

AN ANALYSIS OF THE IMPACT OF THE
TEXAS DEPARTMENT OF PUBLIC SAFETY
MOTORCYCLE OPERATOR TRAINING PROGRAM
UPON MOTORCYCLE RELATED **TRAFFIC** ACCIDENTS

BY

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CHAPTER 1

INTRODUCTION

When choosing to ride a motorcycle, individuals place themselves at greater potential risk than when traveling in other modes of transportation. This increased risk has historically resulted in a greater death and injury rate for motorcyclists than for other types of motor vehicles. In dealing with this problem, public policy decisions have generally taken the form of either vehicle equipment requirements or education. This research shall examine the effectiveness of the education alternative.

Statement Of The Problem

Motorcycles typically have high performance capabilities, including very rapid acceleration and high top speeds. In emergency braking, motorcycles can be less stable than cars and motorcycles have less conspicuity in traffic. Further, when motorcyclists crash, they lack the protection of an enclosed vehicle. These factors are obvious contributors to

the 3,036 motorcycle operator deaths nationwide in 1989. (Insurance Institute For Highway Safety, 1990)

To put this national problem in perspective, the number of deaths in 1989 per 100,000 registered motorcycles was sixty-eight compared with twenty deaths per 100,000 for registered passenger cars. Per vehicle miles traveled, the number of deaths on motorcycles was approximately eighteen times that for cars. (Insurance Institute For Highway Safety, 1991) Motorcycle traffic accident statistics for Texas reflect these same disproportionate relationships.

Texas Motorcycle Traffic Accidents

In Texas in 1989, approximately 6% (719,204) of Texas motor vehicle operators had a motorcycle endorsement for their driver license. During the same year, motorcycles represented 1.4% (187,687) of the total motor vehicles registered with the Texas Motor Vehicle Division. (Texas Department of Public Safety, 1989, p. 30)

While licensed Texas motorcyclists represent only a minimal percentage of resident drivers and total Texas registered motor vehicles, 7.2% of the 1989 traffic fatalities were persons riding motorcycles. This disproportionate number caused the 1989 motorcyclist

fatality rate to be 12.9 per 10,000 registered motorcycles compared with 2.6 motor vehicle fatalities per 10,000 registered motor vehicles other than motorcycles. (Texas Department of Public Safety, 1989, p. 2) Examination of the factors contributing to motorcycle traffic accident disparity reveals very diverse characteristics.

Characteristics Of Motorcycle Accidents

Motorcycle traffic accidents are the result of a combination of factors. These include, but are not limited to, a lack of appropriate knowledge and skills on the part of motorcyclists and limited motorcycle conspicuity. Consumption of alcohol also contributes to crashes. (U.S. Department of Transportation, 1985-1986) Examining the physical factors of accidents further illustrates the diversity of the problem.

In Texas, in 1989, 55% of motorcycle crashes involved another vehicle while 40% involved colliding with the roadway or some other fixed object. At least 2% of the crashes involved a collision with a person or animal. The remainder (3%) collided with a railroad train or parked vehicle. More than 48% of the motorcycle traffic accidents occurred on city streets. The majority (61%) occurred during daylight on dry road surfaces (93%) and during clear

weather (96%). (Texas Department of Public Safety, 1989) While minor yearly fluctuations in the number of traffic fatalities occur, they remain a serious problem. This has resulted in a predominant role for rider education programs as an emphasis on safety. (**Rothe** and Cooper, 1987, p. 15)

Motorcycle Education Evaluation Studies

A disproportionate crash rate for motorcyclists has been the impetus for motorcycle training programs designed to reduce the likelihood of motorcycle traffic accidents. **Rothe** and Cooper observed that the majority of motorcycle training evaluations were designed to judge effectiveness in reducing motorcycle traffic accident or violation rates. Methods of data collection have typically included survey questionnaires or accident statistics. Accident statistics have been derived from self-reporting or official reports.

Effectiveness Evaluation

Methods of effectiveness evaluation normally follow a retrospective, post **hoc** research design comparing graduates of training programs with untrained motorcyclists. This occurs due to the difficulty of conducting a longitudinal study using random group assignments before commencement of

a driver education course. A major weakness of this evaluation design is a lack of control for self-selection bias and pretraining differences between groups. However, "A well designed retrospective post **hoc** research design can produce relevant data." (Rothe and Cooper, 1987, p. 27-28)

Applied Research Elements

The intervention process evaluated by this study is the Texas Department of Public Safety motorcycle operator training program. Motorcycle operator training programs are specific applications of driver education. They are administered with the assumption that improvement in knowledge, skills and attitudes will reduce the likelihood of crash involvement through improved performance in traffic situations. The Department of Public Safety program attempts to accomplish these goals through use of a training curriculum (Motorcycle **RiderCourse:Riding** and Street Skills) created and maintained by the Motorcycle Safety Foundation. During the target year of this study (1988) more than 1,700 students completed the Motorcycle **RiderCourse:Riding** and Street Skills program in Texas. (Burdette, 1992)

This study compares the crash rate experience (January 1, 1989 through December 31, 1991) of motorcyclists licensed in Texas in 1988. The experimental group consisted of licensed

motorcyclists at least eighteen years old who completed motorcycle operator training in one of five metropolitan areas in Texas in **1988**. The control group consisted of licensed motorcyclists who never completed motorcycle operator training in Texas. The control group was comprised of an equal number of randomly selected licensed motorcyclists frequency matched by age, sex and place of residence. The five metropolitan areas designated by this study (Austin, Dallas-Fort Worth, El **Paso**, Houston and San Antonio) accounted for more than seventy-five percent of all civilian motorcycle operator training program participants during **1988** in Texas. (**Palma, 1991**)

This experimental design essentially replicates an earlier study of the Texas Department of Public Safety motorcycle operator training program conducted by Doctor Linda Lloyd in **1989**. The motorcycle operator training program at that time consisted of the **1984** edition of the Motorcycle Safety Foundation Motorcycle Rider Course. Doctor Lloyd's inquiry found an increase in crash rate for the group receiving training as compared to an untrained control group. (Lloyd, **1989**)

This research study utilizes a program evaluation methodology design to determine if the **1988** motorcycle operator program was instrumental in producing better

motorcycle riders. The dependent variable measures motorcycle crashes for trained participants as compared to a control group. The independent variable of training includes an enhanced edition of the Motorcycle Safety Foundation Motorcycle Rider Course (Motorcycle **RiderCourse:Riding** and Street Skills). This study is to **determine** if changes to the training program as administered in the Lloyd study will provide a different experimental outcome. As an effort to control for confounding factors, a questionnaire was mailed to a frequency matched random sample of the trained and untrained groups. This questionnaire inquired concerning years of motorcycle operation and motorcycle miles driven. It also inquired as to the type of roadways driven upon.

Research Question

The research question asks if the Texas Department of Public Safety motorcycle operator training program produces safer motorcycle operators. The following analysis summarizes the findings of this study.

Research Analysis

The experimental and control groups each consisted of 349 members frequency matched by age, sex and residence

location. A questionnaire was also used to determine the motorcycle riding experience, the number of miles traveled in 1991 and the type roads traveled by a random sample (100) of each group. Due to an extremely low response rate, statistical significance tests were not employed to compare the trained and untrained respondents.

The crash records of the trained group were compared to those of the untrained group for an identical three year period. Analysis indicates that the trained motorcyclists had a motorcycle crash rate 5.38 times higher than the untrained motorcyclists. This resulted in the hypothesis that trained motorcyclists would have a lower crash rate than untrained motorcyclists being rejected.

Limitations in this study on time and resources precluded full investigation of all potential confounding variables. As variables which were not controlled may impact the effectiveness of motorcycle operator training, the research performed in this study is not conclusive. This project also fails to fully address **program** modifications which may be required. It is suggested that a future study attempt to control for all known confounding variables. Program modifications may evolve from the results of more comprehensive research.

Summary

This research project is organized into six chapters. Chapter One contains the introduction and statements of the problem and the research question. Chapter Two presents the results of the literature search concerning the effectiveness of motorcycle operator training. The major topics of Chapter Three include legislative and legal foundations as well as a historical perspective of motorcycle training programs. Chapter Four contains a discussion of the research methodology used in the compilation of this report and the hypothesis. Chapter Five provides analysis of the motorcycle crash rates for the trained and untrained group to test the hypothesis. Chapter Six comments upon the findings of the study, acknowledges factors not measured and offers conclusions concerning the data.

CHAPTER 2

LITERATURE REVIEW

The following literature review illustrates the difficulty in **determining** program effectiveness for motorcycle operator training. Studies designed to evaluate the effectiveness of driver education in reducing the number of accidents experienced by participants have various methodological problems. Deficiencies include alleged demonstrations of program effectiveness without documentation of implementation, content and learning activities. (Shinar, 1978) The research often fails to control for self-selection factors such as personality, gender, socioeconomic status and education. Controlling for exposure is also considered crucial in driver education evaluation. (McGuire and Kersh, 1969)

The National Highway Traffic Safety Administration Driver Education Evaluation Program Study (1975) observed that elimination of selection bias requires random **preassignment** of new drivers to control and experimental groups. However, random assignment of new drivers is often precluded. Driver

education may be a legal requirement of licensing. In addition, insurance companies may offer premium reductions for driver education graduates. When a fully controlled experimental design is not possible, a retrospective study can be considered. The experimental and control groups should be matched by key self-selection factors. The research should also utilize appropriate analysis techniques in order to detect program defects. (Jonah, et al., 1982)

The purpose of this literature review is to report previous research that has examined motorcycle operator training effectiveness. The effectiveness criteria, variables and outcomes of previous studies will be reported as the first step toward answering the research question.

Motorcycle Operator Training Effectiveness

Two basic assumptions underlie driver education programs. First, that current knowledge, skills and attitudes are inadequate or incorrect and their improvement will reduce the likelihood of a crash. (Shaoul, 1975) Secondly, trained or experienced persons will perform better in most traffic situations than untrained people. (U.S. Department of Transportation, 1975) This assumes that accidents are more likely to be experienced by drivers who exhibit unsafe

driving behavior. It also assumes driver education will improve subsequent driver behavior and reduce traffic accidents. (Rothe and Cooper, 1987, p. 16)

Driver training program developers believe the **essential** feature of the driving task to be interaction between perceptual motor skills and decision making strategies. This suggests the need to educate new drivers about decision making in addition to developing their perceptual motor skills. (Naatanen and **Summala**, 1976) Motorcycle operator training programs are a specific application of driver education programs. Further, a National Highway Traffic Safety Administration (NHTSA) study indicates that motorcycle rider education can be effective in rapidly increasing the skill level and reducing the risk level of beginning motorcyclists. (U.S. Department of Transportation, 1990, p. 12)

Essential Training Elements

This training is characterized as effective only if riders are motivated to develop both basic and street riding skills. (U.S. Department of Transportation, 1992, p. 1-2) In addition, NHTSA advocates that the learning process be controlled to ensure that beginning riders gain experience in a low risk **environment** before full riding privileges are

granted. Finally, experienced riders must maintain an acceptable level of safety knowledge and skill throughout their riding career in order to maintain effectiveness. (U.S. Department of Transportation, 1990, p. 2)

In addition, to ensure long term viability, motorcycle operator training programs must be practical to administer without sacrificing the goal of crash reduction. They must also be acceptable to the motorcycle **community**. If motorcycle operators fail to participate in a program, it is rendered useless. Training effectiveness is also tempered by inability to discriminate between adequate and inadequate levels of skill and knowledge required for motorcyclists to ride safely. (U.S. Department of Transportation, 1990, p. 3)

Review of the evaluation literature to date shows that minimal substantive conclusion can be drawn concerning the hypothesized effectiveness of motorcycle rider training in reducing motorcycle accidents. The following cited studies will illustrate this fact in more depth.

Table 2.1 summarizes the results and methods of ten key studies performed since 1975. The pattern of results is mixed. Six of the studies found no difference in accident rates between those with training and those without. Even

TABLE 2.1
PREVIOUS COMPARISON STUDIES
EVALUATING THE EFFECTIVENESS OF MOTORCYCLE TRAINING

CONCLUSION	YEAR	STUDY AUTHOR	LOCALE	COMPARISON YEARS	MATCHING CRITERIA	DATA SOURCE
No difference in accident rates.	1980	NHTSA	New York	5	Random	Driving Records
No difference in accident rates.	1982	Jonah, et al.	Canada	4	Random	Survey, Driving Records
No difference in accident rates.	1984	Mortimer	Illinois	3	Age, gender, education, drinking, distance traveled	Surveys
No difference in accident rates.	1987	Rothe and Cooper	Canada	2	Age, gender, insured distance traveled	Surveys
No difference in accident rates.	1991	Kiger, et al.	Ohio	2	Age, gender, location, distance traveled, motorcycle size	Driving Records

(Table 2.1 continued)

CONCLUSION	YEAR	STUDY AUTHOR	LOCALE	COMPARISON YEARS	MATCHING CRITERIA	DATA SOURCE
No difference in accident rates.	1988	Mortimer	Illinois	3	Age, gender. education. drinking. distance trav- eled	Surveys
Higher injury crash rate for trained group.	1975	Krause and Franti	California	3	Random	Driving Records
Higher accident rate for trained group.	1989	Lloyd	Texas	4	Age, gender, location	Driving Records
Higher accident rate for trained group.	1992	Waller	Texas	3	Age, gender. residence	Driving Records
Lower accident rate for trained group.	1989	McDavid, et al.	Canada	5	Age, gender, location. driving record	Driving Records

more discouraging, three studies suggest that training increases the likelihood of an accident. Only one study observed accident rates falling with training.

Research **Supporting** The Neutrality of **Training**

A five year study of motorcycle operator training effectiveness was conducted in 1980 by the New York State Department of Motor Vehicles. In this study, all new motorcycle operator license applicants were randomly assigned to a three hour training course, a skills test, a twenty hour training course or a control group. The traffic accident experience for each group was evaluated for the following five year period. No significant differences in motorcycle crash rates were found between the trained groups, the new licensing test group or the control group. (U.S. Department of Transportation, 1987)

In Illinois, Mortimer (1984) found that motorcycle operator training program graduates do not have significantly different crash rates. Mortimer's study controlled for age, years licensed, gender, distance traveled, education and riding after drinking. A motorcycle operator trained group for the period of 1977 through 1979 was compared to a control group composed of persons contacted at motorcycle dealer retail outlets. Each person

in the groups was asked to complete a survey questionnaire to determine motorcycle crash rates and their age, gender and other control factors. This study found that the trained motorcyclists did not have a lower self-reported crash rate per mile traveled than the comparison group. (Mortimer, 1984) Mortimer (1988) repeated the study with a larger control group. Illinois motorcycle operator training graduates between 1980 and 1983 were used as the experimental group. Again, motorcycle operator training graduates failed to have lower crash rates than untrained motorcyclists. (Mortimer, 1988)

In a Canadian study, Jonah, et al., (1982) used **self-**reported data as well as official accident reports for data sources. A trained group comprised of persons taking the Canada Safety Council Motorcycle Training Program was compared with registered motorcyclists randomly selected from a motorcycle operator file. Self-reported crash data as well as demographic and riding characteristics for both groups was obtained through telephone interviews. It was found that the trained group was more likely to be female, older, better educated and have higher income. The trained group was also more likely to be married, have their own motorcycle, be licensed for a shorter period of time and have traveled less distance on their motorcycle. The

untrained group was more likely to have reported drinking alcohol and riding a motorcycle. The study found that trained motorcyclists had crash rates that were no different than untrained motorcyclists when age, years licensed, gender, distance traveled, education and alcohol consumption were controlled. (Jonah, et al., 1982)

A study conducted by the Insurance Corporation of British Columbia (1987) evaluated the relationships between motorcycle operator characteristics, attitudes and crash rates. The traffic accident data source for this study came from the driving records of insured motorcyclists. Telephone interviews were used to determine that only 47% of the respondents had received formal training. There were no significant differences between the trained and untrained groups in crash rates. Also, motorcycle traffic violation conviction rates, other-vehicle crash rates and other-vehicle traffic violation conviction rates were substantially the same. (Rothe and Freeman, 1987)

In 1987, the Ohio Department of Highway Safety instituted the office of the Ohio Motorcyclist Enrichment Program (OMEP). This office administers a statutory requirement that all 16 and 17 year **olds** receive training to be eligible for a driver license motorcycle endorsement. The Ohio program also provides training to beginning riders over 18

years of age, experienced riders and motorcycle operator training instructors. Ohio statute further requires that the Enrichment Program be evaluated periodically. Kiger, et al., (1991) initially assessed the training using program evaluation methodology to compare the 1989 and 1990 motorcycle crash rates of OMEP students to a control group of untrained motorcycle riders. The experimental and control groups were matched on age, gender, county of residence, motorcycle riding background and size of motorcycle owned by riders. Sources of data included driving, motorcycle crash, demographic and OMEP student files. **Kiger's** study found that 1989 and 1990 motorcycle crash rate comparison for 16 and 17 year olds could not be made between OMEP trained and untrained motorcyclists. A large enough sample of licensees and crashes was not available. The study found that the crash involvement of the OMEP students over 18 years of age was not statistically different from the untrained motorcyclists for 1989 and 1990. (Kiger, et al., 1991)

Research **Supporting** the **Ineffectiveness** of Training

The following research used accident reports when observing that the training of motorcyclists appeared to increase crash rates. In 1977 in England, Raymond compared trained motorcyclists with a comparison group while

controlling for miles traveled. Raymond found a greater number of motorcycle traffic accidents occurring per mile for the trained group. This study attributed the greater crash rate to an increase in confidence gained from the training. (Raymond, 1977)

In California, Krause and Franti (1975) identified trained motorcyclists involved in traffic accidents who sustained medically treated injuries. This data was compared with crash experience for a random sample of owners of registered motorcycles. Their research found that the trained motorcyclists were overrepresented when compared with injury crash rates for the untrained group. (Krause and Franti, 1975)

Research Replication

This applied research study will essentially replicate a doctoral dissertation authored by Doctor Linda Lloyd in 1989. Doctor Lloyd conducted research concerning the Texas Department of Public Safety Motorcycle Rider Course using a historical cohort design. The study compared the crash rate experience of motorcyclists licensed in Texas in 1985.

The experimental group consisted of those licensed motorcyclists who completed the Motorcycle Rider Course in

one of five metropolitan areas in Texas in 1985 (504 students). The control group consisted of 504 randomly selected licensed motorcyclists who had never completed the Motorcycle Rider Course. The groups were frequency matched by place of residence, age and sex. The five metropolitan areas selected (Austin, Dallas-Fort Worth, El Paso, Houston and San Antonio) accounted for more than 75% of 1985 Texas Motorcycle Rider Course program participants.

The crash experience of each cohort group during the period of 1985-1988 was compared by utilizing Texas Department of Public Safety official traffic accident reports. All cohort members were followed until an endpoint (crash, death, or end of study period). For those with more than one crash, the endpoint for analysis was the first crash. To estimate the total riding experience and risk exposure for the two groups, a random sample of 100 motorcyclists was selected from each group and requested to respond to a questionnaire. The incident rate analysis included the number of crashes in the numerator and the person-days at risk in the denominator.

To test the null hypothesis that motorcycle operator training is unrelated to the occurrence of a crash, the accident experience of the trained and untrained groups was compared. Further, the crash rates of the groups

stratified for age, sex and location were examined. Lloyd's study found that trained motorcyclists had 2.4 times the rate of motorcycle crashes as compared to untrained motorcyclists. (Lloyd, 1989)

Research Supporting The Effectiveness Of Training

Only one study was found in the literature which concludes that motorcycle training reduces motorcycle traffic accidents. In British Columbia, McDavid, et al., (1989) drew relatively small sample sizes (139 each) for a trained and untrained group. These males (only) were frequency matched by age, gender, residence location and motorcycle license endorsement. The driving records of the two groups were evaluated over a five year period. McDavid found that trained riders tend to have fewer accidents of all kinds (all motor vehicle accidents combined). The trained group also had fewer motorcycle accidents and less severe motorcycle accidents. McDavid states, "Although these differences are not large in a statistical sense, they suggest that when care is taken to carefully match trained and untrained riders, training is associated with a reduction in accidents." McDavid also points out that self-selection bias toward training may influence motorcycle operator effectiveness studies in other ways. Persons who elect to participate in training due to being more safety

conscious may also be more inclined to report minor traffic accidents. This could figure disproportionately in official accident statistics. (McDavid, et al., 1989, pp. 61-72)

Summary

This literature review examines the hypothesis that motorcycle operator training is effective in significantly reducing the incidence of motorcycle crashes for trained motorcycle riders as compared to untrained riders. No substantial body of scientific knowledge exists at this time to prove the veracity of this hypothesis. In spite of this fact, the Texas Legislature has laws which have resulted in Texas Department of Public Safety providing motorcycle operator training. This is done with the assumption that trained motorcyclists will be better able to anticipate problems, learn appropriate motorcycle handling skills and appreciate the necessity for safe riding. (Palma, 1991) The legal foundations for this issue in Texas and a historical perspective on the development of motorcycle operator training nationwide are contained in the following chapter.

CHAPTER 3

RESEARCH SETTING

Research conducted by Lloyd indicated that motorcycle operator training as provided by the Texas Department of Public Safety failed to be effective in reducing motorcycle crash rates. (Lloyd, 1989) Since the Lloyd study, the motorcycle operator training curriculum used by the Department of Public Safety has been modified to include substantial enhancements. (Burdette, 1992) The central issue of this study will be to determine if the curriculum enhancements improved the effectiveness criteria (crash rates) for program graduates as compared to an untrained group.

Legislative And Legal Foundations

House Bill 306 of the 68th Texas legislature (1983), Regular Session, created the Motorcycle Operator Training and Safety Program. Under this authority, Article 6701c-4, Vernon Civil Statutes, allowed the Governor of Texas to designate the Texas Department of Public Safety (DPS) as the

agency responsible for administration and coordination of the program. Further, the statute requires DPS to employ a Motorcycle Safety Foundation Chief Instructor as director of the program. The law also requires the governor to appoint an advisory committee to advise the coordinator on effective administration of the program. Resource funding is provided by requiring all drivers with a motorcycle endorsement on their driver license to pay an additional \$5.00 surcharge upon renewal. The funds are authorized by statute to administer the program and train instructors. This budget also is used to purchase and develop training, education, and public awareness materials and to establish training sites. Article **6701c-4** states its purpose as making available to motorcycle operators information and courses in knowledge, skills and safety relating to the operation of motorcycles. It further requires dissemination of information to the general public on sharing the roadway with motorcycles.

State sponsored motorcycle operator training in Texas is a relatively new concept. However, motorcycle operator training as a public intervention process has been under scrutiny for many years. Early efforts toward developing an appropriate curriculum began during the last quarter century and have continued with numerous revisions.

Historical Perspective

The Accident Prevention Division of the U.S. Public Health Service was one of the initial groups to specifically address motorcycle safety education issues. (U.S. Public Health Service, 1966) As part of this effort, the first Policies and Guidelines for Motorcycle Education was published in 1969 by the National Education Association. (American Driver and Traffic Safety Education Association, 1980)

Continuing the movement toward training as a safety issue, the Motorcycle Safety Foundation (MSF) was founded in 1973. In 1974, MSF released its Beginning Rider Course to address perceived training needs. (Motorcycle Safety Foundation, 1974) While administering the Beginning Rider Course, MSF continued training research focused on task and motorcycle control analysis. Another area of emphasis included instructional objectives for motorcycle safety education. After substantial research, MSF **developed** curriculum specifications identifying the content and methods of teaching skill areas. Using these curriculum specifications, MSF introduced the Motorcycle Rider Course (MRC) in 1977 as an enhanced version of the Beginning Rider Course. (Burdette, 1992) The **MRC**, with subsequent revisions, was used as the training curriculum by the Texas

Department of Public Safety during 1985. This training year (1985) provided the student population evaluated by Lloyd. (Lloyd, 1989)

In 1986, after two years of development, MSF introduced the Motorcycle **RiderCourse:Riding** and Street Skills (**MRC:RSS**) program as an updated version of the **MRC**. The **MRC:RSS** was used in Texas during the 1988 calendar year for the student population examined by this study. (Burdette, 1992) The **MRC:RSS** enhancements provide impetus for replicating the Lloyd study to determine if curriculum changes created change in the effectiveness criteria (comparison of accident rates for the trained and untrained groups).

Training Curriculum Comparison

Table 3.1 provides illustration of the numerous differences found when comparing the **MRC** with the **MRC:RSS**. First, the **MRC:RSS** divides the training curriculum into two distinct levels. One level deals with basic riding skills. The second level addresses street survival strategies. This includes focusing on the physical skills of cornering, stopping and swerving to avoid obstacles. The **MRC** either failed to include or did not appropriately emphasize the second level components. The **MRC:RSS** discusses risk

TABLE 3.1

MOTORCYCLE OPERATOR TRAINING CURRICULUM DIFFERENCES

TOPIC	MRC*	MRC:RSS**
Basic riding skills	Yes	Yes
Street survival skills	No	Yes
Risk awareness and management	No	Yes
Speed and maneuverability relationships	No	Yes
Classroom simulation of motorcycle operating controls	No	Yes
Focus on variety of riding techniques	No	Yes

* 1984 Motorcycle Safety Foundation Motorcycle Rider Course

** 1986 Motorcycle Safety Foundation Motorcycle Rider **Course:Riding** and Street Skills

awareness and risk management. It also briefly addresses personal responsibility for driving decisions. A second important factor included is the relationship between speed and maneuverability for a motorcycle. The **MRC** did not discuss these topics. The **MRC:RSS** provides classroom instruction and simulation concerning the location and operation of motorcycle controls. This visualization technique is done to mitigate student apprehension by learning before actually operating a **motorcycle**. The **MRC** failed to include this aspect.

Third, the **MRC:RSS** requires students to operate on the driving range at a speed of 12 to 15 miles per hour in order to improve motorcycle stability. In contrast, the **MRC** recommended a range operating speed of 8 to 10 miles per hour. This lower operating speed sacrifices attention on riding technique in favor of concentration on balancing a less stable motorcycle.

Fourth, the **MRC:RSS** provides instruction on cornering and other aspects of maneuverability. The **MRC** instead focused on path of travel considerations only.

Finally, student learning is made a clear responsibility of the instructors in the **MRC:RSS** model. This is accomplished by having the instructor **communicate** with the

students at all times concerning what to do, when to do it and the degree of action to take. Under the **MRC** curriculum the instructor merely directed student traffic and evaluated their path of travel. The **MRC:RSS** has been employed as the curriculum for the Department of Public Safety motorcycle operator training program since its creation by MSF. (Burdette, 1992)

Program Application

The Department of Public Safety Motorcycle Safety Bureau is assigned the task of receiving and disseminating information concerning motorcycle legislation, rules and requirements. In addition, the Bureau is responsible for the development of Texas Administrative Rules concerning motorcycle operator curriculum. This includes instructor certification, documentation records and public education. In Texas in 1988 some 250,000 motorcycles were registered. Also in 1988, approximately 6% (725,000) of the licensed Texas Drivers had a motorcycle endorsement on their driver license. Of this number, 1,772 students completed the Department of Public Safety program at 29 permanent and 19 temporary training **sites**. (Texas Department of Public Safety, 1988)

Authorized Training Entities

The Motorcycle Safety Bureau administers training courses as well as contracting with other entities. Authorized contract entities include qualified individuals, associations, partnerships and corporations. Education and governmental agencies are also authorized to perform this service. Under the terms of training contracts, sponsors are required to provide appropriate facilities, equipment and documentation. After providing approved motorcycle operator training, the Department of Public Safety monetarily reimburses the contractor for each student trained.

Temporary training sites are established at municipalities with insufficient population to support a permanent program. The Motorcycle Safety Bureau maintains a mobile classroom and related appurtenances for transport to temporary training sites. Currently, Bureau personnel perform this service as required by student demand. (Palma, 1991)

Evaluating a program of this scope and nature requires a carefully planned methodology in order to minimize sources of bias and error. The following chapter will address appropriate methodological literature, the specific

methodology of this study and pertinent data sources. Variable measurement will be identified along with the strategies employed to enhance validity and reliability.

CHAPTER 4

METHODOLOGY

This research used a program evaluation methodology design to compare the cumulative 1989, 1990 and 1991 crash rates of specified trained and untrained motorcyclists licensed since 1988. The major strength of evaluation research is its practical application of methodology to problem solving in an intervention or prevention setting. (Adams and Schvaneveldt, 1985, p. 327) Important preconditions to the evaluation process include the need for a clearly articulated program structure and specific intervention goals. This requires a clear statement linking program structure and operation to proposed goals. (Rutmann, 1977) This also involves securing valid, reliable and applicable information about programs, program structures, processes, outcomes and impacts. (Franklin and Thrasher, 1976)

The purpose of the Texas Department of Public Safety motorcycle operator training program is to make available to all motorcycle riders information in related knowledge,

skills and safety. This is accomplished through specified training curricula and public information campaigns. Quality assurance inspections and performance audits are required periodically to verify linkage between program structure, operation and proposed goals. Key performance indicators include the number of students trained and impact upon motorcycle traffic accident rates. (**Palma**, 1991) The articulation of program structure and training goals has been previously addressed in this study. The evaluation precondition of securing appropriate information concerning program structure, process and impact is contained in the following methodology discussion.

Program Evaluation

Program evaluations are undertaken to judge the worth of ongoing programs and to assess the utility of innovative program improvements. They also rate the effectiveness of program management and meet accountability requirements. This serves management needs by providing information on coverage and process. This amounts to feedback on whether a program is meeting specifications. More specifically, program evaluation for outcome evaluation purposes is undertaken to ascertain how a program is carried out. This links program inputs to outcomes. (Rossi and Freeman, 1985, p. 142)

Program evaluation outcome valence refers to the final outcome of a program. It may be either positive or negative. Positive valence indicates that program efforts have achieved progress toward accomplishing program goals. Negative valence occurs when programs have no impact or when their influence is evaluated as negative toward the clients of the program. (Sylvia, et al., 1985, p. 114) The basic aim of impact assessment is to produce an estimate of the outcome valence of an intervention. Obstacles to impact assessment exist because social phenomena have many causes. Obstacles also occur because empirical generalizations may be weak and because social programs typically have only modest impact. The critical issue is whether or not a program produces more of an effect than would have occurred without the intervention or with an alternate intervention. (Rossi and Freeman, 1985, pp. 185-189) Another important aspect of making an accurate determination of effect concerns avoiding bias and error in research.

Sources of Bias and Error

Although evaluation research is a standard tool in public administration, it is not without problems. (See Table 4.1) A common limitation in evaluation research is the ability to actually measure what has occurred. It is also difficult to measure the quality of participation in a program where the

TABLE 4.1
POTENTIAL BIAS AND ERROR FACTORS

SOURCE	EFFECT	CONTROL
Measurement error	Inability to measure: (1) What occurs. (2) Quality of group participation.	(1) Official records to avoid reporting error. (2) None
Self-selection	Persons most in need of training may fail to participate.	None: Assumed that bias will favor the trained group.
Pre-training	Factors other than experimental stimulus could explain differences.	Random sample survey ques- tionnaire
Random sample survey question-naire	(1) Failure to deal with social context. (2) Questionnaire response arti-ficiality.	(1) None (2) None
Drop-out rates	Persons concluding the intervention process may least need the training.	Drop-outs not included in the study.
Failure to properly administer the in-tervention process	Failure to adequately assess the interven-tion strategy.	None

participants may not be wholeheartedly involved. Another disadvantage of this design includes pretraining differences which may impact the likelihood of a crash. Self-selection must also be considered. (Babbie, 1989, pp. 328-330)

Self-selection is important because any intervention that requires participants to change existing habits or take instruction may encounter difficulty in attracting target groups. (Rossi and Freeman, 1985, p. 192) Since motorcycle operator training is voluntary, it cannot be assumed that training program participants have the same attitudes, experience and skills as untrained riders. As an example, **Rothe** and Cooper found through survey research that motorcycle operator training participants were more safety conscious than motorcyclists declining to participate in the program. (**Rothe** and Cooper, 1987) As there is **self-selection** bias in this study, it is assumed that the bias is in favor of the trained group who are expected to be more safety prudent. Regardless of assumptions, Jonah, et al., (1982) doubt that random assignment to treatment conditions would indicate program effectiveness in the **absence** of observable program effects on outcome criteria. (Jonah, et al., 1982)

Drop-out rates are important because subjects leaving a program may be different from those who remain until completion. Those who feel they are benefitting from an intervention are likely to remain. Those who find the program unrewarding are likely to drop out. The consequence of attrition can be that participants remaining in a program are those who need the program the least. (Rossi and Freeman, 1985, p. 194) To control for this factor, drop-outs were not included in this study.

Evaluation programs may not show impact because of failure to deliver the intervention in the way specified. This fails to adequately assess the intervention strategy itself. (Rossi and Freeman, 1985, p. 157) As an example, administration of the intervention may vary in effectiveness according to the skill of program instructors. (Babbie, 1989, p. 30)

Confounding Factors

Confounding factors are extraneous variables which, if left unchecked, may lead to incorrect inferences about the effects of experimental treatment on dependent measures. (Adams and Schvaneveldt, 1985, p. 137) Confounding factors include endogenous change where natural events may influence outcomes. They may be caused by secular drift where long

term trends in the community produce changes. Short-term events may enhance or mask results. In addition, maturational processes over time can mimic or enhance program results. (Rossi and Freeman, 1985, p. 192) The experimental design soundness of this study is diluted by the inability to control or measure all potential confounding variables. Road, weather, light conditions and driver attitudes are but a few of the possible explanations. Therefore, it is acknowledged that the limitations of time and resources placed on this study precluded complete investigation of relevant factors.

In its simplest sense, evaluation research is a process to determine whether the intended result was produced. It is therefore ironic that one of the most difficult aspects of evaluation research is determining whether the **program** under review succeeds or fails. (Babbie, 1989, p. 337) Validity refers to the extent a measure can measure what it purports to measure. (Nunnally and Durham, 1975, p. 227) Reliability refers to the reproducibility of the measures used to assess events or outcomes. (Stanley, 1971, p. 356) Since measurement error impacts both validity and reliability, variable measurement of data sources is critical.

Variable Measurement

Different dependent variables have been measured by previous studies to **determine** the effectiveness of motorcycle operator training. For example, a study by the New York State Department of Motor Vehicles (1987) evaluated total crash reduction effectiveness of a motorcycle operator training program. (U.S. Department of Transportation, 1987) Raymond and Tatum (1987) evaluated the number of motorcycle crashes per miles driven for a trained group of motorcycle operators as compared to an untrained control group. (Raymond and **Tatum**, 1987) Hurt (1981) evaluated the crash records of trained and untrained motorcycle operators to **determine** the incidence of medically treated injuries occurring for each. (Hurt, et al., 1981) As illustrated by Table 4.2, the dependent variable for this study will be the motorcycle traffic accident rate of Texas Department of Public Safety trained motorcyclists and untrained motorcyclists.

Dependent Variable Data Source

Traffic accident involvement may be evaluated from either self-reported data or from official government reports. Mortimer (1988) found that official traffic accident reports and self-reported information concerning motorcycle

TABLE 4.2

VARIABLES

Dependent Variable	Definition	
Motorcycle traffic accident rate	Official DPS traffic accident records reflecting crashes occurring for the trained and untrained group from 01-01-89 thru 12-31-91.	27 crashes (trained) 5 crashes (untrained)
Independent Variable	Definition	
Motorcycle operator training	DPS motorcycle operator training course (1988) intervention process.	349 persons trained
Control Variables	Definition	Sample
Metropolitan residence	Sample taken from five metropolitan areas only to control environmental variables	60 (17%) Austin
		135 (39%) Dallas/ Ft. Worth
		23 (7%) El Paso
		108 (31%) Houston
		23 (6%) San Antonio
Motorcycle operator training graduate	Successful completion of DPS motorcycle operator training in 1988.	349 students trained
Non-motorcycle operator training	Motorcyclists who have never completed DPS motorcycle operator training.	349 persons (control group)

(Table 4.2 continued)

Control Variables		Definition			Sample
Age/Sex		Total males or females/four age groups.			See following illustration.
AUSTIN					
	< 20	20-29	30-39	40+	TOTAL
F	0	6	4	4	14 (23%)
M	12	17	8	9	46 (77%)
DALLAS - FT. WORTH					
	< 20	20-29	30-39	40+	TOTAL
F	1	11	21	6	39 (29%)
M	34	24	14	24	96 (71%)
EL PASO					
	< 20	20-29	30-39	40+	TOTAL
F	0	0	4	2	6 (26%)
M	8	4	1	4	17 (74%)
HOUSTON					
	< 20	20-29	30-39	40+	TOTAL
F	1	8	12	11	32 (30%)
M	17	18	14	27	76 (70%)
SAN ANTONIO					
	< 20	20-29	30-39	40+	TOTAL
F	0	2	2	0	4 (17%)
M	4	6	3	6	19 (83%)

traffic accidents differed statistically. Most single vehicle accidents without injury were often not reported. (Mortimer, 1988, p. 187) Further, if questionnaire responses are relied upon for motorcycle accident information, the participants may only report what they think is socially acceptable. (Sudman, 1986) As dependent variable measurement for this study, official Department of Public Safety motorcycle traffic accident records were utilized to determine accident frequency. This effectively limits, but does not exclude, the bias of accident experience self-reporting. Texas law (Vernon's Civil Statutes, Article **6701d**, Article IV, Section 44) requires drivers to report traffic accidents involving injury to or death of any person. This reporting requirement also applies with damage to property to an apparent extent of at least five hundred dollars. Although a reporting exemption exists for minor damage, it is mitigated by the high death and injury rate for persons involved in motorcycle crashes. A high death and injury rate for motorcyclists results in a higher reporting rate than for other classes of vehicles.

The motorcycle traffic accident experience of each person was evaluated for the three year period from January 1, 1989 through December 31, 1991. This was accomplished through inquiry of the Department of Public Safety computerized driver history file.

Independent Variable **Data** Sources

The treatment or experimental stimulus in this study is the presence of training (independent variable). A trained group was selected consisting of motorcyclists who completed the Texas Department of Public Safety Motorcycle Operator Training Course in 1988. To identify the trained group, the Department of Public Safety 1988 Motorcycle Operator Training class roster computerized data file was queried for all persons who:

- (1) trained in the Texas metropolitan areas of Austin, Dallas-Fort Worth, El **Paso**, Houston and San Antonio;
- (2) successfully completed a training class;
- (3) possessed a motorcycle operator driver license from 1988 to the present, and
- (4) were born before 12/31/70.

To receive a motorcycle license in Texas one must be at least eighteen years old or have completed the Department of Public Safety motorcycle operator training course. (**Palma**, 1991) This means the trained group was comprised of motorcyclists at least eighteen years old in 1988. Any

licensed motorcyclist less than eighteen would by default have completed the course. Using this information, a data file was created classifying each member of the trained group into an age/sex/place of residence cell.

The Control Group

A control group was selected consisting of licensed motorcyclists who had never completed formal motorcycle operator training. A Statistical Analysis Software random number generator was used to generate driver license numbers. The records corresponding to these numbers were checked to verify the driver had a valid motorcycle license in 1988 and lived in one of the specified cities. The records were further evaluated to determine if the licensee was at least eighteen years old in 1988. If the driver met the criteria, he or she was selected until a corresponding number of persons were identified for each appropriate age/sex/place of residence cell. A name check program was run against this list to ensure that the random sample untrained group did not contain any members of the trained group. An additional check screened for Department of Public Safety Motorcycle Operator Training certified instructors.

Traffic Accident Evaluation

The crash experience of the trained group was compared to that of the untrained group as an aggregate. Comparison was also made across **age/sex/place** of residence variables. Variables of miles driven, type roads traveled and years of motorcycle driving experience were evaluated from a random sample of the two groups. The Department of Public Safety driver history record does not provide information on the type vehicle driven in a traffic accident. In order to identify accidents involving motorcycles for the trained and control groups, the official accident reports were manually evaluated. The risk period for each group member began and concluded simultaneously during the three year evaluation period. Group members were removed from the accident count after one crash, but continued to contribute person-days at risk for purposes of analysis.

Survey Questionnaire

It is appropriate to measure aspects of the context within which a program evaluation is conducted. Riecken and **Boruch** have shown that miles traveled and types of roads traversed are among the confounding variables which can explain differences in crash rates. Years of riding experience also will logically impact crash experience.

(Riecken and **Boruch**, 1974, pp. 120-121) As riding experience and risk exposure vary systematically between the groups, a survey questionnaire was mailed to a random sample (100 each) of the trained and untrained group. This was to determine the variables of miles driven annually on a motorcycle, types of roads traversed and years of riding experience. The sample was constructed using a Statistical Analysis Software produced random number table without replacement. Addresses for the sample were obtained from the Department of Public Safety driver license file. Data obtained was compared in relation to crash experience between the trained and untrained group. This was done using Department of Public Safety driver history files including stratification for age, sex and residence location.

Statistical Techniques

Tests for statistical significance of the association between variables in this study included Chi square and **t**-tests. Chi square calculations have been completed using information from the crash reports. Tests of significance were set at the **p** < 0.05 level.

Alternate Methodological Technique

This study could be done through survey research alone and thus increase the flexibility of questions and analysis. Unfortunately, the questions chosen might represent the least common denominator in assessing orientations and **circumstances**. This is reflected in the inability of survey search to deal with the context of social interventions. It is also influenced by the potential artificiality in questionnaire responses. (Babbie, 1989, p. 254)

Hypothesis

The program specific hypothesis tested is that motorcycle operators trained in the Department of Public Safety motorcycle operator training course will have a significantly lower motorcycle crash rate than a control group of frequency matched untrained motorcyclists.

CHAPTER 5

ANALYSIS

This analysis will assess crash rates for the trained and control groups to test the hypothesis of the study. The incidence rate includes the number of crashes in the numerator. A crash is defined as a motor vehicle traffic accident where a trained or control group member was operating a motorcycle. The person-days at risk are calculated for the denominator. The total number of **person-days** at risk for each group was calculated by **summing** the amount of observation time contributed during the evaluation period by each group. To further explain these findings, additional incident analysis was performed for specific age, sex and location groups. The data is analyzed using Chi square with tests of significance set at the **p** < 0.05 level. Other significance analysis utilizes t-tests.

The results are presented in three sections. First, the overall crash experience of the trained and comparison groups is **examined**. Then, a more detailed comparison of the crash experiences of the two groups is evaluated. This

uses the three potentially confounding variables on which the groups are matched (age, sex, and residence location). The third section uses information from the survey to examine the crash rates in the context of miles traveled, riding experience and types of roads traversed.

Motorcycle Crash Rates

The trained group of 349 motorcyclists had 27 crashes during the three years of the study. One member had more than one crash, however, only the first crash was included for purposes of this study. No fatalities occurred. This gave a crash rate of 0.70 per 10,000 person-days of observation. The comparison group had only five crashes during the evaluation period with no person having more than one crash. No fatalities occurred for the control group. This yielded a crash rate of 0.13 per 10,000 person-days of observation for the untrained group. The rate ratio for the risk of a crash after training equals 5.38 ($.70/.13 = 5.38$). As with Lloyd's findings, this rate ratio indicates that training is associated with a significant increase in the risk of a crash as compared with untrained motorcyclists.

The trained group had significantly more crashes during the three year period (Chi-square = 15.13, $p < .05$). Because of this result, the hypothesis that trained motorcyclists

will have a significantly lower motorcycle crash rate was rejected. In the following two sections, variables which may explain the higher incidence of crashes among the trained group are examined.

Confounding Variables

Age

The two groups were frequency matched on the potentially confounding variables of age, sex and residence location. Four age groups were examined including persons less than 20 years old, persons 20-29, persons 30-39 and persons 40 years old and older. Table 5.1 shows the distribution of crashes by sex, age group and training status. Table 5.2 gives the incidence rate summary by age group and training status. Younger (up to age 29) trained male motorcyclists were more likely than untrained motorcyclists in the same sex and age group to have experienced a crash. The average age of trained motorcyclists who had a crash was 26.69 years (**s.d.** = 13.96 and median = 19). The average age of the comparison group who had a crash was 22.40 (**s.d.** = 2.15 and median = 20). The average age of the trained group involved in a crash was not significantly different from the comparison group involved in a crash ($t = 0.34$).

TABLE 5.1

DISTRIBUTION BY SEX AND AGE
AT TIME OF CRASH FOR TRAINED GROUP

	< 20		20-29		30-39		40+		TOTAL	
	NO.	%	NO.	%	NO.	%	No.	%	NO.	%
F	1	4	0	0	1	4	0	0	2	8
M	12	44	8	29	1	4	4	15	25	92
TOTAL	13	48	8	29	2	8	4	15	27	100

DISTRIBUTION FOR SEX AND AGE
AT TIME OF CRASH FOR UNTRAINED GROUP

	< 20		20-29		30-39		40+		TOTAL	
	NO.	%	No.	%	NO.	%	No.	%	No.	%
F	0	0	0	0	0	0	0	0	0	0
M	2	40	2	40	1	20	0	0	5	100
TOTAL	2	40	2	40	1	20	0	0	5	100

TABLE 5.2**INCIDENCE RATE SUMMARY BY
LOCATION AND TRAINING STATUS**

Age	Trained Group	Untrained Group	Rate Ratio
<20	.34	.05	6.80
20-29	.20	.05	4.00
30-39	.05	.02	2.50
40+	.10	----	----

Sex

Table 5.3 provides the incidence rate summary by sex and training status. Seventy-three percent of the motorcyclists in each group were male. Males accounted for 92% of the trained group crashes and 100% of the comparison group crashes. The male crash incidence rate for the trained group was 0.89 per 10,000 person-days of observation as compared to an incidence rate of 0.17 for the untrained males. The female crash incidence rate for the trained group was 0.19. The control group females had no crashes. The rate ratio for risk of crash after training was 5.23 ($0.89/0.17 = 5.23$) for males. The trained men had significantly more crashes (Chi-square = 13.33, $p < .05$). No significant difference existed in the number of crashes for the women.

Residency Location

Licensed motorcyclists representing five areas of the state were included in this study. The frequency of crashes experienced for motorcyclists in each area by training status is shown in Table 5.4. None of the areas were disproportionately represented for the trained group as compared to the number of participants from the area. For

TABLE 5.3
INCIDENCE RATE SUMMARY BY
SEX AND TRAINING STATUS

	Trained Group	Untrained Group	Rate Ratio
F	.19	----	
M	.89	.17	5.23

TABLE 5.4**ACCIDENT DISTRIBUTION BY AGE AND LOCATION
FOR TRAINED GROUP**

	<20		20-29		30-39		40+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Austin	3	11	0	0	1	4	0	0	4	15
Dallas	5	19	2	7	0	0	2	7	9	33
El Paso	1	4	1	4	0	0	0	0	2	7
Houston	3	11	5	19	1	4	2	7	11	41
San Antonio	1	4	0	0	0	0	0	0	1	4

**ACCIDENT DISTRIBUTION BY AGE AND LOCATION
FOR UNTRAINED GROUP**

	<20		20-29		30-39		40+		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
Austin	1	20	1	20	0	0	0	0	2	40
Dallas	0	0	1	2	0	0	0	0	2	40
El Paso	0	0	0	0	0	0	0	0	0	0
Houston	1	20	0	0	0	0	0	0	1	20
San Antonio	0	0	0	0	0	0	0	0	0	0

the control group, the number of crashes (5) was sufficiently small to make evaluation of proportional distribution difficult.

Rate ratios comparing the rate for each group in each residence location are shown in Table 5.5. Similar to Lloyd (1989), the incidence rate for the trained group in all residence locations was higher than the rate for the comparison group. The rates for the trained group ranged from a low of 0.02 per 10,000 days of risk in San Antonio to a high of 0.28 in Houston. For the comparison group, the crash rate ranged from 0.02 per 10,000 days of risk for Houston to 0.05 in both Austin and Dallas. No crashes occurred for the control group in El Paso or San Antonio.

Survey Data

A survey questionnaire was mailed to a random sample (100 each) of the trained and untrained groups to determine riding experience and risk exposure. A follow-up questionnaire was subsequently mailed to compensate for a low response rate (See Appendix A). The survey responses included 29 persons from the trained group and only 10 persons from the untrained group. Due to this minimal response, statistical significance tests were not employed.

TABLE 5.5
INCIDENCE RATE SUMMARY BY
LOCATION AND TRAINING STATUS

	Trained Group	Untrained Group	Rate Ratio
Austin	.10	.05	2.00
Dallas	.23	.05	4.60
El Paso	.05	----	----
Houston	.28	.02	14.00
San Antonio	.02	----	----

Riding Experience

The respondents from the trained group reported riding experience from 2 to 45 years. The respondents from the comparison group reported riding experience from 5 to 40 years.

The trained group reported riding an average of 9.1 years (**s.d.** = 10.00 and median = 5). The comparison group reported riding an average of 21.6 years (**s.d.** = 12.54 and median = 17).

Riding Exposure

The survey respondents reported the number of miles traveled on a motorcycle in 1991. The number of miles traveled was also reported proportionally for city streets, interstate highways, county roads and other type roads.

The miles traveled by the trained group ranged from 10 to 16,500 miles with an average of 6,017 (**s.d.** = 4043.61 and median = 5,000). The **miles** traveled by the comparison respondents ranged from 10 to 11,000 miles with an average of 2,231 (**s.d.** = 3544.22 and median = 300).

Riding Environment

The types of roads traveled by the trained and untrained respondents are shown in Table 5.6. The trained and untrained respondents reported approximately the same proportion for riding on city streets. Proportional reporting for the other types of roads shows no correlation between the trained and untrained respondents.

The concluding chapter of this study will comment on the findings, acknowledge factors not measured and offer conclusions concerning the data.

TABLE 5.6
PROPORTION OF RIDING COMPLETED
ON DIFFERENT TYPES OF ROADS BY
TRAINING STATUS

	Trained Group	Untrained Group
City Streets	42.0%	39.5%
Interstate Highways	30.1%	17.0%
County Roads	24.1%	11.5%
Other Roads	3.8%	32.0%

CHAPTER 6

CONCLUSIONS

This study found that trained motorcyclists had significantly higher crash rates than a frequency matched comparison group of untrained motorcyclists. The number of crashes during the three-year evaluation period were few (32 for both groups combined). However, a rate ratio of 5.38 indicates that extending the evaluation period would not significantly change the conclusions of this study.

As documented by the literature review, researchers have commonly arrived at the same findings. **McDavid**, et al., (1989) produced the only study indicating motorcycle operator training effectiveness as measured by a more desirable accident rate. However, this research must be viewed in the context of minimal sample size (139 per cohort). (**McDavid** et al., 1989) This limits generalizability and **demonstrates** the need for further research.

Suggestions For Further Research

Lloyd (1989) theorizes that higher crash rates for trained motorcyclists may be a function of increased confidence levels. Persons completing training may tend to operate their motorcycles within closer tolerance of ability limits. Driving a motorcycle at the limit of one's skill allows less reaction time when traffic patterns are disrupted. This could explain higher crash rates. Lloyd further acknowledges that it is difficult to measure factors influencing traffic accident involvement. Precrash events, motorcycle operator attitude and physical condition are contributory variables. The characteristics of the roadway, weather and other drivers are equally important. (**Lloyd**, 1989, pp. 78-79) Clearly, the magnitude of the motorcycle crash problem merits comprehensive research.

Lloyd (1989) observed that self-selection characteristics of the trained group may indicate greater safety consciousness. Belief in the responsible operation of a motorcycle may also include an above average tendency to report traffic accidents to proper authority. This could explain crash rate differences as a product of underreporting by less safety conscious untrained motorcyclists. (Lloyd, 1989, p. 80) Although this is feasible, the high rate of injury in motorcycle crashes

tends to elevate reporting for all groups. Additional scientific investigation of reporting frequency would allow more substantial analysis.

This study included only motorcyclists who were properly licensed. However, the National Highway Traffic Safety Administration estimates 40% of motorcyclists are either unlicensed or improperly licensed. (U.S. Department of Transportation, 1990) A high percentage of unlicensed motorcyclists suggests the existence of numerous confounding variables. These variables may involve crashes by novice riders who do not own a motorcycle. Improper license for motorcycle size could be a significant variable. Operator physical handicaps such as impairment of vision or limbs may also prohibit motorcycle licensure. Further, delinquent driving records may prohibit certain motorcyclists from obtaining proper licensing. Investigation of these variables could lead to increased motorcycle operator training effectiveness and result in greater motorcycle safety.

Program Modification Options

Motorcycle operator training involves three basic elements: curriculum, teaching methodology and students. Since 1973, the Motorcycle Safety Foundation has

continuously researched and enhanced its motorcycle operator training curriculum. In addition, the MSF has undertaken meticulous analysis of the tasks associated with motorcycle operation. (Motorcycle Safety Foundation, 1986) For these reasons, it is generally concluded that MSF training provides a comprehensive program of instruction. Graduates of the course have the basic skills and knowledge required for safe street riding. (National Highway Traffic Safety Administration, 1982, p. 2)

Teaching Methodology

Further, MSF has given ample consideration to accepted methods of student instruction. (U.S. Department of Transportation, 1987) The **MRC:RSS** instructor guidelines detailed earlier in this study were developed as part of ten million dollars in MSF research work since 1973. These guidelines place primary responsibility upon the instructor for being actively involved in student learning. The guidelines also stress participative classroom learning relating directly to motorcycle operation activities. (Burdette, 1992)

Student Variables

While program content and methodology research continues, the variables of student input have been somewhat subordinated. This is important to motorcycle operator training effectiveness if student attitude and values influence driving choices. **Rothe** (1987) observed that training mechanically teaches how the physical task of driving may be accomplished. However, motorcycle operator training typically fails to adequately address the development of decision making abilities. Perhaps this could be overcome by more rigorously instructing students concerning values and awareness of appropriate conduct. According to **Rothe**, "Education allows individuals to form character and to develop an awareness of their roles and experiences in the moral order of society." (**Rothe**, 1987, p. 17) In this context, it is suggested that driving skill program content be augmented with greater emphasis on responsibility for safe driving behavior.

Summary

This research project **examined** the hypothesis that motorcycle training is effective in significantly reducing the incidence of motorcycle crashes for trained riders as compared to untrained riders. Specifically, the research

question asks whether the Texas Department of Public Safety motorcycle operator training program produces safer motorcycle operators. The importance of conducting research in this area concerns the potential for reducing motorcycle crash deaths and injuries.

Motorcycle Training Goals

Motorcycle education programs follow the premise that training serves as a countermeasure to motorcycle crash deaths and injuries. In order to accomplish this goal, the Motorcycle Safety Foundation has provided motorcycle operator training programs since 1974. The first MSF program, Beginning Rider Course, was created based upon the judgement of consultants concerning novice training. Since the initial program, the MSP curriculum has undergone substantial enhancements based upon scientific research. (Motorcycle Safety Foundation, 1986, p. 1) The most recent edition of the MSP training curriculum (Motorcycle **RiderCourse:Riding** and Street Skills program) is used by the Texas Department of Public Safety.

Planning for the Future

A search of relevant literature has identified potential benefits and deficiencies of motorcycle operator training

programs such as the MRCRSS. As an obvious effectiveness problem, virtually all scientific evidence concerning motorcycle operator training indicates failure to reduce crash rates. To examine this issue, this study defined motorcycle operator training in Texas and provided historical perspective. Appraisal of program evaluation methodology was undertaken with potential sources of bias and error cited. In addition, variables, data sources and alternate methodological techniques are identified.

The program specific hypothesis that trained motorcyclists in Texas would have a significantly lower motorcycle crash rate than untrained motorcyclists was rejected. Motorcycle operator training students in Texas during 1988 experienced a three year motorcycle crash rate ratio 5.38 times greater than a frequency matched control group. This conclusion concerning motorcycle operator training effectiveness **is** consistent with the majority of available literature. It must therefore be considered that training as presently configured has limitations. These limitations stem from either content, methodology or interaction with other intervention processes. As government decision makers consider this perplexing problem, it is essential that comprehensive solutions and strategic planning be pursued.

APPENDIX

A. Survey Questionnaire and Consent Letters

TEXAS DEPARTMENT OF PUBLIC SAFETY

5805 N LAMAR BLVD BOX 4087 AUSTIN TX 78773.0001

5121485.2000



JAMES R. WILSON
DIRECTOR

DUDLEY M. THOMAS
ASST. DIRECTOR



COMMISSION
ROBERT B. HOLT
CHAIRMAN
CALVIN R. GUEST
ALBERT B. ALKEK
COMMISSIONERS

Dear Motorcycle Operator:

You have been randomly selected from a sample of licensed motorcyclists in Texas to participate in a survey of motorcycle riding experiences. Data from this survey will be used to assess the effectiveness of motorcycle operator training in Texas.

We invite you to participate in this study by taking a minute to complete and return the enclosed prepaid postcard. The postcard is numbered to facilitate response follow-up procedures. All responses will be treated confidentially.

Your return of the postcard indicates that you have agreed to participate in the study and are interested in the future of motorcycling in Texas.

Thank you for your attention to this important matter.

Sincerely,

Frankie Waller, Chief
Staff Services Division

MOTORCYCLE OPERATOR SURVEY

1. How many years have you operated a motorcycle? _____
2. Approximately how many miles did you ride your motorcycle during 1991? _____
3. What percentage of your 1991 riding was done
_____ % on city streets.
_____ % on interstate highways.
_____ % on country roads.
_____ % on other roads.
100 % TOTAL

TEXAS DEPARTMENT OF PUBLIC SAFETY

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DUDLEY M. THOMAS
ASST. DIRECTOR



COMMISSION
ROBERT B. HOLT
CHAIRMAN
CALVIN R. GUEST
ALBERT B. ALKEK
COMMISSIONERS

Dear Motorcycle Operator:

A few weeks ago you were invited to participate in a study of motorcycle operator training in Texas. You have been randomly selected from a sample of licensed motorcyclists in Texas to participate in a survey of motorcycle riding experiences. Data from this survey will be used to assess the effectiveness of motorcycle operator training in Texas.

As our records indicate you have not responded to the original inquiry, you are again invited to agree to participate in this study by taking a minute to complete and return the enclosed prepaid postcard.

Thank you for your attention to this important matter.

Sincerely,

Frankie **if +**

Frankie Waller, Chief
Staff Services Division

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