THE DEVELOPMENT OF AN INSTRUMENT TO MEASURE KNOWLEDGE OF TRAFFIC SAFETY CONCEPTS FOUND TO DIFFERENTIATE BETWEEN VIOLATORS AND NON-VIOLATORS

By

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ABSTRACT

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It was the purpose of this study to develop an instrument consisting of items pertaining to traffic laws and safe driving practices which were answered significantly different by traffic violators and non-violators, thus differentiating between the two. Also of concern in the development of this instrument was the search for traffic safety concepts which are familiar or unfamiliar to drivers.

This instrument which was termed the research instrument, was determined from the analyzed results of the administration of a 110-item experimental instrument to 500 traffic violators and non-violators.

The experimental instrument consisted of 110 true-false and multiple choice items developed from 66 traffic safety concepts found to be essential to the driving task by Blackburn. The 500 subjects selected for this study were Detroit metropolitan and Wayne County Michigan male drivers. In this group, there were 223 traffic violators (persons who have acquired 12 or more points against their driving record in the past two years and have been called in by the Secretary of State's Office of Driver Improvement Services for a re-examination interview) and 277 non-violators (drivers who have not received a moving violation in the past two years).

These subjects were selected in the following manner: (A) Traffic Violators--The traffic violators were acquired through the Secretary of State's

Detroit Office of Driver Improvement Services. Each male individual who appeared at this office was administered the experimental instrument until 223 subjects were obtained. (B) Non-violators--The non-violators were somewhat more difficult to acquire, therefore, three methods were employed to obtain them: (1) Personal interviews with persons applying for license renewal at selected Detroit police precincts, (2) Administration of the instrument by Detroit safety officers to members of various community groups with whom they were acquainted and (3) Through mail questionnaire response. The experimental instrument was sent to 600 subjects and thirty-six percent of these questionnaires were returned.

Chi square analysis and the cross-validation process were employed to determine items to be included in the research instrument. The procedure for determining these items was as follows: The 500 subjects were randomly placed in two equal groups (A and B). Both groups were further divided into ten subgroups consisting of subjects matched on at least three of five research variables which were: (A) Age, (B) Extent of education, (C) Years of driving experience, (D) Average miles driven per year and (E) Accident experience.

Group A was submitted to the first Chi square analysis to identify items which were answered differently by traffic violators and non-violators, thus differentiating between the two. Group B was submitted to the second Chi square analysis to determine whether the items found to differentiate in Group A continued to do so in Group B. This procedure is called the cross-validation process. All items which continued to differentiate in this process are included in the research instrument.

Through the above analysis, 29 items were found to be answered differently by traffic violators and non-violators at the .15 level of significance or better, thus differentiating between the two. It was also found that a greater number of non-violators answered the 29 items correctly than did the violators.

Along with identifying items which differentiate traffic violators from non-violators, the writer was interested in determining whether there are traffic safety concepts which are familiar or unfamiliar to drivers. It was found that 38.1 percent of the items in the total instrument were answered correctly by 75 percent or more of the subjects. These items could be considered familiar to the driver. Moreover, 10.9 percent of the total instrument was answered incorrectly by 75 percent or more of the subjects. These items could be considered unfamiliar to the drivers.

The study further revealed information about the difference in knowledge of traffic laws and safe driving practices between violators and non-violators. It was found that violators and non-violators differed significantly in their knowledge of traffic laws and safe driving practices. The two groups differed significantly with a probability of 99.9 in 100. This indicates that the non-violators have more knowledge of traffic laws and safe driving practices than do traffic violators.

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Dedicated To

My Wife, Earlene and Daughter, Denise

Without whose encouragement and assistance this

ambitious task could not have been completed.

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CHAPTER I

I. THE PROBLEM

One of the great needs in traffic safety is to ascertain the knowledge licensed drivers possess of traffic laws and driving practices thought to be essential to the safe operation of a motor vehicle.

The term "ascertain" as used here means to determine a driver's knowledge of traffic laws and driving practices through the use of instruments which have been tested experimentally and have been found to be valid and reliable. The term "knowledge" as used here has a much broader meaning than is traditionally associated with the term. Here, knowledge means the possession of facts about traffic laws and safe driving practices along with an understanding of their function in the traffic situation.

It is imperative in the evaluation process that the instrument of measurement consist of items which will differentiate between individuals exhibiting markedly different driving behavior.

Many of the present instruments employed to ascertain the driver's knowledge of traffic laws and driving practices are inadequate. Most of these instruments consist of items which have not been analyzed in terms of their power to differentiate between individuals with different driving skills.

Therefore, if the process of ascertaining the knowledge licensed drivers possess of traffic laws and safe driving practices, as mentioned above, is to be determined effectively, there must first be an instrument developed which has as its base those items which will differentiate between individuals exhibiting markedly different driving behavior.

Statement of the problem. It was the purpose of this study to develop an instrument consisting of items pertaining to traffic laws and safe driving practices which were answered significantly different by traffic violators and non-violators, thus differentiating between the two. Also of concern in the development of this instrument was the search for traffic safety concepts which are familiar or unfamiliar to drivers.

Other factors to be considered. The solution to the main problem contained in this study was sought by determining the answers to the following questions:

(1) What traffic laws and driving practices are thought to be essential to the driving task?

(2) How do violators and non-violators differ in their knowledge of traffic laws and safe driving practices?

(3) Which traffic laws and driving practices are most unfamiliar to drivers?

II. DE-LIMITATIONS

It was found necessary to delimit this study in the following manner. Male drivers from the Detroit, Michigan metropolitan area were used in studying responses to the test items. The exclusion of females is due to the many variables which are being controlled at present in this study--variables such as age, driving experience and education. Therefore, the inclusion of women would tend to make the study somewhat cumbersome. Moreover, one might hypothesize that women have different problems in driving than men. Therefore, it is not within the scope of this study to investigate the problems of women drivers.

A further limitation of the study is that both male groups, violators and non-violators alike, will be matched for study only in regard to the following variables: (1) age, (2) driving experience, (3) education and (4) miles driven per year.

III. DEFINITION OF TERMS USED

Knowledge. In this report, "knowledge" will have a much broader meaning than is traditionally associated with the term. Here, "knowledge" will mean the possession of facts about traffic laws and driving practices along with an understanding of their function in the traffic situation.

Traffic laws. For the purpose of this investigation, the term "traffic laws" will pertain to those state legislative acts and local ordinances governing use of motor vehicles.

Driving practices not directly regulated by law. In this report, "driving practices" will mean those acts performed by the driver (Rules of the Road) which are not directly regulated by law and to which most drivers adhere. For example, reduction of speed when approaching parked cars or intersections and yielding the right-of-way in the interest of safety would demonstrate driving practices not directly regulated by law.

Safe operation of a motor vehicle. In this report, the term "safe operation of a motor vehicle" means to drive free of a reportable accident for at least the past three years.

Violator. Throughout this report, the term "violator" will refer to those drivers who have acquired 12 points or more against their driving record in the last two years and have been called in by the Secretary of State's Office of Driver Improvement Services for a re-examination interview.

Non-violators. Throughout this report, the term "non-violator" will refer to those drivers who have not received a moving traffic violation in the past two years.

Motor vehicle. The term "motor vehicle" will be interpreted as meaning any vehicle which is designed primarily for transportation of people or goods which is self-propelled and operated primarily upon the public highways.

Experimental instrument. For the purpose of this study, the term "experimental instrument" will mean the first instrument developed by the writer for use in this study to ascertain the driver's knowledge of traffic laws and safe driving practices.

Research instrument. For the purpose of this study, the term "research instrument" will mean the instrument which contains those items which differentiate between traffic violators and non-violators.

IV. BASIC ASSUMPTIONS

1. Knowledge of traffic laws and safe driving practices contribute to safe driving.

2. Drivers vary in their knowledge of traffic laws and safe driving practices.

3. Driving can be improved through increased knowledge of essential traffic laws and safe driving practices.

4. Present measuring devices used to determine the driver's knowledge of traffic laws and safe driving practices are inadequate.

5. Identification of drivers who meet the minimum driving knowledge requirements can be facilitated through the development of a valid and reliable instrument to measure knowledge of traffic laws and safe driving practices.

6. Knowledge a driver possesses of traffic laws and safe driving practices can be measured.

V. HYPOTHESIS

There is no significant difference in mean scores on a knowledge test of traffic laws and safe driving practices between groups of traffic violators and non-

violators. Moreover, no items on a test of traffic laws and safe driving practices will be found which will differentiate traffic violators from non-violators.

VI. NEED FOR THE STUDY

A great deal has been written and spoken about the driver's lack of knowledge of traffic laws and safe driving practices. Traffic safety experts have estimated that 80-95 percent of the traffic accidents occurring on the highways today can be attributed to driver error. According to these experts, the conditions which contribute to driver error are: failure to obey traffic laws, lack of skill, inattention, emotional disturbances, attitudes, physical deficiencies and lack of knowledge.[1]

Although it has not been determined empirically what percentage of traffic accidents are due to lack of knowledge on the part of the driver, traffic safety experts have, nevertheless, estimated that 5-15 percent of all traffic accidents can be attributed to lack of knowledge of traffic laws and driving practices on the part of drivers. The traffic safety experts estimation that 5-15 percent of all traffic accidents are being caused by the driver's lack of knowledge may be a conservative estimate. The "multiple cause" principle recognizes that most accidents occur only when a combination of circumstances exist simultaneously. When the "multiple cause" principle of accident causation is considered, the possibility of lack of knowledge contributing to the accident takes on a much greater significance. An example will serve to illustrate this more clearly.

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[1]Michigan State Police, Michigan Traffic Accident Facts, A Report Prepared by the Michigan State Police Commissioner's Office (Lansing: Michigan State Police, 1960), p. 14.

> It is after midnight. Rain has stopped falling, but the streets are still wet. A man leaves a bar and staggers homeward. He comes to the corner. He is wearing dark clothing. The street lighting is poor. A car is approaching the intersection at thirty-five miles per hour when the speed limit is twenty-five. It has poor windshield wipers and brakes. The driver has just completed an eight hour shift at a nearby factory. He is tired and not fully alert. As he approaches the intersection, he does not see the pedestrian. The inebriated pedestrian sees the headlights of the approaching car, but either misjudges its distance and speed or believes the driver will yeild to him in the crosswalk. The driver finally sees the pedestrian crossing the street, jams on his brakes, but is too close to avoid hitting the pedestrian.[2]

There is no single cause for this accident. Everyone of those circumstances had to be present in order for this particular accident to happen. However, lack of knowledge on the part of the driver concerning: (a) the distance required to stop a vehicle traveling thirty-five miles an hour on wet pavement with poor brakes, and (b) the degree to which fatigue, limited visibility due to darkness and ineffective windshield wipers reduce sight distances could have been contributing factors in this accident. The cause of the above mentioned accident cannot be clearly attributed to the driver's lack of knowledge alone. It can readily be seen, however, that lack of knowledge could have contributed to this accident, and many others, perhaps even more than is presently believed by traffic safety experts.

Even though traffic safety officials and others have cited lack of knowledge as one of the contributing variables in traffic accidents, they have failed to develop valid and reliable instruments which will measure this variable.

In support of the development of valid and reliable drivers knowledge tests, Campbell states:

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[2]Gordon H. Sheehe, "The Traffic Accident Situation." East Lansing, Michigan: Michigan State University, Highway Traffic Safety Center, 1960, p. 7. (Mimeograph).

> It is usually assumed that the Rules of the Road test actually measures knowledge about the Rules of the Road, but sometimes questions that appear to measure a given thing do not actually do so, and the driver license administrator needs to consider this problem.[3]

The above statement by Campbell summarizes the point the writer is attempting to set forth; namely, that more than "face-validity" is needed if there is to be reliable measurement of driver's knowledge of traffic laws and driving practices. Moreover, as stated earlier, effective measurement must be based on experimentally tested instruments.

A very limited movement toward the improvement of driver's knowledge tests by driver licensing officials and driver educators is underway at present. Moreover, there is a decided movement by both groups for more uniformity of driving requirements and improved selectivity of drivers. Baker states, "Improvement of the quality of driving can be advanced by establishing sound, practical standards to be met by applicants prior to granting the driving privilege."[4]

The Uniform Vehicle Code,[5] likewise, suggests that there be more uniformity in the driver licensing tests and testing procedure. This includes the setting of standards for driving. In Chapter VI of the Uniform Vehicle Code,[6] a pattern of driver licensing is set forth which is intended to help foster the uniformity of driving standards throughout the country. In further support of the

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[3] B. J. Campbell, "The Improvement of Written Drivers Licenses Examinations Through Test Analysis" Special Study for the Institute of Government. Chapel Hill, North Carolina: University of North Carolina, 1960. p. 9.

[4] J. Stannard Baker, "Examining Applicants for Driver's Licenses," (Evanston, Illinois: Northwestern University, 1957), p. 42.

[5] National Committee on Uniform Traffic Laws and Ordinances, Uniform Vehicle Code (Washington, D. C., revised 1956).

[6] Ibid., pp. 50-63.

belief that there should be better selection of drivers, a statement from the 1960 report of the President's "Action Program" follows: "The general level of driving knowledge and skill will be improved if standards for drivers are high and driver examinations uniformly well administered."[7]

It seems to follow then that the need for more effective selection of drivers supports the search for an instrument which will measure, with a considerable degree of validity, the degree to which these standards are being upheld. The above statements clearly support the need for improved driver selectivity and the development of an instrument which will effectively measure a driver's knowledge of traffic laws and safe driving practices.

The need for this study then rests upon the following premises: (1) The need to develop a valid and reliable instrument which will measure the knowledge licensed drivers possess of traffic laws and safe driving practices and (2) That the lack of the above mentioned instrument has in part contributed to the ineffective selection of drivers throughout the country.

In view of the above statements, it seems to this writer that it is necessary to develop an instrument to measure a driver's knowledge of traffic laws and driving practices.

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[7]President's Committee for Traffic Safety, "Motor Vehicle Administration," Report of the President's Committee for Traffic Safety (Washington, D. C.: Government Printing Office, 1960), p. 6.

CHAPTER II

REVIEW OF THE LITERATURE

The theory underlying this study is: There are measurable and enduring characteristics of the driver which are significant in causing driver error and motor vehicle accidents. This theory is founded in research conducted in the area of human variables in motor vehicle accidents.[1]

The basic thread running through all of these investigations which tends to hold them together is the belief that the crux of driving behavior rests within each individual driver rather than with external forces.

The search for these internal characteristics has taken various forms; for example, studies have been concerned with: (1) the driver's susceptibility to accidents, (2) the driver's temporary states and limiting characteristics, and (3) the characteristics of drivers in relation to driver error and accidents. The review of the literature that follows is an attempt to summarize some of the major investigations in the above mentioned areas. Researchers have sought to find characteristics of the driver in these areas which are significant in causing driver error and motor vehicle accidents.

I. LITERATURE ON THE DRIVER'S SUSCEPTIBILITY TO ACCIDENTS

In the search for characteristics which are significant in causing driver error, early researchers sought to prove the driver's susceptibility to accidents or the "accident-proneness" concept. In support of this concept, a study by Slocombe and Brakeman on the "accident-proneness" of 29,531 licensed drivers in the State

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[1] R. A. McFarland and M. A. Moseley, Human Variables in Motor Vehicle Accidents: A Review of the Literature (Boston: Harvard School of Public Health, 1954), p. 22.

of Connecticut found, as reported by McFarland: "That the distribution of these accidents differed from that which would be expected on the basis of chance alone."[2] These findings have been questioned because of the failure to take chance factors into consideration when studying accident repeaters.

Although earlier "accident-proneness" studies were questioned, these studies did lead to the development of the clinical concept of "accident-proneness." Here, the emphasis is upon the psychological characteristics of persons who have accidents.

Early studies by Dunbar found a different pattern of personality traits in patients who were admitted to a general hospital for broken bones than those admitted for heart and circulatory complaints. From these studies Dunbar concluded that, "Injuries served as self-punishment for guilt and also served secondary purposes, such as controlling or punishing the authority figure and securing wanted attention or compensation."[3]

A study by Tillman and Hobbs using taxicab drivers further supported Dunbar's theory. Tillman and Hobbs reported results similar to Dunbar's and indicated that several behavioral indices might be capable of differentiating accident-repeater and accident-free groups.[4] The above two studies, along with similar studies, have encouraged traffic safety officials to accept the "style-of-life" principle of driving. As applied to driving, this principle implies that a man drives as he lives.

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[2] Ibid., pp. 22-23.

[3] H. F. Dunbar, T. P. Wolfe and J. M. Rioch, "The Psychic Component of the Disease Process (Including Convalescence) in Cardiac, Diabetic and Fracture Patients." I. Am. J. Psychiat., 93:649-679, 1936, p. 678.

[4] W. A. Tillman and G. E. Hobbs, "The Accident Prone Automobile Driver: A Study of Psychiatric and Social Background." I. Am. J. Psychiat. 106(5):328, 1949.

Although the "accident-proneness" concept has been questioned on the basis that chance factors were not taken into consideration when accident repeaters were studied, studies in this area have served to identify characteristics within the driver which are significant in causing driver error. These characteristics take the form of poor psycho-social adjustment along with other failures of the driver to meet physical and social demands of life.

II. LITERATURE ON THE DRIVER'S TEMPORARY STATES AND LIMITING CHARACTERISTICS

Temporary states and limiting characteristics of drivers have been studied in an attempt to identify factors which have temporarily adverse effect upon driving behavior. The areas which have commanded the most attention have been: (a) the effects of fatigue on the driver, (b) the effects of alcohol on the driver, and (c) the effects of emotional states on the driver.

The effect of fatigue. Fatigue and driving have been studied by the National Safety Council.[5] This study reported that drivers often spend excessively long hours at the wheel, but most driver-asleep accidents occur after being at the wheel only a few hours. The National Safety Council study used amount-of-time-spent-behind-the-wheel as the criterion for judging fatigue in the above mentioned study. This criterion has been questioned by researchers in the field because many traffic safety officials believe that other variables should be taken into consideration when studying fatigue and its effect on drivers. For example, variables such as operational errors and activities prior to driving should be considered along with time-spent-behind-the-wheel when studying driver fatigue. A concept developed by Bartlett known as "skill fatigue" is thought to have some relevance for motor

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[5]National Safety Council, How Long on the Highway (Chicago: National Safety Council, Inc., 1937).

vehicle driving.[6] The "skill fatigue" concept places emphasis on the study of operational errors and fatigue rather than upon the length of time behind the wheel and fatigue.

In further support of the need for an evaluation of fatigue in relationship to variables other than long hours of driving is the study by McFarland.[7] McFarland concluded from his study of long-haul trucking accidents that "While hours of duty and hours since last rest are important, more needs to be known about the off-duty activities of truck drivers as an additional complicating factor."[8]

It can be seen by the above brief summary of the pertinent research conducted in the area of fatigue and driving that the study of fatigue as a contributing characteristic to driver error is difficult and results are often conflicting. This research, however, has helped to identify possible factors leading to driver error.

The effects of alcohol on the driver. In search for temporary states and limiting characteristics contributing to driver error, alcohol and its effects on the driver has been given considerable attention by traffic safety researchers. The big question in regard to the effects of alcohol on the driver is: How much alcohol does one have to consume to be considered "under the influence"? McFarland reports:

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[6] F. C. Bartlett, "Fatigue Following Highly Skilled Work." Proc. Roy. Soc. London S. B. 5131(864), p. 256.

[7] R. A. McFarland, "Human Variables in the Design and Operation of Highway Transport Equipment." Soc. Automotive Engin., 62:345, 1954.

[8] R. A. McFarland, Human Factors in Highway Transport Safety. (Boston: Harvard School of Public Health, 1954), p. 128.

> The American Medical Association and the National Safety Council have selected two levels of concentration of alcohol in the blood as critical points in the determination of "under the influence". If the blood contains less than 0.05 percent of alcohol, the individual is not considered to be affected. If the level is 0.15 percent or more, this is Prima Facie evidence of being under the influence.[9]

Disregarding the debate of "under the influence", it becomes important to know whether persons involved in traffic accidents have been drinking. Still further, it is important to know what effect, if any, alcohol has on driving behavior.

The National Safety Council has estimated in its 1962 edition of Accident Facts that 50 percent of the drivers involved in fatal accidents in 1961 had been drinking and about half of these drivers were "under the influence."[10]

This statement does not present the complete picture of the extent of alcohol as a factor in causing accidents. Halcomb, from his studies of alcohol and traffic safety, has concluded that "precise determination must be made in regard to the proportion of drivers on the road at any one given time who have been drinking or the distribution of blood alcohol values of random samples of drivers should be taken".[11]

Halcomb found in his study through the use of urinalysis evidence of alcohol in 47 percent of 270 drivers who had been hospitalized as a result of their accidents.[12] Similar studies by Thorndike have concluded that the likelihood of an

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[9] McFarland, Op. Cit., p. 48.

[10] National Safety Council, Accident Facts (Chicago: National Safety Council, Inc., 1962), p. 42.

[11] R. L. Halcomb, "Alcohol in Relation to Traffic Accidents." J. A. M. A. 111(12):1078. 1952.

[12] Ibid. p. 1084.

accident increases as the amount of alcohol in the blood becomes greater.[13] These studies further suggest that impairment in driving efficiency frequently occurs with amounts of blood alcohol which have been considered to be too small to be important.

The most important factor in the alcohol and driving question is: Does alcohol affect performance at the wheel? Early studies conducted by Newman, Fletcher and Abramson found that alcohol impairs the more-complicated and less-frequently performed driving tasks.[14] Studies in other countries seem to support the above findings. Goldberg, a Swedish scientist conducted a study similar to Newman's on alcohol and its effect on driving performance.[15] His conclusions supported those of Newman's, however, Goldberg found impairment of driving skill began at a much lower blood alcohol level than reported by Newman.

The most beneficial outcome of the alcohol and driving research has been the findings that alcohol tends to reduce driving efficiencies and these reduced efficiencies often lead to driver error and accidents.

The effect of emotional states on the driver. Very little study has been conducted in this area. However, traffic safety experts have stated that many accidents have occurred due to the emotional state of the driver. These claims have no real foundation, therefore, the question of the driver's emotional state and its effect on driving behavior still remains unanswered.

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[13] R. L. Thorndike, "The Human Factors in Accidents With Special Reference to Aircraft Accidents." Project 21-30-001, Rept. (Final Report) U.S. Air Force, School of Aviation Medicine, Randolph Field, Texas, February, 1951.

[14] H.W. Newman, E.D. Fletcher and M. Abramson, "Alcohol and Driving." Quart. J. Study on Alcohol 3(1), 1942. p. 30.

[15] L. Goldberg, "Alcohol Research in Sweden." Quart. J. Study on Alcohol 10(2), 1948. p. 87

III. LITERATURE ON THE CHARACTERISTICS OF DRIVERS IN RELATION TO DRIVER ERROR AND ACCIDENTS

Research conducted in the area of characteristics of the driver in relation to driver error and accidents has contributed greatly to the fund of knowledge about human variables in motor vehicle accidents. Studies in the area have been concerned with: (a) the driver's sensory abilities, i.e. vision and hearing, (b) the driver's psycho-motor abilities, i.e. muscular strength and control, measures of reaction time and manipulative abilities, (c) the driver's personal and emotional adjustments, (d) the driver's biographical data, i.e. information concerning age, sex, and driving experience, etc. and (e) the driver's cognitive and intellectual abilities in relation to driving, i.e. mental ability and knowledge of the principles of safe driving.

There have been classic studies conducted in the area of characteristics of drivers in relation to driver error and accidents. Among these are studies by Fletcher[16] on vision, Thorndike,[17] Johnson[18] and Lauer[19] along with DeSilva and Forbes[20] on psycho-motor abilities. A study by McFarland and Moseley[21] on

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[16]E.D. Fletcher, "Visual Acuity and Safe Driving." J. Am. Optometric Assn. 20(7):439-442, 1949.

[17]Thorndike, Op. Cit., pp. 1-46.

[18]H.M. Johnson, "The Detection and Treatment of Accident Prone Drivers." Psychol. Bulletin. 43(6):489-532, 1946.

[19]A.R. Lauer, "What Visual Acuity Is Needed for Driving?" Optometric Weekly. 41(14):485-488, 1950.

[20]H.R. DeSilva and T.W. Forbes, Driver Testing Results. (Cambridge: Harvard Traffic Bureau, 1937).

[21]R.A. McFarland and A.L. Moseley, Human Factors in Transport Safety. (Boston: Harvard School of Public Health, 1954).

biographical data has set guideposts for future study in this area. Important as all these areas of study are, it is with the cognitive and intellectual abilities in relation to driving area that is of most concern here.

Both intelligence and knowledge of safe driving principles have been studied. These studies, likewise, are based on the theory that there are measurable and enduring characteristics of drivers which are significant in causing driver error.

The most significant study conducted in the area of intelligence and driving performance, was conducted by the Harvard School of Public Health. The findings in this study have been interpreted to indicate that safe driving probably requires a certain minimum of mental ability, however, superior intelligence by itself is no guarantee of freedom from accidents.[22]

Research results in the area of the driver's knowledge of safe driving principles are conflicting. A study by Brody using knowledge tests of safe driving principles indicated that there was no correlation between scores on such tests and accidents.[23] Studies by the Eno Foundation, however, revealed that accident repeaters matched with accident free drivers made lower scores on knowledge tests.[24]

Attitude measurement and driving knowledge tests. Attitude toward driving has been regarded by traffic safety experts as being the most important single variable in traffic safety. Moreover, the development of the proper "safety attitude" is the stated aim of most safety programs.

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[22]R. A. McFarland and A. L. Moseley, Human Variables in Motor Vehicle Accidents: A Review of the Literature. (Boston: Harvard School of Public Health, 1954), p. 35.

[23]L. Brody, "Personal Factors in the Safe Operation of Motor Vehicles." (New York: Center for Safety Education, New York University, 1941).

[24]Eno Foundation for Highway Traffic Control, Personal Characteristics of Traffic Accident Repeaters. (New York: Center for Safety Education, New York University, 1948), p. 103.

Although proper attitude development is of major concern to traffic safety experts, attitudes have been hard to define and have been even more difficult to identify or measure. Several attempts have been made to develop driver attitude tests and rating scales. Conover,[25] Lauer,[26] and Siebrecht[27] have been some of the pioneers in this area. The "Siebrecht Attitude Scale" is perhaps the most popular and best known attitude measurement instrument in the field of traffic safety. This instrument was designed to measure an individual's attitude toward driving and has been used mostly with high school students. The reliability and validity of this scale and others like it has been questioned. The results of the administration of these instruments, however, could be used as guidelines directing attention to potential shortcomings in the driver.

Lauer has experimented with a relatively new method of evaluating a driver's attitude.[28] This method uses supervisors and associates of the driver to rate him on driving attitudes on the basis of observed driving behavior. This method proved to be highly successful in the selection of army drivers.

In addition to the above mentioned methods of identifying and measuring driver attitudes, researchers have employed various personality scales and inventories. Rommell employed the Minnesota Multiphasic Personality Inventory

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[25] D.W. Conover, "A Preliminary Analysis of Attitudes Relating to Driving." Proc. Iowa Acad. Sci. (54:227-229), 1941.

[26] A.R. Lauer, "Statistical Study of Attitudes." Paper presented at the 50th Annual Meeting of the Iowa Academy of Sciences, Iowa City, Iowa, 1936. Abstracted, Proc. Iowa Acad. Sci. (43:307-312), 1936.

[27] E.B. Siebrecht, "Measuring Driver Attitudes." Research Contributions to Safety Education. (New York: New York University, 1941), pp. 1-10.

[28] A.R. Lauer and Others, "Aptitude Tests for Army Motor Vehicle Operators." Project 29565100, Rept. 981 (Final Report) Sub-task 78. Personnel Research Section, Dept. of the Army, Wash., D.C. October, 1952. pp. 1-65.

in his study of accident-free and accident-repeating youths.[29] Heath used the Thurstone Temperament Schedule to ascertain what personality characteristics might distinguish traffic law-violators from non-violators.[30] Rainey used the Guilford-Zimmerman Temperament Survey in addition to the Allport-Vernon-Lindzey Study of Values to determine whether or not there were significant differences between students who elect to take driver education from those who do not elect to take such training.[31]

All of these studies, through the use of the various personality inventories and scales, have identified attitudes considered conducive to unsafe driving, namely: (a) to have an attitude toward driving as a form of activity which relieves psychic tension, (b) to have less capacity for managing or controlling hostility, and (c) to be categorized more frequently as consistently or occasionally belligerent or covertly hostile and less frequently appropriately assertive.[32]

Although some progress is being made in the study of attitudes, as evidenced by the above research still more measurement and evaluation of driving attitude obviously needs to be conducted. New and improved methods of attitude identification also need to be found.

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[29] R. C. S. Rommell, "Personality Characteristics, Attitudes and Peer Group Relationship of Accident-Free and Accident-Repeating Youth," Unpublished Doctoral Thesis. (University Park, Penn.: The Pennsylvania State University, 1958), pp. 1-110.

[30] E. D. Heath, "The Relationship Between Driving Records, Selected Personality Characteristics, and Biographical Data of Traffic Offenders." Unpublished Doctoral Thesis. (New York: New York University, 1958), pp. 1-120.

[31] R. V. Rainey, et. al., "Study of the Human Factors in Motor Vehicle Accidents." (Denver: University of Colorado Medical Center, University of Colorado, 1958), pp. 1-130.

[32] J. E. Intorre, "Some Sociological Consideration With Respect to Motor Vehicle Accidents." American Driver Education Assn. News and Views, March, 1962. p. 22.

Driving knowledge tests. Driving knowledge tests take three forms: (a) test to be used with driver education textbooks, (b) test to be used in the selection and evaluation of commercial drivers and test used by insurance companies to select teenage insurees, and (c) test of knowledge of traffic laws administered by State Driver Licensing Authorities.

The driving knowledge tests to be used with driver education textbooks are varied and many. The two most popular driver education knowledge tests are: (A) THE SPORTSMANLIKE DRIVING TEST which was designed to be used with the text SPORTSMANLIKE DRIVING and (B) THE MAN AND THE MOTOR CAR DRIVING TEST which was developed for the text MAN AND THE MOTOR CAR.[33, 34]

It is important to note that both tests were developed with the intent to measure the individual's knowledge of safe driving practices as described in the text for which the test was developed. This type of test is important. However, there are tests needed in driver education which will not only measure a driver's knowledge of traffic laws and safe driving practices but will also differentiate between potential traffic violators and non-violators.

The Center for Safety at New York University is devising a National Driver Education Test. This test is designed to be used nationwide in ascertaining knowledge an individual possesses of safe driving practices. The shortcoming of this test is: It is not constructed with the thought of identifying future traffic violators from non-violators.[35]

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[33] Center for Safety Education, Man and the Motor Car. (Englewood Cliffs: Prentice Hall, Inc. (5th Edition), 1961).

[34] American Automobile Association, Sportsmanlike Driving. (Washington, D.C.: The American Automobile Association (4th Edition), 1955).

[35] Center for Safety Education, "National Driver Education Test." (New York: New York University, 1962).

The commercial driving industry has put the driver's knowledge test to better use than most other sources employing knowledge tests. For example, an early study by Shellow, as reported by McFarland, using the records of 166 motormen selected by driving tests among other tests, compared with 163 motormen selected without tests, found that those selected by test had significantly less accidents and were employed longer.[36] This study demonstrates that driving knowledge tests can be profitably employed in the selection of drivers.

In further support of using driving knowledge tests as instruments of selection, a number of insurance companies are experimenting with driving knowledge tests to select teenage insurees. These insurance companies feel that teenagers who possess a complete knowledge of safe driving practices are better drivers.

The largest users of driving knowledge tests are State Driver Licensing Authorities. Due to the nature of most state licensing laws, the state driving knowledge tests are not employed to their greatest potential.

An appropriate summation for the above discussion on driving knowledge tests is:

> While knowledge of a correct situation is not always assurance that correct action will be taken, the well-informed driver seems to be a better risk than the poorly informed. One effective use of knowledge and information tests for drivers is to disclose individual deficiencies in driver knowledge as an aid to the determination of the areas where driver education is needed.[37]

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[36] McFarland, Op. Cit. p. 58.

[37] Eno Foundation For Highway Traffic Control, The Nature and Improvement of Drivers. (New York: New York University, Center for Safety Education, 1949), p. 100.

SUMMARY

In the review of the literature presented in this Chapter, the results of many studies conducted in the area of human variables and motor vehicle accidents were presented. The purpose of presenting this material was to lend support to the theory that the crux of driving behavior rests within each individual driver rather than with external forces. The search for these internal characteristics has taken the form of studies concerned with: (1) The driver's susceptibility to accidents, (2) The driver's temporary states and limiting characteristics and (3) The characteristics of driver's in relation to driver error and accidents.

In summary of the findings in each of the areas, it was found that studies in the area of the drivers susceptibility to accidents revealed that poor psycho-social adjustment along with other failures of the driver to meet physical and social demands of life were the internal characteristics which lead to driver error. Studies on the driver's temporary states and limiting characteristics revealed that any variable which affects the body or mind, such as fatigue, alcohol or emotional stress can lead to driver error. Finally, research in the area of characteristics of drivers in relation to driver error and accidents has revealed that the driver's sensory and psycho-motor abilities, along with his personal, emotional adjustment and cognitive and intellectual abilities in relation to driving are internal characteristics which are significant in causing driver error.

The findings in the review of the literature have reinforced the writer's efforts to continue the search for internal characteristics of drivers which are significant in causing driver error.

CHAPTER III

CONSTRUCTION OF THE EXPERIMENTAL INSTRUMENT, POPULATION AND EXPERIMENTAL DESIGN

I. THE CONSTRUCTION OF THE EXPERIMENTAL INSTRUMENT

The experimental instrument consisted of 66 of 210 concepts found essential to the driving task by Blackburn.[1] Blackburn used a jury of 75 leading traffic safety experts and driver education teachers in addition to several hundred secondary high school students who had completed a course in driver education to identify the concepts.

Due to the nature of the present study, all 210 concepts could not be used. Therefore, the writer arbitarily chose those concepts which 75 percent of the jury selected as being essential to the driving task. This procedure produced 66 concepts. Multiple choice and true-false items were included in the instrument to obtain the individual's first thoughts about the concept in question. The multiple choice items were included to reveal the individual's reflective thinking when confronted with more than one choice. The following procedure was used in the development of the test items.

A. Through a review of ten driver education textbooks, 36 tests and driving manuals from state departments of driver-licensing, 132 true-false and multiple choice items were developed covering the 66 traffic safety concepts identified above.

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[1] Blackburn, J. "Concepts of Driver Education and Their Relative Importance for a Driver Education Course in the Secondary School." (Unpublished doctoral dissertation). Boston University, 1956.

B. A form consisting of the 132 items was submitted to several college driver education instructors, two high school driver education instructors and five graduate students in driver education. This jury evaluated each of the items in terms of its relatedness to one of the 66 concepts.

As a result of this procedure, a 110-item questionnaire consisting of 63 true-false and 47 multiple choice items was developed.

II. ADMINISTRATION OF THE EXPERIMENTAL INSTRUMENT TO THE PILOT GROUP

The experimental instrument was administered to a pilot group of 80 persons, 59 Michigan State University janitors, 10 traffic violators attending the Lansing Driver Improvement School and 11 Michigan State University bus drivers and mechanics.

The pilot group was used to determine whether there were any irrelevant items and also to determine singleness of idea, clarity of expression, suitability of language and ease of interpretation of each item. The experimental instrument was scored by the number of "rights".

Through the administration of the experimental instrument to this group, several items were found to be unclear. These items were reworded and returned to the questionnaire.

III. POPULATION

The subjects for the study were 500 male drivers from the Detroit metropolitan and Wayne County area of Michigan. This group consisted of 223 traffic violators (persons having 12 or more points against their driving record who were called in for license re-examination interviews) and 277 non-traffic violators (persons with violation free driving records for the past three years). The sample was drawn in the following manner:

A. Traffic Violators (223) The traffic violators were acquired through the Secretary of State's Detroit Office of Driver Improvement Services. Each of these individuals had acquired 12 points against his driving record and was appearing for a license re-examination. The writer submitted the experimental instrument to 223 such individuals.

B. Non-Traffic Violators (277) The non-traffic violators were somewhat more difficult to acquire; therefore, three methods were used to obtain them. The first method was through personal interviews with individuals applying for license renewal at selected Detroit Police Precincts (#7 and #13). This method rendered only 16 subjects in two weeks time; therefore, it was abandoned.

The second method employed the use of six Detroit police safety officers, each of whom were given 20 questionnaire forms and requested to administer them to violation free individuals in various community groups with whom they were acquainted. The officers administered the instrument by two methods: (1) by personal interview with various groups of non-violators and (2) by the take-home method (the individual takes the questionnaire form home and completes it at his convenience). An analysis of the results of the administration of the instrument in the above two manners produced no measurable difference in test scores between individuals who took the test home and those who did not. As a result of the safety officers efforts, 88 subjects were acquired. It should be noted that these subjects represented the following occupation groups: professional truck drivers, factory workers, clerical workers, business executives, engineers, school teachers, high school and college students and police officers. No single occupation group dominated this sample.

An interesting observation in regard to the above sample is that the violator group consisted of approximately the same occupational areas, with the exception of police officers.

The third method employed to acquire subjects was through mail questionnaire response. The experimental instrument was sent to 600 non-traffic

violators in the Detroit metropolitan and Wayne County area. The subjects who were to receive the questionnaire were selected from the Central Driving Record Files, maintained by the Secretary of State's Office in Lansing, Michigan. This file has the complete driving record, as far as convictions for moving traffic violations and reportable accidents are concerned, of each licensed driver in the State of Michigan. The Central Files are arranged in four groups alpha-numerically by the first letter of the individual's last name and his driver's license code number. In order to obtain the names and addresses of male Detroit area non-violators, each of the four alpha-numerical groups were searched until the desired number of individuals was acquired. It should be noted that the above procedure was repeated twice on samples of 300 each making a total sample of 600 drivers. Through this procedure, 177* subjects were acquired.

IV. EXPERIMENTAL DESIGN

The stated purpose of this study is to develop an instrument which will differentiate the traffic violator from the non-violator in terms of traffic laws and safe driving practices. This instrument, which will be termed the Research Instrument, will be determined from the analyzed results of the administration of the experimental instrument, mentioned in Chapter III earlier, to 500 traffic violators and non-violators. The items which are found through Chi square analysis[1] to differentiate between traffic violators and non-violators will be subjected to a process of cross-validation. Cross-validation process merely submits a second group of similar subjects to a Chi square analysis. This analysis will determine

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*Actually 220 questionnaires were returned, however, only 177 were used in the study. The remaining 44 were returned too late to be of use.

[1]A. L. Edwards, Statistical Methods for the Behavioral Sciences. (New York: Rinehart and Company, Inc., 1959), p. 366.

whether the items found to differentiate in the first group continue to do so in the second group.

Those items which continue to differentiate in the cross-validation process will then be included in the final research instrument. The design of the study is as follows:

A. Through a process of assigning random numbers of each subject, the 500 subjects were divided into two groups: A and B of 250 subjects each. Group A was termed "the validation group". This group was the first group in the study to be submitted to the Chi square analysis. Group B was termed the "cross-validation" group. This group was submitted to the second Chi square analysis to determine whether the items found to differentiate in Group A continue to do so in Group B.

B. Groups A and B above were further divided into the following five research variables: (1) age (2) extent of education (3) years of driving experience (4) average miles driven per year and (5) accident experience.

Each variable was divided further into a high and low range by deriving a cut-off point for it. (See Table VI, pp. 61). For example, the age variable cut-off point for the 500 subjects was 27 years. All individuals who were 27 years and younger were placed in the low or youth range. All individuals 28 years and older were placed in the high or aged range. The above cut-off point was determined by computing the average age of the 500 subjects. Table VI presents the cut-off point range for each variable and the number of subjects in each group.

In order to match the subjects on as many of the five research variables as possible, ten sub-groups were developed. Each of the groups consist of at least three variables on which the subjects within the groups are matched. *

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*Five subjects could not be grouped due to the inability to find a sub-group for which three or more of their characteristics could be matched. However, they are considered in the complete analysis of the data.

On each of the 10 pairs of sub-groups under A and B, the cross-validation process was applied.

The ten sub-groups make it possible to draw conclusions about groups of individuals matched on several variables. From the above research design, answers to the following questions were sought.

1. Which items differentiate between violators and non-violators matched on at least three or more variables?

2. Which items are of common knowledge to both traffic violators and non-violators?

3. Which items are unknown to both traffic violators and non-violators?

4. What is the total mean score for the violator group? What is the total mean score for the non-violator group? Is there a significant difference between these scores?

5. Which items should be included in the final research instrument?

The results of the above research design are presented in Chapter IV.

CHAPTER IV

DEVELOPMENT OF THE RESEARCH INSTRUMENT

The development of the research instrument was the stated purpose of this study. Moreover, the research instrument was to consist of items which were answered significantly different by traffic violators and non-violators and thus would differentiate between the two groups. The writer identified differentiating items by: (A) Administering the experimental instrument to 223 traffic violators and 277 non-violators. This group of 500 subjects were randomly divided into two groups (A and B) of 250 subjects each. These two groups were further divided into ten sub-groups consisting of traffic violators and non-violators alike. The subjects within each of the ten sub-groupings were matched on at least three of five research variables. (See Table VII for distribution of subjects in sub-groups 1-10 in Appendix I, pp. 62). (B) The responses of subjects in group A--the validation group--to the test items were submitted to a Chi square analysis[1] to determine whether there were any significant differences between the responses of traffic violators and non-violators. (C) The above process was repeated with group B. This procedure is referred to as the "cross-validation process". The cross-validation process sought to determine whether the items found to differentiate violators from non-violators in group A continue to do so in group B.

The above procedure revealed that 29 test items or 27.1 percent of the total test differentiated traffic violators from non-violators at the .15 level of significance or better.

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[1]This analysis was accomplished on a high speed electronic computer (MISTIC) at Michigan State University by having the observed frequencies for Chi square analysis punched on computer cards and analyzed with the Simms program of Chi square analysis.

Table I presents the 29 test items which comprise the research instrument. A point of interest in Table I is: These 29 items represent several traffic safety concepts thought to be essential to the driving task by traffic safety experts. They also represent items which were answered significantly different by traffic violators and non-violators, thus differentiating between the two.

I. ANALYSIS OF THE DATA COMPRISING THE RESEARCH INSTRUMENT

Although it was important to identify items which were answered differently by violators and non-violators, it was equally as important to determine whether these items were answered correctly most often by violators or non-violators, thus enabling the writer to determine which group was more knowledgeable about traffic laws and safe driving practices.

In order to determine whether the average score of correct answers for violators on the 29 items in the research instrument were greater than the average score of correct answers for non-violators, the scores for the groups were submitted to two statistical tests.

First, the F-test was employed to determine whether the variance of the matched populations might be different. Second, the t-test of significance was used to test the significance of the difference between the two groups scores. The result of the F-test revealed that there was a significant difference between the variances of the two groups. The probability was 1.35, that is, the chances of variances of the two groups being different was more than 99. out of 100 or a significance level of .01. Thus, the t-test of significance of difference between mean test scores of traffic violators and non-violator groups was employed.

The average score of correct answers for the traffic violators was 16.4. The average score of correct answers for the non-violator group was 20.8. The difference between the two groups was significant with a probability of 99.9 in 100. This indicates that the traffic violators and non-violators differed significantly in their knowledge of traffic laws and safe driving practices.

TABLE I

RESEARCH INSTRUMENT

ITEMS WHICH WERE ANSWERED SIGNIFICANTLY DIFFERENT BY TRAFFIC VIOLATORS AND NON-VIOLATORS AND DIFFERENTIATE BETWEEN THE TWO GROUPS

Item No.	Item	Item Type		Item Category
3	It is unlawful not to stop and exchange information if one is involved in an accident.	T	F	TLSDP*
5	The need for trained drivers increases with the rise in traffic volume.	T	F	DAT*
6	When approaching a school bus stopped on the highway, to load or unload passengers, one should slow down and pass with care.	T	F	TLSDP
7	New headlights will increase a driver's visibility, thus eliminating the need to reduce one's speed at night.	T	F	TLSDP
10	The effects of alcohol on one's driving can be compensated for by one's driving skill.	T	F	DAT
18	Pedestrians have the right-of-way at all times.	T	F	TLSDP
21	In educating the future driver, a great deal of emphasis should be placed on attitude development.	T	F	DAT
22	When approaching an intersection, one should look left then right and then back left again before proceeding across.	T	F	TLSDP

*These letters represent the category of Traffic Laws and Safe Driving Practices.
**These letters represent the category of Driving Attitudes.

Item No.	Item	Item Type		Item Category
27	The faster one drives, the more likely he is to have an accident.	T	F	TLSDP
30	Pedestrians who disregard traffic regulations should be punished.	T	F	DAT
32	A comfortable sitting position in the driver's seat is important to safe driving.	T	F	DAT
38	A vehicle has more traction on gravel surfaces than any other type.	T	F	MM***
40	Driving is a social task.	T	F	DAT
41	The posted speed limit is the safe, maximum speed at which one can drive at all times without being arrested.	T	F	TLSDP
47	"Dragging" from stoplights is not as dangerous as open highway racing.	T	F	DAT
57	Most accidents happen at intersections.	T	F	TLSDP
59	When the right wheels slip off the pavement, the driver should pull them on immediately.	T	F	MM
6	Driver A meets a school bus on a four lane undivided highway discharging passengers. Driver A should: (A) Proceed with caution. (B) Stop and wait for the flashing red lights to be turned off. (C) Stop, honk his horn and proceed.	M	C	TLSDP

***These letters represent the category of mechanical and manipulative skills.

Item No.	Item	Item Type		Item Category
11	Driver A is traveling on a black-top highway. This road does not have a posted speed limit. Driver A's speed should be governed by: (A) The ability of his vehicle to operate at high speeds. (B) His driving skill. (C) Road conditions and traffic around him.	M	C	TLSDP
13	Driver A is driving at night and he approaches Driver B traveling in the opposite direction. Driver A should: (A) Move to right in order to give B more room. (B) Reduce speed. (C) Dim headlights.	M	C	TLSDP
14	Driver A approaches Driver B who is traveling 50mph on an open country road. A wishes to overtake and pass B. While waiting to pass, A should stay: (A) 3 (B) 4 (C) 5 car lengths behind B.	M	C	TLSDP
15	Driver A, while traveling on a hardtop surface discovers he has a flat tire. What should he do? (A) Pull partially off the roadway. (B) Stay on the roadway so as not to ruin his tire. (C) Pull completely off the roadway.	M	C	TLSDP
17	Pedestrians must know and understand driving problems so they will: (A) Understand the driver's problems. (B) Be better drivers. (C) Have a better understanding of traffic laws.	M	C	TLSDP
18	Driver A approaches an intersection. The light is in his favor; however, a pedestrian steps from the curb and starts across the street. What should A do? (A) Blow horn and continue on slowly. (B) Stop and yield to the pedestrian. (C) Continue thru the intersection but at a reduced rate of speed.	M	C	TLSDP

Item No.	Item	Item Type		Item Category
21	The most important part of a driver education program should be: (A) The development of driving skills. (B) The development of a sense of responsibility and courtesy. (C) Development of a complete knowledge of traffic laws.	M	C	DAT
32	Which of the following aspects of athletics is unwanted in driving? (A) Fair play. (B) Competition. (C) Sportsmanlike conduct.	M	C	DAT
39	After one has passed a vehicle in heavy traffic he should: (A) Honk his horn. (B) Check his mirror and look over his shoulder. (C) Blink his lights before returning to his proper traffic lane at night.	M	C	TLSDP
41	Which of the following will most likely help to improve the driving records of teenagers and young adults? (A) Stricter traffic law enforcement. (B) An understanding of their responsibility to other drivers. (C) Increased knowledge of traffic laws.	M	C	DAT
42	Which of the following has precedence in controlling traffic? (A) Traffic signal. (B) Stop sign. (C) Traffic officer.	M	C	TLSDP

Table II lists the results of the comparison of mean scores between violators and non-violators on the 29 items of the research instrument.

TABLE II

RESULTS OF F-TESTS, t-TESTS AND MEAN SCORES

ITEM	TRAFFIC VIOLATORS	NON-VIOLATORS
F-TEST	p> .01	p> .01
MEAN SCORE	16.4	20.8
t-TEST	p> 99.9	p> 99.9

In order to give a clearer picture of the difference in scores between the two groups, Table III showing the quartile ranges for each group is presented.

TABLE III

QUARTILE RANGE FOR BOTH THE VIOLATOR AND NON-VIOLATOR GROUPS ON THE 29 ITEMS OF THE RESEARCH INSTRUMENT

NON-VIOLATOR			VIOLATOR		
Score	Number of Subjects	Quartile	Score	Number of Subjects	Quartile
28	1		25	4	
27	1		24	3	
26	5		23	1	
25	16		22	18	
24	12		21	19	
23	44		20	14	
22	40	Q 3	19	16	
21	43		18	24	Q 3
			17	29	
20	28	Q 2	16	15	Q 2
19	19		15	13	
			14	14	
18	21	Q 1	13	11	Q 1
17	19		12	6	
16	16		11	8	
15	4		10	9	
14	5		8	7	
13	3		7	2	
			6	1	
			5	1	
	Average Score:	20.8		Average Score:	16.4

In order to give more meaning to the test items in the research instrument, the writer developed three descriptive item categories. Each of the 110 test items in the experimental instrument was classified according to one of the following categories: (A) Items Pertaining to Knowledge About Traffic Laws and Safe Driving Practices. An example of this type of item would be: The traffic signal has precedence in controlling traffic over all other methods. (B) Items Pertaining to Knowledge About Driving Attitude. An example of this type of item would be: "Dragging" from stoplights is not as dangerous as open highway racing. (C) Items Pertaining to Knowledge About Mechanical and Manipulative Skills. An example of this type of item would be: In order to correct a vehicle beginning to skid, the driver should hit the brake hard and turn the front wheels into the direction of the skid.

It should be noted that these three categories are part of the instrument intended to measure the driver's knowledge of traffic laws and safe driving practices and are not separate measures of driving attitudes, traffic laws and safe driving practices or mechanical and manipulative skill. Moreover, items which fit these various categories can only be interpreted as items measuring an individual's knowledge about these areas.

Using the three descriptive item categories as a guide, the analysis of the data comprising the research instrument revealed that 15 items or 50 percent of the differentiating items fit into the traffic laws and safe driving practices category. (See Table I). It is further revealed that 11 items or 36.6 percent of the differentiating items fit into the driving attitude category. Lastly, four items or 13.4 percent of the differentiating items represented the mechanical and manipulative skill category. It is interesting to note that the items comprising the three categories were distributed proportionally the same throughout both the research instrument and the experimental instrument. That is: (A) The traffic laws and safe driving practices category contained 15 items or 50 percent of the

research instrument. Likewise, 57 items or 51.8 percent of the experimental instrument consisted of items pertaining to traffic laws and safe driving practices. (B) The driving attitude category contained 11 items or 36.6 percent of the research instrument. Forty-six items or 36.6 percent of the experimental instrument consisted of items pertaining to driving attitudes. (C) The mechanical and manipulative skill category contained 4 items or 13.4 percent of the research instrument. Seven items or 12.6 percent of the experimental instrument consisted of items pertaining to driving attitude.

The significant factor revealed in the above analysis is that the items comprising the research instrument and which also exemplified the three descriptive categories were distributed proportionally the same throughout both the research instrument and the experimental instrument.

The conclusion to be drawn from these data is that knowledge about driving attitudes, traffic laws and safe driving practices and mechanical and manipulative skills should be considered equally as important when measuring a driver's knowledge of traffic laws and safe driving practices.

II. ANALYSIS OF THE ITEMS IN THE RESEARCH INSTRUMENT IN TERMS OF THE NULL HYPOTHESIS

In the process of determining the research instrument, a testable hypothesis was stated in the null form. The hypothesis was stated in the null form so that the data are given a chance to disprove it.

The null hypothesis stated that: There is no significant difference in mean scores on a knowledge test of traffic laws and safe driving practices between groups of traffic violators and non-violators. Moreover, no items on traffic laws and safe driving practices will be found which will differentiate traffic violators from non-violators.

On the basis of data comprising the research instrument, the null hypothesis was rejected. The first part of the hypothesis was rejected on the strength of the significant difference (.01) found between the mean proportion of correct answers for violators and the mean proportion of correct answers for non-violators on the 29 items in the research instrument. The second part of the null hypothesis was rejected by virtue of the 29 items found to be answered differently by traffic violators and non-violators at the .15 level of significance or better, thus differentiating between the two.

III. ANALYSIS OF TRAFFIC SAFETY CONCEPTS FOUND TO BE FAMILIAR OR UNFAMILIAR TO TRAFFIC VIOLATORS AND NON-VIOLATORS BASED ON THE 110 ITEM EXPERIMENTAL INSTRUMENT

The stated purpose of this study was to develop an instrument consisting of items pertaining to traffic laws and safe driving practices which were answered significantly different by traffic violators and non-violators. Also of concern in the development of this instrument was the search for traffic safety concepts which are familiar or unfamiliar to drivers.

The second part of the purpose will be of concern here. That is the identification of traffic safety concepts found to be familiar or unfamiliar to drivers. The purpose in presenting these data is to identify areas of strength and weakness in the driver's knowledge of traffic laws and safe driving practices.

The criterion for determining whether an item was familiar or unfamiliar follows: An item which 75 percent or more of the subjects answered correctly was considered to be familiar to the subjects. Any item which 75 percent or more of the subjects answered incorrectly was considered to be unfamiliar to the subjects.

The following procedure was used to identify familiar or unfamiliar items: Replies to each of the 110 test items in the experimental instrument were

analyzed in terms of the number of subjects answering each item correctly or incorrectly. Depending on the results of the above procedure, the items were classified either familiar or unfamiliar. The three categories of traffic safety knowledge mentioned earlier served as guidelines for determining the driver's strength and weaknesses in these knowledge areas.

Table IV and V present those items which were answered correctly by 75 percent or more of the subjects and those items which were answered incorrectly by 75 percent or more of the subjects.

It is revealed in Table IV that 42 items or 38.1 percent of the total 110 test items were answered correctly by 75 percent or more of the 500 subjects. These 42 items can be termed familiar to the subjects. It is further revealed that 50 percent of those items were from the traffic law and safe driving category, 41.7 percent represented the driving attitude category and 9.3 percent of the items were from the mechanical and manipulative skill category.

Table V reveals that 12 items or 10.9 percent of the total 110 item experimental instrument were answered incorrectly by 75 percent or more of the subjects. These 12 items can be termed unfamiliar to the subjects. It is further revealed that all three categories comprising knowledge of traffic laws and safe driving practices were represented here.

SUMMARY

The data presented in Tables IV and V pertaining to traffic safety concepts found to be familiar or unfamiliar to traffic violators and non-violators revealed that: Over three-fourths of the subjects in this study are knowledgeable to some extent in all three areas which comprise knowledge of traffic laws and safe driving practices. However, this knowledge is not extensive as is evidenced by the fact that only 38.1 percent of the total test items were answered correctly by 75 percent of the subjects. This factor becomes even more significant when

it is recognized that these items represent areas which traffic safety officials, driver educators and others feel are essential to the driving task.

The conclusion that can be drawn from the data presented here is that no one area of traffic safety knowledge appeared to be weaker than the other. Therefore, in order to improve the driver's knowledge of traffic laws and safe driving practices, the following must be implemented: (A) More emphasis must be placed on knowledge of driving attitudes, (B) Traffic laws and safe driving practices likewise must receive added emphasis, (C) Lastly, knowledge of mechanical and manipulative skill is essential to safe driving, therefore, greater emphasis must also be placed in this area.

TABLE IV

ITEMS WHICH 75 PERCENT OR MORE OF THE SUBJECTS ANSWERED CORRECTLY

ITEM NUMBER	ITEM CATEGORY	TRUE-FALSE ITEMS
1	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
2	DRIVING ATTITUDE	
4	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
9	DRIVING ATTITUDE	
11	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
12	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
17	DRIVING ATTITUDE	
20	MANIPULATIVE AND MECHANICAL SKILL	
22	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
23	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
25	DRIVING ATTITUDE	
27	DRIVING ATTITUDE	
33	DRIVING ATTITUDE	
36	DRIVING ATTITUDE	
38	MANIPULATIVE AND MECHANICAL SKILL	
42	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
43	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
44	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
45	DRIVING ATTITUDE	
47	DRIVING ATTITUDE	
49	DRIVING ATTITUDE	
51	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
53	DRIVING ATTITUDE	
60	DRIVING ATTITUDE	

*Table Continued on Next Page.

TABLE IV - CONTINUED

ITEM NUMBER	ITEM CATEGORY	MULTIPLE CHOICE ITEMS
2	DRIVING ATTITUDE	
3	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
5	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
9	DRIVING ATTITUDE	
10	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
11	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
12	MANIPULATIVE AND MECHANICAL SKILL	
14	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
15	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
19	DRIVING ATTITUDE	
20	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
28	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
37	DRIVING ATTITUDE	
38	DRIVING ATTITUDE	
39	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
40	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
41	DRIVING ATTITUDE	
42	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
	PERCENT OF TOTAL TEST ANSWERED CORRECTLY	38.1

TABLE V

ITEMS WHICH 75 PERCENT OR MORE OF THE SUBJECTS ANSWERED INCORRECTLY

ITEM NUMBER	ITEM CATEGORY	TRUE-FALSE ITEMS
26	MANIPULATIVE AND MECHANICAL SKILL	
35	DRIVING ATTITUDE	
57	DRIVING ATTITUDE	
61	DRIVING ATTITUDE	
		MULTIPLE CHOICE ITEMS
6	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
22	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
23	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
25	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
28	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
45	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
46	TRAFFIC LAWS AND SAFE DRIVING PRACTICES	
47	DRIVING ATTITUDE	

PERCENT OF TOTAL TEST ANSWERED INCORRECTLY: 10.9

CHAPTER V

ANALYSIS OF SUB-GROUP DATA

The purpose of this Chapter is to present data on the ten sub-groups consisting of individuals possessing similar characteristics. Although these data are not directly related to the stated purpose of this study, it does present information about the subjects used in the study; therefore, the writer included it in the body of this paper.

An attempt was made to identify items which differentiate between traffic violators and non-violators possessing similar characteristics. However, due to the paucity of subjects within each sub-group, few items were able to pass the Chi square test of significance.

The following data was derived from sub-group analysis:

Table VIII presents data on combined sub-groups A_1 and B_1. (See Appendix II, pp. 63). This sub-grouping consists of 16 traffic violators and 41 non-violators. The subjects within this group were matched on all five research variables. These variables are: (A) Age--The subjects are between the ages of 17 and 27 years old. (B) Education--They have less than eleven years of education. (C) Years of driving experience--The subjects have driven less than eleven years. (D) Miles driven per year--They drive less than eleven thousand miles a year and (E) Accidents--The subjects are accident-free.

It is further revealed that sub-groups A_1 and B_1 possess seven items which differentiated traffic violators from non-violators. This was the highest number of differentiating items found among the ten sub-groupings. Moreover, sub-groups A_1 and B_1 have next to the lowest number of correctly answered items.

Table IX presents data on combined sub-groups A_2 and B_2. (See Appendix II, pp. 64). This sub-grouping consists of 25 traffic violators and 11 non-violators. The subjects within this group were matched on all five research variables.

These variables are: (A) Age--The subjects are between the ages of 17 and 27 years old. (B) Education--They have less than eleven years of education. (C) Years of driving experience--The subjects have been driving less than eleven years. (D) Miles driven per year--They drive less than eleven thousand miles a year. (E) Accidents--The subjects have been involved in one or more accidents.

Table IX reveals that three items were found which differentiate traffic violators from non-violators. A factor of further significance is that this group contains the highest number of items answered correctly (35) by 75 percent or more of the subjects in this grouping. Moreover, they have the least number of items answered incorrectly.

Table X presents data on combined sub-groups A_3 and B_3. (See Appendix II, pp. 65). This sub-grouping consists of 21 traffic violators and 14 non-violators. The subjects within this group were matched on all five research variables. These variables were: (A) Age--The subjects are between the ages of 17 and 27 years old. (B) Education--They have less than eleven years of education. (C) Years of driving experience--The subjects have been driving less than eleven years. (D) Miles driven per year--They have driven more than eleven thousand miles a year. (E) Accidents--The subjects are accident free.

Table X further reveals that only one item differentiates traffic violators from non-violators in this grouping. Along with having one of the fewest number of differentiating items, sub-group A_3 and B_3 have the second lowest number of items found to be significant in the first Chi square analysis but failed to hold up in the cross-validation process.

Table XI presents data on combined sub-groups A_4 and B_4. (See Appendix II, pp. 66). This sub-grouping consists of 36 traffic violators and 4 non-violators. The subjects within this grouping were matched on four research variables. These variables were: (A) Age--The subjects are between the ages of 17 and 27 years old. (B) Education--They have less than eleven years of education. (C) Years of driving experience--The subjects have been driving less than eleven years. (D) Miles driven per year--They drive more than eleven thousand miles a year. (E) Accidents--They have been involved in one or more accidents. The subjects in sub-group A_4 and B_4 failed to be matched on one research variable. This variable was: Years of driving experience.*

Table XI reveals that there is only one item which differentiates traffic violators from non-violators in this sub-grouping. It is further revealed that sub-group A_4 and B_4 is among three sub-groups which have eight items which all subjects within the sub-group answered correctly. These items represent the category of traffic laws and safe driving practices.

Table XII presents data on combined sub-groups A_5 and B_5. (See Appendix II, pp. 67). This sub-grouping consists of 5 traffic violators and 32 non-violators. The subjects within this grouping were matched on three research variables. These variables were: (A) Age--The subjects are between the age of 17 and 27 years old. (B) Education--They have more than eleven years of education. (C) Accidents--The subjects are accident free. The subjects in sub-groupings A_5 and B_5 failed to be matched on two research variables which were: (A) Years of driving experience and (B) Miles driven per year.

It is revealed by Table XII that only one item was found to differentiate traffic violators from non-violators in this sub-grouping. However, this sub-grouping is one of three groupings in which eight items were found to be answered

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*This sub-grouping and five others failed to be matched on all five research variables. This failure is due to an insufficient number of subjects in the groupings possessing the unmatched variable as well as the matched variable.

correctly by all subjects within the sub-group. These eight items were from the traffic laws and safe driving practices category. A further note of interest is that sub-groupings A_5 and B_5 are one of three groupings which 34 or more items were answered correctly by 75 percent or more of the subjects within the sub-grouping.

Table XIII presents data on combined sub-groups A_6 and B_6. (See Appendix II, pp. 68). This sub-grouping consists of 26 traffic violators and 18 non-violators. The subjects within this grouping were matched on three research variables. These variables are: (A) Age--The subjects are between the ages of 17 and 27 years old. (B) Education--They have more than eleven years of education. (C) Years of driving experience--The subjects have been driving less than eleven years. The subjects in sub-groupings A_6 and B_6 failed to be matched on two research variables which were: (A) Miles driven per year and (B) Accidents.

Five items are found in this sub-group which differentiate traffic violators from non-violators. However, the point of real significance is the large number of items (8) which all subjects in this sub-grouping answered correctly. Another point of interest is the low degree of items (13) answered incorrectly by 75 percent or more of the subjects in this sub-grouping.

Table XIV presents data on combined sub-groupings A_7 and B_7. (See Appendix II, pp. 69). This sub-grouping consists of 54 non-violators and 10 violators. The subjects within this grouping were matched on four research variables. These variables are: (A) Age--The subjects are between the ages of 27 and 73 years old. (B) Education--They have less than twelve years of education. (C) Miles driven per year--The subjects have driven less than eleven thousand miles per year. (D) Accident experience--They are traffic accident free. The subjects were unable to be matched on one research variable. This variable was: Years of driving experience.

Four items were found to differentiate traffic violators from non-violators. It is further revealed that sub-grouping A_7 and B_7 is one of four sub-groups which failed to produce a single item which all group members answered correctly. However, this sub-grouping produced a large number of items (32) which 75 percent or more of the subjects answered correctly.

Table XV presents data on combined sub-groups A_8 and B_8. (See Appendix II, pp. 70). This sub-grouping consists of 49 traffic violators and 12 non-violators. The subjects in this sub-grouping were matched on three research variables. These variables are: (A) Age--The subjects are between the ages of 27 and 73 years old. (B) Education--They have less than twelve years of education. (C) Accident experience--The subjects have been involved in one or more accidents.

The subjects in sub-grouping A_8 and B_8 failed to be matched on two research variables which were: (A) Years of driving experience and (B) Miles driven per year.

Five items were found to differentiate traffic violators from non-violators in this sub-grouping. It is further revealed that four of the five items were from the category of driving attitudes. The factor of significance here is that sub-grouping A_8 and B_8 is the only grouping where the category of knowledge about driving attitudes has been identified as an area of major difference between violators and non-violators in this study.

Table XVI presents data on combined sub-groups A_9 and B_9. (See Appendix II, pp. 71). This sub-grouping consists of 55 non-violators and 16 violators. The subjects within this sub-grouping were matched on all five of the research variables. These variables are: (A) Age--The subjects are between the ages of 27 and 73 years old. (B) Education--They have less than twelve years of education. (C) Years of driving experience--The subjects have more than eleven years of driving experience. (D) Miles driven per year--The subjects

drive more than eleven thousand miles a year. (E) Accident experience--They are accident-free.

Table XVI reveals that five items differentiate traffic violators from non-violators. The majority of these items (3) were from the traffic laws and safe driving practices category.

Table XVII presents data on combined sub-groups A_{10} and B_{10}. (See Appendix II, pp. 72). This sub-grouping consists of 16 traffic violators and 34 non-violators. The subjects within this group were matched on three research variables. These variables are: (A) Age--The subjects are between the ages of 27 and 73 years old. (B) Education--They have more than twelve years of education. (C) Years of driving experience--The subjects have more than eleven years of driving experience. The subjects in sub-group A_{10} and B_{10} failed to be matched on two research variables. They were: (A) Average miles driven per year and accident experience. Two items were found to differentiate traffic violators from non-violators in this grouping. However, the most significant factor revealed by Table XVII is the large number of items (47) found to differentiate traffic violators from non-violators in the first Chi square analysis, but failed to hold up in the cross-validation process. The 47 items which failed to continue to differentiate was the largest such group of items among the 10 sub-groupings.

The cross-validation process is exemplified in this sub-grouping. That is, through the use of the cross-validation process, those items which truly differentiated traffic violators from non-violators were brought forth.

Conclusions: Because of the limited number of subjects within each of the 10 sub-groupings, the writer decided not to draw conclusions on data derived from each sub-group separately. However, conclusions can be drawn from the sub-group data as a whole. It was the intent of the writer to draw conclusions on all five research variables. However, the data on two variables did not lend itself to study, therefore, the conclusions will be drawn on the following variables.

(A) Age--There is a high relationship between violations and accidents for the younger group of subjects. However, the older groups tend to show a lesser relationship between violations and accidents.

(B) Average Miles Driven Per Year--There is a high relationship between miles driven and violations. That is, groups of individuals with a high mileage driven rate tend to have a high violation rate.

(C) Accident Experience--As an over-all picture of accident involvement, the data revealed that a higher percentage of traffic violators were involved in accidents than the non-violators.

CHAPTER VI

SUMMARY AND CONCLUSION

I. SUMMARY

The purpose of this study was to develop an instrument consisting of items pertaining to traffic laws and safe driving practices which were answered significantly different by traffic violators and non-violators, thus differentiating between the two. Also of concern in the development of this instrument was the search for traffic safety concepts which are familiar or unfamiliar to drivers.

The following steps were undertaken in the process of determining this instrument:

(A) Concepts of traffic laws and safe driving practices thought to be essential to the driving task were identified. These concepts were derived from 210 identified by Blackburn. From Blackburn's 210 concepts, 66 were chosen. An experimental instrument consisting of 110 multiple choice and true-false items was developed to cover these concepts.

(B) An hypothesis was stated in the null form. This hypothesis stated: There will be no significant difference in mean scores on a knowledge test of traffic laws and safe driving practice between groups of traffic violators and non-violators. Moreover, no items on a test of traffic laws and safe driving practices will be found to differentiate traffic violators from non-violators. The hypothesis was stated in the null form so that the data are given a chance to disprove it.

(C) The experimental instrument was administered to 500 Detroit metropolitan and Wayne County Michigan male drivers. The purpose of this

administration was to identify items which were answered significantly different by traffic violators and non-violators.

(D) An analysis was made of the results of the administration of the experimental instrument to the 500 subjects. This group consists of 223 traffic violators and 277 non-violators. The analysis was intended to reveal those items which were answered significantly different by the two groups, thus identifying items to be placed in the research instrument.

In order to develop the research instrument and test the hypothesis, the 500 subjects were randomly assigned to two equal groups (A and B) of 250 subjects each. Group A was termed "the validation group". This group was the first in this study to be submitted to the Chi square analysis. Group B was termed the "cross-validation group". This group was submitted to the second Chi square analysis to determine whether the items found to differentiate in group A continues to do so in group B. Those items which continue to differentiate constitute the research instrument. As a further part of the study, the subjects were matched in terms of five research variables: (A) Age, (B) Extent of education, (C) Years of driving experience, (D) Average miles driven per year and (E) Accident experience.

In order to match the subjects on as many of the five variables as possible, ten sub-groups were developed. Each of the ten sub-groups consist of subjects matched on at least three of the five research variables. The results of the data analysis follows:

(1) The hypothesis testing procedure revealed that there was a statistically significant difference between the mean scores of the traffic violator group and the non-violator group on the 29 items which constituted the research instrument. This difference was determined by two statistical tests. First, the F-test was employed to determine whether the variance of the scores of the matched population might be different. Second the t-test of significance was used

to test the significance of the difference between the two group scores. The results of the F-test revealed that the difference of variances between the two group scores was at a probability of 1.35. That is, the chances of variances of the two groups being different was more than 99.9 in 100. This indicates that the traffic violators and non-violators differed significantly in their knowledge of traffic laws and safe driving practices.

(2) Using Chi square analysis to determine differentiating items, it was found that 27.1 percent or 29 of the 110 items in the experimental instrument held up in the cross-validation process, between group A and B at the .15 level of significance or better. These 29 items constitute the research instrument.

(3) Through categorizing the responses to the items in the research instrument into three descriptive categories, (A) Items pertaining to knowledge about traffic laws and safe driving practices, (B) Items pertaining to knowledge about driving attitudes and (C) Items pertaining to knowledge about mechanical and manipulative skills. The significant factor revealed here is that the items comprising the research instrument and which also exemplified the three descriptive categories were distributed proportionally the same throughout both the research instrument and the experimental instrument.

(4) In regard to the factors revealed about the group characteristics of the subjects, it was revealed that the average age of the traffic violator group is 29.5 years. They have completed eleven years of education and have been driving for 12 years. They drive more than 17.5 thousand miles a year and have been involved in 1.2 accidents and have 5.1 traffic violations.

The non-violator group is 34.8 years old, has completed more than 12 years of education, has been driving 17.9 years and drive 11.9 thousand miles a year. They have been involved in .2 accidents and have a violation free driving record.

(5) Forty-two items or 38.1 percent of the total 110 item experimental instrument were answered correctly by 75 percent or more of the 500 subjects.

These 42 items can be termed familiar items to the study group. Furthermore, 12 items or 10.4 percent of the items in the instrument were answered incorrectly. These ten items can be termed unfamiliar.

II. CONCLUSION

On the basis of the results of the present study, several conclusions are made:

1. There is a significant difference in mean scores on a knowledge test of traffic laws and safe driving practices between groups of traffic violators and non-violators.

2. Items can be found on a test of traffic laws and safe driving practices which are answered significantly different by traffic violators and non-violators.

3. No one area of traffic safety knowledge appeared to be weaker than the other; therefore, in order to improve the driver's knowledge of traffic laws and safe driving practices, equal emphasis must be placed on knowledge of driving attitudes, traffic laws and safe driving practices in addition to knowledge of mechanical and manipulative skill.

4. There are concepts of traffic laws and safe driving practices which are familiar to motor vehicle drivers. There are also concepts which are unfamiliar to these drivers.

5. The employment of the Chi square analysis and the cross-validation process facilitates the selection of test items which will differentiate traffic violators from non-violators.

III. RECOMMENDATIONS

On the basis of the results of the present study, several recommendations can be made for the improvement of traffic safety:

1. All instruments employed by traffic safety officials, driver educators and others to ascertain the driver's knowledge of traffic laws and safe driving practices should be submitted to the Chi square analysis and cross-validation procedure, so as to include only those items in their instruments which differentiate traffic violators from non-violators.

2. All drivers should be subjected to a periodic license renewal examination. Individuals who are found to be deficient in knowledge of traffic laws and safe driving practices should be required to attend a driver's improvement school.

3. All traffic violators should be required to attend a driver improvement school.

4. An increased program of public information regarding traffic laws and safe driving practices should be initiated.

IV. IMPLICATIONS FOR FURTHER RESEARCH

A number of recommendations for future research are tenable.

1. Test the research instrument developed in this study on the general driving public to determine whether the instrument has predictive powers. That is, will it differentiate traffic violators from non-violators.

2. Submit the State Driver License Examinations to a statistically designed study similar to the one conducted here. The purpose of such an undertaking would be:

(a) To determine the weak and the strong points in the present tests and,

(b) To determine areas of knowledge deficiency on the part of drivers.

3. Although the study results seem to allude that the findings are unique to the Detroit area drivers, the writer feels that the results can be applied to drivers throughout the State. Therefore, it is recommended that a study similar to the present investigation be undertaken on a State-wide basis.

4. The remainder of Blackburn's 210 traffic safety concepts should be tested to determine whether or not they are essential to the driving task.

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APPENDIX I

CHARACTERISTICS AND NUMBER OF SUBJECTS IN THE TEN SUB-GROUPS

TABLE VI

THE CUT-OFF POINT RANGE FOR EACH RESEARCH VARIABLE AND THE NUMBER OF SUBJECTS IN EACH RANGE GROUP

VARIABLE	CUT-OFF POINT	RANGE OF LOW GROUP	RANGE OF HIGH GROUP	NUMBER OF SUBJECTS FROM GROUP A		NUMBER OF SUBJECTS FROM GROUP B	
				HIGH	LOW	HIGH	LOW
Age By Year	27	16-27	28-73	122	128	127	123
Education	12	6-12	13-18	75	175	60	190
Driving Experience By Years	10	1-10	11-49	111	139	123	127
Miles Driven Per Year By Thousands	11	1-11	12-100	130	120	130	120
Accidents In Past Three Years	0	0	1-9	97	153	86	164

TABLE VII

DISTRIBUTION OF SUBJECTS IN SUB-GROUPS 1-10
AS DRAWN FROM CROSS-VALIDATION GROUPS A AND B

	CROSS-VALIDATION	
Sub-Group	Group A	Group B
1	27*	30*
2	18	18
3	19	16
4	18	22
5	16	21
6	28	16
7	34	30
8	33	28
9	26	45
10	28	22

*These numbers represent the total number of subjects from each group.

APPENDIX II

ANALYSIS OF DATA IN THE TEN SUB-GROUPS

TABLE VIII

ANALYSIS OF COMBINED DATA OF SUB-GROUPS A_1 AND B_1

Differentiating Items		Familiar Items		Unfamiliar Items		Partially Significant Items*	
3**	15***	2**	5***	16**	29***	8**	3***
5	32	6	7	18	40	11	4
7		9	8	24		12	5
21		10	10	26		13	6
59		14	12	35		19	11
		27	13	39		21	14
		28	18	40		22	16
		34	19	46		29	23
		45	28	48		30	24
		49	31	56		31	25
			35	61		32	27
			36			33	30
			37			38	33
			38			41	34
			41			42	44
			42			43	45
						44	
						50	
						51	
						52	
						53	
						55	
						57	
						58	
						62	

*Items which were answered differently by violators and non-violators in the first Chi square analysis but failed to hold up in the cross-validation process.

**This column denotes true-false items.

***This column denotes multiple choice items.

TABLE IX

ANALYSIS OF COMBINED DATA OF SUB-GROUPS A_2 AND B_2

Differentiating Items		Familiar Items		Unfamiliar Items		Partially Significant Items*	
6**	39***	4**	3***	26**	4***	2**	2***
	42	5	5	56	25	3	14
		7	8	61	26	6	16
		9	11		29	10	17
		12	13		41	12	21
		13	18		43	15	22
		14	20		45	16	27
		20	24			18	32
		21	31			24	
		22	33			38	
		23	35			39	
		25	36			41	
		28	37			46	
		30	38			48	
		31	44			50	
		42				58	
		45					
		47					
		52					
		55					
		57					
		59					

*Items which were answered differently by violators and non-violators in the first Chi square analysis but failed to hold up in the cross-validation process.

**This column denotes true-false items.

***This column denotes multiple choice items.

TABLE X

ANALYSIS OF COMBINED DATA OF SUB-GROUPS A_3 AND B_3

Differentiating Items	Familiar Items		Unfamiliar Items		Partially Significant Items*	
17***	2**	2***	16**	6***	6**	6***
	3	3	18	7	15	9
	7	5	19	10	26	12
	8	27	24	16	31	13
	10	30	26	18	39	14
	11	35	35	21	40	19
	12	37	40	22	58	20
	13	39	41	23	59	24
	17	41	44	26		25
	20	42	46	29		31
	21	46	48	32		36
	27		50	34		54
	29		61	40		55
	34			43		
	38			44		
	42			45		
	43			47		
	47					
	49					
	51					
	62					
	63					

*Items which were answered differently by violators and non-violators in the first Chi square analysis but failed to hold up in the cross-validation process.

**This column denotes true-false items.

***This column denotes multiple choice items.

TABLE XI

ANALYSIS OF COMBINED DATA OF SUB-GROUPS A_4 AND B_4

Differentiating Items	Familiar Items		Unfamiliar Items		Partially Signifcant Items*	
13***	1/	1/	16**	4***	15**	6***
	2**	8***	18	9	33	17
	3	11/	24	16	38	21
	4	12/	35	21	41	22
	5/	14	39	26	48	23
	6	15/	40	28	49	25
	7	27	44	29	57	29
	8	30	46	43	58	32
	9	31	48	45		33
	10	35	50	47		39
	11/	36	56			40
	12	38	62			41
	13	46				44
	17/					
	20					
	21					
	22					
	23					
	25					
	28					
	31					
	34					
	36					
	42					
	43					
	47					
	53/					
	54					
	63					

*Items which were answered differently by violators and non-violators in the first Chi square analysis but failed to hold up in the cross-validation process.

**This column denotes true-false items.

***This column denotes multiple choice items.

/Items all subjects answered correctly.

TABLE XII

ANALYSIS OF COMBINED DATA OF SUB-GROUPS A_5 AND B_5

Differentiating Items	Familiar Items		Unfamiliar Items		Partially Significant Items*	
32**	1/	2***	16**	4***	10**	28***
	4**	7	18	6	16	35
	5/	8	35	9	27	38
	9	11/		10	31	40
	14/	12/		21	34	42
	19	13		22	35	43
	20	14		23	44	44
	22	15		25	46	
	25	16		26	50	
	28	18		29	54	
	29	19		32	58	
	30/	20		45		
	33/	24				
	36/	27				
	37	31				
	39	34				
	41	41				
	43	46				
	47					
	51					
	52/					
	55					
	62					
	63					

*Items which were answered differently by violators and non-violators in the first Chi square analysis but failed to hold up in the cross-validation process.

**This column denotes true-false items.

***This column denotes multiple choice items.

/Items all subjects answered correctly.

TABLE XIII

ANALYSIS OF COMBINED DATA OF SUB-GROUPS A_6 AND B_6

Differentiating Items		Familiar Items		Unfamiliar Items		Partially Significant Items*	
18**	6***	1/	1/	26**	4***	13**	10***
	11	2/	3***	35	22	15	17
	14	3**	5/	48	25	16	18
	21	4	7/	56	26	19	23
		6	8		28	30	31
		7	13		29	39	32
		8	15/		45	49	43
		9	19		47		
		20	20				
		23	30/				
		27	34				
		29	36				
		31	37				
		32	38				
		34	42				
		41	44				
		47	46				
		49					
		50					
		52/					
		59					
		60					
		61					
		62					
		63					

*Items which were answered differently by violators and non-violators in the first Chi square analysis but failed to hold up in the cross-validation process.

**This column denotes true-false items.

***This column denotes multiple choice items.

/Items all subjects answered correctly.

TABLE XIV

ANALYSIS OF COMBINED DATA OF SUB-GROUPS A_7 AND B_7

Differentiating Items	Familiar Items		Unfamiliar Items		Partially Significant Items*	
1**	1**	9***	16**	6***	3**	11***
22	2	10	24	14	10	15
27	4	13	26	19	13	25
30	6	18	35	20	14	29
	7	31	40	23	15	
	8	37	48	28	19	
	9	41	56	32	21	
	10	42	58	43	23	
	12	46	61	44	28	
	17		62	45	29	
	20			47	30	
	22				31	
	27				32	
	34				39	
	36				41	
	37				42	
	38				46	
	43				47	
	44				50	
	45				51	
	49				55	
	53				60	
	59				63	

*Items which were answered differently by violators and non-violators in the first Chi square analysis but failed to hold up in the cross-validation process.

**This column denotes true-false items.

***This column denotes multiple choice items.

TABLE XV

ANALYSIS OF COMBINED DATA OF SUB-GROUPS A_8 AND B_8

Differentiating Items		Familiar Items		Unfamiliar Items		Partially Significant Items*	
47**	17***	1**	1***	15**	4***	3**	20***
	21	2	2	16	6	5	22
	41	6	3	18	19	7	24
	42	8	5	19	25	10	29
		9	11	40	26	13	32
		11	12	56	39	24	33
		12	13	58	40	25	37
		14	15	61	43	30	45
		17	27		44	33	
		20	30			34	
		21	35			37	
		22	36			38	
		23	46			40	
		27				42	
		29				46	
		31				48	
		32				50	
		36				51	
		43				57	
		45				62	
		49					
		55					
		59					
		60					
		63					

*Items which were answered differently by violators and non-violators in the first Chi square analysis but failed to hold up in the cross-validation process.

**This column denotes true-false items.

***This column denotes multiple choice items.

TABLE XVI

ANALYSIS OF COMBINED DATA OF SUB-GROUPS A_9 AND B_9

Differentiating Items	Familiar Items		Unfamiliar Items		Partially Significant Items*	
7**	3**	1***	15**	4**	1**	7***
10	6	2	24	6	2	8
32	13	3	25	14	4	10
38	17	5	26	20	5	13
57	23	9	39	23	8	15
	27	11	41	25	11	16
	29	12	46	32	12	17
	31	18	48	41	14	21
	33	27	56	45	19	24
	34	30	58		20	26
	37	35	61		21	31
	42	36	62		22	37
	43				28	38
	45				30	39
	47				35	40
	60				36	42
	63				40	43
					50	44
					51	46
					52	47
					54	
					55	

*Items which were answered differently by violators and non-violators in the first Chi square analysis but failed to hold up in the cross-validation process.

**This column denotes true-false items.

***This column denotes multiple choice items.

TABLE XVII

ANALYSIS OF COMBINED DATA OF SUB-GROUPS A_{10} AND B_{10}

Differentiating Items	Familiar Items		Unfamiliar Items		Partially Significant Items*		
32**	1/	2***	20**	4***	1**	52**	10***
40	11/	5	35	6	3	53	14
	17**	8	48	25	5	54	16
	22	9	56	28	7	55	17
	23	13	58	40	8	59	18
	25	24	61	43	9	62	21
	26	33		44	10	63	23
	27	37		45	11		26
	30/			47	12		31
	34				13		35
	37				14		36
	41				16		42
	43				18		45
	51				19		46
					24		
					28		
					29		
					31		
					32		
					33		
					38		
					39		
					42		
					44		
					45		
					46		

*Items which were answered differently by violators and non-violators in the first Chi square analysis but failed to hold up in the cross-validation process.

**This column denotes true-false items.

***This column denotes multiple choice items.

/Items all subjects answered correctly.