NJDOT Bureau of Research
QUARTERLY PROGRESS REPORT

Project Title:	Motorcycle Crash Analysis
RFP NUMBER: 2008-17	**NJDOT RESEARCH PROJECT MANAGER**: Edward S. Kondrath
TASK ORDER NUMBER: 12	**PRINCIPAL INVESTIGATOR:** Yusuf Mehta, Ph.D, P.E. Rowan University
Project Starting Date: 1/1/2008 **Original Project Ending Date**: 06/30/2009	**Period Starting Date**: April 1, 2008 **Period Ending Date**: June 30, 2008

Task	**% of Total**	**% of Task this quarter**	**% of Task to date**	**% of Total Complete**
Literature Survey	10	50	100	10
1. Survey of Best National and International Practices	10	100	100	10
2. Analysis of New Jersey Motorcycle Accident Rates	15	20	20	3
3. Needs for Enhancements to Motorcycle Training and Licensing	30	20	20	6
4. Motorcycle Compatibility with the Highway and the Roadside	15	10	10	1.5
5. Develop Strategic Plan and Recommendations for Improving Motorcycle Safety	10	0	0	0
6. Final Report	10	0	0	0
TOTAL	100			30.5

Quarterly Progress Report – June 2008

Project Objectives:

The goal of this project is to develop a strategic plan for the reduction of New Jersey motorcycle accident rates in both fatal and non-fatal crashes. The specific objectives are to:

1) Determine the root causes for New Jersey both fatal and non-fatal motorcycle crashes.

2) Develop specific recommendations for reducing the NJ motorcycle rates which incorporate the unique nature of the New Jersey highway system.

1. Progress this quarter by task:

Task 1 –Literature Survey on Best Practices

- A literature survey on the effectiveness of motorcycle training programs has been completed. The literature is decidedly mixed on the effectiveness of current motorcycle training courses. Some studies show that current programs are effective while some studies have actually concluded that training may result in a negative benefit. Training appears to only produce a benefit in terms of accident reduction during the first year of riding. These surprising findings however may be more a result of the inconsistent study methodologies used by these studies than the courses themselves. Appendix A contains a white paper on the effectiveness of motorcycle training programs

- A literature survey on the risk of injury and fatality in motorcycle-guardrail collisions has been completed. Motorcyclists are particularly at risk in collisions with guardrails. In 2005, motorcyclists comprised 42% of fatalities due to guardrail collisions, whereas only 3% of vehicles on the roads were motorcycles. More motorcyclists were killed in guardrail collisions than passengers of any other vehicle type in 2005. The literature proposes several design solutions to remediate this problem. Appendix B contains a white paper on the risk of injury and fatality in motorcycle-guardrail collisions.

Task 2 –Analysis of New Jersey Motorcycle Accident Rates

- Task 2.1 Analysis of Motorcycle Fatalities in New Jersey. Analysis of the NHTSA Fatal Automotive Reporting System database (FARS) is underway to determine the characteristics of fatal motorcycle crashes in New Jersey.

Task 3 – Needs for Enhancements to Motorcycle Training and Licensing

Task 3.1, 3.2, 3.3 Survey motorcyclists, instructors, and dealers and collate data as the survey results are received

- On June 9th 2008, the PI. Yusuf Mehta and Co-PI, Dr. Clay Gabler, met with Tom Wright and Scott McNear from New Jersey Motor Vehicles Commission for the preliminary review of the survey data collected and overall progress of the project.
- The survey was launched in May 2008 and establishment has been met with an unprecedented response from the target population. See Appendix B for materials that were distributed as well as the survey. Nearly a 10% response rate is being achieved which is very high for a survey of this nature. It is suggested that the population of motorcyclists being surveyed have a heightened passion for riding and the goals of this survey. Preliminary analysis of the data shows us that there are proven methods for which safety on a motorcycle can be improved. According to the survey, this includes:

    - Taking a Motorcycle Safety Foundation (MSF) course. A common theme among the responses is that a majority of inexperienced and experienced riders alike have much to gain from a MSF course. Through our preliminary data, it is confirms that there is a significant decrease in accidents with riders whom have taken the MSF course. Many responses have suggested that the state implement policy to make this a mandatory requirement to get a motorcycle license.
    - The States' licensing process does not accurately prepare or test riders for the dangerous roads in NJ. Common themes suggest that the state adopt the MSF course as a prerequisite for licensure. Also, many feel that riders should be limited to the size (cubic centimeters, cc) of bike they may ride, depending on what they test within the practical road test. For instance, if a new rider were to test on a small scooter, then their license would be restricted to a maximum size bike. If the new rider were to take the test on a larger bike and pass, then they would be permitted to operate any size bike. Riders believe that if you are afraid to use your large bike in a road test for fear of dropping it, then perhaps the bike is too big for the rider.
    - Riders feel that the state has the ability to close the gap between riders and drivers by improving driver education, enforcing cell phone laws, and developing a public service advertising campaign on cars and motorcycles sharing the road.

- See Appendix C for diagrams and figures regarding the survey responses to date.

Task 4 – Motorcycle Compatibility with the Highway and Roadside

- Task 4.1 Analysis of Motorcycle-Guardrail Collisions. Using satellite images of the sites of serious and fatal motorcycle-guardrail crashes in NJ, the research team has begun to examine the roadway geometric characteristics of these sites. The sites of serious and fatal motorcycle-guardrail crashes in NJ were identified using the results of Task 4.3. One early finding is that motorcycle-guardrail crashes typically do not involve a curve whereas serious, but non-fatal motorcycle-guardrail crashes, frequently involve a curve. The team is currently computing fatality crash rates in motorcycle-guardrail crashes.

- Task 4.3 High Risk Motorcycle Crash Locations. The NJCRASH database for 2005-2007 has been analyzed to identify highway locations which are particularly dangerous for motorcyclists. The crash locations were rank ordered using five different metrics of crash risk – (1) fatals, (2) fatals and serious injuries, (3) weighting the KABCO police reported injuries using the NJDOT 5-4-3-2-1 weights, (4) computation of social cost of each crash location using established FHWA injury costs, and (5) crash frequency. We have asked NJDOT to provide the research team with hardcopy reports from these crash sites. We have also

2. Proposed activities for next quarter by task

- Conduct field investigation of crash sites closer to Glassboro, NJ.
- Continue to collect and analyze data from the survey responses.
- Enhance Survey with 3 questions to relate when an accident occurred relative to experience, training, and type of motorcycle.
- Keep the public informed of the progress of this project through press releases.
- Continue analysis of NJ Motorcycle Accident rates.
- Continue analysis of Motorcycle Compatibility with the Highway and Roadside
- Develop and submit papers of our findings to the Transportation Research Board regarding:
    - The development and success of a web-based survey.
    - The analysis and conclusions to date of the responses to the survey.

3. List of deliverables provided in this quarter by task

- Literature Review on Training Effectiveness provided by Virginia Tech (Appendix A)
- Literature Review on Motorcycle Compatibility with Guardrail provided by Virginia Tech (Appendix B)
- Response cards and surveys to be distributed (Appendix C)
- To-date survey results are included in (Appendix D)

4. Progress on Implementation and Training Activities

- None Scheduled

5. Problems/Proposed Solutions

- None Scheduled

Total Project Budget	199561.50
Total Project Expenditure to date	60866.26
% of Total Project Budget Expended	30.5

APPENDIX A

THE EFFECTIVENESS OF MOTORCYCLE TRAINING AND LICENSING: A LITERATURE REVIEW

The Effectiveness of Motorcycle Training and Licensing: A Literature Review

By

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June 2008

Executive Summary

Motorcycle-crash fatalities in the United States have been increasing since 1997, when the total number of fatalities reached a record low (Baldi et al., 2005). Motorcycle training programs have been put in place before this rise and many studies have aimed to show their effectiveness. The curricula offered most frequently in the United States are the Motorcycle Safety Foundation's *RiderCourses*, though other courses are offered including the Harley Davidson *Rider's Edge* and programs developed by individual states.

Research to date has not overwhelmingly supported either the notion that training is effective or ineffective. No standard methods for evaluation exist and studies vary greatly in the comparisons that are made and the effects of training that are investigated. Some studies demonstrated that motorcycle training is effective (Baldi et al., 2005; Baer et al., 2005b; Billheimer, 1998; and Swaddiwudhipong et al., 1998), while others demonstrated that it is ineffective (Savolainen and Mannering, 2007 and Mortimer, 1984). A survey of government-sponsored training programs in each state was conducted to review the effectiveness of the different state offerings. Based on criteria developed by Baldi et al., some states were found to have more effective programs than others (2005).

Many studies evaluated the effectiveness of training programs through a comparison of the accident rates between trained and untrained riders. An evaluation of the California Motorcyclist Safety program established that accident rates decreased in the years following the introduction of the program (Billheimer, 1998). Several studies also demonstrated that accident rates for trained riders are lower than those for untrained riders in the year following the completion of the training (Billheimer, 1998 and Swaddiwudhipong et al., 1998). However, several studies have demonstrated that the difference between the accident rates of the two groups diminishes two years after training was received (Billheimer, 1998 and Swaddiwudhipong et al., 1998). Some studies have concluded that a trained rider is more likely to be involved in an accident than an untrained rider (Mortimer, 1984 and Savolainen and Mannering, 2007).

Motorcycle education has also proven effective in increasing the usage of personal protective equipment. Trained riders were found to make use of personal protective equipment more often than untrained riders (Mortimer, 1984; Savolainen and Mannering, 2007; and Swaddiwudhipong et al., 1998). According to the National Agenda for Motorcycle Safety (NAMS), for training to prove effective, it needs to be available for all those who seek to take it. People may be discouraged from participating in motorcycle education if they need to drive significant distances to reach a training site (MSF, 2000). The number of government-sponsored sites per ten thousand riders in each state varies from less than one to almost four (Baer et al., 2005a).

Since training is not mandatory everywhere, many people will choose not to participate in motorcycle safety education courses. As indicated in the NAMS Report, one way to increase the amount of participation is to offer incentives for completing a course (MSF, 2000). Several motivators have proven effective in increasing enrollment, such as low

costs, testing waivers, or licensure immediately upon completion of a course (MSF, 2000 and Baer et al, 2005b).

Licensing is intertwined with rider education; licensing procedures often encourage motorcyclists to seek formal training. Different licensing procedures have shown to have different effects on accident rates. States that require training before issuing a license to a rider tend to have lower fatality rates than states that did not require training prior to licensure (McGwin, Jr., et al., 2004). Moreover, licensing systems in which a rider was restricted in the use of his/her license for longer periods of time tended to have a lower accident rate (McGwin, Jr. et al., 2004). Graduated licensing systems have also proven effective in reducing accident rates. In New Zealand, a decrease in accident involvement and hospitalization for riders aged 15 to 19 was found after the implementation of a graduated licensing system (Reeder et al., 1999).

Introduction

This literature review aims to look at the effectiveness of motorcycle education courses, especially amongst the various training programs in the United States. The effectiveness of programs is examined through the effect that training had on accident rates and the use of personal protective equipment found through past research. Moreover, the literature study aims to review different motorcycle licensure systems and their effectiveness.

Curriculum

The most frequently used training curricula are those developed by the Motorcycle Safety Foundation, MSF (MSF, 2000). The two novice courses taught are the *Motorcycle RiderCourse: Rider and Street Skills* (MRC:RSS) and the *Basic RiderCourse* (BRC). The BRC is a more recent program that some states have adapted as their main curriculum, though many still use the MRC:RSS (Baer et al., 2005a). Both courses involve training in the classroom and on a motorcycle. The classroom training incorporates information about how to operate the motorcycle. Moreover, the classroom training focuses on safety measures that motorcyclists can take to protect themselves and become more conspicuous on the road. The skills training includes the basic skills needed to safely operate a motorcycle, such as braking, cornering, and swerving. These are considered some of the more difficult maneuvers and are not easily mastered. The MSF courses are all taught by certified *RiderCoaches*, who undergo extensive training to become prepared to teach the courses (MSF, 2008).

Another novice course frequently offered is Harley-Davidson's *Rider's Edge* New Rider course, which is based on the courses developed by the MSF. The course is offered directly at Harley-Davidson dealers and upon completion of the course the graduate is awarded a card stating they have passed the MSF RiderCourse. This course also incorporates both knowledge and skill training (Harley-Davidson, 2008). Moreover, some states have developed their own curriculum for training motorcyclists. Oregon and Maine are two examples of such states. These are also generally based on the MSF courses; however, they are modified as the states see fit (Baer et al., 2005b).

Effectiveness of Training Programs

The effectiveness of motorcycle training classes has been evaluated in several different ways. However, no standard methods for evaluation exist and studies vary greatly in the comparisons that are made and the effects that are studied. Previous studies have also usually used small sample groups, opening the possibility that the data does not accurately represent the population (Haworth, 2000). Haworth et al. found that the evaluation of training courses is typically based on the amount of accidents occurring in years following the training, rather than on the curriculum itself (2000). Research to date has not overwhelmingly supported either the notion that training is effective or it is ineffective.

Effectiveness of Curricula

According to Haworth et al., one common flaw in studying the effectiveness of motorcycle training is the lack of directly examining the teaching methods used. Many studies, instead, focus on different outcome events that may be influenced by training, such as accident and injury rates (1999). These studies do not take into account the inherent differences in curricula, training sites, and instructors (Baldi et al., 2005).

Baldi et al. evaluated the government sponsored training programs in each state based on three main categories: administration, education, and licensing. Each category was broken down into subcategories, which were assigned point values. The categories and effective practices were based on suggestions made in the National Agenda for Motorcycle Safety (NAMS). A maximum of 36 points could be attained by each state. After the evaluation, the states were divided into three categories, low, medium, and high, with "low" being one standard deviation below the average and high being one standard deviation above. Eight states were classified as "low" and ten states were categorized as "high." The scores ranged from 3 points (South Carolina) to 24 points (Oregon). New Jersey was classified as "low," receiving a total of 8 points (Baldi et al., 2005). However, it should also be noted that significant changes in the program have been made since the completion of this review. At the time of the evaluations, the program was under the control of the Division of Highway Traffic Safety. In 2005, the leadership changed hands and is now under the control of the Motor Vehicle Commission (NJMVC, 2005).

Effect on Accident Rates

Several studies have shown that training produces a decline in accidents as well as an increase in riders using personal protective equipment. California accident trends were analyzed to see the effects of the introduction of a safety program in 1987. The California Motorcyclist Safety Program (CMSP) was mandatory for all people under the age of eighteen seeking a motorcycle license at the time of its introduction, though this age was increased to twenty-one in 1991. In the nine years following the introduction of the program, the number of fatal motorcycle accidents dropped 69% (Billheimer, 1998). However, Billheimer suggests several other factors besides the introduction of a mandatory training program may have influenced this decline. He notes that a mandatory helmet law was introduced in 1992. Also, the number of motorcycles sold during this time period declined. Therefore, the decrease cannot be pinned solely to the introduction of the CMSP (Billheimer, 1998).

A match-case study was done to see the effects of motorcycle training by the CSMP. Trained and untrained riders were paired based on age, sex, and riding experience to make a more accurate comparison between the two groups. It was found that there were fewer accidents per unit distance for trained riders with little experience before training as opposed to their untrained counterparts. Both one and two years after the training period, there was no significant difference found between trained and untrained riders. Moreover, no significant difference was seen between the trained riders with prior experience and their untrained equivalents (Billheimer, 1998). Billheimer (1998) concluded that those who had little to no experience prior to taking the course benefited most from it. Similar results were seen through a study done in rural Thailand, people in three villages were given motorcycle training, while people in three other villages were not. Injury rates were monitored in both the experimental and control villages to determine the effectiveness of the training. During the first year succeeding the training, the injury rates for trained riders were lower than those for untrained riders. However, after two years, the difference in the injury rates between the two groups diminished (Swaddiwudhipong et al., 1998).

However, some studies have shown that existing training courses may not be effective or may even have negative effects. In Indiana, it was found that those who completed the BRC were 44% more likely to be involved in an accident. Moreover, those who took the course more than once were 180% more likely to be involved in an accident than untrained riders (Savolainen and Mannering, 2007). Savolainen and Mannering offer several different factors that this may be attributed to. First, the course may give people the feeling of improved skill, increasing risk taking behaviors because they are operating at the same perceived risk level. Alternatively, the course may be attracting a group of riders who are less skilled. Thus, the course is not the cause of more people being in accidents, it is the inherent skill level of the people themselves. The last possibility is that the course itself may be ineffective (Savolainen and Mannering, 2007).

Mortimer (1984) reviewed of the effectiveness of the MRC:RSS and found that 22.1% of those surveyed who had taken the motorcycle rider course reported being in an accident in the twelve months prior to the study, whereas 16.2% of the untrained survey group reported being in an accident. When these numbers are adjusted for miles ridden, the accident rate for those who received the training course was more than twice as great as the rate for the control group. For the trained group the rate was 103.5 accidents per million miles, as opposed to 43.8 accidents per million miles for the control group (Mortimer, 1984). Moreover, for those who held a license for less than two years, there was no significant difference in accidents between the trained and untrained groups. This is significant because it is anticipated that the training will affect drivers most within the first 2 years of receiving a license (Mortimer, 1984).

Effect on Personal Protection Equipment Usage

Generally, it was found that people who receive training are more likely to use personal protective equipment while riding. In Mortimer's study evaluating the MRC:RSS, it was observed that people who received training wore protective equipment while riding more

often than those who did not. However, it was also noted that people who received training were more likely to wear their seatbelt while driving a car. Thus, this observation may be a reflection of the nature of those who seek training (Mortimer, 1984). It was also found that the education programs in Thailand were effective in increasing the number of licensed motorcyclists and those that wore their helmets (Swaddiwudhipong et al., 1998). Moreover, in a study completed in Indiana, it was found that only 5% of those who received training never wore their helmet, as opposed to the 14% of the untrained riders who did not wear a helmet (Savolainen and Mannering, 2007).

Availability of Training

Though the research to date is not overwhelming supportive of the notion that training is effective, several studies have demonstrated its effectiveness in reducing accident rates (Baldi et al., 2005; Baer et al., 2005b; Billheimer, 1998; and Swaddiwudhipong et al., 1998) and promoting the use of personal protective equipment (Mortimer, 1984; Savolainen and Mannering, 2007; and Swaddiwudhipong et al., 1998). Training should be made available to everyone seeking it (MSF, 2000). There are numerous reasons why a person might be discouraged from taking a course. Among these are scarcity of openings in each course, proximity to training sites, and enrollment processes. The NAMS Report recommends that training should be convenient for those who seek it, so as not to discourage people. By eliminating these issues, people may be more encouraged to participate in training (MSF, 2000).

Proximity to Training Sites

People need to be able to easily get to the places where training is offered (MSF, 2000). In a survey of the United States, the number of government training sites per 10,000 riders varied greatly from state to state. North Dakota had the greatest ratio of sites to riders, with almost four sites for every ten thousand riders. Other states, such as New Jersey offered less than one government training site per ten thousand riders (Baer et al., 2005a). There are two state sponsored training sites in New Jersey, located in Sea Girt and Egg Harbor Township (Figure 1). However, there are also ten private training sites across New Jersey (NJMVC, 2008).

Figure 1. Locations of government training sites in New Jersey. There are two state sponsored motorcycle training sites in New Jersey, marked by the pins.

In order to promote training, courses need to be available for people throughout the entire state (MSF, 2000). This may prove difficult due to the need to have a large, open lot for the skills training to take place as well as a classroom area for the knowledge portion of the training (Baer et al., 2005b). Moreover, in more rural areas it may not be economically efficient to offer courses. However, people generally are not willing to participate in training if it is inconvenient for them to reach the site. In order to reach more people in Nevada and Oregon, a mobile classroom unit was purchased and is taken on the road to different areas of the state. Motorcycles are also transported with the unit, providing participants with the same training they would receive had they gone to a more permanent site. The sites chosen for the mobile unit to stop at ensure that no one will have to drive more than two hours to take a course (Baer et. al, 2005b).

Scarcity of Openings

The number of seats available in each course is limited by the nature of the course itself. In order to provide practical training, the instructor must be able to supervise everyone that is practicing and provide advice to individuals on how to improve his/her skills. Moreover, the number of available motorcycles is limited and the classes need to be kept small to ensure everyone receives ample practice time. Baer et al. (2005b) concluded that through an optimization of resources, the number of classes could increase, allowing

more people to receive training. At a community college in Maryland, seventy-two students can be trained in one weekend. This is accomplished by staggering the schedules of six groups of twelve students, giving each group a chance to practice on the range (Baer et al., 2005b).

Another way to increase the amount of seats available is to increase the duration of the year in which the course is offered (Baer et al., 2005b). Most states hold courses for nine months out of the year or more; many states hold courses year-round (Baer et al., 2005b). In 2008, New Jersey MVC offered courses for six months in Sea Girt, and four months in Egg Harbor Township (NJMVC, 2008), though more training is available through the private sector.

Ease of Enrollment

Enrolling in a course should be simple, so as not to discourage people from taking one (Baer et al., 2005a). In some states, such as Delaware and Idaho, students can enroll for state sponsored classes directly with the state offices. Other states require students to enroll through the community college which a class is offered through. However, students must first enroll in the college before enrolling in the course, which requires processing time. With a limited amount of space available in classes, this can prove frustrating to students trying to enroll (Baer et al. 2005b).

The design of the website can greatly ease the enrollment process. Students can enroll for any state sponsored course in Idaho through one website. This centralizes the data and enrollment information so as to eliminate confusion (Baer et al., 2005b). Centralizing registration makes it easier for students to enroll in classes and eliminates confusion about how to enroll in the course. Moreover, it reduces any additional steps that must be taken between finding an available course and enrolling in it. New Jersey MVC developed a new website for motorcycle safety education, www.njridesafe.org, in 2006. This website contains enrollment and registration information, as well as information about the course itself (NJMVC, 2007). However, registration must be completed over the phone (NJMVC, 2008)

Motivation for Training

Since training is not mandatory, many people will not take a motorcycle education course. Offering incentives for training is one way to increase the amount of people who participate (MSF, 2000). Often these incentives include making it easier for people to obtain motorcycle licenses. However, the same incentives for training are not offered everywhere.

One motivation for seeking motorcycle training is to facilitate the process of obtaining a license after the completion of a course. Many states will waive either the knowledge or skills tests, or both, required to obtain a license for someone who has passed an approved course, either private or state sponsored. This has shown to draw more people to seek training (MSF, 2000). Upon successful completion of an approved course in New Jersey, the skills test will be waived for the graduate (Baer et. al, 2005b).

Some states offer licensure immediately upon successful completion of a course. Maryland, for example, gives students an endorsement sticker to add to their license the day they complete the course. Information about passing students is sent to the data services center, where licensing information on each student is updated. Therefore, there are no other steps required after finishing a course before a student can legally ride a motorcycle (Baer et al., 2005b). New Jersey riders who complete a course must still attain their license through the MVC (NJMVC, 2008).

Another incentive is a reduction of points on a license for participating in a motorcycle safety class (Baer et al., 2005b). The reduction applies to all points on a license, not just points accumulated while riding a motorcycle. Eight states, including New Jersey, offer this incentive for training (Baer et al., 2005b). New Jersey views the motorcycle education class as a defensive driving course, resulting in a 2 point reduction for those who complete the course (NJMVC, 2008).

One barrier to taking motorcycle training courses is the price of the course. Thus, making training affordable is another motivation for people to enroll in courses (Baer et al., 2005b). The average cost of a state sponsored training course in the United States is $106.16, though there is a large degree of variation in costs (Baer et al., 2005a). New Jersey is one of three states to offer free motorcycle training courses through the state (Baer et al., 2005a). However, private classes, which may be easier for some people to attend due to proximity, are not free of charge.

Licensure

Licensing is intertwined with rider education; licensing procedures often encourage motorcyclists to seek formal training. Many aspects of licensing are facilitated through the completion of a motorcycle training course. Some states waive testing procedures for those who have completed an approved course (Baer et al., 2005a). As demonstrated above, this incentive motivates people to seek training.

Even though a motorcycle license is required in all fifty states and the District of Columbia (McGwin, Jr. et al., 2004) as well as in New Zealand, Australia, and other countries (Reeder et al., 1999 and Haworth et al., 1999), non-licensed motorcyclists account for a large portion of people who are involved in motorcycle accidents. In Maryland, 17% of motorcycle owners do not possess a license; however, 27% of motorcyclists involved in accidents were unlicensed (Braver et al., 2007). In 2005, 8% of New South Wales riders involved in accidents were unlicensed, though they were involved in 32% of fatal accidents (de Rome et al., 2007). Licensing procedures vary between the different states as well as amongst different countries. Most states in the United States do not have a graduated licensing system established for motorcycle riders; however, this is more widely used in other countries such as New Zealand and Australia. There is no graduated licensing system established for motorcyclists in New Jersey. A person must hold a motorcycle permit for a minimum of twenty days before he/she is eligible to take the road test (NJMVC, 2008).

Licensing Systems

Each state has different requirements to obtain a motorcycle license. Of the fifty states and the District of Columbia, 47 states require operators to hold a permit before they can acquire a license as of 2004. However, restrictions placed on permits vary by state. According to McGwin, Jr. et al., the three restrictions most frequently placed on permit holders amongst the states are no passengers or night riding and a helmet must be in use at all times. Tiered licensing programs are in place in nine states and three states have a graduated licensing system similar to those currently in place for automobile drivers (McGwin, Jr. et al., 2004).

There exists a three step licensing process in Victoria, Australia. First, one must have a learner permit for at least three months. Then a skills test is taken to obtain a restricted license, which is held for a year. It can then be upgraded to an unrestricted license without any further testing. Restrictions on the learner's permit and restricted license include a maximum engine size and a zero BAC level. In order to obtain a restricted license, the seeker must complete a licensing training course (Haworth et al., 1999). In New South Wales, Australia, the licensing process is similar. However, as of 1990, training is required before receiving both the learner's license and the provisional license, where the provisional license is the equivalent of the restricted license in Victoria. The duration of holding each license is slightly different, requiring the learner's permit to be held for three months and the provisional license to be held for one year (de Rome et al., 2007).

A similar system was enacted in New Zealand in 1987. Though a graduated licensing system for automobile drivers is only required for people between the ages of 15 and 24 seeking a license, it is required for everyone seeking a motorcycle license. There are three stages in the graduated licensing system: learner's license, restricted license, and unrestricted license. The learner's license is attained after passing two written tests, a vision test, and an off-road skills test and held for six months unless the holder receives formal training. Restrictions on this license apply to engine size, speed, passengers, time of day, and BAC level. A learner's plate must also be displayed on the motorcycle. The restricted license is procured after successfully completing an on-road test. The restrictions on this license are the same as for the learner's license; however, passengers may be carried in a side car and travel speed is not restricted. This license is held for 18 months, which can also be reduced by receiving training. The unrestricted license is then obtained without further testing. The duration for which both the learner's and restricted licenses are held can both be halved by successfully completing training (Reeder et al., 1999).

Effect of Different Licensing Systems on Accident Rates

Accident rates differ in areas where different licensing systems are in effect. A correlation between accident rates and licensing systems can be drawn. In the United States, it was found that states requiring a training course for licensing tended to have lower fatality rates. Moreover, those states who implemented a system in which a permit was associated with restrictions, the accident rates per number of drivers were significantly lower than for states without permit restrictions. Also, states that require a skill test to attain a permit, mandate a longer duration of time between receiving a permit

and obtaining a license, or place three or more restrictions on permit holders have a lower fatality rate than other states when comparing the number of accidents per miles traveled (McGwin, Jr. et al., 2004).

The effects of the New Zealand graduated licensing system the accident rates were studied to determine the impact of the system. Data from 1978 to 1994 were examined in the study. It was found that the number of people between the age of 15 and 19 who were involved in a crash decreased between 1984 and 1993. Moreover, there was an observed 22% decrease in hospitalization for people in this age group after the graduated licensing system was enacted. As anticipated, the greatest decline in accidents and hospitalizations decreased the most for the 15 to 19 year old age group, as compared to the 20-24 year old and the 25 year old and above groups. However, there was also a decline in the number of people in this age group who owned motorcycles (Reeder et al., 1999).

Conclusion

The literature gives mixed findings on the effectiveness of current motorcycle training programs; however, motorcycle training programs will continue to evolve. Several studies have demonstrated a decrease in accident rates for years following the implementation of training. The difference in accident rates between trained riders and untrained riders who have been riding for approximately the same duration of time, however, diminishes two years after training. Some studies have even shown that training may even have a negative influence on riders, though this may be attributable to several different factors. Moreover, not all training courses are equally effective. Improvements can be made to current training systems in order to increase the positive effects that training may cause. Making training widely available to people is important in increasing its effectiveness. Since training has proven to increase the use of personal protective equipment, this will be beneficial in reducing the severity of accidents. Moreover, people need to be aware of the training opportunities that are available to them. Information needs to be widely spread in order to have the desired effect. Lastly, the current licensing system can be adapted to increase the amount of supervised practice time motorcyclists must complete before receiving an unrestricted license.

References

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APPENDIX B

REDUCING THE RISK OF SEVERE INJURY AND FATALITY IN MOTORCYCLE-GUARDRAIL COLLISIONS: A LITERATURE REVIEW

Reducing the Risk of Severe Injury and Fatality in Motorcycle-Guardrail Collisions: A Literature Review

By

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Virginia Tech
Blacksburg, VA

June 2008

Executive Summary

Motorcyclist fatalities can occur from a variety of accidents. In the United States in 2005, motorcyclists comprised 42% of fatalities due to guardrail collisions, whereas only 3% of vehicles on the roads were motorcycles (Gabler, 2007). More motorcyclists were killed in guardrail collisions than passengers of any other vehicle type in 2005 (Gabler, 2007). Guardrails are designed to retain cars and other large vehicles such as vans and trucks. However, motorcycles also share the road with these vehicles. Motorcyclists are usually thrown from their motorcycle in the event of a collision, leaving them at the mercy of the surrounding environment, including roadside barriers, as they come to a stop. Guardrails have been very effective in saving the lives of occupants of cars and trucks, and cannot simply be removed to protect motorcyclists. However, the literature describes improvements can be made in several areas in order to keep motorcyclists, as well as car occupants, safe in guardrail collisions.

Several modifications to guardrails have been proposed in order to make them more motorcycle friendly. The posts of guardrails are generally viewed as the most hazardous component (Domhan, 1987). The small faces concentrate the force and a collision with one usually results in a much more severe injury than a collision with a smoother surface. One modification that can be made to prevent motorcyclists from colliding with these posts is the addition of a supplementary covering beneath the W-beam, which would inhibit the motorcyclist from sliding under the guardrail. Also, impact attenuators could be added around the posts. These cover the post and provide a larger, smoother surface area for a motorcyclist to collide with. Lastly, the shape of the post itself could be modified to reduce the amount of small faces exposed.

Modifying all barriers would not be economically efficient (Domhan, 1987). Thus, the literature recommends that areas that pose the most threat to motorcyclists should be targeted for modification. Several European countries have begun to make modifications to guardrails. Moreover, a regulation is being developed in Europe that incorporates motorcyclist safety in guardrail designs. Regulations provide an effective means of making roads safer for motorcyclists everywhere.

Introduction

Motorcyclist fatalities can occur from a variety of accidents. In the United States in 2005, motorcyclists comprised 42% of fatalities due to guardrail collisions, whereas only 3% of vehicles on the roads were motorcycles (Gabler, 2007). More motorcyclists were killed in guardrail collisions than passengers of any other vehicle type in 2005 (Gabler, 2007). Guardrails are designed to retain cars and other large vehicles such as vans and trucks. However, motorcycles also share the road with these vehicles. Motorcyclists are usually thrown from their motorcycle in the event of a collision, leaving them at the mercy of the surrounding environment, including roadside barriers, as they come to a stop. Guardrails have been very effective in saving the lives of occupants of cars and trucks, and cannot simply be removed to protect motorcyclists. However, the literature describes improvements can be made in several areas in order to keep motorcyclists, as well as car occupants, safe in guardrail collisions.

The injuries sustained in a motorcyclist-guardrail collision are dependent on the design of the barrier (Ouellet, 1982). Steel guardrails are designed to absorb the energy from an impact through deformation. With less energy present, the chances of the colliding object being redirected into oncoming traffic is significantly reduced. However, barriers are designed to retain large vehicles such as cars and trucks—not motorcycles. The posts supporting the W-beam of the guardrail are one of the most serious dangers to motorcyclists. They generally have narrow faces and sharp edges, causing the force to be highly concentrated on the motorcyclist as he/she collides with it. These posts are unforgiving to the tumbling cyclists (Domhan, 1987).

Research has been conducted in Europe and Australia to reduce the number and severity of injuries and fatalities incurred from collisions with roadside barriers. Several different modifications to roadside barriers have been designed to reduce the severity of the injuries inflicted on colliding motorcyclists. Some of these redesigns have been installed in Europe and Australia based on these findings in order to make the roads more motorcycle friendly. However, to date, little has been done to address the issue in the United States.

Injury Countermeasures

Shielding motorcyclists from the posts of the guardrail is an effective way to reduce the severity of injuries and the fatality rate since posts are the most hazardous component. The I-beam shaped post is the most commonly used post; however, it also contains the most edges and narrow faces. Different modifications to guardrails have been designed in order to ensure they are motorcycle friendly. One modification is the addition of a lower W-beam. This additional beam prevents a motorcyclist from moving under the barrier as he/she comes to a halt, preventing him/her from colliding with the harsh edges of the posts. Several other methods of protecting motorcyclists from the I-beam posts have also been developed. SEC-Envel developed a metal shield that is attached below the W-beam and serves the same purpose as the addition of an extra W-beam (Figure 1). However, it is constructed from a flat piece of ductile metal, so it absorbs more energy upon impact than does the additional W-beam. It has been in use in France since 1997 and

approximately 500 kilometers were installed across France by the year 2000 (FEMA 200).

Figure 1. Metal shield developed by SEC-Envel. The flexible metal covers the hazardous posts and prevents motorcyclists from colliding with them (FEMA, 2000 [left] and Limi et al., 2008 [right]).

The Plastrail by Sodilor is another guardrail modifier made in France (Figure 2). Constructed from plastic, it is designed to enlarge the surface area around the post, therefore the concentration of the energy transfer upon impact. The Mototub by Sodirel (Figure 3) is similar to the Plastrail; however, it is fabricated from 70% recycled material (FEMA, 2000).

Figure 2. The Plastrail by Solidor. This plastic covering provides protection to motorcyclists by covering the posts of the guardrail (Limi et al., 2008).

Figure 3. The Mototub by Sodirel. The Mototub is made from 70% recycled material and prevents motorcyclists from hitting the posts of the guardrail (FEMA, 2000).

Impact attenuators are another means of protecting motorcyclists from posts. These surround the posts and create a larger surface area to collide with as well as protect the motorcyclists from the harsh faces of the posts (Figure 4). They can be made from a

variety of different synthetic materials (Duncan et al., 2000). Testing on neopolene impact attenuators has shown that they have significantly reduced the severity of injuries incurred upon collision, though they are most effective in collisions occurring between 50 and 60 km/h (Domhan, 1987). Also, other testing was done with cadavers to determine the difference in severity of the injuries incurred when impact attenuators were in use as opposed to unprotected I-beam posts. It was also found that the injuries were significantly less severe when the impact attenuators were used (Jessl, 1985 and Schuler, 1985, cited in Duncan et al., 2000).

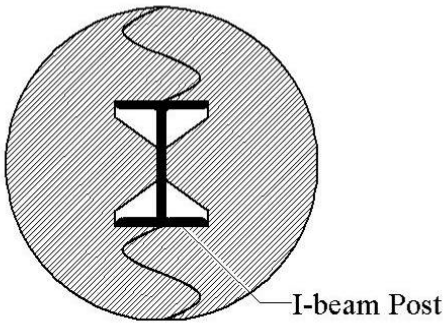

Figure 4. Sample Impact Attenuator. Impact attenuators surround posts, creating a larger surface area for impact as well as protecting motorcyclists from the sharp edges of posts (adapted from FEMA, 2000).

The shape of the post itself can also be altered to reduce the severity of an injury caused upon collision. Posts that are more rounded and have fewer exposed sharp edges have been designed to replace the I-beam posts. The sigma-post has a cross-section shaped like the capital Greek letter sigma (Σ), thus having less exposed sharp edges and a more rounded shape (Figure 5). These features do not allow for the energy to concentrate in areas as highly as it concentrates in a collision with the I-beam post. Posts with other cross sections shaped like the letters "C" and "Z" (Figure 5) have also been used to reduce the severity of injuries (Duncan et al., 2000).

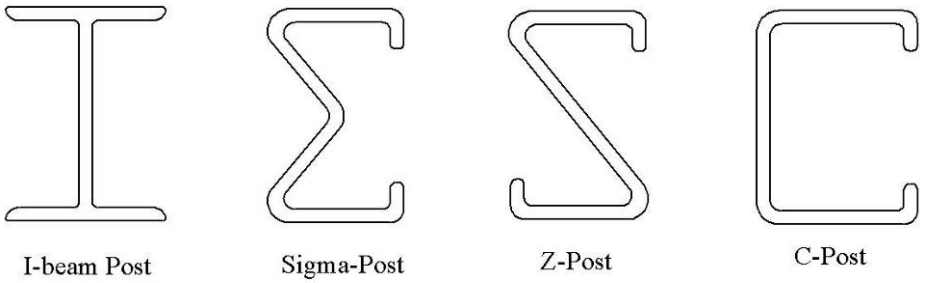

Figure 5. Various Post Designs. The I-beam post is the most commonly used post; however, it also poses the greatest threat to motorcycles. The Σ -, Z-, and C- posts have a more rounded shape and less harsh edges, making them safer for motorcyclists (adapted from FEMA, 2000).

Cost and Feasibility

Both motorcyclists and passengers of other vehicles are protected through these modifications; however, it is not economically beneficial to modify all guardrails to be motorcycle friendly. A cost analysis of replacing systems in Germany was done and it was found that the cost of updating the current systems was too high as compared with the costs of accidents. However, it was also found that if ten percent of guardrails were made motorcycle friendly, the additional safety measures would be cost effective (Domhan, 1987). Thus, areas that pose the most danger, also known as black spots, need to be targeted for barrier improvement. Tight and non-constant curves are potential black spots due to the difficulty of maneuvering a motorcycle around them (FEMA, 2000). In addition, areas where accidents have already occurred may be considered black spots and are candidates for improved barrier systems. In Germany, several stretches of roadway seen to be hazardous were equipped with improved barrier systems. "According to the police accident reports available for these sections, the accidents that occurred reportedly would have been much more severe or even fatal had the guardrails at the scenes not been fitted with W-beams or crash absorbers" (Domhan, 1987). Though these modifications are proven to be effective, other actions must be taken in conjunction with them because they are too expensive to implement on every guardrail.

International Motorcycle Initiatives

Initiatives have been taken across Europe in order to make roads safer for motorcyclists. More frequently now roads are being upgraded to better accommodate motorcyclists. A stretch of highway RV 32 in Norway was opened on May 7, 2008 that had been modified to incorporate safety measures for motorcyclists that are usually overlooked in road design (FEMA, 2008a). Moreover, France has allocated over five million euros a year for the improvement of crash barriers around hazardous curves and the fitting of motorcycle friendly devices in black spots. The Provincial Council of Utrecht in the Netherlands decided to only install motorcycle friendly barriers when new barriers are erected (Baird et al., 2005). These are just some examples of recent measures taken to protect motorcyclists; programs have been put in place in other European Countries such as Germany and Portugal to ease the severity of motorcycle accidents.

Regulations

Several studies and research have been completed showing the increased severity that guardrails can add to a motorcycle collision. As of 2005, throughout Europe no regulations on crash barrier design and testing were set to consider the implications on motorcyclists (Baird et al., 2005). Moreover, based on an analysis of the methods used, motorcyclists have not been considered in the international standard testing methods of roadside barriers (Gowan, 1996, cited in Duncan et al., 2000). In 2005 Spain pioneered the development of a barrier-motorcyclist crash test which takes the first step toward such an international standard (Perandones et al., 2008). In June, 2008, a resolution was passed in Europe to modify safety barrier regulations so as to incorporate safety features to protect motorcyclists (FEMA, 2008b). As demonstrated above, roadside barriers pose a serious threat to motorcyclists, causing significant numbers of injuries and fatal accidents to occur. Regulations governing both barrier and road design would make the roads safer by reducing the total number of fatal guardrail collisions involving motorcyclists.

Conclusion

Roadside barriers pose a serious hazard to motorcyclists. Although barriers have been proven to be extremely beneficial to car occupants, these barriers could cause more severe injuries to motorcyclists than would be incurred if the barrier was not present. Several modifications have been designed in order to reduce the severity of injuries. Modifying barriers in black spots so as to reduce the severity of injuries is an effective way of protecting motorcyclists. Moreover, developing regulations incorporating motorcycle safety would ensure that motorcyclists are not excessively injured in the event of a guardrail collision. Several different options exist to reduce the representation of motorcyclists in fatal guardrail collisions.

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APPENDIX C
SURVEYS AND RESPONSE CARDS

Figure 1-B Survey Access Code/Response Card

WE NEED YOUR HELP!

On behalf of the New Jersey Motor Vehicle Commission, and the New Jersey Department of Transportation, we are requesting your help for a very important project. Your responses to our 5 minute survey will provide valuable information for motorcyclists in New Jersey. To respond, visit

www.rowan.edu/mvc

and enter the code found on the reverse of this card.
This code does not link any personal information,
it simply lets us know that you have responded.

Would you rather have a printed version?
Simply fill out this form and mail it back to:

Motorcycle Research Team
ATTN: Yusuf Mehta
Rowan Hall
201 Mullica Hill Road
Glassboro, NJ 08028

Name: _____

Address: _____

City: _____

State: _____ Zip: _____

Rowan University

STATE OF NEW JERSEY
MOTOR VEHICLE COMMISSION

Rowan University

March 25, 2008

Fellow Dealer,

On behalf of the New Jersey Motor Vehicle Commission (NJMVC), and Rowan University, we are requesting your help for a very important project. The fatality rates of motorcyclist in New Jersey have reached an all time high. In 2006, 89 individuals were killed in motorcycle accidents. Our purpose in writing to you today is to gather information. With this information the NJMVC will be able to make New Jersey's roadways a safer place to ride.

Enclosed you will find a survey that we ask you to complete and mail back in the postage paid envelope. If you would like a faster and easier alternative, we suggest that you respond online using the instructions below. Your answers will be completely confidential. No personal information is requested or linked to the survey.

To respond online simply go to **http://www.rowan.edu/njmvc** and enter the code found below. This code does not link any personal data, it simply lets us know that you only responded once.

Thank you in advance for your participation in this important project. If you have any questions about the administration of the survey, please contact the survey administrator, [name], [title] at [phone] or [email].

D0123456789

D0123456789

1. What type of motorcycles do you sell? (Please Check all that apply)
   ① Cruiser
   ② Sport Touring
   ③ Sport
   ④ Dual Sport
   ⑤ Off Road

2. Do you require customers to obtain a motorcycle endorsement prior to **purchasing** a motorcycle?
   ① Yes
   ② No

3. Do you require customers to obtain a motorcycle endorsement prior to **riding** a purchased motorcycle off the lot?
   ① Yes
   ② No

4. Do you encourage new riders to take a safety course prior to purchasing a motorcycle?
   ① Yes
   ② No

5. Do you know what rider safety courses are available to your customers?
   ① Yes
   ② No

6. Do you believe there should be more locations offering the course?
   ① Yes
   ② No

7. Do you feel that motorcycle safety courses are effective tools to help riders?
   ① Not effective
   ② Somewhat effective
   ③ Effective
   ④ Very effective
   ⑤ Extremely effective

8. Do you feel the MVC written test covers enough information?
   ① Not enough information
   ② Less than enough information
   ③ Enough information
   ④ More than enough information
   ⑤ Too much information

9. Do you feel the MVC motorcycle road test adequately assesses weather a person has the skills to become licensed to operate a motorcycle?
   ① Yes
   ② No

10. Do you encourage customers to wear protective helmets when they ride?
    ① Yes
    ② No

D0123456789

11. If YES, what kind of helmet is your PRIMARY recommendation?
① Half
② 3/4- Face
③ Full Face/Flip-up
④ Novelty
⑤ None

12. Do you encourage customers to wear protective gear when they ride?
① Yes
② No

13. What kinds of protective gear do you suggest?
(Please check all that apply)
① Gloves
② Protective Pants (Not Jeans)
③ Boots
④ Protective Jacket
⑤ Joint/Spine protectors
⑥ None

14. What kind of protective gear do you sell?
(Please check all that apply)
① Gloves
② Protective Pants (Not Jeans)
③ Boots
④ Protective Jacket
⑤ Joint/Spine protectors
⑥ None

15. What types of situations do you feel are most dangerous to a motorcyclist?
① Intersections
② Highways
③ Two lane rural roads
④ Parking lots
⑤ Residential roads/areas

16. What do you feel is the most likely cause of motorcycle accidents?
① Inattentive or distracted drivers
② Wildlife / Animals
③ Stunts / Excessive Speed
④ Inexperienced Riders
⑤ Curves

17. Do you feel that the conditions of roadway surfaces ever compromises the safety of a rider?
① Yes
② No

MORE QUESTIONS NEXT PAGE


D0123456789

18. Do you have any additional comments that you feel will help to reduce motorcycle fatalities?
(Please print, limit 200 characters)

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_____

We appreciate your time filling out this survey.

STATE OF NEW JERSEY
MOTOR VEHICLE COMMISSION

Rowan University

March 25, 2008

Fellow Rider Coach,

On behalf of the New Jersey Motor Vehicle Commission (NJMVC), and Rowan University, we are requesting your help for a very important project. The fatality rates of motorcyclist in New Jersey have reached an all time high. In 2006, 89 individuals were killed in motorcycle accidents. Our purpose in writing to you today is to gather information. With this information the NJMVC will be able to make New Jersey's roadways a safer place to ride.

Enclosed you will find a survey that we ask you to complete and mail back in the postage paid envelope. If you would like a faster and easier alternative, we suggest that you respond online using the instructions below. Your answers will be completely confidential. No personal information is requested or linked to the survey.

To respond online simply go to **http://www.rowan.edu/njmvc** and enter the code found below. This code does not link any personal data, it simply lets us know that you only responded once.

Thank you in advance for your participation in this important project. If you have any questions about the administration of the survey, please contact the survey administrator, [name], [title] at [phone] or [email].

I0123456789

I0123456789

1. What year were you born?

1	9		
0	0	0	0
● 1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	● 9	9	9

2. What is your sex?
   ① Male
   ② Female

3. How many years have you been actively **riding**?
   ① Less than 2 years
   ② 2 years to 5 years
   ③ 5 years to 10 years
   ④ 10 years to 20 years
   ⑤ More than 20 years

4. How many years have you been actively **training**?
   ① Less than 2 years
   ② 2 years to 5 years
   ③ 5 years to 10 years
   ④ 10 years to 20 years
   ⑤ More than 20 years

5. How did you obtain your Motorcycle endorsement?
   ① Motor Vehicle Commission Test
   ② Motorcycle Safety Foundation Course
   ③ No endorsement

6. In your opinion, how difficult is the basic rider course for the average rider?
   ① Not difficult
   ② Somewhat difficult
   ③ Difficult
   ④ Very difficult
   ⑤ Extremely difficult

7. Do you feel the MVC written test covers enough information?
   ① Not enough information
   ② Less than enough information
   ③ Enough information
   ④ More than enough information
   ⑤ Too much information

8. Do you feel the MVC road test covers enough information?
   ① Not enough information
   ② Less than enough information
   ③ Enough information
   ④ More than enough information
   ⑤ Too much information

9. Do you feel there are enough locations offering the course?
   ① Yes
   ② No

I0123456789

10. In the U.S. there are no restrictions on which bike a person can ride, regardless of their experience and skill. What do you believe should be done to keep riders from riding bikes beyond their skill level?
(Please mark all that apply)
① Nothing, it is part of our freedom.
② Riders should be required to take more courses based on the size of their bike.
③ Riders should have to ride for a certain amount of time before being allowed to ride a larger bike.
④ There should be a certification system for different types of motorcycles.

11. In your opinion, how difficult is the experienced rider course for the average rider?
① Not difficult
② Somewhat difficult
③ Difficult
④ Very difficult
⑤ Extremely difficult

12. Do you believe more riders would enroll in ERC's if there were increased incentives and availability?
① Yes
② No

13. Do you have any additional comments that you feel will help to reduce motorcycle fatalities?
(Please print, limit 200 characters)

_____

_____

_____

_____

_____

_____

_____

_____

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_____

We appreciate your time filling out this survey.

R0123456789

1. What year were you born?

1	9		
0	0	0	0
● 1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	● 9	9	9

2. What is your sex?
   - ① Male
   - ② Female

3. What type of motorcycle do you ride?
   - ① Cruiser
   - ② Sport Touring
   - ③ Sport
   - ④ Dual Sport
   - ⑤ Standard

R0123456789

4. What reason(s) do you ride?
   (Please check all that apply)
   ① Recreation
   ② Fuel Economy
   ③ Touring
   ④ Social Activities
   ⑤ Sport/Professional

5. How many years have you been actively riding?
   ① Less than 2 years
   ② 2 years to 5 years
   ③ 5 years to 10 years
   ④ 10 years to 20 years
   ⑤ More than 20 years

6. How often do you wear a helmet?
   ① Never
   ② More than 0% but less than 25%
   ③ More than 25% but less than 50%
   ④ More than 50% but less than 75%
   ⑤ More than 75% but less than 100%
   ⑥ 100%

7. If there was no helmet law, what percentage of the time would you wear your helmet?
   ① Never
   ② More than 0% but less than 25%
   ③ More than 25% but less than 50%
   ④ More than 50% but less than 75%
   ⑤ More than 75% but less than 100%
   ⑥ 100%

8. Why do you wear a helmet?
   (Please check all that apply)
   ① I don't
   ② It's the law

R0123456789

③ Safety
④ My friends wear helmets

9. What kind of helmet is your PRIMARY helmet?
① Half
② 3/4- Face
③ Full Face/Flip-up
④ Novelty
⑤ None

10. Do you wear any other protective gear, on a regular basis?
(Please check all that apply)
① Gloves
② Protective Pants (Not Jeans)
③ Boots
④ Protective Jacket
⑤ Joint/Spine protectors

11. Have you ever consumed alcohol before riding your motorcycle?
① Yes, less than 2 drinks
② Yes, more than two, but less than 4 drinks
③ Yes, 4 or more drinks
④ No

12. Do you have a valid NJ drivers license?
① Yes
② No

13. Do you have a valid Motorcycle endorsement?
① Yes
② No

R0123456789

14. How did you obtain your Motorcycle endorsement?
    ① Motor Vehicle Commission Road Test
    ② Motorcycle Safety Foundation Course
    ③ I do not have a motorcycle endorsement
15. What motorcycle did you use to take the test/course?
    ① My own
    ② A friend's
    ③ A rented motorcycle
    ④ A rented scooter
    ⑤ Course supplied motorcycle
    ⑥ I have not taken the test/course

16. What was the engine displacement of the bike you used for the test / course?
    ① Less than 100cc
    ② 101cc - 500cc
    ③ 501cc - 1200cc
    ④ Over 1200cc
    ⑤ I have not taken the test/course

17. If you took the NJMVC Road Test, do you think it accurately tested your ability to operate a motorcycle properly?
    ① Yes
    ② No
    ③ I didn't take the NJMVC Road Test

18. Have you ever taken the Motorcycle Safety Foundation course?
    ① Yes
    ② No

    If you answered **YES** to question 18, please answer the following questions, if not please skip to question 21.

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19. Please rate the courses overall effectiveness based on skills learned:

① Not effective
② Somewhat effective
③ Effective
④ Very effective
⑤ Extremely effective

20. Do you feel the course covered enough information?

① Not enough information
② Less than enough information
③ Enough information
④ More than enough information
⑤ Too much information

21. Please rate your interest in taking a motorcycle safety course:

① Not interested
② Somewhat interested
③ Interested
④ Very interested
⑤ Extremely interested
⑥ Did not know it was offered

22. What factors kept you from taking one?

(Please select all that apply)

① It is too expensive
② I don't have the time for one
③ I am not interested
④ I don't think it will be helpful
⑤ I don't know where they are
⑥ I didn't know they existed
⑦ Not convenient to my location

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23. Have you ever been involved in an accident with your motorcycle?

① Yes
② No

If you answered **YES** to question 23, please answer the following questions, if not please skip to question 29.

24.What were the circumstances?

① Single vehicle
② Multiple vehicle my fault
③ Multiple vehicle other driver's fault
④ Animal or other road hazard

25. Where did the accident occur?

① An intersection
② Highway
③ Two lane rural road
④ Parking lot
⑤ Residential road/area
⑥ Off road

26. When you got into your accident, what protective gear were you wearing?
(Please check all that apply)

① Gloves
② Protective Pants (Not Jeans)
③ Boots
④ Protective Jacket
⑤ Joint/Spine protectors
⑥ None

27. Was medical attention required?

① Yes, overnight hospitalization
② Yes, but no overnight hospitalization

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③ No

28. Did you feel the severity of the accident required reporting it to law enforcement?

① Yes
② No

29. What types of situations do you feel are most dangerous to a motorcyclist?

① Intersections
② Highways
③ Two lane rural roads
④ Parking lots
⑤ Residential roads/areas

30. What do you feel is the most likely cause of motorcycle accidents?

① Inattentive or Distracted car and truck drivers
② Wildlife / Animals
③ Stunts/Excessive Speed
④ Inexperienced Riders
⑤ Curves

31. Do you feel that the conditions of roadway surfaces ever compromises your safety as a rider?

① Yes
② No

32. Do you have any additional comments that you feel will help to reduce motorcycle fatalities? (Please print, limit 200 characters)

_____

We appreciate your time filling out this survey.

APPENDIX C
PRELIMINARY SURVEY ANALYSIS FIGURES

Figure 1-C Survey Responses by Age and Gender

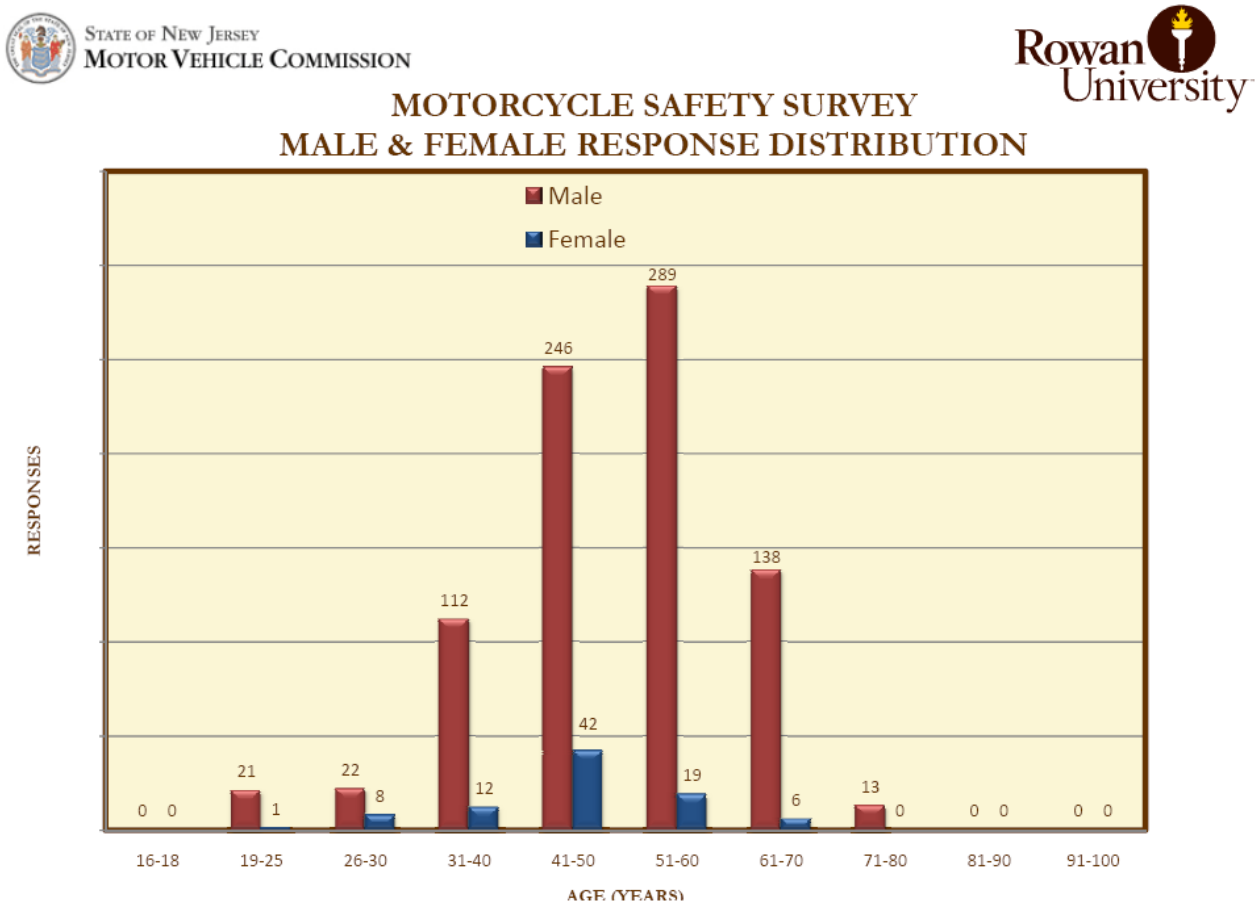

Figure 2-C Accidents Based on Training and Motorcycle Type

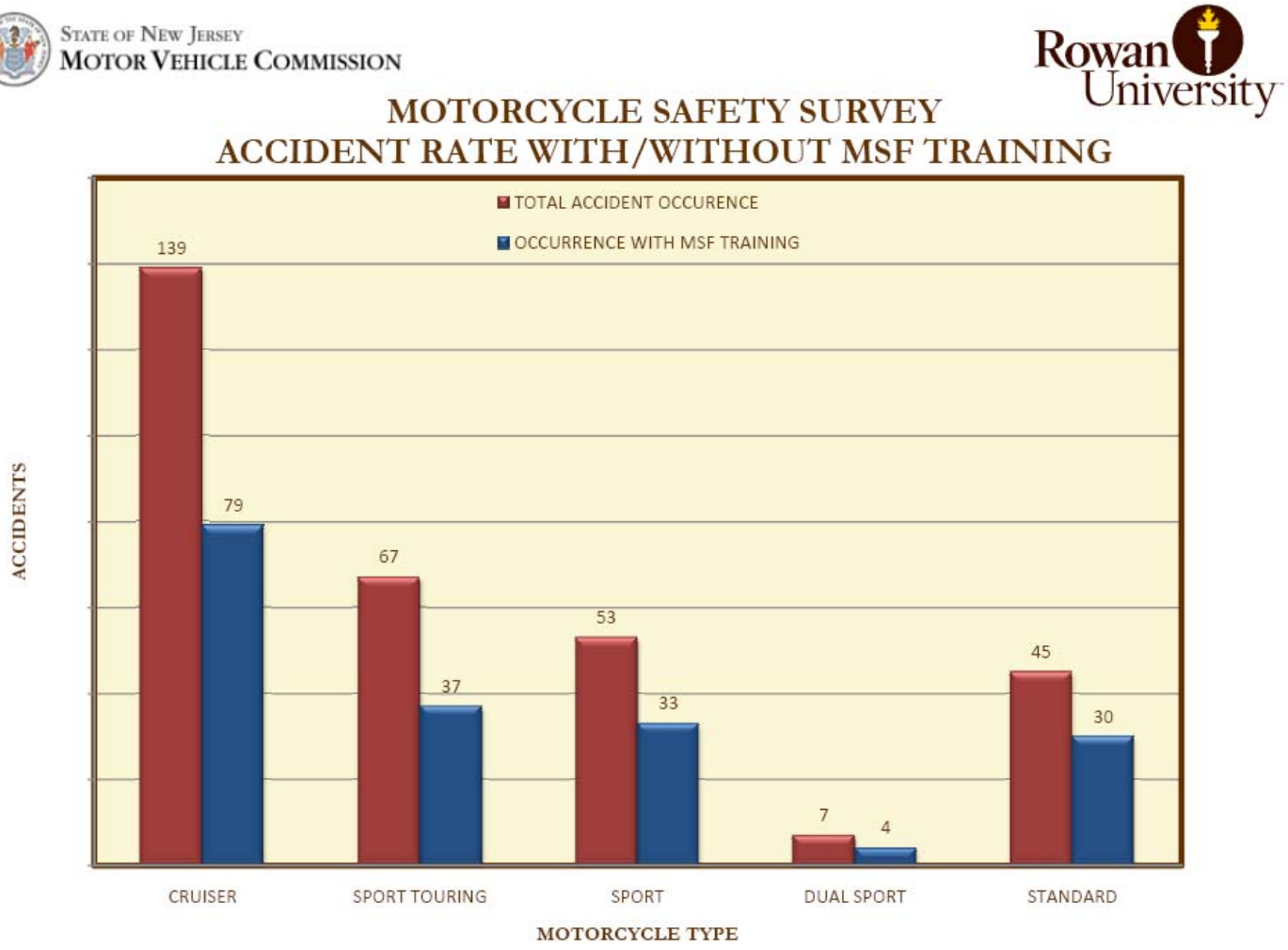

Figure 3-C Accidents Based on Training and Motorcycle Type