National Cooperative Transit Research & Development Program

RESEARCH RESULTS DIGEST

These **Digests** are issued in the interest of providing an early awareness of the research results emanating from projects in the NCTRP. By making these results known as they are developed, it is hoped that the potential users of the research findings will be encouraged toward their early implementation in operating practices. Persons wanting to pursue the project subject matter in greater depth may do so through contact with the Cooperative Research Programs Staff, Transportation Research Board, 2101 Constitution Ave., N.W., Washington, D.C. 20418.

DIGEST 1 — June 1982

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Review of Literature Related to Bus Operator Stress

An NCTRP staff digest of the essential findings from the literature review on NCTRP Project 33-1, "Transit Bus Operator Selection and Training for Dealing With Stress," being conducted by Group Associated Management Services, Inc., Detroit, Michigan, in association with Performance Technologies Corporation, Kansas City, Kansas.

THE PROBLEM AND THE SOLUTION TO IT

Some bus operators possessing the basic skills to operate the vehicle may still experience difficulties in performing their job satisfactorily because of an inability to cope effectively with the public. Use of all possible training and disciplinary action may not help when the individual hired does not have the psychological strengths necessary to deal effectively with continuous public contact, and the resultant stress may lead to more workers' compensation claims for nonvisible physical injury (i.e., heart and psychological problems) as well as to more accidents, absenteeism, and personnel turnover.

Various selection and training methods are currently being used by individual transit agencies. Some of these methods have been developed specifically for application in the transit industry, some have evolved from practice within individual agencies, and others represent modifications to methods originally developed for agencies outside of the transit industry. At present, however, no single method of selecting or training bus operators from the viewpoint of their ability to deal with stress is considered to be generally acceptable for wide application by transit agencies. To ensure that methods have general applicability, the range of needs and capabilities of different size transit agencies, regional differences, and the makeup of the bus operator population (i.e., male, female, and minorities) must be fully considered.

The objective of NCTRP Project 33-1 is to provide an evaluative device or questionnaire for use as part of the bus-driver-selection process that will validly indicate the applicant's susceptibility to stress that is likely to affect job performance. The research will also provide two training modules: one designed to help newly hired operators anticipate and deal with typical stressful situations, and one designed to help supervisors recognize stress symptoms displayed by operators and provide guidance on appropriate courses of action.

Project 33-1 is scheduled for completion in late 1983. In the interest of disseminating information as early as possible, the preliminary findings of the first research task, the literature review, are provided in this Digest. Individuals seeking information regarding bus operator stress should find this summary of previous work of interest. The cited literature does not constitute an exhaustive list of stress-related research because only those studies considered to be pertinent to the current project are included. Further, readers of this Digest are requested to help identify additional studies that should be considered by the researchers. In light of the project time schedule, information regarding other studies should be submitted to the Program Director, Cooperative Research Programs, by September 1982.

FINDINGS

The literature review is presented in three parts: (1) occupational stress in general, (2) stress specifically associated with bus operators, and (3) existing stress measurement instruments. Preliminary conclusions drawn by the researchers regarding the state of the art are included but are subject to revision as more information becomes available. A summary of the features contained in existing stress models and previous studies (see Table 1) and a selected list of studies reviewed by the research team (see Bibliography) are also included.

Occupational Stress

Much of the early work on occupational stress was concerned with stress among white male executives and white collar workers (e.g., Selzer and Vinokur, 1974, 1975; Ansell, 1981). But gradually, an awareness grew that blue collar workers also suffer stress, and that this stress is just as important economically and humanly as is stress among executives (Shostak, 1980). In general, studies of occupational stress, including the studies of blue collar stress, have used one of three models as the basis of their research: an "external stress" model; an "internal stress" model; and an "interactive stress" model.

Studies following the external-stress model have emphasized the role of environmental forces external to the individual. Margolis, Koes, and Quinn (1974) and Kahn and Quinn (1970), for example, have looked at such factors as noisy or dangerous work environments, or pressures of fast-moving assembly lines, and have shown that they are related to such health problems as coronary heart disease and mental ill health. These studies, however, do not explain why some workers succumb to the stress of a given work environment, while other workers subject to apparently the same environment do not succumb. Although such studies may report statistically significant findings, they ordinarily find only a relatively small number of workers suffering from stress.

A number of investigators, therefore, began looking at individual differences between workers in an attempt to explain stress: these are the studies based on the internal-stress model. One of the best known of these models is the "Type A" and "Type B" behavior model (Stokols et al., 1978; Chesney and Roseman, 1980). These studies have shown a clear relationship between an aggressive, hard-driving personality pattern and such stress-related problems as peptic ulcers. Still, as with the external-stress-model studies, even where the results were statistically significant, the model really explained stress only in a relatively small number of workers.

Ivancevich and Matteson (1980) therefore proposed an interactive-stress model. Stress, they suggested, is the result not just of the personal characteristics of workers; and not just of the characteristics of the work place; but it is also the result of an interaction between the personal characteristics of workers and the characteristics of their work environment. The Ivancevich and Matteson occupational stress model includes four major elements: (1) antecedents of stress (stressors), (2) stress itself, (3) moderators of stress, and (4) outcomes of stress.

The antecedents of stress are the external causes of stress; they have been described in such studies as those by Margolis, Kroes, and Quinn (1974) and Young (1975). They include noise, temperature, and fumes in the physical environment; work overload, role conflict and ambiguity, and career goal discrepancy at the individual level; intragroup conflict and dissatisfaction at the group level; and management style and organizational climate at the organizational level. Not all antecedents of occupational stress occur within the work place; family relations, for example, can be a source of occupational stress antecedents.

Stress itself, the second element in the Ivancevich and Matteson model, is primarily a matter of the worker's perception; it involves how stressors are perceived by the individual. "Internal" stress has been studied by such researchers as Hall and Mansfield (1971) who call the phenomenon "strain." Also, and this is part of the interactive feature of this model, stress itself involves how the individual perceives the consequences of stress. One bus operator, for example, may receive only a few customer complaints but be greatly disturbed by them, while another bus operator may receive a great many customer complaints but not be disturbed by them at all.

The third element of stress in the Ivancevich and Matteson model is the moderators of stress; these are what are usually considered "internal" stress in other models. They include personality differences as well as such demographic differences as age, sex, race, and total hours worked. Moderators of stress have been studied by such researchers as Sutton (1981) and Barlow (1978).

The fourth element of stress in the Ivancevich and Matteson model is the outcomes and consequences of stress. These are what one usually uses to judge and measure the presence of stress. They include behavioral and attitudinal consequences, as well as physiological and medical consequences. They have been studied by such researchers as Diehr et al. (1981), Jenkins and Zyzanski (1980), and Sommer (1978).

These four elements of stress in the Ivancevich and Matteson model are not neatly, mutually exclusive; and they may not be in the academic sense "necessary and sufficient" to explain stress. But, then, academic studies of stress have not yet agreed upon neat, mutually exclusive categories; nor have they found a set of "necessary and sufficient" variables to explain the various models that have been developed.

Occupational Stress of Bus Operators

Much effort has been devoted to the selection and training of bus operators, but little of this effort has been directed at their occupational stress. A bus-operator-selection instrument was developed by Baehr (1976), for example; but it is a generalized screening device, not a specific screener for stress.

Claus (1980) concludes that "the basic factors responsible for the four most important disease groups in the drivers must be sought in job-determined stress and strain. According to the current state of medical research, plausible connections can be shown to exist between job-determined strain and stress effects on health."

One of the few bus-operator training programs that deals with stress is the Coach Operator Refresher Training Program developed for SEMTA (Southeastern Michigan Transportation Authority, 1981). It contains a stress module that trains operators to deal with the stress encountered in the work environment. Another leader in the development of bus-operator stress programs is the Southern California Rapid Transit District.

A study by the Paris Metropolitan Transportation System (RATP, 1978) found that "the job of bus driver" is a biotechnically illegitimate one, combining two fundamentally incompatible tasks: driving a vehicle in increasingly heavy traffic, identifying and checking bus tickets with an increasing number of passengers, and simultaneously observing the requirements of all operations necessary to driving a bus, such as respecting speed limits and ensuring passenger safety.

This concept is supported in a study by Blau (1979, 1981) in which he surveyed the perceived significant problems of bus operators, and the effects of these perceived problems on job satisfaction and job performance, and found that bus operators are slightly satisfied with their jobs; are more satisfied than dissatisfied with their achievement, pay, independence, job security, and social service; and are more dissatisfied than satisfied with company policies and practices, recognition, supervision, human relations, and working conditions.

Blau concluded that the social support perceived by operators, particularly from superintendents, was related to stress and job dissatisfaction; that breadth of experience as a bus operator was related to perceived social support from superintendents, but not to job stress itself; and that job stress was related to ineffective job performance. Implicit in Blau's conclusions is the notion that job stress among bus operators could be decreased if superintendents learned to increase their social support of bus operators (or at least made bus operators believe that their social support had been increased).

In other words, job stress can be reduced by other means than by changing the bus operators; it can be reduced by modifying the environment in which bus operators work. And it can most effectively be reduced by modifying the interaction between the bus operators, their supervisors, and other elements of their work environment.

Stress Measurement Devices

The personality types described by Holland (1973) might provide one explanation for bus operator stress. Holland's Vocational Preference Inventory is not a stress measurement device; but his vocational preference profile for bus operators does suggest a reason for some bus operator stress. The profile shows a potential conflict between mechanical preferences on the one hand, and social preferences on the other hand. The abilities that contribute to efficient handling of the bus sometimes interfere with the efficient handling of passengers; and the abilities that contribute to the efficient handling of passengers sometimes interfere with the efficient handling of the bus.

But while the use of a vocational preference inventory as part of a stress tolerance device might be innovative, it is not an approach to be advocated unreservedly, or without other more conventional alternatives. In fact, the review of the literature suggests that a valid and reliable stress tolerance device should be multidimensional, measuring several elements of the bus operator's personal characteristics.

A promising measure is the State-Trait Anxiety Inventory, by Spielberger, Gorsuch, and Lushene (1970). It is one of the best standardized measures of anxiety, and a wealth of subsequent research has established its reliability and validity.

The Jenkins Activity Survey (Jenkins, Zyzanski, and Rosenmann, 1979) purports to identify "Type A" personalities in the work setting. It has the advantage of being designed for identifying stress vulnerable individuals. It is new, however, and there has been relatively little standardization, reliability, or validity data published in the research literature. It is also relatively expensive, and it is too complex to be hand scored for large populations.

The Minnesota Multiphasic Personality Inventory (MMPI), and in particular Scale 7, has been used successfully in many studies of stress. It has been called the "sine qua non in the psychologist's armamentarium of psychometric aids," and the "old soldier with some 6,000 citations on its chest" (Buros Mental Measurements Yearbook). The instrument checks for personality factors related to stress, and also has a scale to check proneness to psychosomatic complaints.

The Guilford-Zimmerman Temperament Study is another widely used instrument, although the Buros Mental Measurements Yearbook questions its validity. Specifically, the reviewer in Buros suggests that the scales do not measure what they purport to measure.

The California Psychological Inventory (CPI) has received mixed reviews. The key issue seems to be whether it is used appropriately; some research studies have used the CPI inappropriately, and some clinicians have relied too heavily on it as a sole diagnostic device.

APPLICATIONS

Although the final products of Project 33-1, the evaluative device and the two training modules, will not be available until late 1983, the literature review does provide a preliminary, advance indication of both the nature and the potential applicability of those products.

First, and most important, the literature review shows that the occupational stress of bus operators results from an interactive process. Some stress is the result of the personal characteristics of bus operators; some stress is the result of the working environment of bus operators; but most stress is the result of an interaction between the personal characteristics of bus operators and their working environment.

Second, the review of the literature shows that bus operators can be trained to modify or to redirect the personal characteristics which cause them stress; that they can be trained to cope with the conditions in their working environment which cause them stress; and that they can be trained to deal more effectively with the stress caused by the interactions of their personal characteristics and their working environment.

Third, the review of the literature shows that supervisors and managers can learn how to modify the working environment of bus operators so that it will be less stressful.

Fourth, the review of the literature shows that training bus operators and their managers and supervisors in procedures for dealing with stress is more cost effective than screening out stress-prone bus operators in the selection process. The basic reason for this is that the interaction between the personal characteristics of bus operators and their working environment involves some inherent inconsistencies. The personal characteristics that contribute to successful operation of the machine interfere, to some extent, with successful dealings with passengers; and the personal characteristics that contribute to successful dealings with passengers interfere, to some extent, with the successful operation of the machine.

Screening out bus operator applicants who do not have an appropriate balance of abilities will not eliminate the need for a stress training program; but, instead, will severely restrict the pool in the labor force from which satisfactory applicants can be drawn.

Finally, the review of the literature shows that a stress tolerance measuring device should be multidimensional. From the viewpoint of measurement, at least, stress is not a simple phenomenon; no single scale can provide an adequate description of it. An effective device will have to measure bus operator stress along several dimensions, including possibly such dimensions as aggression, anxiety, social aptitudes, and mechanical aptitudes.

TABLE 1. SUMMARY OF PREVIOUS MODELS AND STUDIES

STUDIES	ELEMENTS OF STRESS MODEL									
	Antecedents	Moderators	Internal Strain	Consequences	Interactive Model	Bus Operator Selection & Training	Bus Operator Stress	Measurement	"White Collar" Stress	"Blue Collar" Stress
Brown (1968)						x		x		
Gardner (1977)						x		x		
Whisman (1978)						x		x		
Selzer & Vinokur (1974, 1975)	x	x	x		x			x	x	
Ivancevich & Matteson (1980)	x	x	x	x	x					x
Margolis, Koes, & Quinn (1974)	x			x				x		x
Kahn & Quinn (1970)	x			x				x		x
Stokols & Others (1978)		x		x				x		x
Chesney & Roseman (1980)		x		x				x	x	
Young (1975)	x							x		
Hall & Mansfield (1971)			x					x		
Sutton (1981)		x								
Diehr & Others (1981)				x				x		
Wolf & Others (1979)				x				x		
Jenkins & Zyzanski (1980)				x						
Shostak (1980)					x					x
Baehr (1976)						x		x		
SEMTA (1981)						x	x			x
Blau (1979, 1980)					x	x	x	x		x
Holland (1973)						x		x		
MMPI								x		
Guilford-Zimmerman								x		
CPI								x		

BIBLIOGRAPHY

Akhmedov, T. I., "Effect of Emotional Tension in Bus Drivers." Gig. Sanit. 5 (May 1981) pp. 75-76.

Ansell, E. M., "Professional Burnout: Recognition and Management." AANA Journal 49, No. 2 (April 1981) pp. 135-142.

Appelbaum, S. H., "Managerial/Organizational Stress: Identification of Factors and Symptoms." Health Care Management Review 5, No. 1 (Winter 1980) pp. 7-16.

Aronsson, G., and Barklof, "Working Environment for Local Transit Personnel in Large and Medium Size Towns." Psychological Institute of Stockholm University (October 1980) pp. 1-78. (Translated by N.S. Joint Publications Research Service for Urban Mass Transportation Administration.)

Baehr, M. E., National Validation of a Selection Test Battery for Male Transit Bus Operators. Washington, D. C.: Urban Mass Transportation Administration, U.S. Department of Transportation (June 1976).

Baker, H. S., Schoeftan, O., and Routh, F. D., Transit Operation Absenteeism: Extent, Costs, and Strategies for Reducing It. Transportation Reasearch Forum, U.S. Department of Transportation (June 1976).

Barlow, A. R., The Relationship Between States and Traits of Two Personality Variables--Anxiety and Aggression--and Current and Retrospective Measures of Driving Performance. Wollongong, New South Wales, Australia: Wollongong University Thesis (November 1978).

Barrett, G. V., and Thornton, C. L., "Relationship Between Perceptual Style and Driver Reaction to an Emergency Situation." Journal of Applied Psychology 52, No. 2 (1968) pp. 169-176.

Barrett, G. V.; Thornton, C. L.; and Cabe, P. A., "Relation Between Embedded Figures Test Performance and Simulator Behavior." Journal of Applied Psychology 53, No. 3, Part 1 (1969) pp. 253-254.

Barry, P. Z., "The Relationship Between Stress and Accidents: A Preliminary Investigation." Dissertation Abstracts International 34, 2-B (August 1973) pp. 743.

Berlinguer, G., "Maladies and Industrial Health of Public-Transportation Workers." Italian Institute of Social Medicine (1962). (Translated by Joint Publications Research Service for Urban Mass Transportation Administration.)

Blau, G., Bus Operator Survey Report. Cleveland, Ohio: Regional Transit Authority (1979).

Blau, G., "An Empirical Investigation of Job Stress, Social Support, Service Length, and Job Strain." Organizational Behavior and Human Performance 27, No. 2 (April 1981) pp. 279-302.

Bose, S., Roy, K. P., and Das, Gupta S. C., "An Attitude Study of Multi-Accident Omnibus Drivers." Indiana Journal of Applied Psychology 6, No. 1 (1969) pp. 3-12.

Bracy, L. F., "An Exploration of the Relationship Between Personality Factors and Automobile Accident Proneness." Dissertation Abstracts International 31, 8-B (February 1971) p. 4967.

Brenner, M., Branscomb, H. H., and Schwartz, G. E., "Psychological Stress Evaluator--Two Tests of a Vocal Measure." Psychophysiology 16, No. 4 (July 1979) pp. 351-357.

Brown, I. D., "Subjective and Objective Comparisons of Successful and Unsuccessful Trainee Drivers." Ergonomics 9 (1966) pp. 49-56

Brown, I. D., "Some Alternative Methods of Predicting Performance Among Professional Drivers in Training." Ergonomics 11, No. 1 (1968) pp. 13-21, 27.

Brown, I. D., "Personality Traits and Their Relationship to Traffic Violations." Perceptual and Motor Skills 42, No. 2 (April 1976) pp. 467-470.

Burkner, A., "Rosenzweig P-F Study Scores of Drivers with Traffic Violations and Drivers with Visual Handicaps." Psychologie und Praxis 19, No. 2 (April-June 1975) pp. 72-79.

Caplan, R. D., et al., Job Demands and Worker Health. Ann Arbor, Mich.: Survey Research Center, Institute for Social Research Center, University of Michigan (1980).

Chapman, J. L., "Evaluation of Psychological Stress as an Investigative Tool." Legal Medicine (1980) pp. 57-74.

Chesney, M. A., and Roseman, R. H., "Type A Behavior in the Work Setting." In Current Concerns in Occupational Stress, C. L. Cooper and R. Payne (Eds.). New York: John Wiley & Sons (1980).

Clayton, A. B., Use of Physiological Measures in the Assessment of Driving Load. Birmingham University (1971).

Cullen, J., Fuller, R., and Dolphin, C., "Endocrine Stress Responses of Drivers in a 'Real-Life' Heavy-Goods Vehicle Driving Task." Psychoneuroendocrinology 4, No. 2 (1979) pp. 107-115

Diehr, P., et al., "Acute Headaches: Presenting Symptoms and Diagnostic Rules to Identify Patients with Tension and Migraine Headache." Journal of Chronic Diseases 34, No. 4 (1981) pp. 135-142.

Edwards, K. A., and Johnston, R., "Increasing Greeting and Farewell Responses in High School Students by a Bus Driver." Education and Treatment of Children 1, No. 1 (Fall 1977) pp. 9-18.

Edwards, M. L., "Personality and Attitudinal Factors Related to Problem Driving." Dissertation Abstracts International 36, 5-B (November 1975) p. 2493.

Endler, N. S., and Okada, M., "A Multidimensional Measure of Trait Anxiety: The S.R. Inventory of General Trait Anxiousness." Journal of Consulting and Clinical Psychology 43, No. 3 (June 1975) pp. 319-329.

Eyer, J., "Social Causes of Coronary Heart Disease." Psychother Psychosom 34, Nos. 2-3 (1980) pp. 75-87.

Fernandez, Seara Jose L., "Psychology of the Automobile Driver: Personality Factors of Drivers with Multiple Accidents." 33, No. 151 (March-April 1978) pp. 217-228.

Finkelman, J. M., et al., "Noise and Driver Performance." Journal of Applied Psychology 62, No. 6 (December 1977) pp. 713-718.

Foster, P. M., and Gardner, G., The Recruitment and Retention of Bus Drivers in Central London. Research Report #1850. London: Tavistock Institute of Human Relations (1966).

Garbe, C., "Health and Health Risks Among City Bus Drivers in West Berlin." Institute for Social Medicine and Epidemiology of the Ministry of Health, West Germany (1980). (Translated by N.S. Joint Publications Research Service for Urban Mass Transportation Administration.)

Gardner, G., "The Higher Order Needs of London Bus Crews: A Two-Factor Analysis." Human Relations 30, No. 9 (1977) pp. 767-785.

Gardner, G., "Bus Route Control as a Socio-Technical System." Melbourne Psychology Reports 24 (1976).

Gerson, A. R., "Job Stress: Causes, Symptoms, and Solutions." Occupational Health and Safety 48, No. 3 (April 1979) pp. 46-47.

Gibson, H., III, and Deseran, F. A., "Observations of a Bus Driver: A Study of Interpersonal and Conventional Roles." MISSA Series 24 (1977).

Gordeeva, A. K., "Some Manifestations of the Strength of the Nervous System in Bus Drivers' Work." Voprosy Psikhologii 1 (January-February 1977) pp. 137-142.

Hakkinen, S. I., "Traffic Accidents and Professional Driver Characteristics: A Follow-Up Study." Accident Analysis and Prevention 11, No. 1 (March 1979) pp. 7-18.

Hall, D. T., and Mansfield, R., "Organization and Individual Response to External Stress." Administration Science Quarterly, 16 (1971) pp. 533-547.

Heimstra, N. W., "The Effects of 'Stress Fatigue' on Performance in a Simulated Driving Situation." Ergonomics 13, No. 2 (1970) pp 209-218.

Heimstra, N. W., Ellingstad, V. S., and De Kock, A. R., "Effects of Operator Mood on Performance in a Simulated Driving Task." Perceptual and Motor Skills 25, No. 3 (1967) pp. 729-735.

Henslin, J. W., "The Cab Driver: An International Analysis of an Occupational Culture." Dissertation Abstracts International 28, 10-A (1968) p. 4270.

Higgins, C. W., Validation of Selection Process for Bus Operators: Phase I, National Test Battery for Male Transit Bus Operators. Boston, Mass.: Massachusetts Bay Transportation Authority (no date).

Hodgson vs. Greyhound Lines, Inc., U.S. Seventh Circuit Court of Appeals, July 25, 1974. Civil Rights Court Digest 8(1), 3 (1975).

Hoffman, H., The Risks for Healthy and for Somatically Diseased Persons to Take Part in Road Traffic and, Vice Versa, the Risks to the Traffic by the Participation of Diseased Persons: Prophylactic Measures. Bonn, West Germany: Bonn University (1966).

Hogue, C. C., "Coping Resources, Stress, and Health Change in Middle Age." Dissertation Abstracts International 35, 8-B (February 1975) pp. 4017-4018.

Holland, J. L., The Psychology of Vocational Choice: A Theory of Personality Types and Model Environments. Waltham, Mass.: Blaisdell (1973).

Hollien, H., "Vocal Indicators of Psychological Stress." Annual of the New York Academy of Science 347 (1980) pp. 47-72.

Hollowell, P. G., The Lorry Driver. London: Routledge and Kegan Paul (1968).

Intorre, J., "A Scale to Identify Problem Drivers." Dissertation Abstracts 27, 3-A (1966) p. 631.

Ivancevich, J. M., and Matteson, M. T., Stress at Work: A Managerial Perspective. New York: Scott Foresman (1980).

Ivancevich, J. M., and Matteson, M. T., "Optimizing Human Resources: A Case for Preventing Health and Stress Management." Organizational Dynamics (Autumn 1980) pp. 5-25.

Jenkins, C. D., and Zyzanski, S. J., "Behavioral Risk Factors and Coronary Heart Disease." Psychother Psychosom 34, Nos. 2-3 (1980) pp. 149-177.

Jenkins, C. D., Zyzanski, S. J., and Rosenmann, R., Jenkins Activity Survey. New York, NY.: Psychological Corporation (1979).

Kahn, R. L., and Quinn, R. P., "Role Stress." In Mental Health and Work Organization, McLean (Ed.), Chicago: Rand McNally (1970) pp. 50-115.

Kueting, H. J., Stress and Strain on Drivers: Literature Review. Cologne, West Germany: Federal Institute of Road Research (May 1976).

Levonian, E., "Personality Characteristics of Juvenile Driving Violators." Accident Analysis and Prevention 1, No. 1 (1969) pp. 9-16.

Mackie, R. R., et al., A Study of the Relationships Among Fatigue, Hours of Service, and Safety of Operations of Truck and Bus Drivers: Final Technical Report. Springfield, Virginia: National Technical Information Service (1972).

Mackie, R. R., and Miller, J. C., Effects of Hours of Service Regularity of Schedules, and Cargo Loading on Truck and Bus Driver Fatigue. Springfield, Virginia: National Technical Information Service (1978).

MacKinnon, N. J., "Role Strain: An Assessment of a Measure and Its Invariance of Factor Structure Across Studies." Journal of Applied Psychology 63, No. 3 (1978) pp. 321-328.

Margolis, G. L., Kroes, W. H., and Quinn, R. P., "Job Stress: An Unlisted Occupational Hazard." Journal of Occupational Medicine 16 (1974) pp. 659-661.

Marzi, A. and Sirigatti, S., "Driver Education: Problems and Psychological Guidelines." Studi e Richerche di Psicologia 10 (1967).

Maslow, A. H., Motivation and Personality. New York: Harper and Row (1954).

McBridge, R. S., "Prediction of Driving Behavior Following a Group Driver Improvement Session." Journal of Applied Psychology 54, No. 1, Part 1 (1970) pp. 45-50.

McDonald, R., Tempone, V. J., and Simmons, W. L., "Locus of Control as a Personality and Situational Variable." Perceptual and Motor Skills 27, No. 1 (1968) pp. 135-141.

McDonald, W. F.,"The Victim: A Social Psychological Study of Criminal Victimization." Dissertation Abstracts International, Microfilm No. 71-15693 (1972).

McGuire, F. L., "Personality Factors in Highway Accidents." Human Factors 18, No. 5 (October 1976) pp. 433-442.

Miller, J. M., "Efforts to Reduce Truck and Bus Operator Hazards." Human Factors 18, No. 6 (1976) pp. 533-550.

Moldavskaya, S. I., and Zagorodnyaya, V. F., "Psikhoifiziologicheskiye Kriterii i Metodika Professional 'Nogo Otbora Voditeley Avtotransporta" (Psychophysiological Criteria and Methods of Occupational Screening of Motor Vehicle Drivers). Gigiyena Truda i Professional 'Nye Zabolevaniya 5 (1977) pp. 24-27.

Nesbit, T. R., Development of an Advanced Driver Training Program for School Bus Drivers. Milford, Mich.: General Motors Proving Grounds (January 1975).

Nobaco, R. W., et al., "Transportation, Stress, and Community Psychology." American Journal of Community Psychology 7, No. 4 (August 1979) pp. 361-380.

Perry, J. L., "Transit Operator Survey Questionnaire." Unpublished survey instrument. Irvine, Calif. Institute of Transportation Studies (1982).

Pestonjee, D. J., and Singh, U. B., "Neuroticism-Extraversion as Correlates of Accident Occurrence." Accident Analysis and Prevention 12, No. 3 (September 1980) pp. 201-204.

Pyle, R. L., "Corporate Fitness Programs--How Do They Shape Up?" Personnel (January-February 1979).

Quane, W. L., "The Relationship of Visual Perceptual Capabilities as Measured by the Perception of Traffic Hazards Test and Behavioral Categories as Measured by the Mann Inventory." Dissertation Abstracts International 31, 7-A (January 1971) p. 3182.

Radu, I., and Pitariu, H., "Psychological Aspects of Road Traffic." Revista de Psihologie 24, No. 2 (April-June 1978) pp. 157-162.

Regie Autonome Des Transports Parisiens (RATP; Paris Metropolitan Transportation System). "Study Concerning the Job of Bus Driver in Road System" (October 1978). (Translated by U.S. Department of Transportation, Urban Mass Transportation Administration, Office of Transit Services.)

Reimann, J., "Investigation on the Reduction of Stress of Drivers in Regularly Scheduled Buses in Inner City Traffic." Institute for Occupational Science of Berlin Technical University (1981). (Translated by U.S. Joint Publications Research Service for Urban Mass Transportation Administration.)

Rimm, D. C., et al., "Systematic Desensitization of an Anger Response." Behavior Research and Therapy 9, No. 3 (August 1971) pp. 273-280.

Sainchez, J. J., "Personality of the Conductor and Accident Causality." Revista de Psicologiia General y Aplicada 22:86-87 (1967) pp. 143-159.

Saunders, D. R., Baehr, M. E., and Froemel, E. C., "Identification of, and Correction for, Effects of Racial Bias and Job Tenure on Supervisory Ratings of Bus Operator Performance." Psychological Reports 3, Part 1 (June 1977), pp. 859-865.

Schenck, S., and Schmidt, G., "Psychological Analysis of Apparent Distribution of Trolley Car Accidents in a Metropolitan Area." Probleme und Ergebnisse der Psychologie 40 (1972) pp. 49-68.

Schwartz, G. E., "Stress Management in Occupational Settings." Public Health Reports 95, No. 2 (March-April 1980) pp. 99-108.

Selzer, M. L., and Vinokur, A., "Life Events, Subjective Stress, and Traffic Accidents." American Journal of Psychiatry 131, No. 8 (August 1974) pp. 903-906.

Selzer, M. L., and Vinokur, A., "Role of Life Events in Accident Causation." Mental Health and Society 2, 1-2 (1975) pp. 36-54.

Seyle, H., The Stress of Life. New York: McGraw-Hill (1980).

Shere, E. S., and Priel, I., "Psychological Aspects and Motor Vehicle Accidents." Israel Annals of Psychiatry and Related Disciplines 10, No. 1 (March 1972) pp. 92-100.

Shostak, A., "The Human Cost of Plant Closings." AFL-CIO American Federalist (August 1980).

Sigelman, C. K., and Sigelman, L., "Authority and Conformity: Violation of a Traffic Regulation." Journal of Social Psychology 100, No. 1 (October 1976) pp. 35-43.

Skinner, H. A., "The Multidimensional Assessment of Stressful Life Events." Journal of Nervous and Mental Disease 168, No. 9 (September 1980) pp. 535-541.

Slosar, J. A., Jr., "Ogre, Bandit, and Operating Employee: The Problems and Adaptations of the Metropolitan Bus Driver." Urban Life and Culture 1, No. 4 (January 1973) pp. 339-362.

Smith, D. L., "The Relationship of the Six Basic Interests of Personality Measured by the Allport-Vernon-Lindzey Study of Values and Driving Record of Michigan Civilian Drivers as Determined by Accident Involvement and Traffic Violations." Dissertation Abstracts International 32, 6-A (December 1971) p. 3106.

Sommer, B., "Stress and Menstrual Distress." Journal of Human Stress 4, No. 3 (September 1978) pp. 5-10.

Southeastern Michigan Transportation Authority, Coach Operator Refresher Training Course. Detroit, Mich.: SEMTA (1981).

Spencer vs Toussaint., U.S. District Court, E. D. Michigan, February 18, 1976. In Mental Health Court Digest 20, No. 9 (1977).

Spielberger, C. D., Gorsuch, R. L., and Lushene, R. E., STAI Manual. Palo Alto, Calif.: Consulting Psychologists Press (1970).

Sterling, P., and Eyer, J., "Biological Basis of Stress Related Mortality." Soc. Sci. Med. 15, No. 1 (February 1981) pp. 3-42.

Stokols, D., et al., "Traffic Congestion, Type A Behavior, and Stress." Journal of Applied Psychology 63, No. 4 (August 1978) pp. 467-480.

Sutton, R. I., "Control, Prediction, Understanding, and Social Information: Towards an Integration of the Job Stress Literature." Ann Arbor, Mich.: Institute for Social Research, University of Michigan (1981). Working paper.

Theorell, T., "Life Events and Manifestations of Ischemic Heart Disease." Psychother Psychosom 34, 2-3 (October 1980) pp. 135-148

Toren, N., "The Bus Driver: A Study in Role Analysis." Human Relations 26, No. 1 (February 1973) pp. 101-112.

Whisman, R. W., "The Relationship of Selected Personality Traits and Personal Characteristics of Drivers to the Occupational Performance of School Bus Drivers in Ohio." Dissertation Abstracts International 39, 2-A (August 1968) p. 844.

Wyss, V., "Electrocardiographic Investigations During Car Driving." International Automobile Safety Conference, Detroit, Michigan (1970).

Wyss, V., Investigations on Comparative Oxygen Pulse Values Measured in Car Driving and in Equivalent Work on Bicycle Ergometer. Turin, Italy: Fiat Auto-Avio Research Laboratories (1971).

Young, M. E., Driver Performance Under Abnormal Conditions: Physical Impairment, Drugs, and Gases (A Bibliography with Abstracts). Springfield, Virginia: National Technical Information Service (1975).

Zeeman, E. C., "Mathematical Model for Conflicting Judgements Caused by Stress, Applied to Possible Misestimations of Speed Caused by Alcohol." British Journal of Mathematical and Statistical Psychology 29, No. 1 (May 1976) pp. 19-31.