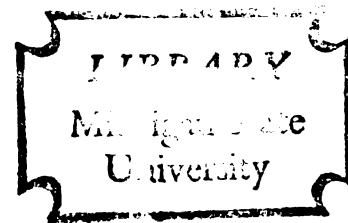




THESIS



This is to certify that the

thesis entitled

PROBLEMS OF A SELECT GROUP  
OF OLDER DRIVERS

presented by

Harry Lang McDonald

has been accepted towards fulfillment  
of the requirements for

Ph.D. degree in Education

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## ABSTRACT

### PROBLEMS OF A SELECT GROUP OF OLDER DRIVERS

by

Harry Lang McDonald

The purpose of this study was to determine specific driving problems of a selected sample of older drivers.

A pilot study was conducted to discern the quality of the questionnaire and to determine if the items were clearly stated. The sample population of ninety-six persons who completed the questionnaire was taken from a Defensive Driving Course sponsored by the American Association of Retired Persons in the Detroit, Michigan, area. An evaluation of the results of the pilot study was made with the appropriate corrections incorporated into the revised questionnaire.

The subjects used in the final analysis were one hundred eighty-six persons who possessed driver's licenses and who were also members of one of the eleven retirement clubs in Ingham County, Michigan, registered with the Michigan Commission on Aging. The subjects were asked to complete a copy of the questionnaire during a regularly scheduled meeting. Only those club members in attendance, who operated a motor vehicle, and who were over sixty-five years of age were asked to complete the questionnaire.

The following conclusions have been reached regarding general driving problems of this select group of older drivers:

- 1) The subjects realized inherent problems in driving during peak hours, in heavy traffic hours, or during dark hours, but that they did not recognize the specific problem as nervousness.
- 2) A review of selected literature revealed that there is a need for awareness of physical limitations related to audition and the aging process. The responses in this area would seem to indicate a lack of concern for the problems associated with loss of hearing.
- 3) That those participating in this study, as well as those depending on them for transportation, would be forced to change their everyday mode of living if the driving privilege were taken away.
- 4) The review of related literature would seem to suggest that this age group possibly should encounter additional problems not indicated by their responses to this questionnaire. It would seem that this select group was far above average or that they did not realize that they had additional problems.
- 5) Responses which the subjects recorded were the only source of data. A variety of tests methods, had they been utilized, might have reduced the length of the questionnaire and might possibly have given more detailed answers in those areas. The limitation of dependence on the subjects answers gave other valuable insight. The subject may or may not have given the correct response but he did give what he thought to be the correct response.

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By  
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The author dedicates this paper to the memory of  
Garrett Beshear for his encouragement and guidance which  
made not only this paper but the degree for which the  
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To the individual who gave up her father not only willingly but many times, as a result of her age, did not understand why, the author expresses a special thank you to his daughter, Lisa Louise.

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## CHAPTER I

### THE PROBLEM AND DEFINITIONS OF TERMS USED

#### I. THE PROBLEM

The older driver has been and continues to be under the scrutiny of the general driving population. This has been especially true since the advent of modern high-speed vehicles and highways with their many ramifications. Unfortunately, there has been relatively little research to ascertain any deficiencies which may occur within this age group. With the limited amount of knowledge concerning the older driver and their driving habits, the solution advanced by many is to retire the older drivers from the ranks of those who are privileged to operate a motor vehicle.

Statement of the problem. The purpose of this study was to determine the general driving problems of a select group of older drivers. A secondary objective of the study was to determine if the attitude, knowledge, and general information sections incorporated within the questionnaire had a relationship to the general driving problems of this select group of older drivers.

Need for the study. If the driving privilege is taken away from the older driver at a predetermined age, there

would be those denied the privilege to drive who are, or who could be, capable drivers. In addition, there is usually a severe emotional shock associated with the withdrawal of the driving privilege. This researcher feels that a more appropriate approach would be to determine those problems which are most prevalent in the older driver and ascertain whether those problems could be corrected or compensated for.

Delimitations. The study was restricted to members of those retirement clubs, within Ingham County, Michigan, who were registered with the Michigan Commission on Aging. Only those drivers in attendance during the regular club meeting were asked to complete a questionnaire.

Limitations. The importance of truthful responses to each question incorporated within the questionnaire and the possibility of less than truthful answers.

## II. DEFINITIONS OF TERMS

Scotopic conditions. Scotopic conditions referred to dark or night hours.

Photopic conditions. Photopic conditions apply to light or day hours.

Disengagement. Disengagement, for this study, meant the separation of the individual from society as a result of his own choice.

Older driver. The older driver, for this study, referred to subjects who were sixty-five years or older.

Change of "set". The change of "set" referred to the ability of a person to deviate from his normal pattern of behavior in order to cope with the situation at hand.

### III. ORGANIZATION OF THE REMAINING CHAPTERS

Chapter II contains a summary of the literature related to this study. The categories considered are: 1) The Psychophysical Aging Process, 2) Psychological, Sociological, and Biological Aspects of the Aging Process, and 3) The Driving Task as Related to the Older Driver.

Chapter III contains a delineation of the procedures for obtaining data for this study. Included are: 1) A description of the subjects, 2) Procedures of Measurement, 3) Testing Procedures, 4) Organization of Data, and 5) Analysis of Data.

Chapter IV contains the analysis of data collected for this study. The general areas are as follows: 1) Demographical Data, 2) Knowledge and Attitude Sections of the Questionnaire, 3) Problems that Subjects Indicated they Experienced in Driving, 4) Questions not Related to the General Problem Areas, and 5) the Summary.

Chapter V includes a summary for the study, conclusions and recommendations.

## CHAPTER II

### REVIEW OF RELATED LITERATURE

Chapter I contained a discussion of the problem, definitions of terms used in the study, and the organization of chapters which follow. This chapter contains a summary of the literature related to this study. The first of three categories considers research as it pertains to the psychophysical aging processes of vision, audition and reaction time. The second category applies to the psychological, sociological, and biological aspect of aging. The third category deals with the driving task and its relationship to the first two categories.

#### I. THE PSYCHOPHYSICAL AGING PROCESS

Visual. Byrnes in 1967 divided the driving task into three phases: the information obtaining phase, a decision making phase, and an action phase.<sup>1</sup> She cited the visual sense as the predominant phase in the driving task. The critical elements of the visual phase were listed as: detection of objects, definition and recognition of objects, determination of distance between objects, and recognition of

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<sup>1</sup>V. A. Byrnes, "Vision and Its Importance in Driving," Sight Saving Review, 37(2):87-91, 1967.

color as related to traffic control devices. She recommended that visual field, color vision and night acuity, with and without glare, be added to the driver's vision test. She added that after the age of sixty-five the entire test should be administered every two years until the individual no longer operated a motor vehicle.

Planek, Condon, and Fowler related that one of the effects definitely demonstrated in aging was that of reduction of visual efficiency.<sup>2</sup> One area in which this lack of efficiency was apparent was glare recovery. Glare is the result of light entering the eye in such a manner as to inhibit distinct vision. Wolf in 1960 gave three general types of glare.<sup>3</sup> The first is veiling glare, which occurs when light is superimposed on the image as it appears on the retina and reduced the contrast needed for distinct vision; the second is dazzling glare which occurs when all light levels are high which produces a dazzling effect; and the third type of glare is a result of high light intensity which reduces retinal sensitivity in part or whole and results in the blinding of the individual. This type is called scotomatic glare.

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<sup>2</sup>Thomas W. Planek, Margaret E. Condon, and Richard C. Fowler, An Investigation of the Problems and Opinions of Aged Drivers, Report No. 5/68 (Chicago: National Safety Council, 1968), pp. 25-26.

<sup>3</sup>E. Wolf, "Glare and Age," Archives of Ophthalmology (October, 1964), pp. 502-14.

Forbes, Vanosdall, Pain and Bloomquist in 1968 reported a decrease of visual acuity with increasing age in all areas.<sup>4</sup> They also reported a number of individual cases showing night vision difficulty not only in the higher age groups but also in younger groups.

Individuals differ in their ability to recover from glare. The ability of the pupil of the eye to constrict and dilate quickly with the change of luminance level is one example.<sup>5</sup> A second example is the amount of scatter of light through the various bodies or parts which make up the eye. This quality changes with increasing age to produce more and more scatter. This hypothesis as an explanation for reduced visual acuity was disproven to a degree as a result of research conducted in 1967 by Allen and Vos.<sup>6</sup> They contended that the concept of ocular scatter (at least in the interior portions of the eye) does not adequately explain the loss of visual acuity in the older subjects tested. Acuity in this group was inversely related to age.

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<sup>4</sup>T. W. Forbes, F. Vanosdall, R. R. Pain, and D. W. Bloomquist, Low Contrast and Standard Visual Acuity Under Mesopic and Photopic Illumination (Highway Traffic Safety Center and Department of Psychology, Continuing Education Service, Michigan State University, East Lansing, Michigan), pp. 1-2.

<sup>5</sup>Planek, Condon, and Fowler, op. cit., p. 26.

<sup>6</sup>M. J. Allen and J. J. Vos, "Ocular Scattered Light and Visual Performance as a Function of Age," American Journal of Optometry and Archives of American Academy of Optometry, 44:717-28, 1967.

Weale in 1961 suggested that, under both daylight and dark conditions, amounts of illumination reaching the retina decreases as a function of age.<sup>7</sup> Weale attributed this loss to such factors as stiffening of the cornea, lessened adaptability of the pupillary reflexes, yellowing of the crystalline lens, development of opacities in the vitreous humor, and changes in the density and structure of the retina.

Wolf in 1964 indicated that with increasing age the ability to see after glare depended upon luminance of the target, large size, and shorter distance from the eye to the target.<sup>8</sup> Christie and Fisher<sup>9</sup> and Reading in both 1966<sup>10</sup> and 1968<sup>11</sup> also contended that there was a definite age relation factor.

Rodstein in 1966 stated that "between the ages of sixteen and ninety years recovery time from exposure to

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<sup>7</sup>R. A. Weale, "Retinal Illumination and Age," Transactions of the Engineering Society, 26:95-99, 1961.

<sup>8</sup>Wolf, op. cit., pp. 502-14.

<sup>9</sup>A. W. Christie and A. J. Fisher, "The Effect of Glare from Street Lighting Lanterns on the Vision of Drivers of Different Ages," Transactions of the Illuminating Engineering Society, 31:93-108, 1966.

<sup>10</sup>V. M. Reading, "Yellow and White Headlamp Glare and Age," Transactions of the Illuminating Engineering Society, 31(4):109-21, 1966.

<sup>11</sup>V. M. Reading, "Disability Glare and Age," Vision Research, 8:207-14, 1968.

glare is doubled every thirteen years."<sup>12</sup> The American Automobile Association cited findings of McGough which suggested that this reduction of ability was especially true under scotopic (night) conditions.<sup>13</sup> Although he found no significant differences at any age level, he suggested that the amount of light necessary to make an object visible was about four times as great when glare was present. Burg found increasing threshold levels and increasing recovery time for both male and female subjects when they were separated into five-year age groups.<sup>14</sup> Correlations were obtained between both threshold and recovery test, and age. The correlation was low when related to age. He suggested that although trends were correlated with age groups that individual cases did not themselves show as reliable a relationship. Therefore, prediction between age and performance is not certain.

Another area within the visual task which is manifested with advancing age is that of peripheral vision. Wolf in 1967

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<sup>12</sup>M. Rodstein, "The Effects of the Aging Process on Accidents in Older and Aged Adults" (Paper presented at the Annual Meeting of the National Safety Council, Chicago, October 26, 1966).

<sup>13</sup>American Automobile Association, Field of Vision as Related to Age (Research Report No. 67, Washington, D. C., 1965).

<sup>14</sup>Burg, "Light Sensitivity as Related to Age and Sex," Perceptual and Motor Skills, 24:1279-88, 1967.

revealed that there was a slight, but distinct, decline in the visual field of his subjects up to the age of fifty-five with a more pronounced shrinkage in each decade that followed.<sup>15</sup> He also reported pronounced changes in sensitivity which occurred after the age of sixty. He maintained that retinal changes which have been detected at this age are associated with the changes in the metabolism of the retina. The changes were related to oxygen deprivation. Young subjects exhibited similar losses in visual sensitivity after deliberate denial of oxygen. Burg reported that the field of vision was constant to approximately the age of thirty-five, thereafter it narrowed progressively with advancing age.<sup>16</sup> It was interesting to note that Burg found that females consistently demonstrated a slightly larger field of vision than males. Burg concurred with the earlier study of Wolf that there is a gradual loss of sensitivity up to the age of approximately fifty-five and a very rapid loss in years which follow.<sup>17</sup>

Burg suggested that the normal "static visual acuity test" does not reveal an important aspect of the visual

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<sup>15</sup>E. Wolf, Study on the Shrinkage of the Visual Field with Age, Highway Research Record No. 164 (Washington, D. C.: National Academy of Sciences, 1967) pp. 1-7.

<sup>16</sup>A. Burg, "Lateral Vision Field as Related to Age and Sex," Journal of Applied Psychology, 52:10-15, 1968.

<sup>17</sup>E. Wolf, op. cit., 502-14.

task.<sup>18</sup> He went on to report that the functional testing of the driver's vision must also be taken into account. "Dynamic visual acuity" was the term used for this type of test. This additional test of visual acuity should be used not only at photopic (daylight) but also in levels of illumination encountered at scotopic (night) levels. There is, as might be expected, a much higher age-related change in scotopic vision than there is in photopic vision.

Richards in 1966 conducted research with subjects whose ages ranged from sixty to ninety.<sup>19</sup> Vision was checked at varying levels of illumination which dealt specifically to night driving. He indicated an absolute loss in average vision and a loss of ability to see without sharp contrasts.

Forbes, Vanosdall, Pain and Bloomquist in 1968 reported a decrease of average visual acuity with increasing age in all areas.<sup>20</sup> They also reported a number of individual cases showing night vision difficulty not only in the higher age groups but also in younger groups. Reported

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<sup>18</sup>A. Burg, "Visual Acuity as Measured by Dynamic and Static Tests," Journal of Applied Psychology, 50:460-66, 1966.

<sup>19</sup>O. W. Richards, "Vision at Levels of Night Road Illumination: Changes of Acuity and Contrast Sensitivity with Age," American Journal of Optometry and Archives of American Academy of Optometry, 43:313-19, 1966.

<sup>20</sup>Forbes, Vanosdall, Pain, and Bloomquist, op. cit., pp. 1-2.

within their study were findings of Pease and Allen<sup>21</sup> and Richards<sup>22</sup> which called attention to a great loss in visual efficiency of older age groups at illumination levels corresponding to average night driving conditions (0.1 lamberts or thereabouts).

Audition. Aaron and Strasser suggested that hearing is one of the physical characteristics of a driver that relates to the safe operation of a motor vehicle.<sup>23</sup> The American Automobile Association in 1965 stated "poor hearing handicaps a driver. It can prevent him from hearing other vehicles or horn signals from cars that are about to pass."<sup>24</sup>

To illustrate the magnitude of loss of hearing in the aged driver, Hulbert (cited by Alexander, King, and Warskow)<sup>25</sup> in 1967 suggested that approximately 40 per cent of those persons sixty-five years of age and older have impaired hearing with an additional 0.1 per cent being totally deaf.

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<sup>21</sup>P. L. Pease and M. J. Allen, "Low Contrast Visual Acuity and the Effects of Ambient Illumination, Filters and Scatter," American Journal of Optometry (April, 1967).

<sup>22</sup>O. W. Richards, "Vision at Levels of Night Road Illumination XII Changes of Acuity and Contrast Sensitivity with Age," Journal of Optometry, 43:313-19, 1966.

<sup>23</sup>J. E. Aaron and Marland K. Strasser, Driver and Traffic Education (New York: The MacMillan Company, 1966), p. 134.

<sup>24</sup>American Automobile Association, op. cit., p. 56.

<sup>25</sup>G. J. Alexander, G. F. King, and M. A. Warskow, Development of Information Requirements and Transmission Techniques for Highway Users (Deer Park, New York: Airborne Instruments Laboratory, 1967), Vol. II.

Orr in 1967 suggested that diminished hearing is a principal handicap of the older driver which relates to judgment errors experienced by this age group.<sup>26</sup>

Reaction time. Another area of the aging process that should be included within the psychophysical realm is that of reaction time. Planek, Condon, and Fowler reported in 1968 that:

Since much of a driver's movement is controlled by external, rather than internal, stimulus patterns the measurement of reaction time becomes an important variable in assessing the capacity of an individual to drive an automobile.<sup>27</sup>

They reported that reaction time, specifically visual, has definitely increased when correlated with advancing age. The American Automobile Association reported in 1966<sup>28</sup> and 1967<sup>29</sup> studies which indicated that both simple and complex reaction time in simulated driving conditions resulted in a rise in reaction time as age increased which became pronounced after the age of fifty. They continued by suggesting a sex

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<sup>26</sup>Verne Orr, "The Problem of the Older Driver," Highway User (December, 1967), pp. 18-19.

<sup>27</sup>Planek, Condon, and Fowler, op. cit., p. 38.

<sup>28</sup>American Automobile Association, Reaction Time as Related to Age (Research Report No. 69, Washington, D. C.: AAA, 1966).

<sup>29</sup>American Automobile Association, Age and Complex Reaction (Research Report No. 41, Washington, D. C.: AAA, 1967).

difference in complex reaction time. Women were consistently one-tenth of a second slower than men across all age groups. As a result of individual differences, the assumption, across age groups could be said to have varying validity. It would, however, seem to warrant modification of such rules as recommended following distance as well as other reaction orientated facets of the driving task.

In 1968, Botwinick and Thompson conducted a study which compared a group of young college students to older individuals. The college group was further divided into athletic and non-athletic sub-groups.<sup>30</sup> They found that the non-athletic group was not significantly different from the elderly group. The athletic group, however, did show a typical age difference in reaction time. They suggested that the lack of physical fitness may be an explanatory factor in slowing reaction time.

Lawton reported in 1967 that the increase in reaction time associated with age was shown to be a decrease in ability to integrate, organize and time the response within the central nervous system.<sup>31</sup> An earlier study by Birren

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<sup>30</sup>J. Botwinick and L. W. Thompson, "Age Difference in Reaction Time: An Artifact?," The Gerontologist, 8:25-29, 1968.

<sup>31</sup>A. H. Lawton, "Accidental Injuries to the Aged and Their Psychological Impact," Mayo Clinic Proceedings, 42: 685-97, 1967.

also indicated some basis for the slowing process within the central nervous system.<sup>32</sup>

Botwinick and Thompson suggested in 1968 that the length of exposure time has an effect on the response of all individuals.<sup>33</sup> They contended that speed of judgment is often a matter of readiness of "set" to respond quickly. The length of exposure time does play a role. However, the "set" is probably more common in younger persons.

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<sup>32</sup>J. E. Birren, "Research on the Psychological Aspects of Aging," Geriatric, 18:393-403, 1963.

<sup>33</sup>J. Botwinick and L. W. Thompson, op. cit., 25-29.

## II. PSYCHOLOGICAL, SOCIOLOGICAL, AND BIOLOGICAL ASPECTS OF THE AGING PROCESS

Psychological and Sociological Aging. As an individual operates an automobile, he is not only called upon to operate the vehicle but he must also cope with the demands of his mobile environment. There have been researchers who have suggested that the manner in which the individual negotiates the environment could well determine his success in a mobile society. Mann in 1965 suggested that there are a number of factors which may result in a negative encounter with one's environment.<sup>34</sup> Lack of knowledge, lack of attention, inadequate perception, reduction of physical or mental capacities, and projection of undesirable personality traits were factors cited. He further suggested that accidents are usually caused as a result of several factors. Probably the most important factor is the personality of the individual who is driving the motor vehicle. Eysenck in 1962 indicated that there were personality differences among those who were involved in traffic accidents and those who were not.<sup>35</sup> He contended that those involved in accidents

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<sup>34</sup>William A. Mann, "The Nature of the Problem Driver" (Presented to Driver Improvement School Conference, Kellogg Center, Michigan State University, East Lansing, December, 1965).

<sup>35</sup>H. J. Eysenck, "The Personality of Drivers and Pedestrians," Medicine, Science and the Law, 3:416-22, 1962.

had a tendency to exhibit traits such as aggressiveness, carelessness, and impulsiveness which were not present in those not involved in accidents. Earlier studies in 1958 (Goldstein and Mosel;<sup>36</sup> Case and Stewart<sup>37</sup>) indicated that aggression is a factor often attributed to accidents as well as violations.

Planek, Condon, and Fowler indicated the importance of personality and suggested that "it is possible that aging may produce and/or reduce some of the characteristic patterns correlated with accident involvement."<sup>38</sup> Lawton in 1967 stated:

. . . that the emotional state of the aged person is frequently not one of peace and tranquility. Rather it is often a seething mixture of conflicts, anger, hate, hostility, fear, pride, and over-reaction to others,

he further stated that the older person is often:

living in meaningless semidiscard, surrounded by manifestations of the rejection of elder authority by youth. The older person either responds in kind with his own retaliatory venomous reaction or he may strive to compensate by over emphasizing his seniority. Such competitive responses are intensified amid the urban impersonality of the machine age.<sup>39</sup>

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<sup>36</sup>L. G. Goldstein and J. N. Mosel, A Factor Study of Drivers' Attitudes, with Further Study on Driver Aggression, Highway Research Board Bulletin 172:9-29 (Washington, D. C.: National Academy of Sciences, 1958).

<sup>37</sup>H. W. Case and R. G. Stewart, Development of a Driver Attitude Scale, Highway Research Board Bulletin 172: 30-35 (Washington, D. C.: National Academy of Sciences, 1958).

<sup>38</sup>Planek, Condon, and Fowler, op. cit., p. 42.

<sup>39</sup>Lawton, op. cit., pp. 685-97.

He went on to say that the older driver can usually operate the vehicle in a safe manner, however, he may lose complete control and stability in a driving situation when worry dominates his attention. This statement can also pertain to other age groups and cannot be said to be unique to the old.

Waller in 1967 suggested that the processes of aging affected the ability to drive of both young and old individuals.<sup>40</sup> The accident risk per mile for both age groups was greater than that of the middle age driver. He continued by saying that psychological factors associated with the maturing process seemed to explain this risk, in part, of the young driver. Physiologic factors seemed to predominate among the older driver.

Havighurst in 1968 approached the discussion of "successful aging" in a breakdown of satisfaction and disengagement.<sup>41</sup> He suggested that disengagement often separated the individual from society which was in turn the basis for the development of psychoneurotic reactions of hypochondriasis or depression. The older person, in many cases, was no longer allowed to play a significant role in the society in which he played a vital role. He may also find that he can

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<sup>40</sup>J. A. Waller, Guide for Identification, Evaluation, and Regulation of Persons with Medical Handicaps to Driving (Washington, D. C.: American Association of Motor Vehicle Administrators, 1967).

<sup>41</sup>R. J. Havighurst, "Personality and Patterns of Aging," The Gerontologist, 8:20-24, 1968.

no longer cope with the continuing financial and social demands. As a result, he may turn his interests and energies away from other persons and the environment. His primary interest in life is then directed upon himself, particularly upon his body and its functions.

Sobel also cited disengagement as one method used by older persons to compensate for their decreasing ability to deal with their life situations.<sup>42</sup> He suggests this alienation has relevance to the attention which the older driver may pay to the driving task. It could very well be that this withdrawing of attitudes could account for many of the driving problems associated with this age. He characterized these problems by the heading "lack of attention to others." The withdrawal could result in exclusion of peripheral processes which would virtually leave the driving task to only those automatic, overlearned, and almost reflexive driving skills that cannot cope with modern day traffic.

Birren in 1963 divided the psychology of aging into four subheadings. The first category included the moods and attitudes of the older individual, including both transient attitudes and those of a permanent nature.<sup>43</sup> An example

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<sup>42</sup>H. Sobel, "Stress and Environment Factors in Aging," Psychosomatics, 7:21-28, 1967.

<sup>43</sup>J. E. Birren, "Research on the Psychological Aspects of Aging," Geriatrics, 18:393-404, 1963.

would be self-concepts and life satisfaction. The second category included psychological capacities of the individual. An example here is language skills, problem solving ability, memory, psychomotor dexterity as well as other psychological, functional skills. The third category involved interpersonal relations which considered both extent and intensity. The fourth category contained behavior deviations and psychopathology which can lead to either personal distress or disruption of family or community.

Biological Aging. Shock in 1961 suggested that a portion of the basic functions of the organism do not change to a significant degree with age.<sup>44</sup> He continued by stating that the large organized functions of the body do show a decreased efficiency with increasing age. There is little change in cellular content over the years, however, there is a loss in the number of functioning cells available to a given functional system. He went on to suggest that the decrease in functions which take place during the aging process showed up primarily when the environment placed extra demands on the older person. This lessened ability to recover quickly from a change in stimulus level is the most obvious when associated with aging. Shock cited extensive individual differences in effects of aging on many of the

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<sup>44</sup>N. W. Shock, "Current Concepts of the Aging Process," Journal of the American Medical Association, 175:654-56, 1961.

physiological systems. Some individuals at the age of ninety years showed functions, in some systems, as good as the average person at age fifty. He also cited intra-individual differences in the aging processes of the various systems. There are systems which showed a linear decline throughout the aging process, however, some functions followed different types of aging patterns. Shock cited the example that the range of accommodation of the eye showed a rapid fall between the ages of twenty and fifty but remained practically the same for the remainder of the life span.

Schaie suggested in 1967 that the effects of continuing interaction within one's environment can offset the effects of reaching a particular chronological age if other variables are set.<sup>45</sup> Swartz in 1969 maintained that there was no such thing as physical aging of the body, that what happened to one's body as his chronological age increases is the result of environment which gave rise to the chronic disease picture. He also suggested that:

The tottering step and the shaking hand could be avoided with proper exercise and nutrition, and the forgetful mind, the senility associated with old age could be avoided by constant exercise of the mind.<sup>46</sup>

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<sup>45</sup>K. W. Schaie, "Age Changes and Age Differences," The Genontologist, 7:128-32, 1967.

<sup>46</sup>F. C. Swartz, "Should Senior Citizens Drive," The State Journal, Lansing, Michigan (February, 1969).

Rodstein gave an example of such a chronic disease. He stated that arterial deficiencies which occurred with aging can also affect more than just specific cortical and central nervous system functions.<sup>47</sup> A compression of the carotid or vertebral arteries may be caused in the older driver by a sudden rotation of the head sideways. This could be the result of looking into the side rear view mirror, up into the rear view mirror, or by looking around to see out the back window. These and similar actions, which the older driver is encouraged to do, can pinch the arteries of the neck and result in a loss of blood to the brain. This may cause dizziness, faintness, and possible falls when outside of a vehicle. This would seem to indicate a need for additional evaluation of teaching methods when dealing with the person suffering with any forms of arterial deficiencies.

Schaie and Strother in 1968 conducted research which dealt with older individuals who possessed generally satisfying environmental and social conditions, a high level of education, and a useful professional life.<sup>48</sup> This group was

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<sup>47</sup>M. Rodstein, "The Effects of the Aging Process on Accidents in Older and Aged Adults" (Paper presented at the Annual Meeting of the National Safety Council, Chicago, October 26, 1966).

<sup>48</sup>K. W. Schaie and C. R. Strother, "Cognitive and Personality Variables in College Graduates of Advanced Age," Human Aging and Behavior (New York: Academic Press, 1968) In G. A. Talland (Ed.), pp. 281-308.

found to exhibit a decline in function when compared to younger adults. They suggested that psychological aging was responsible for this decline and did not attribute it to other environmental or personality artifacts. They added that this decrement was most apparent in functions requiring visual-motor responses or when speed was of importance. Busse in 1967 had also suggested this relationship of physical health to the successful aging process and to the changes of both psychological and the physiological functioning of the individual.<sup>49</sup>

### III. THE DRIVING TASK AS RELATED TO THE OLDER DRIVER

Alexander, King, and Warskow conducted an extensive analytical report dealing with the driving task in which they stated that around 95 per cent of the information processed by the driver is carried on through his visual sensory capacities.<sup>50</sup> The authors analyzed and divided the driving task into three major areas: micro-performance, situational performance, and macro-performance. Micro-performance consisted of those tasks which involved fine details of vehicle operation with the two main subtasks of steering and speed control. Situation performance involved mainly the responses of the driver to roadway and traffic situations

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<sup>49</sup>E. W. Busse, "Geriatrics Today - An Overview," The American Journal of Psychiatry, 123:1226-33, 1967.

<sup>50</sup>Alexander, King, and Warskow, op. cit., Vol. II.

which included following, overtaking and passing, response to traffic signals and pedestrians, and reaction to changes in environmental factors necessitating an alteration of driving performance. They suggested that micro-performance and situational performance adequately delineated the control tasks of the vehicle. They further suggested that these alone did not fully define the driving task. The addition of macro-performance, which included considerations of trip preparation and direction finding, is necessarily included due to the factors from the sphere which were thought to influence the mode in which the driver performed on the other two levels.

As a prerequisite to performance of the driving task, Alexander, King, and Warskow discussed the mechanisms of reception and processes separately. Reception related to the sensory receptor mechanisms involved in the receipt of information by the driver.<sup>51</sup> Processing is related to the mental activities involved in making decisions based on information received. Signal search, detection and recognition, and decision making must be considered as an immediate requirement for information processing. There are many tasks which must be received during the same time period that require a considerable task sharing throughout the driving behavior. As a result, the individual's ability of attention is directed to only one information source at

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<sup>51</sup>Ibid.

any given time. As a result, the driver must shift his attention rapidly from one source to the next by using his short-term memory ability to integrate factors. Visual information reception requires the attention and set of the individual if an adequate and accurate perception is gained. The researchers suggested that the driver is faced with what is essentially a vigilance task. The individual must maintain his awareness and his ability to piece together pertinent signals from the chaotic background which is normally present. They further contended that the older drivers cannot maintain vigilant behavior as well as their younger counterparts and that competing tasks adversely affect vigilance performance along with noise, vibration, heat, and fatigue.

Byrnes in 1967 also divided the driving task into three major phases: an information gathering phase, a decision making phase, and an action phase in which the decision is carried out.<sup>52</sup> The researcher cited the visual sense as the predominant information source. She listed the crucial elements of the visual task as: detection of the objects, definition and recognition of the objects, determination of distances between objects and self, and recognition of color in traffic control devices. As cited earlier in this review, she recommended vision tests which would include not only visual acuity but also visual fields, color vision, and night acuity with and without glare.

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<sup>52</sup>Byrnes, op. cit., pp. 17-21.

She recommended all test components except night acuity be administered at five year intervals to age sixty. The total test should be repeated at age sixty and sixty-five with two-year examinations thereafter until the individual no longer operated a motor vehicle. This rationale was based on the fact that night defects and the more extensive visual defects were much more apt to occur in later years.

Cumming conducted a generalized analysis of skills involved in driving in 1963 which was published in 1967.<sup>53</sup> Tracking and speed control were included within the context of an ever changing pattern of external stimuli. He suggested that the performance of this tracking and control operation demands that the driver use the processes of perception, decision making, and motor reaction. It was necessary to investigate the driver's information gathering processes, his capacity for resolving uncertainty in order to make a decision, and the time required to carry it out once the decision was made. The capacity for short-term memory and change of "set" are critical points in analyzing the efficiency of the driving task. The driver worked under what was referred to as an "experimental analog." This could be called conditions of vigilance where stimuli had

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<sup>53</sup>R. W. Cumming, "The Analysis of Skills in Driving," Robot, 29:30-35, 1967.

varying probabilities of occurrence. The tasks were for the most part unknown to the driver in any given trial.

#### SUMMARY

This chapter contained a review of the literature related to this study. Those areas included were: the psychophysical aging process, the psychological, sociological and biological aspects of the aging process, and the driving task as related to the older driver. Chapter III contains a delineation of the procedures for obtaining the data.

## CHAPTER III

### PROCEDURES

This chapter contains a delineation of the procedures for obtaining data for this study. Included are a description of the subjects, procedures of measurement, testing procedures, organization of data, and analysis of data.

Subjects. A sample of one hundred eighty-six persons participated in this study. Each subject was a driving member of one of the eleven Retirement Clubs in Ingham County, Michigan, which was registered with the Michigan Commission on Aging. The clubs were The Lansing Area Retired Teachers Association, The American Association of Retired Persons - Ingham County Chapter 245, Senior Citizens group under Adult Education which meets at Eastern High School, XYZ (Xtra Years of Zest), Vevay Senior Citizens Club in Mason, Webberville Senior Citizens, Williamston Joy Club - Holt, Christ Methodist Church Retirees Club, Fifty Plus - Holt.

The subjects were asked to complete a questionnaire during a meeting of each club as part of their regular meeting. Only those club members who operated a motor vehicle, were over sixty-five years of age, and in attendance were asked to complete a questionnaire.

Information related to the demographical section of the questionnaire was also extracted by observation of the frequency distribution. The following information was requested:

At what age did you have your last eye examination by a doctor?

What year did you last renew your driver license?

What is your age?

At what age did you learn to drive?

How long have you been driving?

What was your occupation before retiring?

What is your sex?

How many miles do you drive during a year's time?

Procedures for measurement. A pilot study was conducted to discern the quality of the questionnaire and to determine if those items included were clearly set forth. The sample was taken from a Defensive Driving Course sponsored by the American Association of Retired Persons in the Detroit, Michigan, area. There were ninety-six persons in two sections of the course who completed a questionnaire.

An extensive evaluation of the results of the pilot study was made with the appropriate corrections incorporated within the revised questionnaire. The revised questionnaire was then administered to one hundred eighty-six Ingham County residents who were members of a retirement club registered with the Michigan Commission on Aging. The revised questionnaire appears in Appendix A.

Testing procedures. After brief remarks were made concerning the study, a questionnaire was given to each driving member in attendance at that meeting. The subjects were given no time limit in which to complete the questionnaires. There was a discussion period following completion and the return of the questionnaires to the researcher. This period varied according to the interest of the group.

Organization of data. Each questionnaire was reproduced, as appropriate, on computer cards in preparation for computer analysis.

Analysis of data. The knowledge and attitude sections of the revised questionnaire were processed by means of a Reciprocal Average Program (RAVE) in an effort to combine portions of the raw data. This technique yielded a weighted total for each person in both knowledge and attitude. The weighted scores appear in Appendix B. The mathematical basis for this technique is given by Torgerson.<sup>54</sup>

A general verbal description of the correlation coefficients as prescribed by Guilford were employed in this study.<sup>55</sup> As a general orientation, he suggested that the

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<sup>54</sup>W. S. Torgerson, Theory and Methods of Scaling (New York: John W. Wiley and Sons, Inc., 1962).

<sup>55</sup>J. P. Guilford, Fundamental Statistics in Psychology and Education (New York: McGraw-Hill Book Company, Inc., 1950), pp. 164-65.

strength of the relationship could be described as follows:

|                     |                                                     |
|---------------------|-----------------------------------------------------|
| Less than .20 ..... | Slight; almost negligible relationship              |
| .20 - .40 .....     | Low correlation; definite but small relationship    |
| .40 - .70 .....     | Moderate correlation; substantial relationship      |
| .70 - .90 .....     | High correlation; marked relationship               |
| .90 - 1.00 .....    | Very high correlation; very dependable relationship |

He also stated that the same interpretations apply alike to negative and positive  $r$ 's of the same numerical size. An  $r$  of  $-.60$  indicates just as close a relationship as an  $r$  of  $+.60$ .

A correlation matrix was utilized to determine any relationship between items of the questionnaire. The combined scores described above were used in place of raw scores for the knowledge and attitude sections. The Correlation Matrix appears in Appendix C. The computations for both the RAVE Program and Correlation Matrix were performed on a CDC 3600 Computer located in the Computer Laboratory at Michigan State University.

A frequency distribution was prepared to assist in the evaluation of other statistical treatment. Observation of the frequency distribution revealed those problems incorporated in the questionnaire which the subjects felt they experienced in driving. Demographical information was also obtained by observation.

## SUMMARY

This chapter has delineated the procedures for obtaining data for the study. Those areas included were a description of the subjects, procedures for measurements, testing procedures, organization of data, and the procedures for analyzing the data. The following chapter will present an analysis of the data.

## CHAPTER IV

### ANALYSIS OF DATA

The preceding chapter contained the procedures for collection of data. This chapter contains the analysis of the data collected on one hundred eighty-six persons in Ingham County, Michigan, who were members of a Retirement Club registered with the Michigan Commission on Aging.

#### Demographical Data

Age at last eye examination. Table I shows the frequency distribution of the ages of respondents at the time of their last eye examination by a doctor.

TABLE I  
AGE AT LAST EYE EXAMINATION

| Age | Number | Age | Number | Age | Number |
|-----|--------|-----|--------|-----|--------|
| 40  | 1      | 63  | 2      | 74  | 4      |
| 46  | 2      | 64  | 11     | 75  | 9      |
| 47  | 1      | 65  | 20     | 76  | 4      |
| 49  | 1      | 66  | 8      | 78  | 4      |
| 54  | 1      | 67  | 16     | 79  | 5      |
| 57  | 1      | 68  | 20     | 80  | 1      |
| 58  | 3      | 69  | 11     | 82  | 1      |
| 59  | 2      | 70  | 2      | 83  | 2      |
| 60  | 1      | 71  | 1      | 84  | 2      |
| 61  | 2      | 72  | 1      | 86  | 1      |
| 62  | 1      | 73  | 1      |     |        |

Table I indicates that responses yielded a range of from 40 to 86 years of age. The mean of 68 was found as a result of evaluation of the responses.

Table II indicates that the elapsed time since previous eye examination ranged from less than one year to thirty-four years. The mean was 11.5 years. However, two-thirds of the respondents had them checked within the last two years.

TABLE II  
NUMBER OF YEARS SINCE LAST EYE EXAMINATION

| Subjects | Number of Years | Subjects | Number of Years |
|----------|-----------------|----------|-----------------|
| 36       | 0               | 2        | 10              |
| 59       | 1               | 2        | 11              |
| 36       | 2               | 2        | 13              |
| 14       | 3               | 1        | 14              |
| 9        | 4               | 1        | 16              |
| 7        | 5               | 1        | 20              |
| 7        | 6               | 1        | 22              |
| 3        | 7               | 1        | 32              |
| 3        | 8               | 1        | 34              |

Renewal of driver license. Table III indicates the year in which the respondents last renewed their drivers' licenses.

TABLE III  
RENEWAL OF DRIVER LICENSE

| Year | Number Responding |
|------|-------------------|
| 1962 | 1                 |
| 1963 | 1                 |
| 1964 | 1                 |
| 1965 | 3                 |
| 1966 | 30                |
| 1967 | 30                |
| 1968 | 77                |
| 1969 | 43                |

Table III reveals a seven year range of responses from 1962 to 1969. The mean year was 1968 indicating the recent renewal of the driver licenses of this sample. There were, however, three subjects driving with expired driver licenses at the time of the study as the State of Michigan requires a renewal of driver licenses every three years.

Age of subjects. Table IV indicates the frequency distribution of ages of the subjects. The lower limit of the age was set by the study at sixty-five and the upper limit or oldest person tested was eighty-nine years of age. The mean age of the subjects was seventy-one years.

TABLE IV  
AGES OF SUBJECTS

| Age | Number | Age | Number | Age | Number |
|-----|--------|-----|--------|-----|--------|
| 65  | 21     | 73  | 13     | 80  | 1      |
| 66  | 22     | 74  | 12     | 81  | 2      |
| 67  | 10     | 75  | 10     | 82  | 4      |
| 68  | 17     | 76  | 7      | 83  | 3      |
| 69  | 13     | 77  | 1      | 85  | 2      |
| 70  | 14     | 78  | 4      | 87  | 1      |
| 71  | 10     | 79  | 8      | 89  | 1      |
| 72  | 10     |     |        |     |        |

Age subjects learned to drive. Table V is a frequency distribution of the ages of the subjects when they learned to drive.

TABLE V

## AGE SUBJECTS LEARNED TO DRIVE

| Age | Number | Age | Number | Age | Number |
|-----|--------|-----|--------|-----|--------|
| 12  | 1      | 23  | 7      | 36  | 2      |
| 13  | 2      | 24  | 5      | 40  | 1      |
| 14  | 9      | 25  | 13     | 44  | 1      |
| 15  | 17     | 26  | 7      | 45  | 1      |
| 16  | 17     | 27  | 4      | 46  | 1      |
| 17  | 9      | 28  | 4      | 49  | 1      |
| 18  | 25     | 29  | 3      | 55  | 1      |
| 19  | 8      | 30  | 3      | 57  | 1      |
| 20  | 16     | 32  | 3      | 61  | 1      |
| 21  | 5      | 33  | 3      | 62  | 1      |
| 22  | 7      | 35  | 2      |     |        |

The lower limit reported was twelve years of age with the upper limit at sixty-two. The mean age for learning to drive was twenty-three years.

How long subjects had been driving. Table VI shows how long subjects had been driving.

TABLE VI

## LENGTH OF DRIVING TIME

| Years<br>Driving | Number<br>of<br>Subjects | Years<br>Driving | Number<br>of<br>Subjects | Years<br>Driving | Number<br>of<br>Subjects |
|------------------|--------------------------|------------------|--------------------------|------------------|--------------------------|
| 17               | 2                        | 43               | 2                        | 53               | 10                       |
| 18               | 2                        | 44               | 3                        | 54               | 6                        |
| 23               | 1                        | 45               | 10                       | 55               | 14                       |
| 30               | 4                        | 46               | 3                        | 56               | 8                        |
| 33               | 1                        | 47               | 3                        | 57               | 2                        |
| 36               | 1                        | 48               | 14                       | 58               | 3                        |
| 38               | 2                        | 49               | 9                        | 59               | 1                        |
| 39               | 3                        | 50               | 27                       | 60               | 5                        |
| 40               | 5                        | 51               | 17                       | 61               | 2                        |
| 41               | 7                        | 52               | 7                        | 62               | 1                        |
| 42               | 3                        |                  |                          |                  |                          |

The range indicated was seventeen to sixty-six years with a mean of forty-eight years of driving experience.

Occupations before retiring. Table VII reports those occupations which subjects engaged in before retirement.

TABLE VII  
OCCUPATIONS OF SUBJECTS

| Occupations   | Number |
|---------------|--------|
| Teaching      | 66     |
| Homemaking    | 41     |
| Clerical Work | 43     |
| Nursing       | 7      |
| Sales         | 7      |
| Farming       | 8      |
| Tradesmen     | 9      |
| Bankers       | 2      |
| Engineering   | 3      |

There were nine general categories within this area. Teaching and clerical workers constituted the majority of the subjects within this study. Homemaking was the third largest group. Other occupations included were: tradesmen, farming, sales, nursing, engineering, and banking.

Sex of the subjects. Table VIII shows the number of males and females which participated in this study.

TABLE VIII  
SEX OF SUBJECTS

| Sex            | Number |
|----------------|--------|
| Men (male)     | 52     |
| Women (female) | 134    |

It would seem from responses reported in Table VIII that more females than drive belong to retirement clubs than do males within the confines of this study.

Miles driven during a year's time. Table IX shows the yearly mileage driven by subjects utilized in this study.

TABLE IX  
MILES DRIVEN

| Miles Driven    | Number | Miles Driven    | Number |
|-----------------|--------|-----------------|--------|
| 0 - 1,000       | 22     | 11,000 - 12,000 | 7      |
| 1,000 - 2,000   | 13     | 12,000 - 13,000 | 2      |
| 2,000 - 3,000   | 12     | 13,000 - 14,000 | 1      |
| 3,000 - 4,000   | 23     | 14,000 - 15,000 | 4      |
| 4,000 - 5,000   | 9      | 15,000 - 16,000 | 4      |
| 5,000 - 6,000   | 21     | 16,000 - 17,000 | 0      |
| 6,000 - 7,000   | 8      | 17,000 - 18,000 | 0      |
| 7,000 - 8,000   | 8      | 18,000 - 19,000 | 0      |
| 8,000 - 9,000   | 7      | 19,000 - 20,000 | 5      |
| 9,000 - 10,000  | 23     | 20,000 - 21,000 | 1      |
| 10,000 - 11,000 | 15     | 21,000 - 22,000 | 1      |

Evaluation of Table IX indicates a range of from less than 1,000 to 30,000 miles driven during a year's time. The mean miles driven was 6,164, whereas, the mean for all drivers is 9,512 miles per year. (The approximate average number of miles driven for the total licensed driving population per year may be found by dividing the total estimated miles driven per year by the estimated total of licensed drivers as reported by the National Safety Council for 1968.<sup>56</sup> This would be 1,010 billion miles/105 million drivers.)

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<sup>56</sup>National Safety Council, Accidents Facts, Chicago, Illinois, 1969, p. 99.

Knowledge and Attitude Sections of the Questionnaire

The knowledge and attitude sections of the revised questionnaire were processed by means of a Reciprocal Average Program (RAVE) in an effort to combine portions of the raw data. Each question within these sections was assigned a suggested correct response by the researcher based on the review of literature for this study. The Reciprocal Average Program utilized the suggested correct response to formulate a weighted score for each subject in both the knowledge and attitude sections. The possible range of scores for the knowledge section was zero to ten. The weighted scores of individuals ranged from zero to eight with a mean of six. The possible range of scores for the attitude section was eleven to twenty. The actual range of weighted scores was twelve to nineteen with a mean score of fourteen. The weighted scores for both the knowledge and attitude sections for each subject appears in appendix B.

Table X incorporates the eight knowledge questions, the number of subjects responding to each question, the suggested correct response, the number of correct responses and percentage of correct responses. It was interesting to note that seventy per cent or more of the sample population identified the correct response to six of the eight knowledge questions. However, only fifty-two per cent responded correctly to questions concerning following distance and to the degree of slipperiness of streets as a result of varying degrees of rain. This knowledge or lack of knowledge

TABLE X  
KNOWLEDGE SECTION OF THE QUESTIONNAIRE

| Questions                                                                                                                       | Number<br>Responding | Suggested<br>Correct<br>Response | Number of<br>Correct<br>Responses | Per Cent<br>of<br>Correct<br>Responses |
|---------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------|-----------------------------------|----------------------------------------|
| Would two car lengths of following distance be sufficient at 30 m.p.h. in good weather?                                         | 186                  | No                               | 96                                | .516                                   |
| Does a flashing red light at an intersection mean the same as a stop sign to you?                                               | 186                  | Yes                              | 144                               | .77                                    |
| If the back of your car starts to skid to the right, should you turn the steering wheel to the right?                           | 186                  | Yes                              | 137                               | .736                                   |
| Would you follow the directions of a police officer even though his directions are in conflict with an operating traffic light? | 186                  | Yes                              | 151                               | .81                                    |
| Do you keep your eyes moving when driving?                                                                                      | 186                  | Yes                              | 165                               | .887                                   |
| Is it possible to steer your car with the brakes locked?                                                                        | 186                  | No                               | 139                               | .747                                   |

TABLE X (continued)

| Questions                                                                                                             | Number<br>Responding | Suggested<br>Correct<br>Response | Number of<br>Correct<br>Responses | Per Cent<br>of<br>Correct<br>Responses |
|-----------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------|-----------------------------------|----------------------------------------|
| Is it important<br>to signal when<br>changing lanes<br>even though you<br>don't see<br>another vehicle<br>behind you? | 186                  | Yes                              | 170                               | .91                                    |
| Streets are<br>more slippery<br>at the begin-<br>ning of rain<br>than during rain.                                    | 186                  | Yes                              | 97                                | .52                                    |

could be a critical factor in the driving task.

Table XI incorporates the ten questions of the attitude section of the questionnaire, the number responding to each question, suggested correct response, number of correct responses, and the per cent of subjects responding correctly. There were three areas of interest within this section. The first dealt with reaction and stopping capabilities. Thirty-one and ten per cent respectively responded that they could stop and react as quickly as they used to be able to do. This would run counter to the literature which indicates reaction time increases with increasing age. This would suggest an area which could possibly cause difficulty at some future time.

The second area dealt with patience of drivers while driving. Approximately twenty-four per cent indicated they were more impatient with other drivers than other drivers were impatient with them.

The third area within the attitude section which seemed worthy of mention indicated that sixteen per cent of the subjects could not see well enough to drive at night. A review of related literature for this study would seem to indicate a reduction of night vision and glare recovery necessary to drive effectively at night.

#### Problems that Subjects Indicated They Experienced in Driving

The problem section of the revised questionnaire consisted of twenty-four questions which were designed to

TABLE XI  
ATTITUDE SECTION OF THE QUESTIONNAIRE

| Questions                                                                              | Number<br>Responding | Suggested<br>Correct<br>Response | Number of<br>Correct<br>Responses | Per Cent<br>of<br>Correct<br>Responses |
|----------------------------------------------------------------------------------------|----------------------|----------------------------------|-----------------------------------|----------------------------------------|
| Do other drivers<br>seem to drive<br>faster than you?                                  | 186                  | Yes                              | 141                               | .758                                   |
| Can you stop as<br>quickly as you<br>used to?                                          | 186                  | No                               | 19                                | .10                                    |
| Do you react as<br>quickly as you<br>used to?                                          | 186                  | No                               | 57                                | .306                                   |
| Do you feel that<br>a driver improve-<br>ment course could<br>improve your<br>driving? | 186                  | Yes                              | 96                                | .516                                   |
| Are you impa-<br>tient with other<br>drivers more<br>than in earlier<br>years?         | 186                  | Yes                              | 45                                | .24                                    |
| Have your gen-<br>eral driving<br>habits changed<br>over the past<br>few years?        | 186                  | Yes                              | 59                                | .317                                   |
| Do you feel that<br>other drivers<br>are impatient<br>with you?                        | 186                  | Yes                              | 46                                | .247                                   |
| Do you see well<br>enough to drive<br>at night?                                        | 186                  | No                               | 22                                | .155                                   |

TABLE XI (continued)

| Questions                                                                                                               | Number<br>Responding | Suggested<br>Correct<br>Response | Number of<br>Correct<br>Responses | Per Cent<br>of<br>Correct<br>Responses |
|-------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------|-----------------------------------|----------------------------------------|
| Do you feel that<br>the establish-<br>ment of a mini-<br>mum speed limit<br>is an unfair<br>invasion of<br>your rights? | 186                  | No                               | 160                               | .860                                   |
| Do you feel that<br>other drivers<br>should give you<br>special priv-<br>ileges because<br>of your age?                 | 186                  | No                               | 170                               | .91                                    |

give an indication of problems experienced by drivers within this age group. Responses to questions dealing with 1) driving during peak traffic hours, 2) implications of the withdrawal of driving privilege, and 3) driving at night were undefined as problem areas. The criterion used to determine a problem was that fifty per cent or greater responses were taken as evidence indicating a problem. To simplify reporting, similar questions from both the problem and information sections were grouped within the three indicated areas. The first question in each of the three areas were problem questions as defined above. Each of the additional questions was added only as supporting evidence.

Driving during peak traffic hours. Table XII indicates the frequency of responses to the two questions which came under this general area.

TABLE XII  
DRIVING DURING PEAK TRAFFIC HOURS

| Questions                                                                 | Number<br>Responding | Yes    |          | No     |          |
|---------------------------------------------------------------------------|----------------------|--------|----------|--------|----------|
|                                                                           |                      | Number | Per Cent | Number | Per Cent |
| Do you drive during peak traffic hours as part of your normal activities? | 186                  | 78     | .42      | 108    | .58      |
| Are you nervous while driving in heavy traffic?                           | 186                  | 45     | .24      | 141    | .76      |

Table XII indicates (1) that fifty-eight per cent of the sample reported that they did not drive during peak traffic hours and (2) that seventy-six per cent of the sample indicated that they had no nervousness as a result of driving in heavy traffic. The responses reported here seem to be in opposition to each other. No explanation is evident except that some of the respondents, even though they don't feel nervous driving in heavy traffic, still avoided driving during peak hours.

Table XIII reports the correlation pertaining to this area as measured by the Pearson Product Moment Correlation Method.

TABLE XIII

## CORRELATION FOR DRIVING DURING PEAK TRAFFIC HOURS

| Questions                                                                 | r    | Range at<br>.05 | Strength of<br>Relationship |
|---------------------------------------------------------------------------|------|-----------------|-----------------------------|
| Do you drive during peak traffic hours as part of your normal activities? |      |                 |                             |
| and                                                                       | -.25 | .184 to .32     | "Slight" - "Low"            |
| Are you nervous while driving in heavy traffic?                           |      |                 |                             |

Key: r = Pearson Product Moment Correlation

Table XIII indicates (1) the lower limits were below .20 suggesting a "slight, almost negligible relationship" and that (2) the upper limits were well within the "low correlation, definite but small relationship" category. The

negative correlation supports the inconsistency in responses as indicated in Table XII.

Implications of the withdrawal of the driving privilege.

There were four questions which came under this general heading, three of which were from the information portion of the questionnaire. The problem question is the first in this area. Table XIV indicates the frequency of responses for each of the four questions. The subjects reported that normal activities of daily living and possibly those who depended on them for transportation would change if the driving privilege was taken away. It was also interesting to note that 75 per cent of subjects indicated that they would rather drive themselves.

TABLE XIV

IMPLICATIONS OF THE WITHDRAWAL OF THE DRIVING PRIVILEGE

| Questions                                                                                                            | Number     |        | Yes    |          | No     |          |
|----------------------------------------------------------------------------------------------------------------------|------------|--------|--------|----------|--------|----------|
|                                                                                                                      | Responding | Number | Number | Per Cent | Number | Per Cent |
| Do you feel that you could carry on your normal activities of daily living if you were no longer permitted to drive? | 186        | 42     |        | .26      | 137    | .74      |
| Would you rather someone else drive you?                                                                             | 186        | 48     |        | .25      | 138    | .75      |

TABLE XIV (continued)

| <u>Questions</u>                                                                          | Number     |        | Yes      |  | No     |          |
|-------------------------------------------------------------------------------------------|------------|--------|----------|--|--------|----------|
|                                                                                           | Responding | Number | Per Cent |  | Number | Per Cent |
| When you drive, do you usually take other persons who are not licensed to drive with you? | 186        | 91     | .49      |  | 95     | .51      |
| Do other persons depend on you for transportation?                                        | 186        | 97     | .52      |  | 89     | .48      |

Table XV indicates those correlations found to exist in this general area. All correlations were "slight" with the exception of the last which was a "low correlation".

Driving at night. Table XVI considered two problem questions related to night driving. It was interesting to note that 49 per cent of the subjects felt that bright lights bothered them less than in past years. There were, in addition, 91 per cent of the subjects who reported that they preferred not to drive at night.

TABLE XV

CORRELATIONS FOR IMPLICATIONS OF THE WITHDRAWAL  
OF THE DRIVING PRIVILEGE SECTION

| Questions                                                                                                                                   | r     | Range at<br>.05 | Strength of<br>Relationship |
|---------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------|-----------------------------|
| Do you feel that<br>you could carry<br>on your normal<br>activities of<br>daily living if<br>you were no<br>longer permit-<br>ted to drive? |       |                 |                             |
| Would you rather<br>someone else<br>drive you?                                                                                              | .009  | -.065 to .083   | "Slight"                    |
| When you drive,<br>do you usually<br>take other<br>persons who are<br>not licensed to<br>drive with you?                                    | .072  | -.002 to .146   | "Slight"                    |
| Do other persons<br>depend on you<br>for transporta-<br>tion?                                                                               | .111  | .037 to .185    | "Slight"                    |
| Would you rather<br>someone else<br>drive you?                                                                                              |       |                 |                             |
| When you drive,<br>do you usually<br>take other<br>persons who are<br>not licensed to<br>drive with you?                                    | .036  | -.038 to .110   | "Slight"                    |
| Do other persons<br>depend on you<br>for transporta-<br>tion?                                                                               | .0745 | .0005 to .148   | "Slight"                    |

TABLE XV (continued)

| Questions                                                                                                | r   | Range at<br>.05 | Strength of<br>Relationship |
|----------------------------------------------------------------------------------------------------------|-----|-----------------|-----------------------------|
| When you drive,<br>do you usually<br>take other<br>persons who are<br>not licensed to<br>drive with you? |     |                 |                             |
| Do other persons<br>depend on you<br>for transporta-<br>tion?                                            | .29 | .227 to .365    | "Low Correlation"           |

Key: r = Pearson Product Moment Correlation

TABLE XVI  
NIGHT DRIVING

| Questions                                                             | Number<br>Responding | Yes    |          | No     |          |
|-----------------------------------------------------------------------|----------------------|--------|----------|--------|----------|
|                                                                       |                      | Number | Per Cent | Number | Per Cent |
| Do you prefer<br>to drive at<br>night?                                | 186                  | 17     | .09      | 169    | .91      |
| Do bright lights<br>bother you more<br>now than in the<br>past years? | 186                  | 89     | .49      | 97     | .51      |

Table XVII indicates the correlation pertaining to this area as measured by the Pearson Product Moment Correlation Method and indicated a "slight; almost negligible relationship" between the two items. The slight negative correlation supports the apparent inconsistency between responses as indicated in Table XVI.

TABLE XVII  
CORRELATION FOR NIGHT DRIVING

| Questions                                                             | r    | Range at<br>.05 | Strength of<br>Relationship |
|-----------------------------------------------------------------------|------|-----------------|-----------------------------|
| Do bright lights<br>bother you more<br>now than in the<br>past years? | .    |                 |                             |
| and                                                                   | -.11 | .036 to .184    | "Slight"                    |
| Do you prefer<br>to drive at<br>night?                                |      |                 |                             |

Key: r = Pearson Product Moment Correlation

### Questions not Related to the General Problem Areas

The following will include responses related to those questions not reported within the three general areas of problem questions. The responses have been grouped to simplify reporting. Information presented in each of the tables in this section included: 1) number of subjects responding, 2) the number of "yes" responses and per cent total, in addition 3) the number of "no" responses and per cent of total.

#### General Driving Habits

Table XVIII includes nine questions of which two are problem and seven information type questions dealing with general driving habits. It was interesting to note that 44 per cent of the subjects reported that they planned their driving moves earlier than in past years. Although this did not meet the criterion for a problem area, it did seem worthy of mention.

#### Past Preparation for Driving Task

Table XIX concerns past preparation for the driving task. There are four information questions included which revealed that 66 per cent had not taken a written test while 74 per cent had not been given a driving test for their first licenses. Fifty-seven per cent of the respondents reported that they had not taken a driver improvement course while 84 per cent indicated that they did not know where a driver improvement course could be taken.

TABLE XVIII  
GENERAL DRIVING HABITS

| Questions                                                                                         | Number<br>Responding | Yes    |          | No     |          |
|---------------------------------------------------------------------------------------------------|----------------------|--------|----------|--------|----------|
|                                                                                                   |                      | Number | Per Cent | Number | Per Cent |
| Do you feel that you must plan your driving moves earlier now than you did a few years ago?       | 186                  | 81     | .44      | 105    | .56      |
| Do you find that you have more difficulty keeping your mind on the driving task than in the past? | 186                  | 31     | .17      | 155    | .83      |
| Do you drive in bad weather as part of your normal routine?                                       | 186                  | 112    | .60      | 72     | .40      |
| Do you use an outside mirror?                                                                     | 186                  | 160    | .86      | 26     | .14      |
| Do you use seat belts or shoulder harnesses while driving?                                        | 186                  | 129    | .69      | 57     | .31      |
| Do you drive on vacation?                                                                         | 186                  | 133    | .72      | 53     | .28      |
| Do you check your speed when you see a police car?                                                | 186                  | 95     | .51      | 91     | .49      |
| Do you drive slower than you used to?                                                             | 186                  | 75     | .40      | 111    | .60      |
| Have you increased the distance you follow other cars in the past few years?                      | 186                  | 111    | .60      | 75     | .40      |

TABLE XIX  
PAST PREPARATION FOR DRIVING TASK

| Questions                                                               | Number<br>Responding | Yes    |          | No     |          |
|-------------------------------------------------------------------------|----------------------|--------|----------|--------|----------|
|                                                                         |                      | Number | Per Cent | Number | Per Cent |
| Did you take a<br>written test<br>for your first<br>license?            | 186                  | 81     | .44      | 105    | .66      |
| Did you take a<br>driving test<br>for your first<br>license?            | 186                  | 49     | .26      | 137    | .74      |
| Do you know<br>where you can<br>take a driver<br>improvement<br>course? | 186                  | 80     | .43      | 106    | .57      |
| Have you ever<br>had a driver<br>improvement<br>course?                 | 186                  | 29     | .16      | 157    | .84      |

Physical Discomfort of Subjects

Table XX consists of three questions which dealt with physical discomfort of the subjects. There are four problem type questions reported here. Eighty-six per cent reported no difficulty encountered in getting in or out of their cars while 53 per cent suggested that they did not become uncomfortable sooner while driving than in earlier years. Eighty-seven per cent reported that they could turn the steering wheel without discomfort.

Problems with Insurance Companies

Table XXI related to problems experienced by the subjects with insurance companies. There were two problem type questions within this section. The first question indicated that 47 per cent of the subjects had experienced difficulties with their insurance companies since their 65th birthday. Only 12 per cent reported difficulty in obtaining auto insurance.

TABLE XX  
PHYSICAL DISCOMFORT OF SUBJECTS

| Questions                                                                             | Number<br>Responding | Yes    |          | No     |          |
|---------------------------------------------------------------------------------------|----------------------|--------|----------|--------|----------|
|                                                                                       |                      | Number | Per Cent | Number | Per Cent |
| Do you have difficulty getting in and out of your car?                                | 186                  | 26     | .14      | 160    | .86      |
| Do you find that you become uncomfortable sooner while driving than in earlier years? | 186                  | 88     | .47      | 98     | .53      |
| Can you turn the steering wheel without discomfort?                                   | 186                  | 162    | .87      | 24     | .13      |

TABLE XXI

## PROBLEMS WITH INSURANCE COMPANIES

| Questions                                                                       | Number<br>Responding | Yes    |          | No     |          |
|---------------------------------------------------------------------------------|----------------------|--------|----------|--------|----------|
|                                                                                 |                      | Number | Per Cent | Number | Per Cent |
| Have you had difficulties with your insurance company since your 65th birthday? | 186                  | 88     | .47      | 98     | .53      |
| Have you found it difficult to obtain auto insurance?                           | 186                  | 22     | .12      | 164    | .88      |

Restricted Driving Space

Table XXII shows two problem questions related to restricted driving space. Seventy-four and 77 per cent respectively of the subjects responded that bridges did not seem to narrow their driving room or make them uneasy as they drove over high bridges.

TABLE XXII

## RESTRICTED DRIVING SPACE

| Questions                                       | Number<br>Responding | Yes    |          | No     |          |
|-------------------------------------------------|----------------------|--------|----------|--------|----------|
|                                                 |                      | Number | Per Cent | Number | Per Cent |
| Do bridges seem to narrow your driving room?    | 186                  | 48     | .26      | 138    | .74      |
| Does driving over high bridges make you uneasy? | 186                  | 42     | .23      | 144    | .77      |

### Hearing Examinations

Table XXIII indicates that 63 per cent of the subjects reported that they had not had their hearing checked in the past year. A review of related literature would seem to indicate that assessment of one's hearing is important to the individual driver. The second question was placed here only to simplify reporting of the data.

TABLE XXIII

#### HEARING EXAMINATION

| Questions                                           | Number<br>Responding | Yes    |          | No     |          |
|-----------------------------------------------------|----------------------|--------|----------|--------|----------|
|                                                     |                      | Number | Per Cent | Number | Per Cent |
| Have you had your hearing checked in the past year? | 186                  | 68     | .37      | 118    | .63      |
| Do you listen to a radio while driving?             | 186                  | 65     | .35      | 121    | .65      |

### Backing the Vehicle

Table XXIV indicates the frequency of responses for the four questions which were grouped within this general area.

TABLE XXIV  
BACKING THE VEHICLE

| Questions                                                                    | Number<br>Responding | Yes    |          | No     |          |
|------------------------------------------------------------------------------|----------------------|--------|----------|--------|----------|
|                                                                              |                      | Number | Per Cent | Number | Per Cent |
| Do you have trouble judging distance in your rear view mirror while backing? | 186                  | 29     | .16      | 157    | .84      |
| Can you look over your shoulder to check traffic without discomfort?         | 186                  | 145    | .78      | 41     | .22      |
| Do you have difficulty backing up?                                           | 186                  | 25     | .13      | 161    | .87      |
| Do you parallel park without problems?                                       | 186                  | 127    | .78      | 59     | .22      |

The responses to questions two, three, and four would seem to indicate an absence of problems in backing the vehicle. The response to question one, however, may indicate a problem as it would seem that the respondents were using a rear view mirror while backing the vehicle.

#### Miscellaneous

Table XXV consists of four miscellaneous problem questions and one information question which are grouped here only to simplify reporting. The most interesting information indicated by this is that 30 per cent of the respondents feel that small errors made by other drivers bothered them, and 26 per cent felt that driving was more of a chore than a pleasure.

TABLE XXV  
MISCELLANEOUS QUESTIONS

| Questions                                                                        | Number<br>Responding | Yes    |          | No     |          |
|----------------------------------------------------------------------------------|----------------------|--------|----------|--------|----------|
|                                                                                  |                      | Number | Per Cent | Number | Per Cent |
| Do small errors<br>made by other<br>drivers bother<br>you?                       | 186                  | 56     | .30      | 130    | .70      |
| Has your car<br>been safety<br>checked in the<br>past six months?                | 186                  | 111    | .60      | 75     | .40      |
| Is driving<br>becoming more<br>of a chore than<br>a pleasure?                    | 186                  | 48     | .26      | 138    | .74      |
| Do you feel<br>that you drive<br>too close to<br>the center line<br>at times?    | 186                  | 34     | .18      | 152    | .82      |
| Has anyone ever<br>told you that<br>you don't drive<br>as well as you<br>should? | 186                  | 26     | .14      | 160    | .86      |

### Summary

This chapter has contained an analysis of data for this study. The five general areas covered were as follows: 1) Demographical Data, 2) Knowledge and Attitude Sections of the Questionnaire, 3) Problems that Subjects Indicated They Experienced in Driving, 4) Questions not Related to the General Problem Areas, and 5) a Summary. In the following chapter, a summary, conclusions, and recommendations are presented.

## CHAPTER V

### SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

#### Summary

The older driver has been and continues to be under the scrutiny of the remainder of the driving population. This has been especially true since the advent of modern high-speed vehicles and highways with their many ramifications. Unfortunately, there has been relatively little research to ascertain any deficiencies which may occur within this age group. With the limited amount of knowledge concerning the older driver and their driving habits, the solution advanced by many is to retire the older driver from the ranks of those who are privileged to operate a motor vehicle.

#### Statement of the Problem

The purpose of this study was to determine the general driving problems of a select group of older drivers through the use of a questionnaire.

#### Need for the Study

If the driving privilege is taken away from the older driver at a predetermined age, there would be those denied the privilege to drive who are, or could be, capable drivers.

In addition, there is usually a severe emotional shock associated with the withdrawal of the driving privilege. This writer feels that a more appropriate approach would be to determine those problems which are most prevalent in the older age driver and ascertain whether those problems could be corrected or compensated for.

#### Gathering the Data

A pilot study was conducted to discern the quality of the questionnaire as a whole and to determine if those items included were clearly set forth. The sample was taken from a Defensive Driving Course sponsored by the American Association of Retired Persons in the Detroit, Michigan, area. There were ninety-six persons in two sections of the course who completed a questionnaire.

An extensive evaluation of the results of the pilot study was made with the appropriate corrections incorporated within the revised questionnaire. The revised questionnaire was then administered to one hundred eighty-six Ingham County residents who were members of a retirement club registered with the Michigan Commission on Aging.

#### Analysis of Data

The knowledge and attitude sections of the revised questionnaire were processed by means of a Reciprocal Average Program (RAVE) in an effort to combine portions of the raw data. Each question within these sections was assigned a suggested correct response by the researcher based on the

review of literature for this study. The Reciprocal Average Program utilized the suggested correct response to formulate a weighted score for each subject in both the knowledge and attitude sections. The possible range of scores for the knowledge section was zero to ten. The weighted scores of individuals ranged from zero to eight with a mean of six. The possible range of scores for the attitude section was eleven to twenty. The actual range of weighted scores was twelve to nineteen with a mean score of fourteen.

A correlation matrix was utilized to determine any relationship between items of the questionnaire. The combined scores described above were used in place of raw scores for the knowledge and attitude sections.

A frequency distribution was prepared to assist in the evaluation of other statistical treatment. Observation of the frequency distribution revealed those problems incorporated in the questionnaire which the subjects felt they experienced in driving. Demographical information was also obtained by observation.

### Summary of Findings

There were three problem areas determined from responses given to questions incorporated within the questionnaire.

Driving during peak traffic hours. Sixty per cent of the sample reported that they did not drive during peak hours. However, they suggested that they were not nervous while driving in heavy traffic. No explanation is evident except that some of the respondents avoid driving during peak hours even though they indicated they were not nervous while driving in heavy traffic.

Implications of the withdrawal of the driving privilege. There were four questions within this general area. The responses indicated first that 74 per cent could not carry on their daily mode of living if they were no longer permitted to drive. Secondly, that they preferred to drive themselves. Thirdly, that other non-drivers depended on them for transportation.

Driving at Night. There were two questions within this area. Ninety-one per cent of the subjects reported that they preferred not to drive at night. It was interesting to note that 49 per cent of the subjects felt that bright lights bothered them less than in past years. Although the reason for preferring not to drive at night was not answered, it would seem that bright lights encountered at night may be worthy of mention in this area.

### Conclusions

The following conclusions have been reached regarding general driving problems of this select group of older drivers:

- 1) The subjects realized inherent problems in driving during peak hours, in heavy traffic hours, or during dark hours, but that they did not recognize the specific problem as one of nervousness.
- 2) A review of selected literature revealed that there is a need for awareness of physical limitations related to audition and the aging process. The responses in this area would seem to indicate a lack of concern for the problems associated with loss of hearing.
- 3) That those participating in this study, as well as those depending on them for transportation, would be forced to change their everyday mode of living if the driving privilege were taken away.
- 4) The review of related literature would seem to suggest that this age group possibly should encounter additional problems not indicated by their responses to this questionnaire. It would seem that this select group was far above average or that they did not realize they had additional problems.
- 5) Responses which the subjects recorded were the only source of data. A variety of tests methods, had they been utilized, might have reduced the length of the questionnaire and might possibly have given more detailed answers in those areas. The limitation of dependence on subjects answers gave other valuable insight. The subject may or may not have given the correct response but he did give what he thought to be the correct response.

Recommendations

The following recommendations are made on the basis of this study. It is recommended that:

- 1) Adult education classes emphasize fundamental reduction of physical capacity which accompanies the aging process. The process of aging comes about in such a way that the individual is not aware of changes which take place during his every-day activities. An awareness of the fundamental reductions should be the first step in the direction of compensation for those reductions.
- 2) Adult education classes, as well as other avenues to the older driver, disseminate information vital for the correction of common problems.
- 3) Methods utilized to train or retrain the older driver be reexamined in an effort to better utilize time which the older driver has allotted for this purpose. The head check procedure, as taught to the younger driver, could cause a momentary loss of clear vision of the older driver. Left foot braking is another example of a teaching technique which should be re-evaluated when retraining adults. The change of method of braking can and does too often cause serious problems.
- 4) There be no compulsory age for termination of the driving privilege. The individual differences among all age groups should indicate that the evaluation as to fitness to drive must be an individual evaluation.
- 5) There be compulsory written and driving tests administered periodically for all age groups that would determine the drivers fitness to retain the privilege to drive.

Recommendations for Further Research

The following are recommendations for further research:

- 1) A similar study be conducted with a larger sample that would more closely approximate a cross section of this age of driver.
- 2) A similar study be conducted that would include a more detailed discussion following completion of the questionnaire in an effort to point up problems which the individual may or may not have identified.
- 3) That a similar study be conducted that would include a further breakdown of data by sex and age of subjects.
- 4) An instrument be developed that would provide a comparison of the individual self-image with that of other persons' evaluations of the individual.
- 5) A similar study be conducted with younger age groups to determine if the findings for this study are unique only to this age group.

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## APPENDICES

APPENDIX A

QUESTIONNAIRE

## DRIVING QUESTIONNAIRE

- \_\_\_\_\_ At what age did you have your last eye examination by a doctor?
- \_\_\_\_\_ What year did you last renew your driver license?
- \_\_\_\_\_ What is your age?
- \_\_\_\_\_ At what age did you learn to drive?
- \_\_\_\_\_ How long have you been driving?
- \_\_\_\_\_ What was your occupation before retiring?
- \_\_\_\_\_ What is your sex?
- \_\_\_\_\_ How many miles do you drive during a year's time?

Circle the appropriate answer to each of the following questions.

- Yes No    Do other drivers seem to drive faster than you?
- Yes No    Do you have difficulty backing up?
- Yes No    Would two car lengths of following distance be sufficient at 30 m.p.h. in good weather?
- Yes No    When you drive do you usually take other persons who are not licensed to drive with you?
- Yes No    Can you stop as quickly as you used to?
- Yes No    Do you react as quickly as you used to?
- Yes No    Does a flashing red light at an intersection mean the same as a stop sign to you?
- Yes No    Do you drive in bad weather as part of your normal routine?
- Yes No    Do you feel that a driver improvement course could improve your driving?

- Yes No Can you look over your shoulder to check traffic without discomfort?
- Yes No If the back of your car starts to skid to the right, should you turn the steering wheel to the right?
- Yes No Have you had your hearing checked in the past year?
- Yes No Are you impatient with other drivers more than in earlier years?
- Yes No Has anyone ever told you that you don't drive as well as you should?
- Yes No Have your general driving habits changed over the past few years?
- Yes No Would you follow the directions of a police officer even though his directions are in conflict with an operating traffic light?
- Yes No Do bridges seem to narrow your driving room?
- Yes No Do small errors made by other drivers bother you?
- Yes No Did you take a written test for your first license?
- Yes No Do you feel that other drivers are impatient with you?
- Yes No Do you feel that you must plan your driving moves earlier now than you did a few years ago?
- Yes No Do you have difficulty getting in and out of your car?
- Yes No Do you find that you become uncomfortable sooner while driving than in earlier years?
- Yes No Do you use an outside mirror?
- Yes No Have you had difficulties with your insurance company since your 65th birthday?
- Yes No Did you take a driving test for your first license?
- Yes No Has your car been safety checked in the past six months?

- Yes No Do you keep your eyes moving when driving?
- Yes No Do you use seat belts or shoulder harnesses while driving?
- Yes No Do you see well enough to drive at night?
- Yes No Do you drive during peak traffic hours as a part of your normal activities?
- Yes No Do you parallel park without problems?
- Yes No Do you feel that you could carry on your normal activities of daily living if you were no longer permitted to drive?
- Yes No Do you have trouble judging distances in your rear view mirror while backing?
- Yes No Is driving becoming more of a chore than a pleasure?
- Yes No Can you turn the steering wheel without discomfort?
- Yes No Is it possible to steer your car with the brakes locked?
- Yes No Are you nervous while driving in heavy traffic?
- Yes No Would you rather someone else drive you?
- Yes No Do you drive on vacation?
- Yes No Do you feel that the establishment of a minimum speed limit is an unfair invasion of your rights?
- Yes No Do you know where you can take a driver improvement course?
- Yes No Have you found it difficult to obtain auto insurance?
- Yes No Do bright lights bother you more now than in the past years?
- Yes No Do you find that you have more difficulty keeping your mind on the driving task than in the past?
- Yes No Is it important to signal when changing lanes even though you don't see another vehicle behind you?

- Yes No Does driving over high bridges make you uneasy?
- Yes No Streets are more slippery at the beginning of rain than during rain.
- Yes No Do you listen to a radio while driving?
- Yes No Do you feel that you drive too close to the center line at times?
- Yes No Do you prefer to drive at night?
- Yes No Do you check your speed when you see a police car?
- Yes No Have you ever had a driver improvement course?
- Yes No Do you drive slower than you used to?
- Yes No Have you increased the distance you follow other cars in the past few years?
- Yes No Do you feel that other drivers should give you special privileges because of your age?
- Yes No Do other persons depend on you for transportation?

## INFORMATION QUESTIONS

1. When you drive do you usually take other persons who are not licensed to drive with you?
2. Do you drive in bad weather as part of your normal routine?
3. Has anyone ever told you that you don't drive as well as you should?
4. Did you take a written test for your first license?
5. Do you use an outside mirror?
6. Did you take a driving test for your first license?
7. Do you use seat belts or shoulder harnesses while driving?
8. Would you rather someone else drive you?
9. Do you drive on vacation?
10. Do you know where you can take a driver improvement course?
11. Do you check your speed when you see a police car?
12. Have you ever had a driver improvement course?
13. Do you drive slower than you used to?
14. Have you increased the distance you follow other cars in the past few years?
15. Do other persons depend on you for transportation?

## KNOWLEDGE QUESTIONS

1. Would two car lengths of following distance be sufficient at 30 m.p.h. in good weather?
2. Does a flashing red light at an intersection mean the same as a stop sign to you?
3. If the back of your car starts to skid to the right, should you turn the steering wheel to the right?
4. Would you follow the directions of a police officer even though his directions are in conflict with an operating traffic light?
5. Do you keep your eyes moving when driving?
6. Is it possible to steer your car with the brakes locked?
7. Is it important to signal when changing lanes even though you don't see another vehicle behind you?
8. Streets are more slippery at the beginning of rain than during rain.

## ATTITUDE QUESTIONS

1. Do other drivers seem to drive faster than you?
2. Can you stop as quickly as you used to?
3. Do you react as quickly as you used to?
4. Do you feel that a driver improvement course could improve your driving?
5. Are you impatient with other drivers more than in earlier years?
6. Have your general driving habits changed over the past few years?
7. Do you feel that other drivers are impatient with you?
8. Do you see well enough to drive at night?
9. Do you feel that the establishment of a minimum speed limit is an unfair invasion of your rights?
10. Do you feel that other drivers should give you special privileges because of your age?

## PROBLEM QUESTIONS

1. Do you have difficulty backing up?
2. Can you look over your shoulder to check traffic without discomfort?
3. Have you had your hearing checked in the past year?
4. Do bridges seem to narrow your driving room?
5. Do small errors made by other drivers bother you?
6. Do you feel that you must plan your driving moves earlier now than you did a few years ago?
7. Do you have difficulty getting in and out of your car?
8. Do you find that you become uncomfortable sooner while driving than in earlier years?
9. Have you had difficulties with your insurance company since your 65th birthday?
10. Has your car been safety checked in the past six months?
11. Do you drive during peak traffic hours as a part of your normal activities?
12. Do you parallel park without problems?
13. Do you feel that you could carry on your normal activities of daily living if you were no longer permitted to drive?
14. Do you have trouble judging distances in your rear view mirror while backing?
15. Is driving becoming more of a chore than a pleasure?
16. Can you turn the steering wheel without discomfort?
17. Are you nervous while driving in heavy traffic?
18. Have you found it difficult to obtain auto insurance?

19. Do bright lights bother you more now than in the past years?
20. Do you find that you have more difficulty keeping your mind on the driving task than in the past?
21. Does driving over high bridges make you uneasy?
22. Do you listen to a radio while driving?
23. Do you feel that you drive too close to the center line at times?
24. Do you prefer to drive at night?

## APPENDIX B

WEIGHTED TOTAL SCORES FOR EACH SUBJECT  
IN ATTITUDE AND KNOWLEDGE SECTIONS

TABLE XXVI  
WEIGHTED TOTAL SCORES FOR EACH SUBJECT  
IN ATTITUDE SECTION

| Subjects  |    |    |    |    |    |    |    |    |    |    |  |
|-----------|----|----|----|----|----|----|----|----|----|----|--|
| 1 - 10    | 14 | 14 | 13 | 13 | 14 | 15 | 14 | 14 | 12 | 15 |  |
| 11 - 20   | 16 | 14 | 15 | 13 | 14 | 12 | 15 | 14 | 13 | 16 |  |
| 21 - 30   | 13 | 16 | 13 | 13 | 13 | 16 | 16 | 14 | 14 | 16 |  |
| 31 - 40   | 13 | 13 | 16 | 12 | 13 | 15 | 14 | 15 | 13 | 13 |  |
| 41 - 50   | 14 | 15 | 14 | 13 | 15 | 14 | 14 | 13 | 12 | 15 |  |
| 51 - 60   | 14 | 17 | 13 | 13 | 12 | 14 | 14 | 16 | 14 | 14 |  |
| 61 - 70   | 15 | 16 | 14 | 14 | 13 | 14 | 13 | 15 | 14 | 14 |  |
| 71 - 80   | 14 | 18 | 16 | 15 | 14 | 14 | 15 | 15 | 13 | 16 |  |
| 81 - 90   | 17 | 17 | 13 | 15 | 16 | 16 | 13 | 13 | 15 | 13 |  |
| 91 - 100  | 13 | 13 | 16 | 14 | 16 | 14 | 13 | 13 | 15 | 15 |  |
| 101 - 110 | 12 | 15 | 15 | 16 | 14 | 18 | 16 | 17 | 15 | 16 |  |
| 111 - 120 | 15 | 18 | 12 | 15 | 14 | 15 | 16 | 13 | 15 | 15 |  |
| 121 - 130 | 14 | 13 | 15 | 14 | 16 | 12 | 14 | 16 | 16 | 14 |  |
| 131 - 140 | 17 | 14 | 16 | 13 | 12 | 19 | 13 | 15 | 14 | 12 |  |
| 141 - 150 | 17 | 14 | 13 | 15 | 14 | 15 | 12 | 16 | 13 | 15 |  |
| 151 - 160 | 15 | 16 | 14 | 14 | 15 | 14 | 18 | 17 | 16 | 18 |  |
| 161 - 170 | 14 | 15 | 15 | 12 | 12 | 13 | 15 | 14 | 16 | 13 |  |
| 171 - 180 | 12 | 15 | 15 | 14 | 15 | 12 | 13 | 13 | 16 | 13 |  |
| 181 - 186 | 15 | 14 | 12 | 16 | 13 | 14 |    |    |    |    |  |

TABLE XXVII

WEIGHTED TOTAL SCORES FOR EACH SUBJECT  
IN KNOWLEDGE SECTION

| Subjects  |   |   |   |   |   |   |   |   |   |   |  |
|-----------|---|---|---|---|---|---|---|---|---|---|--|
| 1 - 10    | 8 | 8 | 6 | 7 | 6 | 8 | 4 | 4 | 6 | 7 |  |
| 11 - 20   | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 5 | 5 | 5 |  |
| 21 - 30   | 6 | 7 | 7 | 6 | 6 | 7 | 7 | 5 | 5 | 6 |  |
| 31 - 40   | 6 | 4 | 7 | 7 | 3 | 7 | 6 | 5 | 5 | 7 |  |
| 41 - 50   | 5 | 6 | 7 | 6 | 5 | 5 | 7 | 6 | 7 | 6 |  |
| 51 - 60   | 6 | 5 | 6 | 5 | 6 | 4 | 6 | 6 | 6 | 6 |  |
| 61 - 70   | 2 | 7 | 3 | 5 | 8 | 7 | 7 | 8 | 5 | 4 |  |
| 71 - 80   | 5 | 6 | 7 | 7 | 8 | 6 | 6 | 6 | 5 | 7 |  |
| 81 - 90   | 8 | 7 | 7 | 6 | 7 | 7 | 5 | 7 | 7 | 6 |  |
| 91 - 100  | 5 | 4 | 5 | 3 | 6 | 7 | 8 | 8 | 3 | 6 |  |
| 101 - 110 | 8 | 0 | 4 | 8 | 5 | 5 | 5 | 3 | 5 | 6 |  |
| 111 - 120 | 5 | 4 | 6 | 7 | 6 | 7 | 7 | 5 | 4 | 8 |  |
| 121 - 130 | 8 | 7 | 7 | 7 | 7 | 5 | 6 | 7 | 7 | 7 |  |
| 131 - 140 | 7 | 5 | 4 | 6 | 5 | 4 | 4 | 6 | 5 | 6 |  |
| 141 - 150 | 4 | 6 | 5 | 7 | 7 | 6 | 7 | 6 | 7 | 2 |  |
| 151 - 160 | 2 | 5 | 8 | 5 | 6 | 6 | 3 | 4 | 7 | 4 |  |
| 161 - 170 | 6 | 8 | 7 | 5 | 3 | 4 | 0 | 6 | 3 | 6 |  |
| 171 - 180 | 5 | 7 | 5 | 7 | 5 | 4 | 4 | 3 | 5 | 4 |  |
| 181 - 186 | 4 | 4 | 4 | 4 | 5 | 6 |   |   |   |   |  |

## APPENDIX C

### PEARSON PRODUCT MOMENT CORRELATION MATRIX

TABLE XXVIII  
PEARSON PRODUCT MOMENT CORRELATION MATRIX



TABLE XXVIII (continued)

| V/R N°.  | 12       | 13       | 14       | 15       | 16       | 17       | 18       | 19       | 20       | 21       | 22       |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| P2       | 1.00000  |          |          |          |          |          |          |          |          |          |          |
| P3       | -0.05450 |          |          |          |          |          |          |          |          |          |          |
| P4       | -0.31927 |          |          |          |          |          |          |          |          |          |          |
| P5       | -0.11175 | 1.00000  |          |          |          |          |          |          |          |          |          |
| P6       | -0.04682 | 0.09504  |          |          |          |          |          |          |          |          |          |
| P7       | -0.10083 | 0.02218  | 1.00000  |          |          |          |          |          |          |          |          |
| P8       | -0.07380 | 0.14626  | 0.08176  |          |          |          |          |          |          |          |          |
| P9       | -0.27187 | 0.01597  | 0.03961  | 1.00000  |          |          |          |          |          |          |          |
| P10      | -0.14582 | 0.24081  | -0.03509 | -0.04974 | 1.00000  |          |          |          |          |          |          |
| P11      | -0.07468 | 0.13427  | -0.02081 | -0.05044 | 0.10150  | 1.00000  |          |          |          |          |          |
| P12      | -0.10443 | 0.02578  | 0.02009  | 0.01009  | 0.02049  | 0.20803  | 1.00000  |          |          |          |          |
| P13      | -0.02350 | 0.05287  | 0.00909  | 0.00599  | 0.08243  | 0.33568  | 0.09285  | 1.00000  |          |          |          |
| P14      | -0.05524 | 0.01321  | 0.01090  | 0.01167  | -0.05797 | 0.19128  | 0.09097  | 0.13389  | 1.00000  |          |          |
| P15      | -0.01508 | 0.04452  | 0.00372  | 0.04557  | -0.00749 | 0.06690  | 0.05432  | 0.11113  | 0.09793  | 1.00000  |          |
| P16      | -0.10022 | 0.03615  | -0.05800 | -0.12371 | 0.01933  | -0.06459 | -0.22688 | 0.13561  | -0.12688 | -0.12688 | 1.00000  |
| P17      | -0.05599 | 0.03367  | -0.12902 | -0.17485 | 0.10728  | 0.22045  | -0.17509 | 0.09304  | -0.06980 | 0.06980  | 0.06980  |
| P18      | -0.15387 | 0.15424  | 0.07369  | -0.07378 | 0.11301  | -0.12596 | -0.03044 | -0.19502 | 0.02113  | 0.09171  | -0.04780 |
| P19      | -0.34348 | 0.11627  | 0.33061  | 0.08899  | 0.00798  | -0.00834 | 0.00219  | 0.00500  | -0.00538 | 0.06107  | 0.06107  |
| P20      | -0.10043 | 0.11404  | 0.15202  | 0.16883  | 0.04899  | 0.00798  | 0.13065  | 0.25413  | 0.15371  | -0.09082 | 0.09082  |
| P21      | -0.02746 | -0.04780 | -0.07019 | 0.06621  | 0.01393  | 0.07930  | 0.07930  | -0.26100 | -0.05285 | 0.14688  | -0.14737 |
| P22      | -0.14415 | 0.09810  | 0.09810  | 0.06932  | 0.15183  | 0.00617  | 0.00617  | 0.06190  | 0.09328  | 0.04071  | 0.09328  |
| P23      | -0.19027 | 0.11859  | 0.11859  | 0.21377  | 0.08826  | -0.02338 | 0.02710  | 0.23725  | 0.13319  | -0.13282 | 0.13319  |
| P24      | -0.00911 | 0.00859  | 0.00859  | 0.09984  | -0.00112 | -0.04811 | 0.14607  | -0.13771 | -0.06697 | 0.19909  | -0.19909 |
| P25      | -0.01097 | 0.16231  | -0.16231 | -0.01401 | 0.02154  | 0.06924  | -0.06217 | 0.02359  | 0.06198  | 0.06198  | 0.06198  |
| P26      | -0.06677 | 0.14042  | 0.14042  | 0.08837  | -0.05993 | -0.08665 | 0.01408  | 0.28445  | -0.11975 | -0.23644 | 0.23644  |
| P27      | -0.13376 | 0.07804  | 0.04039  | 0.07458  | 0.03172  | 0.04067  | 0.17891  | 0.00839  | 0.21325  | -0.04427 | -0.14388 |
| P28      | -0.17950 | 0.03985  | 0.23575  | 0.29672  | -0.07338 | -0.07274 | 0.16003  | 0.30056  | 0.32747  | 0.21917  | 0.21917  |
| P29      | -0.05305 | -0.02028 | 0.22728  | 0.35730  | 0.12027  | 0.01840  | -0.14807 | 0.28436  | 0.18300  | -0.18810 | -0.21486 |
| P30      | -0.04548 | 0.03237  | 0.06224  | 0.13467  | 0.13264  | 0.03051  | 0.03051  | 0.12727  | 0.07334  | 0.03531  | 0.09489  |
| P31      | -0.04407 | -0.09907 | 0.29072  | 0.32508  | 0.14443  | 0.06154  | 0.31404  | 0.05804  | 0.10995  | -0.13027 | 0.13141  |
| P32      | -0.05680 | 0.03441  | 0.06736  | 0.11141  | 0.07853  | 0.02246  | -0.01517 | 0.24876  | 0.07333  | -0.30756 | 0.43049  |
| P33      | 0.02441  | 0.06099  | 0.23311  | 0.23311  | 0.07767  | 0.14379  | 0.22225  | -0.11172 | 0.02278  | 0.08867  | -0.04936 |
| P34      | 0.13224  | 0.04094  | 0.04094  | 0.11009  | 0.00969  | 0.01109  | -0.16825 | 0.18666  | 0.03798  | -0.08318 | 0.14083  |
| P35      | 0.04051  | -0.16099 | -0.16099 | -0.03777 | 0.05118  | 0.02959  | 0.14384  | 0.07953  | -0.14384 | 0.04480  | -0.04324 |
| P36      | -0.10424 | -0.07953 | -0.07953 | -0.08170 | 0.03672  | 0.08939  | -0.04792 | -0.04792 | -0.01133 | 0.04792  | -0.01959 |
| P37      | 0.07500  | -0.04999 | -0.04999 | -0.02656 | -0.03616 | -0.03616 | -0.09943 | 0.06669  | 0.14150  | -0.08078 | -0.08078 |
| P38      | 0.05091  | -0.32356 | -0.32356 | 0.01350  | -0.23616 | -0.23616 | -0.15557 | -0.02701 | -0.02701 | -0.02701 | -0.02701 |
| P39      | 0.07309  | 0.13858  | 0.13858  | 0.01093  | 0.04349  | -0.10011 | 0.21866  | -0.02784 | -0.02784 | -0.02784 | -0.02784 |
| ATTITUDE |          |          |          |          |          |          |          |          |          |          |          |
| UNKNOWN  |          |          |          |          |          |          |          |          |          |          |          |

TABLE XXVIII (continued)

[illegible]

TABLE XXVIII (continued)

|          | VAR NO.  |          |          |
|----------|----------|----------|----------|
| 153      | 45       | 1.00000  |          |
| 113      | 46       | 0.18414  | 1.00000  |
| 115      | 47       | -0.04636 | -0.08528 |
| ATTITUDE | 48       | -0.30239 | -0.16520 |
| KNOWLEDG | 49       | 0.09360  | -0.19454 |
|          | 45       |          |          |
|          | 133      |          |          |
|          | 46       |          |          |
|          | 114      |          |          |
|          | 47       |          |          |
|          | 135      |          |          |
|          | 48       |          |          |
|          | ATTITUDE |          |          |
|          | 49       |          |          |
|          | KNOWLEDG |          |          |

## BIOGRAPHICAL SKETCH

## BIOGRAPHICAL SKETCH

Harry Lang McDonald was born in Clewiston, Florida, on November 1, 1936. He received his elementary and secondary education in the Palm Beach County School System in Belle Glade, Florida. In 1955 he volunteered for the draft and entered the United States Army where he served two years and was honorably discharged in 1961. He entered college in that same year at South Georgia College, Douglas, Georgia. The following year was spent in study at St. Petersburg Junior College, St. Petersburg, Florida, where he received the Associate of Arts Degree. In 1959 he entered the University of Florida, Gainesville, Florida, where he studied for one year. The following year he was the aquatics supervisor in the City of Belle Glade, Belle Glade, Florida. He continued college study in 1961 at Murray State College, Murray, Kentucky, where he received his Bachelor of Science in Physical Education and History in August 1962. He was married to Martha Helen Dunn on August 11, 1962. He began a year of graduate study at Murray State College and received a Master of Arts in Education in June, 1963. He also has studied at Kansas State College, Manhattan, Kansas, and Indiana University, Bloomington, Indiana. In the fall of 1963 he accepted a teaching position in the Palm Beach County School System in West Palm Beach, Florida, where he

taught for four years. His daughter, Lisa Louise, was born March 15, 1965. He was awarded a graduate assistantship at Murray State University for the academic year 1967-68 where he completed a post-master's program of thirty hours in June, 1968. He entered Michigan State University, East Lansing, Michigan, 1968-69 as a Doctoral Candidate. This degree was completed in the spring of 1970. He is presently at Illinois State University, Normal, Illinois, as an Assistant Professor in Traffic and Safety Education.

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