

Working paper

CONDI/T/WP.2/1996

**Bus drivers:
Occupational stress and stress prevention**

Professor M.A.J. Kompier

TNO Prevention and Health, Leiden

Department of Work and Organizational Psychology,
University of Nijmegen

**Bus drivers:
Occupational stress and stress prevention**

Professor M.A.J. Kompier

TNO Prevention and Health, Leiden

Department of Work and Organizational Psychology,
University of Nijmegen

*Note: Working Papers are preliminary documents circulated
in a limited number of copies solely to stimulate discussion
and critical comment.*

Prelim page ii

Copyright page

ISBN 92-2-.....

Table of contents

Table of contents	iii
Preface	iv
Introduction	1
The dream of every boy	1
1. Stress in the bus driver's profession	2
1.1. Work and health of bus drivers: An overview of studies	2
1.2. Sickness absenteeism, work disability and turnover	3
1.3. Health problems	5
1.4. Psycho-physiological costs	6
1.5. Constraints in the working situation	6
1.6. The ergonomic layout of the bus driver's cabin	13
1.7. Conclusions: Work-related problems with respect to health and well-being	16
2. Prevention and intervention: Recommendations	18
2.1. Introduction: How to prevent and combat work stress	18
2.2. Ergonomics	20
2.3. "Combi" jobs (job rotation)	21
2.4. Timetables, shift schedules and the quality of break periods	21
2.5. Social work environment and management style	23
3. Organizational commitment, cooperation and a step-wise approach	27
3.1. Role of parties involved: A joint contract	27
3.2. A step-wise and participatory approach	29
References	36

Preface

Occupational stress can no longer be considered an occasional, personal problem to be remedied with palliatives. It is becoming an increasingly global phenomenon, affecting all categories of workers, all workplaces and all countries. This trend — coupled with its rising cost to the individual, to industry and to society as a whole — has greatly heightened awareness of the need for effective and innovative ways of tackling stress.

Stress prevention at the workplace has proved particularly effective in combating stress, by attacking its roots and causes, rather than merely treating its effects. In line with such an approach, this series of working papers is aimed at providing concrete advice on how to prevent stress in specific occupations particularly exposed to stress. For each occupation considered, the paper indicates a number of preventive measures targeted to the elimination of the causes of stress, rather than the treatment of its effects, and how these measures can become an integral part of the necessary organizational development of a sound enterprise and eventually pay for themselves.

The series includes the following working papers:

- Dr. V.J. Sutherland and Professor C.L. Cooper,
University of Manchester, United Kingdom
Stress prevention in the offshore oil and gas exploration and production industry;
- Professor G. Costa, University of Verona, Italy
Occupational stress and stress prevention in air traffic control
- Professor T. Cox and Dr. A. Griffiths, Nottingham University, United Kingdom
Professor S. Cox, Loughborough University of Technology, United Kingdom
Work-related stress in nursing: Controlling the risk to health
- Professor M.A.J. Kompier, University of Nijmegen, Netherlands
Occupational stress and stress prevention for bus drivers
- Dr. S. Kvanström, Asea Brown Boveri, Sweden
Stress prevention for blue-collar workers in assembly-line production

As the series is intended to stimulate action at enterprise level, its primary audience will consist of managers, supervisors, workers, workers' representatives and engineers who have a concrete interest in introducing anti-stress programmes within their enterprise and an open approach to improvements and change. The series is also directed at policy-makers, as well as government officials and workers' and employers' organizations with a direct interest in this area.

Introduction

The dream of every boy

“It’s the dream of every boy: that large bus, the uniform and the cap. I wanted to be a bus driver and now I am one. And I really like this job, I’m no type for offices and nine-to-five. On the bus, no one tells me what I should and what I should not do. And I’m service-minded, I like contacts with people. But it is hard, there are not many guys left that I started with 15 years ago. Most of them disappeared, they got sick; time pressure in combination with irregular services has worn them out. And many colleagues got back problems as well. And there is that violence these days, I have been assaulted twice and the public has changed. I like my first passenger to smile and humour makes the world go round. But they are in a hurry, no time for jokes, and traffic has intensified terribly. You know this job poses demands that often I cannot meet: ‘Hey driver, please hurry, never mind that yellow light, I have to catch that train’, goes the business man; ‘Good evening, driver, would you please wait till I’m seated, my leg is too bad’, says an old lady. And what should I do when a truck is unloading right in front of me?”

This bus driver is Dutch, but that is not of any importance. He could have been English, German or French, or he could have been from the Scandinavian countries, from the United States or from developing countries in Africa or Asia. And he could have been a she, since not only males drive buses.

There have been numerous studies in these and other countries on the work and health of bus drivers. A small number of these studies address drivers who merely drive in rural areas on long-distance lines. However, since the majority of bus drivers work in metropolitan areas, most of these studies are on city bus drivers. This paper is therefore primarily directed at bus drivers in metropolitan areas, although many of the recommendations made are also valid for rural, long-distance drivers.

It is amazing to what extent all these studies yield comparable results: high demands, low control and low support. This combination spells stress and, consequently, an increased risk of physical and mental occupational ill health, leading to absenteeism and to decreased productivity of employees and enterprises.

The first chapter of this working paper presents an overview and the main results of these studies. First an overview will be shown of the most important studies on the work and health of bus drivers (Section 1.1). Next, several questions will be dealt with:

- What do we know about sickness absenteeism, work disablement and turnover of bus drivers (Section 1.2)?
- What are the main health outcomes as mentioned by the drivers (Section 1.3)?
- What are the psycho-physiological costs of driving a bus (Section 1.4)?
- What are the main constraints in the working situation (Section 1.5)?

— What is the ergonomic quality of the bus driver's cabin (Section 1.6)?

The second chapter is directed towards the prevention of work stress in bus drivers. Many recommendations are given in order to reduce work stress. Several practical experiences from various bus companies demonstrate that it is possible to improve both the quality of work and productivity.

These recommendations relate to ergonomics of the bus cabin (Section 2.2); job rotation and "combination jobs" (Section 2.3); timetables, shift schedules and the quality of break periods (Section 2.4); and the social work environment and management style (Section 2.5).

Stress reduction is not merely a technical process, based on a technical analysis and the proper recommendations. Stress signalling and stress prevention relate to changing and improving organizations and organizational processes. Stress projects in bus companies and in many other enterprises in several branches of industry all over the world have shown that a successful approach aimed at stress prevention is participatory and stepwise.¹ Participatory in the sense that all parties involved play an active role: top and middle management, employees, trade unions and, when available, the personnel department and company doctor. Stepwise, meaning that solutions will be achieved by a problem-solving process involving different phases: preparation, problem analysis, choice of measures, implementation and evaluation.

The third chapter shows how such a successful approach can be achieved.

1. Stress in the bus driver's profession

1.1. Work and health of bus drivers: An overview of studies

Numerous studies have been conducted on the occupational health of bus drivers. Box 1 mentions 32 of the most important studies over three decades from 13 countries.

Many of the 32 studies compare bus drivers with other employees: office employees (often, but not always, from the same company), conductors, non-drivers, blue-collar workers, taxi drivers, employees of a brewery, white-collar employees, employees of a printing office or national statistics (e.g. all Dutch civil servants, or the average male employee).

The studies indicate that being a bus driver is a high-risk occupation.

¹ ILO: *Conditions of Work Digest* on "Preventing stress at work", Vol. 11, No. 2, 1992.

Table 1. Important studies on the work and health of bus drivers					
	Author	Type of study	Country	Year	Sample population
1.	Anderson	4	USA	1992	130 drivers
2.	Aronsson	2	Sweden	1982	4554 bus and tram drivers
3.	Backman	1, 4	Finland	1983	1597 professional drivers, a.o. bus drivers
4.	Brooks	6	United Kingdom	1979	30 bus drivers
5.	Courtney & Wong	3	Hong Kong	1985	Hong Kong buses
6.	Davis & Lowe	3	United Kingdom	1987	London buses
7.	Erlam	2	United Kingdom	1982	12,639 bus drivers
8.	Duffy & McGoldrick	1	United Kingdom	1990	376 bus drivers
9.	Feickert & Forrester	1, 2	United Kingdom	1983	289 bus drivers
10.	Felnemeti & Boon-Heckl	4	Austria	1985	18 bus drivers
11.	Garbe	2	Germany	1983	775 bus drivers
12.	Gardell et al.	1, 2, 4	Sweden	1982	1,422 bus, tram, train and guard workers
13.	Grosfeld	1, 2	Netherlands	1993	2,050 bus drivers
14.	De Haan et al.	1, 2	Netherlands	1978	1,252 bus drivers
15.	Holme et al.	1, 4	Norway	1977	98 bus drivers (14,000 other employees)
16.	Kompier	1, 2, 3	Netherlands	1989	4,180 bus drivers
17.	Kompier	5	Review	1985	
18.	Meifort	1, 2	Germany	1983	300 bus drivers, 300 tram drivers
19.	Meijman et al.	2	Netherlands	1982	135 ex-bus drivers
20.	Morris et al.	4	United Kingdom	1966	413 bus drivers
21.	Mulders et al.	4	Netherlands	1982	12 bus drivers
22.	Netterstrom & Laursen	2, 4	Denmark	1981	1,396 bus drivers
23.	Nijhuis & Bulinga	1, 2	Netherlands	1991	120 bus drivers
24.	Oortman-Gerlings et al.	1, 3	Netherlands	1985	8 buses
25.	Oversloot et al.	1, 2	Netherlands	1982	655 bus drivers
26.	Pikus & Tarannikova	4	Soviet Union	1975	930 bus drivers and 312 ex-drivers
27.	Pokorny et al.	6	Netherlands	1987	990 bus drivers
28.	Ragland et al.	2, 4	USA	1987	1,500 bus drivers
29.	Reimann	4	Germany	1981	28 bus drivers
30.	Rissler & Aronsson	4	Sweden	1983	41 bus drivers
31.	Rusconi et al.	2, 4	Italy	1975	200 bus drivers
32.	Winkleby et al.	5	Review	1988	

1.	Questionnaire on health outcomes and/or working situation
2.	Study on absenteeism, work disability (and rehabilitation), turnover
3.	Ergonomic study
4.	Bio-medical study or physical examination
5.	Literature review
6.	Accident study

1.2. Sickness absenteeism, work disability and turnover

It is amazing to what extent the outcomes of the studies on sickness absenteeism, work disability and turnover are similar. By way of illustration, the results of two large studies are given below.

Between 1974 and 1977, 775 bus drivers in former West Berlin left their jobs. Only 7 per cent of these drivers left the company having reached their pensionable age, whereas 25 per cent left

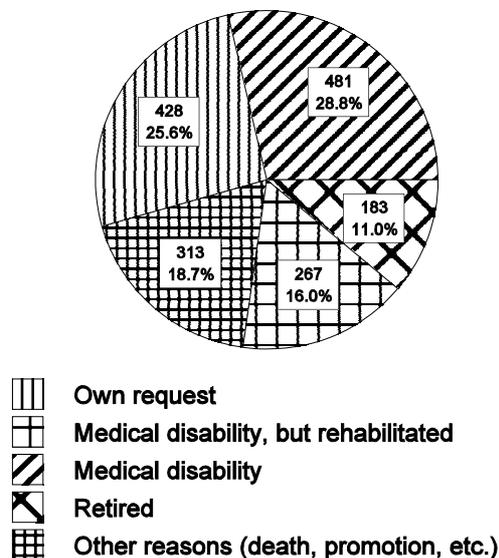
upon their own request, mostly in the first four years. Almost 90 per cent of those drivers with high work experience (over 18 years) left the bus company for reasons of poor health. From those bus drivers who started working for the company at a relatively young age (before age 31), not one left the company at the pensionable age. Those drivers who started after age 40 had the highest chance of reaching their pensionable age. The main conditions leading to disablement related to cardiovascular diseases (32 per cent); the back, tendons and joints (20 per cent); and psychosomatic disorders (21 per cent).²

Absenteeism, turnover and disability, and the inter-relationships between these phenomena among city bus drivers in the Netherlands were studied in the period between 1978 to 1985.³

Absenteeism among these drivers appeared to be two to three times as high as the national average. The risk of disability was more than twice as high as the risk for male Dutch civil servants in general (in the Netherlands, city bus drivers are civil servants). Bus drivers who had to leave their job for medical reasons did so at a younger age than other groups of civil servants. The risk of work disability was more than twice as high for bus drivers than for the average civil servant. The disability risk for musculo-skeletal disorders was four times higher.

During this time, 1,672 bus drivers left their profession for the following reasons.

Figure 1. Turnover of all city bus drivers in the Netherlands (1978-1985)



² C. Garbe: *Ansätze betrieblicher Epidemiologie am Beispiel der Untersuchung gesundheitlicher Selectionsprozesse bei Busfahrern*, paper presented to a conference on working environment in urban public transport, Stockholm, 1983.

³ M.A.J. Kompier: *Work and health of city bus drivers* (in Dutch), doctoral thesis (Delft, Eburon, 1989).

Summary. Sickness absenteeism of bus drivers is significantly higher compared to other professional groups. The same holds true for the risk of disability. Bus drivers who have to leave their job for medical reasons do so at a younger age than comparable groups of employees. The main conditions leading to disability relate to the back, tendons and joints, mental disorders and cardiovascular diseases.

1.3. Health problems

Musculo-skeletal problems

As is demonstrated by many authors (Table 1: 1, 4, 9, 12, 16, 25), the amount of musculo-skeletal complaints among bus drivers compared to other occupational groups indicates that musculo-skeletal disorders are a major work-related health problem for bus drivers. Frequently reported complaints relate to the lower part of the back, neck, shoulders, the upper part of the back and the knees. A recent study shows that Californian bus drivers struggled against their lower back pain by doing exercise, seeking professional treatment and taking medication.⁴

Psychological problems

Many studies (Table 1: 9, 12, 14, 16, 18, 25) indicate strong feelings of fatigue, tension and mental overload among bus drivers.

Stomach and intestinal disorders

Several authors (Table 1: 1, 4, 9, 12) mention problems as regards the stomach and intestines.

Sleeping disorders

Sleeping problems are also characteristic for bus drivers (Table 1: 8, 16, 18). These complaints are especially related to the early shifts.

Main health problems of bus drivers	
—	Musculo-skeletal problems (lower part of the back, neck, shoulders, upper part of the back, knees)
—	Psychological problems (fatigue, tension, mental overload)
—	Stomach and intestinal disorders
—	Sleeping problems

⁴ R. Anderson: "The back pain of bus drivers: Prevalence in an urban area of California", in *Spine*, Vol. 17, No. 12, 1992, pp. 1481-1488.

1.4. Psycho-physiological costs

Several authors studied the psycho-physiological costs of this occupation, during work and leisure. Most of them indicate relative high blood pressure among bus drivers (Table 1: 12, 15, 20, 26, 28, 29). Mulders et al. demonstrated relatively high levels of urine-adrenaline in bus drivers.⁵ Gardell et al. showed that bus drivers under time pressure have high cortisol levels.⁶ These high psycho-physiological costs are supposed to be, or are suspected of being, especially related to cardiovascular problems. In accordance, many authors report more diseases of the heart and blood vessels among bus drivers than other professional groups.

Psycho-physiological costs	
—	Relative high blood pressure
—	Relative high levels of urine-adrenaline
—	Relative high levels of cortisol

1.5. Constraints in the working situation

What are the main constraints in the bus driver's working situation? Typical results of the numerous studies on this question are given in Tables 2 and 3 below.

Table 2. Most common reasons for thinking of quitting [percentage of those bus drivers who stated that they seriously considered quitting (more than one answer allowed)]⁷

To have better working hours	71%
Job too strenuous, stressful, rushed	52%
Working hours led to family problems	35%
Health complaints	32%
Pay too low	43%
Want more interesting duties	26%

⁵ H. Mulders, T.F. Meijman, J. O'Hanlon and G. Mulder: "Differential psycho-physiological reactivity of bus drivers", in *Ergonomics*, Vol. 25, No. 11, 1982, pp. 1003-1011.

⁶ B. Gardell, G. Aronsson and K. Barkloff: *The working environment for local public transport personnel* (Stockholm, Swedish Work Environment Fund, 1982).

⁷ *ibid.*

Anxious about violence and threats of assault	30%
Dislike the company's general attitude to staff	26%
Problems with childminding	6%

Table 3. Stressors reported (percentages for "regular or major problems")⁸

Possibility of assault	70%
Traffic congestion	69%
Risk of carrying large sums of money	67%
Not knowing enough about how the company is managed	59%
No chance to suggest work changes	59%
Peak running times	55%
Public enquiring about other buses/service times	53%
No recognition for good work	53%
Passengers wanting change	49%
Lack of job security	42%
Less help from inspectors	42%
Poor treatment by passengers	36%
Problems unwinding at home	36%
Irregular company medicals	34%
Sleeping problems	29%
Adjusting lifestyle to shift work	27%
Difficulties with family because of long working hours	25%
Worrying about poor health	21%
Learning the routes	14%

⁸ C.A. Duffy and A.E. McGoldrick: "Stress and the bus driver in the UK transport industry", in *Work and Stress*, Vol. 4, No. 1, 1990, pp. 17-27.

These and other studies highlight the following major occupational constraints for bus drivers.

High and conflicting demands: Passengers, time pressure, safety

The driver's task is mentally demanding because of having to cope with conflicting requests. The company and the public want the driver to maintain good contact with passengers and to be service-oriented, for instance to travellers (providing information about timetables, routes, stops, fares, etc.). These are also important aspects for job satisfaction. In the operator's daily life, the demand for service by the individual passenger often conflicts with the need to keep to a tight schedule in dense traffic. The third demand on the driver, also conflicting with the other two, is the demand to drive safely according to traffic regulations.

Photo No. 1. Passengers, time pressure, safety



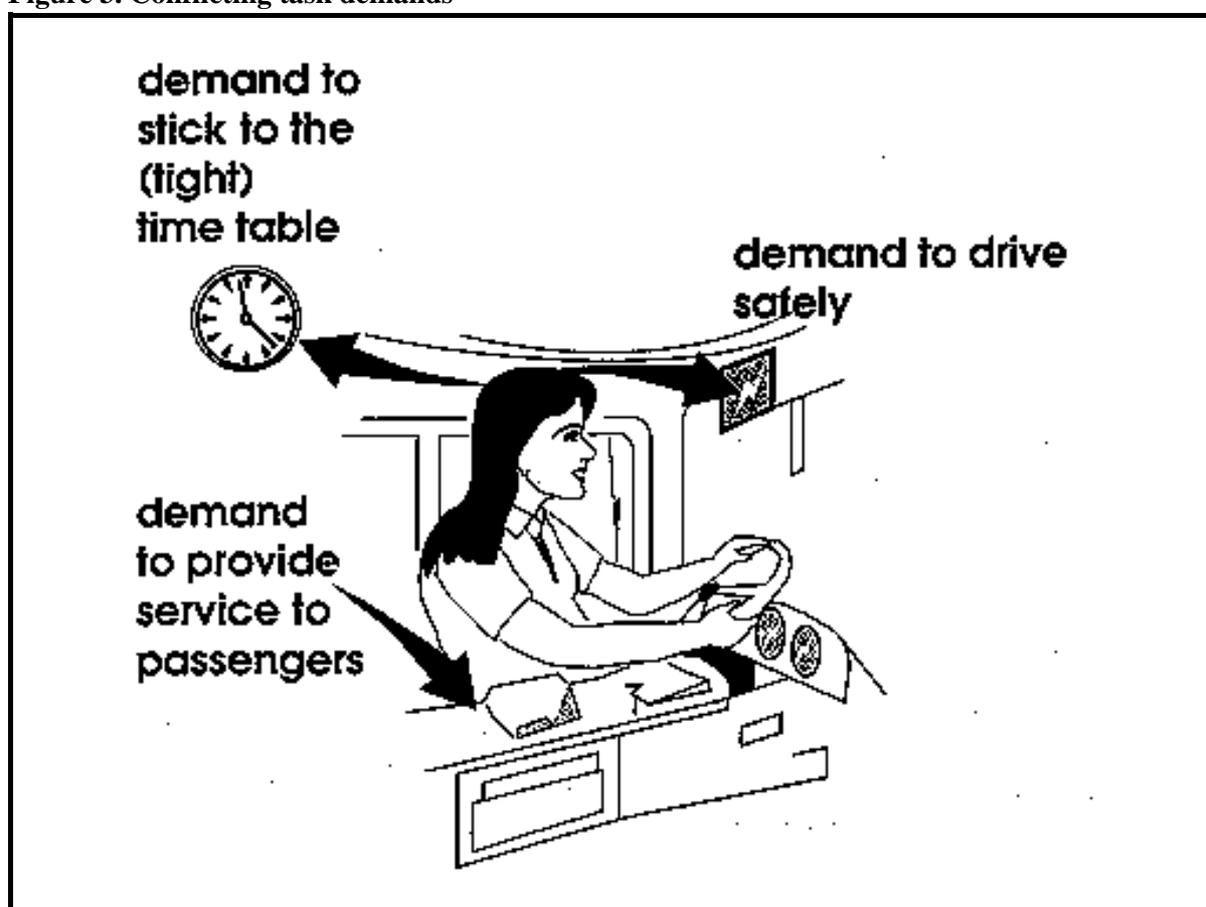
The conflict between these priorities and the ways in which bus drivers cope with them are described by Gardell.⁹

⁹ Gardell et al., op. cit.

The conflict between these priorities seems to be handled in one of two ways. One is for the driver to adopt an attitude whereby the passengers are regarded as freight. In this way, he or she tries to avoid becoming psychologically involved in the passengers' situation. Such an impersonal relationship means, for instance, that a person who is late and runs for the bus can be left behind without compunction. The timetable can then be adhered to, which is good service for those who are already on the bus or waiting for it, and the driver has time for a proper break.

The other attitude means that the driver tries to live up to demands for personal service and handles passengers in a personal way. In many cases, however, this cannot be combined with adherence to the timetable. The conflict may be resolved by driving unduly fast — around 25 per cent of bus and tram drivers report that schedules are so tight that traffic safety is endangered almost daily — or being continually behind schedule, so that passengers complain and there may not be time for a proper break. It therefore seems that, whichever alternative the driver adopts, he or she will constantly have a conscious or subconscious feeling of inadequacy.

Figure 3. Conflicting task demands



Low autonomy and support

It is important to note that whichever alternative the driver adopts, he or she cannot resolve the basic problem of conflicting demands. This is a low autonomy situation, an important cause of work stress. Although bus drivers often characterize themselves as “boss in their own bus”, this power is strongly restricted. To a large extent, they work isolated from colleagues and

superiors. Bus drivers often complain about “not knowing what management is up to” and not getting enough information and support from middle and top management: “There is no recognition for good job performance: to them you are a number”.

Photo No. 2. The bus driver is, to a large extent, isolated from colleagues and superiors



Bus driver's cabin and physical factors

Bus drivers often criticize their daily workplace: an **open** working place due to the frequent opening of the doors. These remarks refer to the inconvenience caused by draft, wind, change of temperature, dry air, cold, noise, bad smell, heat and wet air. Secondly, there is the high level of vibration and the forced seating position (trouble with sitting and working in an uncomfortable body posture). The driver's seat, and also other cabin components, mostly lack sufficient adjustability, such as adjustable springs. Many drivers report a bad layout of the workstation. Thirdly, high numbers of bus drivers report high levels of bad illumination, blinding glare and reflection, which seem to be primarily related to night driving, poor weather conditions and neon lights.

Threats and violence

It is more and more common for transport personnel (bus drivers, tram and train conductors, and subway operators) to have problems with disorderly and troublesome passengers. These problems often occur when passengers do not possess, or do not want to buy, passenger tickets. Sometimes drivers are robbed or assaulted. Physical harm is increasingly becoming an occupational risk for bus drivers, especially in large cities and during night shifts. Also soccer fans and youngsters returning home late after having visited inner-city night life are liable to make threats and be violent.

Key aspects of a bus driver's schedule

- Length of working week and working day
- Number, length and quality of break periods
- Daily rest between two consecutive working days
- Regular or day-to-day assignments
- Continuous or split shifts
- Days off and weekends off
- Forward rotation/backward rotation

Work schedules and the work-leisure relationship

Being a bus driver means working at times when other employees do not and vice versa. Irregular working hours are a major inconvenience for many bus drivers. Since the demand for commuter service and other journeys varies over the day and over days in the week, many drivers work complicated shift systems. There are large differences between schedules. However, certain basic aspects are important for all work schedules.¹⁰

Length of the working week and the working day. A working week does not normally exceed 40 hours and normal daily hours of work are eight. In many countries, bus drivers work less hours since they work part time. On the other hand, many drivers work longer working weeks and working days, particularly in developing countries. These longer working weeks often lead to insufficient opportunities for recovery and unwinding. In addition to normal working hours, bus drivers may work overtime. This might lead to a long working week exceeding, in practice, the official working week.

Number, length and quality of break periods. During the working day, in between two consecutive periods of driving, breaks are provided in order to permit the driver to eat and drink, to relax and to communicate with his or her colleagues. Several problems may be related to these break periods.

- They may be of an insufficient length (e.g. 15 minutes for a lunch break).

¹⁰ *ibid.*

- Their number may be too limited (e.g. only one break period during the working day).
- They may be too late, that is after a too long number of working hours.
- They may be of poor quality since break periods are taken at the terminus of bus lines or in badly designed company locations (e.g. with no possibilities for a proper drink or meal).

Daily rest between two consecutive working days. There are differences in the number of consecutive hours for daily rest in between two consecutive working days. Sometimes the minimum standard of 11 consecutive hours is not met.

Regular or day-to-day assignments. Personnel with regular assignments have regular hours of work and also the same routes as long as the assignment lasts (often six months to one year). Working hours can vary from day to day, but only to a set schedule. Day-to-day assignments involve a kind of ambulatory job. These drivers are kept available to replace colleagues on sick leave or who have taken days off. Characteristic of day-to-day assignments is the great uncertainty about the time and place of the next day's work. This is seldom notified before the afternoon of the day before.

Continuous or split shifts. While continuous shifts dominate in bus enterprises, many companies also organize their schedules on a two-shift basis (early shift and late shift). In most cases, working hours are organized in a way that an early shift one week is followed by a late shift the next week. The morning shift normally starts around 05:00 or 06:00 and ends around 14:00 or 15:00, with a lunch break during the shift. The evening shift starts around 15:00 or 16:00 and lasts until 23:00, 24:00 or 01:00. Other companies use three-shift schedules. In addition to early and late shifts, there is a day shift, starting around 08:00 or 09:00 and lasting until 17:00 or 18:00. In several large cities, bus drivers also work night shifts. Many companies employ split shifts to meet the uneven demand for transportation. A split schedule may indicate that work starts around 06:00 and continues until about 09:30, when the employee is free for four to five hours, and then resumes work around 15:00 hours and continues until about 19:00 hours. As regards health and well-being, split shifts are to be considered a very unfavourable variety of shift work.

Days off and weekends off. A day off may be a single day or may be coupled by a second day off. A day off may be a weekday or a Saturday or Sunday. There is a large variety in the way free days are divided in the schedules. In some shift systems, a day off recurs at regular intervals, e.g. the fourth, fifth or sixth day is free, regardless of the day of the week. In addition to these regular days off, a certain agreed number of complementary days off are added to a regular day off. Often, agreements are made with regard to the number of ordinary free weekends in the schedule. Drivers wish to have as many free weekends as possible.

Forward rotation/backward rotation. Forward rotation means the sequence "early-day-late". Such a clockwise sequence, as much as possible followed by two consecutive days off, is less health threatening than the other way around: "late-day-early". A quick rotation (blocks with three or four consecutive days or working periods) is preferable to a slow rotation (six or seven consecutive working periods).

It has been demonstrated in many studies that bus drivers consider the irregularity of their working and resting times to be an important inconvenience. This irregularity affects family life and leisure activities negatively (see Tables 2 and 3). It also causes sleep problems and provides insufficient opportunities for recovery and unwinding.

1.6. The ergonomic layout of the bus driver's cabin

What is the ergonomic quality of the bus driver's cabin? Studies have demonstrated clear deficiencies in design and construction. These deficiencies relate to the lack of uniformity and of freedom of movement, and to the driver's seat, the steering wheel and pedals. As regards the driver's seat, adjustable lumbar support or adjustable springs are often lacking, which would prevent health impairments due to whole body vibrations. Vibration levels on Dutch buses, exceeding ISO-2631 eight-hour fatigue-decreased proficiency boundaries and, in most cases, even exceeding eight-hour exposure limits, are a major occupational hazard.¹¹ In some buses, the diameter of the fixed steering wheel (550 mm) is too large and a large fixed steering wheel has many disadvantages. Drivers experience difficulties with working postures and movements.¹² As a consequence of the above-mentioned shortcomings, drivers are unable to adjust the seat and the steering wheel in a way that would fit individual body characteristics.

¹¹ P. Oortman-Gerlings, D. van Drimmelen and Y. Musson: *Whole body vibration: Results of empirical measurements* (in Dutch), document no. LA-DR-10-04 (Leidschendam, 1985).

¹² Kompier, op. cit.

Photo No. 3. Restricted freedom of movement for knees and thighs



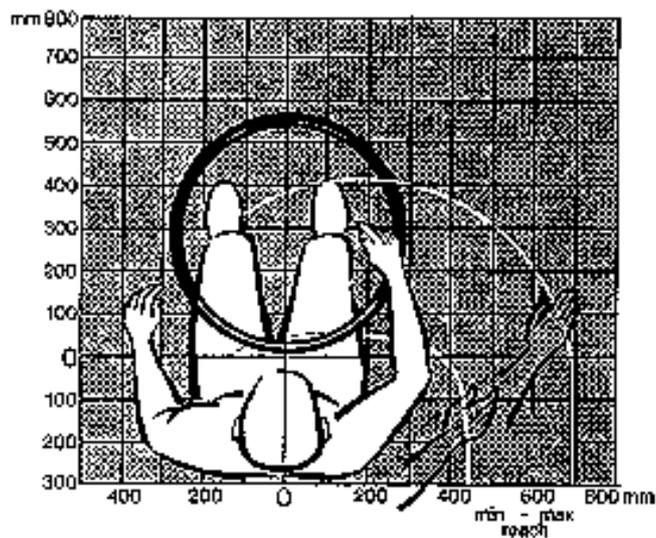
Photo No. 4. Difficulties with working postures when changing the name of the destination



Photo No. 5. Bending the trunk forward when turning the wheel



Figure 3. Diameter of steering wheel related to reach dimensions



Lack of seat adjustability also impedes a proper reach of the foot to the pedals, causing unnecessary muscle strain in lower body members and increasing the risk of accidents (see Photograph Nos. 6 and 7).

Photo No. 6. Short legs, overstretching of ankle, improper use/operation of pedal



Photo No. 7. Long legs, not enough space, improper use/operation of pedal

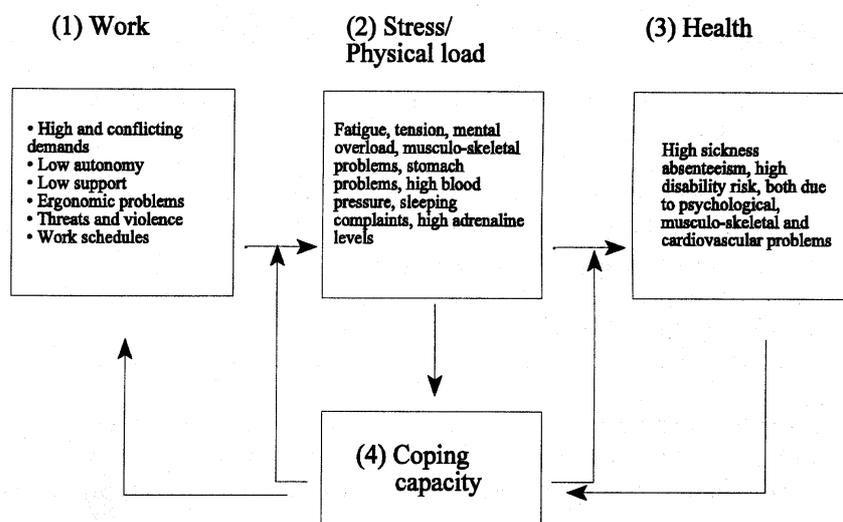


In addition to these occupational hazards, there are special safety risks in many developing countries where urban transport is often carried out by means of old buses. In some cases, these buses were imported from industrialized countries, where they had been considered too old and a safety risk. These buses may be dangerous means of transport, not only for the driver but also for the passengers, especially in case of overcrowding in the bus. The transfer of technology may also pose problems for the drivers, as the dials and controls may be identified in a foreign language. Maintenance manuals are frequently not included as part of the terms of reference of the contracts, driving seats cannot be adjusted to fit bodily dimensions, and training and retraining are rarely practised.

1.7. Conclusions: Work-related problems with respect to health and well-being

There have been numerous studies conducted on the work and health of bus drivers. These studies, although heterogenous in nature, are fairly similar in their conclusions, as summarized in Figure 4.

Figure 4. Work, stress and health of bus drivers



Driving a bus was shown to be an occupation with high risks for health and well-being.

1. Comparisons with other occupational groups generally show higher rates of absenteeism and disability among bus drivers. This is also true for several psychological (strong feelings of fatigue, tension and mental overload, sleeping problems) and musculo-skeletal complaints (back, legs, neck and shoulders).
2. Meaningful and plausible relations have been demonstrated between work factors and the nature and size of the health problems. For instance, between ergonomic problems and self-reported musculo-skeletal problems, absenteeism and disability, and also between high psychological demands, low autonomy and low support, on the one hand, and the amount of psychological complaints and absenteeism due to psychological problems, on the other.
3. To a large extent, 32 studies from a large number of countries yield comparable results.

2. Prevention and intervention: Recommendations

2.1. Introduction: How to prevent and combat work stress

Stress programmes at the worksite can be classified into those directed at changing the work environment (**Work** in Figure 4) and those directed at teaching employees stress management or stress reduction skills (the person's **coping capacity** in Figure 4). As for stress prevention and intervention, another important distinction can be made: between primary prevention, on the one hand, and secondary and tertiary prevention, on the other. Primary prevention concerns interventions aimed at eliminating, reducing or altering stressors. Secondary prevention concerns approaches designed to prevent workers who already show signs of stress from becoming sick and to increase their coping capacity. Tertiary prevention concerns treatment activities directed at those workers who show strong stress reactions and rehabilitation after sickness absenteeism.

By combining the two main axes — **changing work** versus **assisting or treating the person** and **eliminating risks** versus **preventing it from becoming worse** — a framework can be developed which indicates four types of prevention and intervention (see Figure 5 below).

Figure 13. Framework for stress prevention and intervention

		Prevention	
		Primary	Secondary/tertiary
Intervention	Work environment	1	2
	Individual/group	3	4

Three basic strategies to prevent stress are listed below in order of preference.

Stress prevention: Three basic strategies in order of preference

1. Eliminate or modify the stress-producing situation or remove the individual from it.
2. Adapt work organization and the workstation to fit individual characteristics of the employee.
3. Strengthen the person's resilience to stress, for example, through physical exercise, meditation or relaxation techniques, and social support.

The first two strategies are directed at the working situation. The third strategy is person-oriented. Stress management has traditionally focused on individual approaches, usually by counselling individuals or small groups of employees on ways to adapt to, or cope with, various occupational stressors and/or their consequences. More recently, approaches have started to encourage the employee to adjust his or her work environment to abilities and needs, improving the person-environment fit, and advising management and supervisors to allow or even promote such adjustments.

An example of such an approach is the European Union Directive on health and safety.¹³ The Directive states, *inter alia*, that the employer has a duty to ensure the safety and health of workers in every aspect related to the work, following general principles of prevention: avoiding risks; evaluating the risks that cannot be avoided; combating the risks at the source; adapting the work to the individual, especially as regards the design of workplaces; the choice of work equipment, and the choice of working and production methods, with a view to alleviating monotonous work and work at a predetermined pace and to reducing their effects on health.

With the help of Figure 5, one can systematically search for effective strategies against work stress. It facilitates the systematic consideration of possible changes in the work situation and with the worker. A tailor-made programme, referring to the three basic paths, may well be the result of these considerations. A programme to combat work stress will often combine measures from the four quadrants.

In the next section, recommendations to combat and prevent work stress are presented against the background of these three basic strategies (in order of preference) and the conceptual framework in Figure 5. Measures, recommendations and examples are generated and selected from practical experiences of various bus companies and from international stress prevention projects and publications.¹⁴

The main recommendations concern ergonomics of the bus cabin (Section 2.2); job rotation and “combination” jobs (Section 2.3); timetables, shift schedules and the quality of break periods (Section 2.4); and the social work environment and management style (Section 2.5).

¹³ Council Directive of 12 June 1989 on the introduction of measures to encourage improvements in safety and health (*Official Journal*, No. L.183, 29 June 1989).

¹⁴ ILO, *op. cit.*

2.2. Ergonomics

The most important recommendations concerning the design and construction of cabin components are listed in below. Consequently, cabin components should become more adapted to individual anthropometric characteristics (e.g. gender, bodily dimensions, weight).

Ergonomic recommendations

1. Driver's seat

- Ensure that both big and small drivers can adopt comfortable driving postures.
- The range of adjustments of many seats needs to be enlarged. The vertical range should be 100 mm; the range fore and aft should be more than 150 mm.
- Adjustable springs.
- There should be lumbar support which can be adjusted in height and thickness.
- Provide easy-to-operate controls for adjustability.

2. Steering wheel

- The diameter should be less than 500 mm.
- The steering wheel should be adjustable along the axis of the steering column.
- The steering wheel should have an independent adjustment of its angle of inclination (15-32 degrees to the vertical).

3. Pedals

- Pedals should be within easy reach, even for small drivers.
- The pedals should have equal angles.
- The range of the angles should be less than 25 degrees.

4. Dashboard

- Ensure that all displays can be seen easily from the point of vision.
- Arrange displays according to functions and frequency of use.
- Provide easy-to-read labels for each display.
- Ensure easy and safe operation of manual controls, in particular emergency controls.

5. Working space and environment

- Ensure that both big and small drivers can safely enter and leave the workplace.
- Provide more effective heating and cooling systems.

6. Training

- Provide adequate training for new drivers.
- Ensure retraining if new bus models are introduced.

In addition to these recommendations with respect to the bus cabin, there is a major basic recommendation which affects the bus as a means of transport and the ways essential safety standards are met. In particular, this basic recommendation is directed at bus companies in developing countries. As has been described before, urban transport in some countries usually consists of old and overcrowded buses. In many cases, these buses do not meet technical safety standards (e.g. regarding the brake system, mirrors, etc.). Especially in the case of older buses, periodical technical maintenance, and the proper and timely repair and replacement of used parts in the technical system, is extremely important.

Example of a participatory ergonomics intervention

In a bus company, management and the company doctor were impressed by the large number of work-related health problems of its bus drivers. Accordingly and in consultation with the bus drivers' union representatives, management decided to improve ergonomic working conditions. Arrangements were made with several contractors to provide bus types according to certain ergonomic standards (see above recommendations). Each contractor provided one or two buses. These buses were put into operation and, after a trial period, judged by the bus drivers. On the basis of this evaluation, the company management made the final choice for the "best bus" and started replacing old buses by new ones. This policy appeared to be a good policy for two reasons: first, the new buses provided better physical working conditions; and secondly, they also provided better "psycho-social" working conditions. Bus drivers were convinced that their opinions were well taken by management and this really improved the management-labour dialogue.

2.3. "Combi" jobs (job rotation)

"Combi" jobs are a partial solution against the high workload of the bus driver, especially in cities that not only are responsible for municipal transport but also for other municipal services. "Combi" jobs refer to the combination of the bus driver's task with other non-driving tasks (e.g. clerical or mechanical). In practice, however, the successful introduction of combination jobs in bus companies is difficult. This might be due to differences in professional status between the different tasks ("I signed up as a bus driver, so I am here to drive buses"), as well as to the fact that alternative positions for bus drivers are scarce. Although this approach is hard to manage on a collective basis, it has proved to be very successful in individual cases (see Section 2.5 on social medical guidance).

2.4. Timetables, shift schedules and the quality of break periods

Several measures can be recommended in order to attain a more balanced relation between work and recovery, both during the working day and between working days.¹⁵

¹⁵ ILO: Hours of Work and Rest Periods (Road Transport) Convention, 1979 (No. 153), and Hours of Work and Rest Periods (Road Transport) Recommendation, 1979 (No. 161).

Recommendations as to work and resting schedules and timetables

1. Normal hours of work should not exceed 40 hours per week.
2. Normal hours of work should not exceed eight per day as an average.
3. When normal weekly hours of work are unevenly distributed over various days of the week, the normal hours of work should not exceed ten per day.
4. No driver should be allowed to drive continuously for more than four hours without a break.
5. A 20-minute break after two hours of continuous work.
6. The daily rest of drivers should be at least 11 consecutive hours during any 24-hour period starting from the beginning of the working day.
7. The minimum duration of the weekly rest should be 24 consecutive hours, preceded or followed by the daily rest.
8. There should be enough time to reduce task conflicts.
9. Work should be organized in periods of several (maximum four) consecutive days within the same shift.
10. Avoid split shifts.
11. Regular assignments instead of day-to-day assignments.
12. Choose forward rotation: early-day-late.
13. No single day off, but two days off between blocks of working days.
14. Guaranteed possibilities to take days off.
15. All hours worked in excess of normal hours should be considered as overtime and, as such, remunerated at a higher rate or otherwise compensated.

Example of guaranteed possibilities to take days off

In the bus company of Groningen, a medium-sized city in the Netherlands, bus drivers could not take their free days when they wanted, due to a large number of drivers on sick leave. Requests for a day off (often for family reasons or as an extra possibility for recovery) were frequently turned down since “service demanded it”. Thus many drivers were sick and their colleagues worked overtime. Both bus drivers and management were aware of the fact that this development was not only socially undesirable, but also counterproductive. The more drivers worked overtime, the greater the risk that drivers would become sick, that drivers would have to work overtime, etc. Eventually service could be in jeopardy, and the public could well turn to other means of transport. Company management, in consultation with the drivers’ representatives, decided to hire temporary workers, in order to give drivers the opportunity to take free days when it suited them best. This allowed drivers to use the free days that had accumulated by working extra hours. As a result of this measure, sickness absenteeism decreased significantly. After a while, however, the temporary workers were dismissed and the old situation slowly returned.

Example of shift schedules and the quality of break periods

Irregular working hours are a main characteristic of the bus driver’s occupation. Several companies have, however, improved their shift systems by making “irregularity less irregular”. Many companies succeeded in avoiding split shifts in their schedules, since these shifts are a major

risk factor for health and well-being. Some of the companies hired part-time drivers to make this possible.

Other companies have introduced forward rotation: early shift/day shift/late shift. This sequence is preferable to backward rotation as it has less adverse effects on important bodily functions.

Many companies have become aware that, in a both physically and mentally demanding job, there should be guaranteed possibilities for breaks and meals. Often the long break (for lunch or dinner) is not situated in the middle of the eight- or nine-hour shift. Instead, it is given after two or six hours (too early or too late). By systematically trying to situate short breaks and the long break strategically over the shift, many companies have succeeded in improving recovery during work. Various companies have also improved canteen facilities (premises, healthy food, etc.), realizing that these break periods are one of the few possibilities for drivers to meet each other.

2.5. Social work environment and management style

Some important recommendations with regard to the social work environment are listed below. Some of these recommendations have already been taken into account in various companies, as will be shown in the examples given in this section.

Recommendations as to the social work environment

1. Divide the total driving staff into fixed groups of ten to 20 drivers with one fixed supervisor.
2. Introduce a system of work consultation for these groups. Take the remarks from these drivers seriously.
3. Introduce a more supportive style of leadership. Train supervisors and management in their new behaviour.
4. Give possibilities for (re)training.
5. Give special facilities for the older drivers and for drivers with health problems.
6. Promote a timely and active rehabilitation policy ("social medical guidance").
7. Make individual work resumption plans in cooperation with management, the company doctor, the driver and the personnel department.
8. Teach management to be clear: let them explain when something is not possible.
9. Stimulate non-work contacts, e.g. social evenings, sport manifestations, etc.
10. Stimulate a corporate identity.
11. Take care of a proper information flow in the company. People want to know "what is going on".
12. Take into account the wishes of individual drivers.
13. Two persons on the bus instead of one on certain high-risk routes or during night shifts.

A proper professional registration of absenteeism and disability is also advocated in order to identify high-risk persons and high-risk groups as early as possible. It is also preferable to broaden goals and strategies of occupational health services.

Example of teamworking and work consultation

Several bus companies in various countries have taken the criticism seriously that they did not listen to their drivers and that they did not inform their staff about what was going on in the company. Some of the companies stated it this way: “In the past, our drivers were considered primarily as a cost factor instead of as the company’s capital, its human resources. Nowadays a manager ought to be available for his drivers every day. He or she has to inform his drivers and give them feedback, negative and positive”.¹⁶ One of the best methods appeared to be the division of the total driving staff into fixed groups of drivers (ten to 20 persons), each group with its own supervisor. This supervisor, often an ex-driver himself, acts as a link to “the office”. A system of periodical work consultation has proved to be a good means for giving drivers the opportunity to discuss problems they face in their daily routines. This introduction of a more supportive management style, in combination with a system of work consultation, has given bus drivers the conviction that their work problems are taken seriously and that they really count in the company. It also has been demonstrated in various companies that many problems that in the past developed into serious irritations could be dealt with easily. Drivers often could tell exactly how these problems could be solved. Instead of becoming major stressors, minor changes in the timetable, the shift system, the company’s information flow or in the ergonomic layout were often enough to solve problems. Again, not only working conditions were improved, but also the drivers’ morale.

Example of individually adjusted workplans

The general health of older drivers is often worse compared to that of younger drivers. Still, it is usual to demand the same achievement from a driver aged 30 and a driver aged 58, even though it has been shown in various studies that a progressive deterioration of health and well-being takes place in this profession. Some bus companies are experimenting with forms of individually adjusted workplans. Older drivers, or those drivers with serious health complaints, are presented with the opportunity to drive special lines. They also are allowed to choose their shifts. This seems a preferable routine. There is, however, one main problem involved: one should be careful to prevent that optimizing the workload for Group A might mean worse conditions for Group B.

Example of a rehabilitation policy and social medical guidance

Sickness absenteeism figures among bus drivers are high, often because periods of sick leave are long-lasting. In order to prevent sickness absenteeism and to obtain a more productive work organization — as a manager of a large bus company stated: “Sick drivers do not drive, so they are not productive” — companies are in need of an active and timely rehabilitation policy. A quick and medically and socially justified return is desirable. The longer a driver reports sick and stays home, the higher the chance of him or her not returning. It is important that drivers do not lose contact with the company, otherwise there is the risk that the company loses them. A proper way

¹⁶ J. van der Linden: *Work stress: The approach by HTM, The Hague* (in Dutch), paper presented to a conference on working conditions, Maastricht, April 1992.

to prevent this is to systematically search for alternative, mostly temporary, positions in the same company: for instance, as a porter, clerk or as help in the kitchen.

Another possibility is to let drivers drive special shifts (day shifts, special lines), for example, when they are recovering from musculo-skeletal diseases. They can also be offered an individually adjusted work schedule (for instance, driving four hours a day). Often drivers returning after a period of sick leave are not yet able to cope with the normal (high) workload. This does not mean that they cannot work at all until they have recovered totally. Often they are perfectly able to perform less demanding tasks. By doing so, the threshold to start working again is lowered. The application of this principle requires that companies actively search for temporary driving and non-driving positions. Various companies already reserve special positions for those drivers with health complaints.

Example of prevention of threats and violence

In order to take preventive action against aggression and violence, a large municipal bus company developed a special programme, combining primary and secondary/tertiary prevention.

- During the night and on high-risk routes, buses are used where the cabins can be closed off by the drivers. On the one hand, this physical isolation is considered an improvement. On the other hand, drivers state that this physical isolation also leads to psychological isolation, since there is hardly any contact left with passengers.
- On certain high-risk routes, the frequency of inspection and ticket control by a company control team has been raised.
- A radio-telephone has been installed in each bus in order to permit direct contact between the bus driver and the company office. The company office maintains a direct contact with mobile company control teams. These teams are on the spot very quickly in case of an emergency.
- Bus drivers can press an alarm button in order to warn the company in case of an emergency.
- On certain high-risk routes, the bus driver is now supported by a conductor, just like 30 years ago when this used to be the normal situation.
- Supervisors have been trained in coping with drivers who have been assaulted or intimidated.
- Bus drivers have been trained in dealing with aggressive passengers.
- If necessary, individual work resumption plans are being arranged for those drivers who have suffered from violence.

Examples of re-education: Stress management training

A rural bus company, in consultation with the representatives of the drivers, offered its drivers the possibility of being trained in stress management (coping with stress). The actual training and much of the preparation and evaluation was carried out by a specialized consulting agency. Participation was on a voluntary basis. Almost 60 per cent of 450 drivers were trained. The stress management training consisted of five small group sessions lasting two-and-a-half hours each and a follow-up. Topics included stress information, the causes of stress, relaxation methods, realistic thinking, social skills and coping with conflicts. The participants following the entire course received a financial reward.

The participants evaluated the course rather positively. Almost 50 per cent reported less strain and 25 per cent were more satisfied with their work. The participants stressed how valuable the exchange of opinions was between colleagues. It was said there was not enough opportunity given for functional and social contacts in the daily routine. A decrease in absenteeism could not be detected among the participants.¹⁷

Example of re-education: Training on how to deal with passengers

A well-known statement in many bus enterprises is "The bus driver is our visiting card to the public". Several companies developed a training programme to teach drivers how to deal with passengers needing information or who are troublesome. Conclusive results have not yet been published.

Example of re-education: "Sit instruction"

Another bus company, aware of the large amount of musculo-skeletal and stress-related problems among its bus drivers and stimulated by an active company doctor, decided to train its drivers intensively in their working posture. This programme was called "Sit instruction". It consisted of a set of training instructions administered on several occasions: the first pre-employment medical examination, in-company training by a driving instructor, visits from the company doctor on the bus, etc. The main part of "Sit instruction" was a four-hour small group session led by the company doctor and an instructor. Drivers learned to optimize their working posture during the session. They also learned how to stretch their muscles and to reduce their muscular tension in order to prevent muscular overload and pain. Effects on musculo-skeletal complaints and absenteeism have not yet been evaluated.¹⁸

Example of (re)education: Company physical fitness programme

In one bus company, 124 bus drivers (out of a total of 370 drivers) took part in a physical fitness programme. This was initiated by the bus company since musculo-skeletal problems

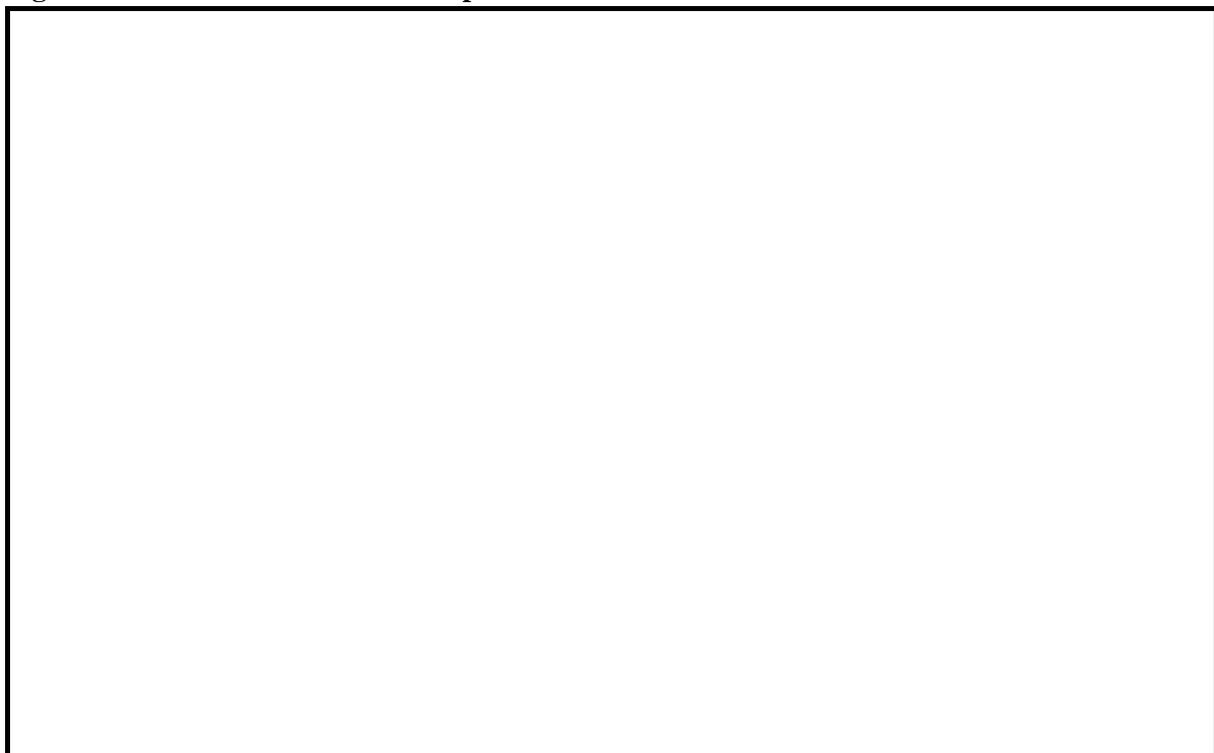
¹⁷ L. Hammecher R. Joppen and S. Plug: "Stress management at GSM", in M. Boelman (ed.): *Prevention and reduction of absenteeism in bus drivers* (in Dutch) (Nijmegen, Reduction of Absenteeism Project, 1993), pp. 149-171.

¹⁸ W.A. van Walt van Praag: "Work behaviour, muscular tension and sit instruction", in Boelman, op. cit., pp. 84-111.

attributed strongly to the absenteeism of the drivers. Participation was on a voluntary basis. More and more drivers dropped out during the programme. Out of the 126 drivers, only 36 trained at least six times per month. A specialized bureau was hired to provide the actual training: medical screening and individual advice for each participant. Evaluation made clear that participants who completed the programme were rather enthusiastic about the training. As in the above-mentioned stress management training, the social contacts with colleagues were especially appreciated. A decrease in absenteeism figures was demonstrated for those drivers who trained at least two times per week.¹⁹

A summary of all recommendations are combined in Figure 6.

Figure 14. Overview of measures to prevent work stress in bus drivers



3. Organizational commitment, cooperation and a step-wise approach

3.1. Role of parties involved: A joint contract

It has been demonstrated that, all over the world, bus drivers face many work- related stress problems. Many recommendations have been introduced.

¹⁹ J. Hamelink, N. van der Linde and J. Taylor: "Company physical fitness", in Boelman, op. cit., pp. 149-171.

The large variety of examples presented in Chapter 2 of this working paper testifies that various bus companies have accepted the challenge to improve both their quality of working life and their productivity. This development can be an example for other bus companies.

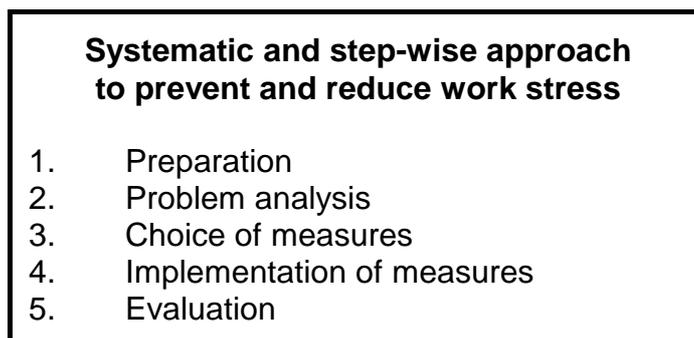
However, stress monitoring and stress reduction is not merely a technical process, based on a technical analysis and on the simple, straight-forward realization of recommendations and receipts. Stress monitoring and stress reduction relate to changing and improving organizations and organizational processes. Such organizational changes can best be obtained when various parties in the company are committed to the same goal. Management and employees need a joint contract to invest, both in a psychological and material sense, in order to achieve this goal. They have to work together.

The promotion of healthy working conditions is the responsibility of the employer. This can often be stimulated by trade unions, work councils, and health and safety committees, which can try to get stress placed on the company agenda.

Stress prevention projects in bus companies and in other branches of industry in various countries have demonstrated that a successful approach is participatory and step-wise.²⁰

A participatory approach means an active role of all parties involved: top management, middle management, employees, trade unions and, when available, the personnel department and the company doctor. Such an approach also presupposes that all parties consider it worthwhile to work together in reducing work stress. If there is no real commitment from these parties, there is a high risk that an initiated stress project will not be successful and will fail in its final objectives (i.e. fewer complaints and absenteeism, an improved working environment, better and more efficient work organization).

An approach to reduce stress should also be systematically based on the following five steps:



²⁰ M.A.J. Kompier and F.H.G. Marcelissen: *Handbook on work stress* (in Dutch) (Amsterdam, Nederlands Instituut voor Arbeidsomstandigheden, 1991); ILO, op. cit.

3.2. A step-wise and participatory approach

First step: Preparation

This step is directed at a clear determination of aims, planning and financial means. The stress issue must be put on the company's agenda. As has been stated above, cooperation between the various company parties is the key issue. By putting stress on the company's agenda, one can concentrate on different data in order to find stress signals: absenteeism figures, high turnover or work disablement rates, number of accidents, overtime hours, backlogs in taking days off, etc. Interviews with bus drivers and middle management can give global indications on possible causes and consequences of stress.

These data can play an important role in getting the parties involved. Other arguments that can stimulate cooperation between company parties can be found in the possible outcomes of anti-stress programmes: a better organized and more effective work organization and a motivated workforce. Improving working conditions often requires investments. In many cases, however, these investments lead to profits. At the moment, productivity rates (the number of driving hours of all drivers divided by the sum of all hours that they get paid for) of many bus companies are rather low. A major reason for this is that there is such a large number of drivers who call in sick. By diminishing the absenteeism rate, productivity rates can be improved. There also will be less costs related to the introduction and training of new drivers who replace those drivers leaving the company for medical reasons.

Second step: Problem analysis

In the second step, it is decided which are the main stressors in a specific company. The major stressors are well known (Chapter 1), but there are differences between companies. These differences might, for instance, regard shift schedules, timetables, leadership style, the ergonomic quality of the bus driver's cabin, the amount of threats and violence, etc.

The following checklist can be used to monitor these stressors.

Checklist to monitor stress risks in the bus driver's occupation

	Yes	No
1. Job content		
1.1 Is it possible to drive without problems with aggressive or troublesome passengers?	--	--
1.2 If not, are adequate preventive measures being taken?	--	--
1.3 Are drivers well-informed on how to provide service to passengers?	--	--
2. Ergonomics		
<i>2.1 Driving seat</i>		
2.1.1 Are there technical safety risks? If so, which risks?	--	--
2.1.2 Does adequate technical maintenance take place?	--	--
2.1.3 Vertical range of adjustment > 100mm?	--	--
2.1.4 Range fore and aft > 150mm?	--	--
<i>2.2 Steering wheel</i>		
2.2.1 Diameter < 500mm?	--	--
2.2.2 Adjustable in vertical direction and fore and aft?	--	--
2.2.3 Independent adjustment of angle of inclination 15-32°	--	--
<i>2.3 Pedals</i>		
2.3.1 Equal angles?	--	--
2.3.2 Range of angles < 25°?	--	--
<i>2.4 Dashboard</i>		
2.4.1 Uniform design of dashboards on buses?	--	--
2.4.2 Easily accessible?	--	--
2.4.3 User friendly?	--	--
2.4.4 Clear colours?	--	--
2.4.5 Easy-to-read displays?	--	--
<i>2.5 Working space</i>		
2.5.1 Enough working space?	--	--
2.5.2 Effective heating and cooling systems?	--	--
2.5.3 Are the drivers trained in the use of cabin components?	--	--
2.5.4 Can both big and small drivers drive safely?	--	--
3. Work and resting schedules and timetable		
3.1 Do normal hours of work exceed 40 hours per week?	--	--
3.2 Does the normal working day exceed eight hours?	--	--
3.3 When normal weekly hours of work are unevenly distributed over various days of the week, do the normal hours of work exceed ten hours per day?	--	--
3.4 Does a driver drive continuously for more than four hours without a break?	--	--
3.5 Is there a 20-minute break following every two hours of work?	--	--
3.6 Is there at least 11 consecutive hours of rest in between two working days?	--	--
3.7 Is the minimum duration of the weekly rest at least 24 consecutive hours (preceded or followed by the daily rest)?	--	--
3.8 Is there enough time to drive safely, according to the schedule and provide	--	--

	Yes	No
3.9 Is work organized in periods of several (maximum four) consecutive days within the same shift?	--	--
3.10 Are split shifts avoided?	--	--
3.11 Are assignments on a regular basis?	--	--
3.12 Are shifts in forward rotation: early-day-late?	--	--
3.13 Are days off coupled instead of single days off?	--	--
3.14 Are there guaranteed possibilities to take days off?	--	--
3.15 Are overtime hours compensated?	--	--
4. Social work environment		
4.1 Is the total driving staff divided into fixed groups?	--	--
4.2 Is there an effective system of work consultation?	--	--
4.3 Is there a supportive style of leadership?	--	--
4.4 Are there possibilities for (re)training?	--	--
4.5 Are there special facilities for older drivers and for drivers with health problems?	--	--
4.6 Is there a timely and active rehabilitation policy?	--	--
4.7 Are individual resumption plans worked out?	--	--
4.8 Is there a clear management style?	--	--
4.9 Is sub-contracting promoted?	--	--
4.10 Is a corporate identity stimulated?	--	--
4.11 Is there a proper information flow in the company?	--	--
4.12 Are wishes of individual drivers taken into account?	--	--
4.13 Can drivers be replaced during illness?	--	--
4.14 Are canteen facilities good?	--	--
4.15 Are vacancies quickly filled?	--	--
The amount of "No" scores should be as low as possible. The higher the number of "No" scores, the greater the number of problems. Special attention should be given to every "No" answer.		

Furthermore, health indicators (such as absenteeism figures, work disability and health complaints) can be studied in more detail. Special risk groups, for instance older drivers, can be identified.

Several questionnaires can also be used in the problem analysis step.²¹ An example of a questionnaire to determine stress-related health complaints is presented below. The complaints (every "Yes" score) are added up. The minimum score is 0 and the maximum score is 13.

²¹ M.A.J. Kompier and L. Levi: *Stress at work: Causes, effects and prevention. Guide for small and medium-sized enterprises* (Dublin, European Foundation for the Improvement of Living and Working Conditions, 1993).

Health complaints questionnaire

Instructions: Please answer each question

	Yes	No
1 Do you occasionally feel pressure in your stomach or is it ever swollen?	<input type="checkbox"/>	<input type="checkbox"/>
2 Are you quickly short of breath?	<input type="checkbox"/>	<input type="checkbox"/>
3 Do you occasionally feel pain in the chest or heart region?	<input type="checkbox"/>	<input type="checkbox"/>
4 Do you occasionally suffer pain in bones and muscles?	<input type="checkbox"/>	<input type="checkbox"/>
5 Do you frequently feel tired?	<input type="checkbox"/>	<input type="checkbox"/>
6 Do you occasionally suffer from a headache?	<input type="checkbox"/>	<input type="checkbox"/>
7 Do you occasionally suffer from back complaints?	<input type="checkbox"/>	<input type="checkbox"/>
8 Do you occasionally suffer from an upset stomach?	<input type="checkbox"/>	<input type="checkbox"/>
9 Do you ever suffer from a numbed feeling or a tingling sensation in your limbs?	<input type="checkbox"/>	<input type="checkbox"/>
10 Do you tire more quickly than you would expect?	<input type="checkbox"/>	<input type="checkbox"/>
11 Do you occasionally feel dizzy?	<input type="checkbox"/>	<input type="checkbox"/>
12 Do you occasionally feel listless?	<input type="checkbox"/>	<input type="checkbox"/>
13 Do you generally wake up still feeling tired?	<input type="checkbox"/>	<input type="checkbox"/>

The average level of complaints in a company, department or position can easily be calculated. These average scores become more reliable as more drivers fill in the questionnaire. The group respondents should not be too small, otherwise coincidence will have too great an influence. In this case, privacy will also be violated. It should therefore be considered a rule of thumb that the groups to be compared (e.g. drivers on several lines or different types of bus) should include at least 15 respondents and that the respondents complete the questionnaires voluntarily and anonymously.

Third step: Choice of measures

In the third step, the orientation is on building an integrated action programme, based on workers' participation and commitment. It has been made clear in the first chapter of this working paper that there is not one, but many, stress factors in the bus driver's occupation. The main recommendations to reduce work stress among bus drivers are listed above in Figure 6.

In most cases, in order to obtain optimal results, a programme for prevention and intervention of work stress should combine measures from all four quadrants in Figure 6, following the three strategies in order of preference: (1) eliminate or modify the stress-producing situation; (2) change the work to fit the individual characteristics of the bus driver; and (3) strengthen the driver's coping capacity.

In dealing with work stress, one should be careful not to concentrate too much on single stressors and partial solutions. One should also be careful to avoid, as far as possible, temporary solutions.

Only some enterprises try to change the work to fit individual characteristics of the employee. Many still concentrate on strengthening the driver's resilience to stress, for instance, through

physical exercise or relaxation techniques (sit instruction, physical fitness, dealing with passengers, stress management). Concerning these last kinds of measures, it can be argued that this is “putting the cart before the horse”.

In case of ergonomic problems, conditions may be improved (for instance, by installing a chair that meets ergonomic standards). The driver should know how to optimally install it and how to adapt it for maximum comfort. There ought to be enough time for this instalment and there ought to be a good chair first. Teaching people how to sit on a bad chair is not very productive. The same holds true for training in dealing with passengers. As one bus driver puts it: “Dealing with passengers in a proper way can only be done when the timetable permits me to”.

Another impeding factor for success is in the temporary nature of several stress programmes. A clear example is the guaranteed possibility to take days off (Section 2.4). This approach was highly successful, but the success was not long-lasting. After a while, the temporary workers were dismissed and the old situation slowly returned.

Another risk is related to the implementation of several stress prevention programmes: stress factors are not separate factors in this occupation. By changing one stressor one might also influence other stressors. This is what often happens when introducing partial solutions. Improvements for one group might even be detrimental to another group. In some companies, the introduction of less demanding schedules for drivers aged 50 or older meant that younger drivers had to work the more demanding shifts. In other enterprises, changing the timetable by giving drivers a longer rest period at the terminus resulted in more time pressure “en route”. In several companies, the advantages of the introduction of free bus lanes (less traffic congestion) were voided by an intensification of the timetable.

Step 4: Implementation

Success in the implementation of anti-stress programmes is largely dependent on a good preparation and communication between the worker whose working situation is involved and the organizational staff (management representatives, personnel manager, company doctor, etc.). The important thing is that these persons are trusted and valued by the various parties in the company.

Some golden rules that are especially useful in this step are presented below.

Ten hints for organizational change

1. Promote commitment and participation from all parties. This will take time and asks for a continuous effort, but it is worthwhile.
2. Spend time beforehand on the ways exchange of information ought to take place.
3. Take care of periodical feedback as the project proceeds. Take time for discussing these proceedings.
4. Promote trust and cooperation between several parties. Take care of good personal contacts.
5. Present several interventions in a systematic order. Give people time to get accommodated to change.
6. Take care of a proper technical preparation of measures. Technical and organizational mistakes might undermine trust in the final results.
7. Try to “score” one or two points on short notice. Such results often bear symbolic value and can be an impetus for further positive change.
8. “Key persons” in the company, formal and informal leaders, should “set the right example”, e.g. take part in a training programme.
9. Pay attention to the position of lower and middle management. These groups often play a crucial role in the process of organizational change.
10. Give the employees the opportunity to influence changes.

Step 5: Evaluation

This step should provide information about the effectiveness of the measures and indicate if additional measures are needed. A proper evaluation also addresses the financial costs and benefits of the project. It is important that attention to work stress is not a one-time event. Paying attention to the quality of working life should be — and continue to be — part of the daily management routine of every company.

This step-wise approach can be difficult to implement. In practice, consecutive steps may overlap and mix to some extent. This approach, combined with a continuous orientation on

organizational commitment, however, can form the basis of a successful stress prevention programme.

There are clear indications that the companies that invest in preventive measures benefit. Benefits range from less staff turnover, less absenteeism and less work disability to a better management-labour relationship, better morale among the staff and better service to the public.

References

- R. Anderson: "The back pain of bus drivers: Prevalence in an urban area of California", in *Spine*, Vol. 17, No. 12, 1992, pp. 1481-1488.
- G. Aronsson: *Sickness absence for local public transport personnel at Stockholm transport*, Report No. 33 (Stockholm, Department of Psychology, University of Stockholm, 1982).
- A.L. Backman: "Health survey of professional drivers", in *Scandinavian Journal of Work Environment and Health*, Vol. 9, 1983, pp. 30-35.
- A.J. Courtney and M.H. Wong: "Anthropometry of the Hong Kong male and the design of bus driver cabs", in *Applied Ergonomics*, Vol. 16, No. 4, 1985, pp. 259-266.
- G.N. Davis and T.J. Lowe: "The ergonomic London bus", in E.D. Megaw (ed.): *Contemporary Ergonomics 1987* (London, Taylor & Francis, 1987), pp. 179-184.
- C.A. Duffy and A.E. McGoldrick: "Stress and the bus driver in the U.K. transport industry", in *Work and Stress*, Vol. 4, No. 1, 1990, pp. 17-27.
- A.R. Erlam: "Sickness absence in drivers of London taxis and buses", in *Journal of Social Occupational Medicine*, Vol. 32, 1982, pp. 20-25.
- D. Feickert and K. Forrester: *Stress factors in urban public transport*, working paper presented to the Conference on Working Environment in Urban Public Transport, Stockholm, 1983.
- A. Felnemeti and U. Boon-Heckl: "Belastungsuntersuchung an Salzburger Busfahrern", in *Zeitschrift für Verkehrssicherheit*, Vol. 31, No. 1, 1985, pp. 16-21.
- C. Garbe: *Ansätze betrieblicher Epidemiologie am Beispiel der Untersuchung gesundheitlicher Selektionsprozesse bei Busfahrern*, working paper presented to the Conference on Working Environment in Urban Public Transport, Stockholm, 1983.
- B. Gardell, G. Aronsson and K. Barklof: *The working environment for local public transport personnel* (Stockholm, Swedish Work Environment Fund, 1982).
- J.A.M. Grosfeld: "Work quality and absenteeism" (in Dutch), in M. Boelman (ed.): *Prevention and reduction of absenteeism in bus drivers* (in Dutch) (Nijmegen, Project Reduction of Absenteeism, 1993), pp. 27-52.
- De Haan, Onland and Brokerhof: *Work absenteeism among bus drivers in Amsterdam* (in Dutch) (Amsterdam, 1978).

- J. Hamelink, N. van der Linde and J. Taylor: "Company physical fitness" (in Dutch), in M. Boelman (ed.): *Prevention and reduction of absenteeism in bus drivers* (in Dutch) (Nijmegen, Project Reduction of Absenteeism, 1993).
- L. Hammecher, R. Joppen and S. Plug: "Stress management at GSM" (in Dutch), in M. Boelman (ed.): *Prevention and reduction of absenteeism in bus drivers* (in Dutch) (Nijmegen, Project Reduction of Absenteeism, 1993), pp. 149-171.
- I. Holme, A. Helgelund, I. Hjermann, P. Leren and P. Lund-Larsen: "Coronary risk factors in various occupational groups: The Oslo study", in *British Journal of Preventive and Social Medicine*, Vol. 31, 1977, pp. 96-100.
- International Labour Office: "Preventing stress at work", *Conditions of Work Digest*, Vol. 11, No. 2, 1992.
- R.L. Kahn and P. Byosiere: "Stress in organizations", in R.A. Dunnette and M.B. Hough (eds.): *Handbook of industrial and organizational psychology*, Second edition (Palo Alto, Consulting Psychologists Press, 1990).
- R.A. Karasek and T. Theorell: *Healthy work: stress, productivity, and the reconstruction of working life* (New York, Basic Books, 1990).
- R.A. Karasek: "Stress prevention through work reorganization: A summary of 19 international case studies", ILO: *Conditions of Work Digest*, Vol. 11, No. 2, 1992.
- M.A.J. Kompier: *A literature review on work and health of city bus drivers* (in Dutch) (Groningen, University of Groningen, 1985).
- M.A.J. Kompier: *Work and health of city bus drivers* (in Dutch), Doctoral thesis (Delft, Eburon, 1989).
- M.A.J. Kompier and F.H.G. Marcelissen: *Handbook on work stress* (in Dutch) (Amsterdam, Nederlands Instituut voor Arbeidsomstandigheden, 1991).
- M.A.J. Kompier and L. Levi: *Stress at work: Causes, effects and prevention. Guide for small and medium-sized enterprises* (Dublin, European Foundation for the Improvement of Living and Working Conditions, 1993).
- K.R. Leroy, L.W. Green, K.D. Mullen and V. Foshee: "Assessing the effects of health promotion in worksites: A review of the stress program evaluations", in *Health Education Quarterly*, Vol. 11, No. 4, 1984, pp. 379-401.
- J. van der Linden: *Work stress: The approach by HTM, The Hague* (in Dutch), working paper presented to the Conference on Working Conditions, April 1992, Maastricht.

- J. Meifort, H. Reiners and J. Schuh: *Arbeitsbedingungen von Linienbus-, und Strassenbahnfahrern*, Bundesanstalt für Arbeitsschutz und Unfallforschung No. 33 (Dortmund, Schriftenreihe Arbeitsschutz, 1983).
- T. Meijman, T. van der Linden, H. Mulders, M. van Bussel and L. Steensma: "Effects in the development of continuous workload and insufficient recovery in bus drivers in Groningen" (in Dutch), in V. Vrooland (ed.): *Work and health: Absenteeism and the quality of working life* (in Dutch) (Samsom, Alphen aan de Rijn, 1982).
- J.N. Morris, A. Kajan, D.C. Pattison and M.J. Gardiner: "Incidence and prediction of ischaemic heart disease in London busmen", in *The Lancet*, September 1966, pp. 553-559.
- H. Mulders, T.F. Meijman, J. O'Hanlon and G. Mulder: "Differential psycho-physiological reactivity of bus drivers", in *Ergonomics*, Vol. 25, No. 11, 1982, pp. 1003-1011.
- B. Netterstrom and P. Laursen: "Incidence and prevalence of ischaemic heart disease among urban bus drivers in Copenhagen", in *Scandinavian Journal of Social Medicine*, Vol. 9, 1981, pp. 75-79.
- F.J.N. Nijhuis and R. Bullinga: "Prevention: Improve the worksite and work organization" (in Dutch), in *Gedrag & Organisatie*, Vol. 19, No. 1, 1991, pp. 36-39.
- P. Oortman-Gerlings, D. van Drimmelen and Y. Musson: *Whole body vibration. Results of empirical measurements* (in Dutch), document no. LA_DR_10-04 (Leidschendam, 1985).
- J. Oversloot, A. Dijkstra, M. van der Grinten, M. Schlatmann and C. de Winter: *Work and Health: Busdrivers in Rotterdam* (in Dutch) (Nederlands Instituut voor Praeventieve Gezondheidszorg, 1982).
- W.G. Pikus and W.A. Tarannikova: "Hypertensive disease incidence in drivers of passenger motor transport", in *Ter Arch*, 1975.
- M.L.I. Pokorny, D. Blom, P. van Leeuwen and W. van Nooten: "Shift sequences, duration of rest periods, and accident risk of bus drivers", in *Human Factors*, Vol. 29, No. 1, 1987, pp. 73-81.
- D.R. Ragland, M.A. Winkleby, J. Schwalbe, B. Holman, L. Morse, L. Syme and J.M. Fisher: "Prevalence of hypertension in bus drivers", in *International Journal of Epidemiology*, Vol. 16, No. 2, 1987, pp. 208-214.
- J. Reimann: *Beanspruchung von Linien Busfahrern*, Forschungsbericht No. 271 (Dortmund, Bundesanstalt für Arbeitsschutz und Unfallforschung, 1981).

- A. Rissler and G. Aronsson: *Stressors, psycho-physiological reactions and health complaints among urban bus drivers*, working paper presented to the Conference on Working Environment in Urban Public Transport, Stockholm, 1983.
- C. Rusconi et al.: “Fattori di rischio coronarico e cardiopatia ischeamica nei conduttori e nei bigliettari di autobus”, in *Minerva Cardioangiologica*, Vol. 23, 1975.
- W.A. van Walt van Praag: “Work behaviour, muscular tension, and sit instruction” (in Dutch), in M. Boelman (ed.): *Prevention and reduction of absenteeism in bus drivers* (in Dutch) (Nijmegen, Project Reduction of Absenteeism, 1993), pp. 84-111.
- M.A. Winkleby, D.R. Ragland, J.M. Fisher and S.L. Syme: “Excess risk of sickness and disease in bus drivers: A review and synthesis of epidemiological studies”, in *International Journal of Epidemiology*, Vol. 17, No. 2, 1988, pp. 255-262.