 24.About 23% of the sample were in a motorcycle crash during the past year and 30% said they were injured during the most recent accident. Forty-four percent have taken a rider training course.

4.1.5. Controls – Motorcycle Riding Experience and Skills

On average, participants have been riding a motorcycle for about 15 years and ride about 7,400 miles per year. Forty-four percent rate their riding skills as highly skilled or very skilled versus fairly, little, or not skilled. The most common type of motorcycle used by participants is a cruiser (53%). The sample consists primarily of males (80%) aged 45 years, who are married (67%), have some college education (M = 3.145; category 3 = some college), and with a mean yearly household income of $50,000 to $74,999 ($M$ = 3.172; category 3 = $50,000 to $74,999).

4.2. Multivariate Analysis

4.2.1. Risky Riding Behavior

Table 5 presents the results from the ordinary least squares (OLS) regression models for factors predicting the frequency of risky riding behavior. Two of three types of information seeking are significant predictors of risky riding behavior at the $p < .100$ level or less. Frequency looking for information on rider training courses is negatively associated with risky riding (b = -.547, $p < .100$) and frequency looking for information on protective gear is positively associated with risky riding (b = .559, p <.100). Looking for information on riding skills was not a significant predictor of risky riding behavior.

Table 5. Frequency of Risky Riding Behaviors Regressed on Looking for Information, Risk Perception, Cues to Action, Riding Experience and Socio-demographic Factors (N = 192)

	(1)	(2)	(3)	(4)
Information about riding skills	.306	.212	-.100	.054
	(.285)	(.283)	(.312)	(.312)
Information about rider training	-.547^{+}	-.479	-.590^{+}	-.460
	(.301)	(.300)	(.309)	(.308)
Information about protective gear	.559^{+}	.544^{+}	.557^{+}	.397
	(.300)	(.297)	(.299)	(.292)
How likely injured in crash		.662*	.622^{+}	.598^{+}
		(.323)	(.327)	(.313)
How often worried about injury		-.406*	-.428*	-.274
		(.202)	(.204)	(.193)
How often visit Ride Safe website			.326*	.166
			(.162)	(.163)
Frequency general Internet usage			.099^{+}	.081^{+}
			(.051)	(.049)
Crash during previous year			.690	.665
			(.566)	(.582)
Injury during most recent crash			.308	-.244
			(.500)	(.476)
Taken rider training			.467	.186
			(.476)	(.470)
Miles ridden per year, thousands				.137***
				(.037)
Years riding				.031
				(.022)
Riding skills, high				-.031
				(.520)
Light commuter, scooter, or other bike				.394
				(.715)
Dirt or dual-purpose bike				.733
				(.821)
Sport bike				1.773*
				(.740)
Touring bike				.383
				(.644)
Age, years				-.051*
				(.024)
Sex, male				.328
				(.620)
Marital status, married				-1.194*
				(.532)
Education level (5 levels)				.024
				(.195)
Household income level (5 levels)				.249
				(.184)
Constant	4.491***	4.272***	2.092^{+}	2.737
	(.378)	(.801)	(1.119)	(1.708)
R^2	.043	.077	.137	.320

Measures of perceived risk were added in model 2. Participants' perception of the likelihood of being injured in a crash is positively associated with risky riding behavior (b = .662, p < .050) and level of worry about being injured is negatively associated (b = -.406, p < .050). This supports similar findings that motorcycle riders

understand the risk of crashing associated with risky riding behaviors (Mannering & Grodsky, 1995). As expected, people who worry more about being injured engage in fewer risky riding behaviors.

In model 3, variables that assess cues to action are added to the model. How often participants' visit the Ride Safe website and use the Internet for a variety of activities is positively associated with risky riding behavior (b = .326, p < .050 and b = .099, p <.100, respectively).

Motorcycle riding experience, riding skills, and socio-demographic factors are added in model 4. On average, participants who ride more miles per year engage in a greater amount of risky riding behavior (b = .137, p < .001). Compared to participants who ride cruiser-type motorcycles, sport bike riders take more risks while riding (b = 1.773, p <.050). Age and marital status are both negatively associated with risky riding. Only frequency of general Internet activities remains significant after adjusting for the factors added in model 4.

4.2.2. Protective Gear

Table 6 presents the results from the OLS regression models for factors predicting the frequency of wearing protective gear items. Using the Ride Safe website to look for information about rider training courses is positively associated with frequency of wearing protective gear (b = .744, p < .100).

Table 6 Frequency Wearing Protective Gear Regressed on Looking for Information, Risk Perception, Cues to Action, Riding Experience and Socio-demographic Factors (N = 192)

	(1)	(2)	(3)	(4)
Information about riding skills	-.409	-.394	-.087	.085
	(.379)	(.380)	(.395)	(.381)
Information about rider training	.744^{+}	.668^{+}	.221	-.174
	(.402)	(.401)	(.391)	(.376)
Information about protective gear	.650	.736^{+}	1.040**	1.045**
	(.399)	(.399)	(.378)	(.357)
How likely injured in crash		-.715	-.637	-.583
		(.433)	(.413)	(.383)
How often worried about injury		-.267	-.218	-.048
		(.271)	(.258)	(.236)
How often visit Ride Safe website			-.342^{+}	-.232
			(.205)	(.199)
Frequency general Internet usage			.065	.021
			(.064)	(.060)
Crash during previous year			1.180	1.055
			(.716)	(.711)
Injury during most recent crash			-1.820**	-1.630**
			(.633)	(.581)
Taken rider training			2.769***	1.562**
			(.602)	(.574)
Miles ridden per year, thousands				.111*
				(.045)
Years riding				-.009
				(.027)
Riding skills, high				-.804
				(.635)
Light commuter, scooter, or other bike				.664
				(.874)
Dirt or dual-purpose bike				4.997***
				(1.003)
Sport bike				3.254***
				(.904)
Touring bike				1.864*
				(.787)
Age, years				.092**
				(.030)
Sex, male				-2.136**

				(.757)
Marital status, married				.209
				(.651)
Education level (5 levels)				.611*
				(.238)
Household income level (5 levels)				.190
				(.225)
Constant	10.629***	12.651***	11.237*** (1.416)	5.132*
	(.504)	(1.073)		(2.087)
R^2	.076	.098	.249	.448

In model 2, neither measure of perceived risk is significant. However, after adding these variables the coefficient for looking for information about protective gear is positive and significant at the (b = .736, p < .100).

In model 3, variables measuring cues to action are added. Frequency of general Internet usage is negatively associated with frequency of wearing protective gear (b = -.342, p < .100). Looking for information about rider training is no longer statistically significant. The coefficient for looking for information about protective gear has increased in strength and level of significance (b = 1.040, p < .010). On average, participants who experienced an injury during their most recent accident made less frequent use of protective gear (b = -1.820, p < .010). Taking a rider training course was associated with more frequent use of protective gear (b = 2.769, p < .001).

Model 4 adds variables to control for differences in motorcycle riding experiences, riding skills, and socio-demographic factors. Miles ridden per year, years riding, and riding skills are not significant predictors of wearing protective gear. Compared to cruiser-type bike riders, participants who primarily ride dirt or dual-purpose bikes, sport bikes, or touring bikes, make greater use of protective gear. Age and education level are positively associated with wearing protective gear (b = .092, p < .010 and b = .611, p < .050, respectively). Men make less use of protective gear than women (b = -2.136, p < .010).

5. DISCUSSION

Findings show that greater use of the Ride Safe website to look for specific safety information is associated with less risky motorcycle riding behavior and greater use of protective gear. Looking for information about rider training courses was associated with less risky riding behavior and greater use of protective gear. Searching for information about protective gear was also associated with greater use of protective gear. This supports prior research that found a positive relationship between seeking information about protective gear and the use of protective gear (de Rome et al., 2011). However, we found that searching for information about protective gear was positively associated with risky riding behavior, an outcome not explored in prior research.

Perception of risk was a significant predictor of risky riding behavior, but not related to the use of protective gear. Perceived risk of an injury during a crash was positively associated with risky riding behavior – the opposite of the hypothesized relationship derived from the HBM, but consistent with previous research finding that motorcyclists have a reasonable understanding of their risk of crashing related to risky riding behavior (Mannering & Grodsky, 1995). As hypothesized, participants who express greater worry of being injured tended to engage in less risky riding behavior. This suggests that motorcyclists are aware that risky riding behavior is associated with a greater risk of being injured in a crash. However, risk taking may be part of motorcyclists' riding style and identity as a motorcyclist. In fact, the type of motorcycle participants' ride was found to be related to risky riding behavior and wearing protective gear. Another important factor is that many motorcyclists express that their main motivation for riding is to have fun and for recreation, and therefore a trade-off between risk/safety and enjoyment exists. The website may be an important source of information on protective gear used by community members who seek to balance the risks associated with their risky riding style by using protective gear.

Frequency of non-specific use of the Ride Safe website was associated with greater risky riding behaviors and less frequent use of protective gear. This is in contrast to the hypothesized relationship that greater general use of the website would expose participants to messages that reinforce safer riding behavior and wearing protective gear. It should be noted that the relationship between non-specific use of the Ride Safe website to risky riding behavior and use of protective gear is mediated when motorcycle riding experiences, skills, and socio-demographics are added. This suggests that general use of the website encourages greater risk taking among sub-groups of the Ride Safe community, an effect that is mediated when differences in other factors are taken into account.

Having taken a rider training course was a strong predictor of the increased use of protective gear, supporting previous research (Mortimer, 1988; Savolainen & Mannering, 2007). However, taking a rider course was not associated with reductions in risky riding behavior. Interestingly, being injured during the most recent crash was associated with less use of protective gear, the opposite of the predicted relationship. This may simply reflect the fact that people who wore less protective gear are much more likely to be injured and that they have been slow in adopting the use of additional protective gear.

5.1. Study Limitations and Recommendations

Although this research advances prior work on information about motorcycle safety, and user behavior, this work is not without limitations. First, the data is cross-sectional and inferences of causal relationships should be made with caution. Second, the findings cannot be generalized to wider population of motorcyclists in the US or even in Alabama. Although the motorcycle community under study is large and focuses on having a diversity of members, the community only represents motorcycle riders who join an online community in one state, Alabama. In addition, it may be the case that individuals who ride particular types of motorcycles or those who participate in networks designed to be exclusive to particular types of riders may be significantly different than the ones in the online community that was studied. Finally, the response rate to the survey was 27.8% of registered users. The results may be biased if the characteristics of participants vary systematically from non-participants. Future researchers should study online communities in more than one state and also consider additional ways to enhance response rates.

6. CONCLUSION

A need exists to strengthen and diversify the safety education of motorcycle users in hopes of a better safety outcome. Easy access to reliable safety information, coupled with potential roadway design improvements, hold promise toward reducing the number and severity of motorcycle crashes in Alabama in the years to come. This study took a proactive approach by investigating riders' reports of their behaviors in relation to motorcycle riding and related activities in an online motorcycle community.

Our research suggests that studying online motorcycle communities may be beneficial for determining factors associated with risk and protective behaviors in motorcycle riding. Our work advances prior work by proactively examining determinants of risk and protective behaviors, rather than reactively examining determinants of motorcycle crashes. Given the pervasiveness of Internet use in the United States and increasing rates of motorcycle riding, examining risk and protective behaviors in online communities of motorcycle riders represents is an innovative approach to studying this population and a mechanism through which future interventions could be disseminated.

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