

Iva Hanzlíková
Junior Researcher
CDV, Transport Research Centre
Líšeňská 33a, 639 00 Brno
Czech Republic
E-mail: hanzlikova@cdv.cz

Professional Drivers: The Sources of Occupational Stress

Key words: professional drivers, occupational stress, workload, fatigue, health risks, intelligent transportation systems

Abstract

This paper will introduce the nature of professional drivers' stress and its possible causes in the theoretical frame, and so is conducted as a selective review of literature that concerned the topic. The work of professional drivers is considered as extremely stressful and this paper deals with factors that lead to fatigue and thus to high probability of traffic accident. The author takes into the account that the context of driving for various groups of professional drivers – taxi drivers, bus and lorry drivers is very different, and also we need to consider that the work of truck drivers is different whether they work for a transport company and they drive generally long distances, or in another sector, where they drive much shorter distances. The paper also traces possible changes in driver education in Czech Republic according directive 2003/59/EC of the European Parliament and of the Council of 15 July 2003 on the initial qualification and periodic training of drivers of certain road vehicles for the carriage of goods or passengers. This directive contains the requirements for driver qualification, standards of periodic training for improving road safety and the safety of the driver.

The paper also describes intended research plan of the author, concerning subjective evaluation of modern information systems by professional drivers in the terms of stress, comfort and satisfaction.

The aim of this paper is to bring an extensive review of knowledge on stress, fatigue and work conditions regarding to road safety in the target group of professional drivers. This review should serve as a theoretical background for further research and practical recommendations and countermeasures for improving road safety (education and training of drivers, fatigue management, application of ITS, campaigns etc.).

Introduction

The number of fatal injuries caused by truck drivers in the Czech Republic during the year 2004 in comparison with 2003 increased by 25 %, although the whole number of all accidents decreased by approximately 10 %. On the other hand, the increase of truck traffic compared to overall traffic in 2004 is approximately 30% (estimates of the Directorate of roads and motorways), which could explain the main cause of this change. We should bear in mind that crashes involving heavy freight vehicles result in high fatality levels (Aty, www). Moreover, there is also a mild trend (6%) of growth of overall accidents is in the group of bus drivers (source: Informace o nehodovosti na pozemních komunikacích České republiky za rok 2004. Ředitelství služby dopravní policie Policejního prezidia ČR:

Accidents in the Czech Republic in year 2004; Directorate of Traffic Policy of Policy presidium).

If we omit the technical conditions of vehicles and roads, what kind of factors can contribute to traffic accidents caused by professional drivers generally? What are the specific features of the professional drivers' task?

We should bear in mind that crashes involving heavy vehicles result in high fatality levels (Aty, www).

Epidemiological, psycho-physiological and survey data all converge in the conclusion that work of professional drivers is extremely stressful, thus we can consider it as a high-risk occupation. Among the main sources of stress we can count awareness of responsibility, fatigue, working conditions, work schedules and mental workload (sensorial, informational and emotional). The work of professional drivers also amounts various health risks.

The difference between non-professional and professional drivers

There are various sub-types of professional drivers. Drivers in public transport, drivers of long-distance coaches, drivers of trams and trains, taxi-drivers and truck drivers. To describe this group easily, we can just say that driving the vehicle is their occupation; they are getting paid and have to keep specific demands from the employer and whole society. Demands related to driving a car by professional drivers are noticeably different from requirements on non-professional drivers. Among the specifics of professional driver's work is the fact that he /she is responsible for lives of many persons in the vehicle (in the case of public transport), but the key factor is the fact that this job means that a professional driver spends practically all the work time by driving a vehicle, which is a high demanding activity both from cognitive perspective (attention, information perception and processing, decision making) and from emotional and social point of view.

Responsibility experienced by drivers in public transport is related to their passengers, but there is also material responsibility in case of lorry drivers (high price of the vehicle and of the load). In both cases the psychological phenomena of responsibility can be perceived as stressful (International Labour Organization, *Stress prevention for bus drivers*, 1996). Different kind of responsibility is a responsibility for own job and material provision of the family. Of course there is also much higher risk of fatigue caused by long and irregular shifts, the important factor of possible stress comes from control of employer (control of oil consumption, keeping the breaks and being in time etc.).

Simply said, driving a vehicle itself is **highly demanding activity**, and with growing amount of kilometers is more stressful. In this sense, the group of truck drivers is the most endangered one. Reed and Cronin (2003) accent that truck drivers are subjected to a number of physical and psychological stresses inherent in their occupation. The long and irregular hours spent behind the wheel cause fatigue and mental stress.

Among the most important skills and requirements of professional drivers are (according to DelVecchio (2004) :

- Reaction time – the ability to quickly respond
- Far and near vision – the ability to see things close at hand (such as signs) or at distance
- Operation and control – controlling operations of equipment or systems
- Equipment maintenance – performing routine maintenance and determining when and what kind of maintenance is needed
- Psychological eligibility (low level of aggressiveness for instance)

The driving task for driver is mentally demanding because it involves having to cope with conflicting demands. This is especially the case of public transport drivers. The company and the public want the driver to maintain good contact with passengers and to be service-oriented, for example through the provision of information to passengers on timetables, routes, stops and fares. The driver is required to drive safely according to traffic rules and conditions. More severe stress reaction may seriously disrupt driver performance and hence reduce safety (Dorn, 2003). Study by Kostyniuk et al. (2002) has identified four factors that are more likely to occur in fatal car-truck crashes than in fatal car-car crashes. These factors are: following improperly, driving with vision obscured by rain, snow or fog, drowsy and fatigued driving and improper lane changing.

Professional drivers and stress

First intensive exploring of stress and workload dates in accordance with work of W.B. Cannon and H. Selye; Selye (In Baštecká, Goldmann, 2001) described general adaptation syndrome and biological reaction of organism on stress, Cannon came with definition of basic “fight or flight” kind of defense. R. S. Lazarus (In Baštecká, Goldman 2001) pointed out that person reacts on danger only if the situation perceives as dangerous. In other words, the process of stress reactions embraces cognitive evaluation and processes of interpretation (Baštecká, Goldmann, 2001). The external component of the Biopsychosocial Model of stress involves environmental events that precede the recognition of stress and can elicit a stress response. A previously mentioned, the stress reaction is elicited by a wide variety of psychosocial stimuli that are either physiologically or emotionally threatening and disrupt the body's homeostasis (Cannon, 1932 In Baštecká, Goldmann 2001). We are usually aware of stressors when we feel conflicted, frustrated, or pressured. Most of the common stressors fall within four broad categories: personal, social/familial, work, and the environment. These stressful events have been linked to a variety of psychological physical complaints. Health problems and increased accidents are also associated with stressful work demands, job insecurity and changes in job responsibilities (Cordon, 1997).

The internal component of stress involves a set of neurological and physiological reactions to stress. Hans Selye (1985) defined (In Baštecká, Goldmann, 2001) stress as "nonspecific" in that the stress response can result from a variety of different kinds of stressors and he thus focused on the internal aspects of stress. Selye noted that a person who is subjected to prolonged stress goes through three phases: Alarm Reaction, Stage of Resistance and Exhaustion. He termed this set of responses as the General Adaptation Syndrome (GAS).

Gradually stress was explored also within a frame of work psychology and ergonomics. Since the term “stress” is often swapped with term “workload”, for clearness lets outline main differences between these two words: workload can be characterized as a factor influencing the human, when a human has to cope with him in different ways (Bajčík, Broniš, 1981). The meaning of term “stress” is broader; it can represent **reaction of organism on different factors, but it also labels the state, in which is the organism because of influencing of internal and external inputs**. Generally it can be defined as a psychic and somatic state, which means in the given moment a deviation from usual level of excitation (Švancara, 2003). However, the term “stress” is widely used in common language and it is understandable between expert and laic public.

The driving profession in general bears a wide range of stress-inducing factors (stressors). Ilmarinen (1995 In Kloimuller et al., 2000) distinguishes between three major classes of risk factors: **high physical work demands** (static muscle effort, repetitive movements), **stressful or dangerous work environment** (risk of accidents, great heat or cold) and **poor**

organization of work (role conflicts, control, fear of failure, lack of recognition and esteem at work).

Occupational stress is associated with specific situations, characteristics of the work environment and its level depends on subjectively perceived factors occurring in different kinds of profession.

Occupation of professional driver is perceived as very stressful, and stress is here the result of conflict demands on driver, and low level of control by driver on these demands and circumstances, for example time press, long shifts, responsibility for security of passengers for instance (Dorn, 2003). We usually distinguish three main forms of psychical load (Baštecká, Goldmann, 2001). The *sensorial* load, which comes from demands on sensorial organs activity and related structures of central nerve system, then the *mental* load, emerging from demands on information processing. It put a lot of demands on psychological processes like attention, memory, imagination, judgment and decision-making etc. The third kind of workload is *emotional*. It arises from situations and requirements that conclude to affective reaction. The example can be reaction of public transport drivers on aggressive passengers or aggressive behaviour of other drivers (blocking a lane). It is possible to say in general that biggest level of stress human experiences, when he or she has a high demand on work and in the same time limited possibilities of decision-making. On the basic of the general stress literature researchers in the area of occupational health have attempted to drive explanatory casual models to predict work-related stress and health. Many of these models assume that causality flows from the environment (including work conditions and background variables), through the person's appraisals and coping resources, to symptoms of stress (Raggatt, 1991). In the same study the tripartite model of coach driver stress (a figure is presented further in this paper) is presented. The model proposes that the impacts of job demands (e.g. driving hours) on work-related stress outcomes are mediated by a set of maladaptive coping behaviors and responses (stimulant use, speeding). Results of the study support this model, it was shown that long driving hours provide the best predictor of maladaptive behaviour such a stimulant use and sleep disturbance among the drivers.

Mathews (2000, In Dorn, 2003) described a transactional model of driver stress that suggested that appraisal of external events and a driver's specific choice of coping strategy play a key role in determining the subjective and behavioral outcomes of driving.

Which are the concrete factors participating on emergence of stress in the case of professional drivers?

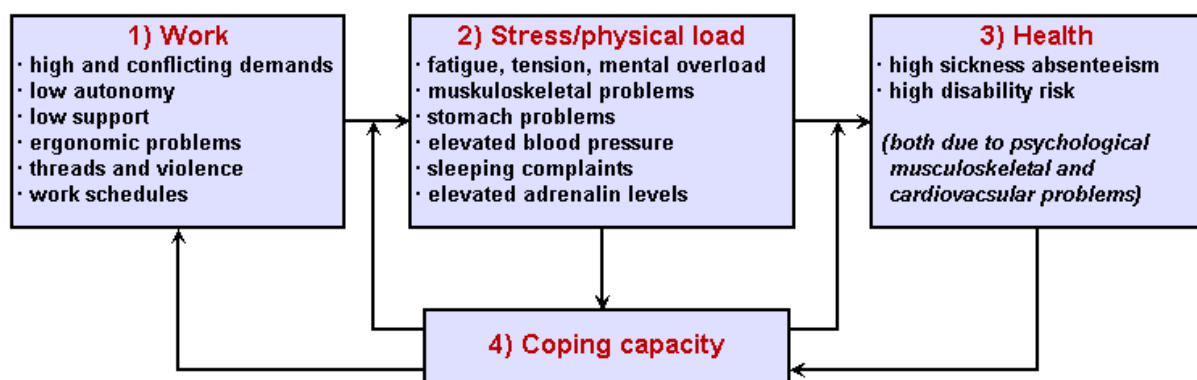
- Processing of big amount of information and signals within a very short time segment – ordinarily for 8 hours per a day
- Awareness that mistake or error are usually irreparable and can lead to tragic consequences
- Every-day conditions raising responsibility and possible risk: big amount of passengers, high price of the vehicle and of the cargo or dangerous character of the cargo (petrol, oil); material and moral responsibility
- Working conditions: vibration, noise with high intensity and frequency, irregular work schedules, long hours
- Irregularity of work and leisure time; night and weekend shifts may not coincide with those of their families. Irregularity of shifts can have negative impacts on their family and personal life
- External environmental factors, in particular extreme temperatures; buses are heated and some air-conditioned, however drivers experience heat, cold, rain or wind because they frequently must open the door (draught)

- Monotony
- Mental, sensorial and emotional load
- Characteristic of traffic (high density, congestions)
- The task is mentally demanding because it involves having to cope with conflicting demands (the company and the public want the driver to maintain good contact with passengers and to be service-oriented, for example through the provision of information to passengers on timetables, routes, stops etc. However the need to provide service to individual passengers often conflicts with the requirement to keep to a right schedule in dense traffic. A further demand, which may conflict with the previous two, is the need to drive safely according to traffic regulations and conditions)
- Ergonomic problems: a driver's cabin is subject to several constraints, and the seat often lacks sufficient adjustability, other source of stress is the fact of using different vehicles for different shifts (no familiarity)
- Feelings of isolation
- Work schedules that strain home life and interferes with sleep (Bartone, 1989; Duffy and McGoldrick, 1990; Evans, 1994; Gardell, Aronsson and Barklof, 1982, In Evans et al., 1999).

All these components may lead to a state of fatigue, which is a key factor causing traffic accident (Kruger, 2000). Although professional driver is obligated to keep breaks for rest, micro sleep is often cause of many traffic accidents. Levels of fatigue and sleepiness are principal indicators of whole ability to drive safely. Generally, driver experiences fatigue mostly in case that begins the shift early morning and finished in evening hours, when the organism is biologically prepared for sleeping (Ward and Smith, 2000). More on topic of fatigue is described further in the paper.

The following graphics shows the factors participating in the **coping capacity**. Here we can see in general level that work demands can cause stress and physical load, which has influence on health, and all this is with connection of capability to cope with these factors.

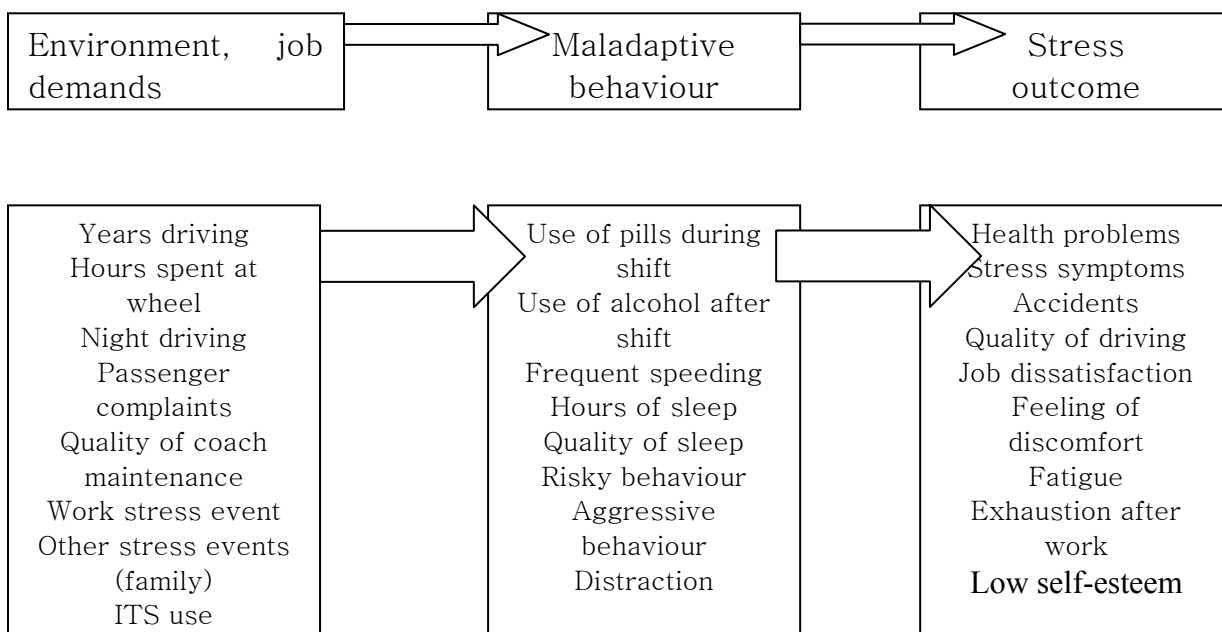
Fig. 1. Model of coping capacity among bus drivers



(Borrowed from International Labour Organization, 1996)

Other possible model regarding sources of occupational stress of long-distance coach drivers, the behaviour and stress outcomes, offers this figure:

Fig. 2. A model of coach driver stress



(according to Raggatt, 1991, adjusted by Hanzlíková, 2004)

Professional drivers and health

When speaking about group of professional drivers and how they have to fight with stress and workload, we should consider how the job influences their health conditions. The fact that drivers are exposed to everyday whole-body vibration, diesel exhaust and noise, leads to increased health risks. According to Evans and Johansson (1998) and their report in *Journal Occupational Health Psychology*, epidemiological data from several different countries consistently find urban bus drivers **among the most unhealthy of occupational groups**, particularly with respect to cardiovascular, gastrointestinal and musculoskeletal disorders. Further, cardiovascular mortality rates are directly linked to years of service as a driver.

Professional drivers are for instance at an increased risk of myocardial infarction. The high risk among bus and taxi drivers was partly explained by unfavorable life-style factors and social factors. The work environment may contribute to their increased risk. Among truck drivers, individual risk factors seemed to explain most of the risks (Bigert et al., 2003). Apart from cardiovascular disorders we can include gastrointestinal and muscular disorders. The same study showed that professional drivers are prone to increased blood pressure and higher hormones – factors that contribute to sickness and death from heart and blood. Drivers are exposed to whole-body vibration, diesel exhaust, and noise while keeping themselves in a combat-like state of vigilance in order to deal with threatening of some motorists. As if this weren't enough, bus drivers must adhere the rules and discipline.

In another study (2003) by Charbotel trucks have been identified as being dangerous for other road users; moreover, professional drivers are also high-risk occupation. The study confirmed the particular severity of truck driver's road injuries with comparison with group of car drivers. Manual of International Labour Organization (www) shows that bus drivers who have to leave their jobs for medical reasons do so on average at a younger age than most comparable groups of employees.

Reed and Cronin (2003) found that drivers reported substantial prevalence of sinus problems, back pain, migraine headaches and hypertension, but drivers usually ignore symptoms or self medicate when working. The same study have emphasized that truck driving is an occupation requiring keen physical and mental health, but this occupation is connected with health problems. Authors highlight that irregular work schedules and the high mobility of the job may create formidable barriers to health care access.

Professional drivers and ITS

Psychology in car manufacturing traditionally deals with questions of ergonomics, but since the 1980's the new in-car devices as well as related new infrastructure has emerged as a rapidly growing field. Broad range of in-vehicle information systems and advanced driver assistance systems were designed to offer potential for reducing traffic accidents and to support the driver in a suitable and user-oriented way. Many of them are intended for a group of professional drivers. Project's AIDE (Adaptive Integrated Driver Vehicle Interface) aim was to make the truck driver's life easier while also allowing technology to make it safer for everyone on the road. But there is a potential dangerous of overload – information overload could be life-threatening (Mele, 2004).

The other study (De Croon et al., 2004) of lorry drivers and on board computer systems (OBC-systems) was dealing with the effect of OBC system on drivers' psychological work environment (i.e., control and demands) and coinciding mental health (i.e. need for recovery after work) and job attitudes (i.e. organizational commitment). OBC-systems are used to collect and provide data transmission in the vehicle for mileage, fuel consumption and waiting times. Low job control and high psychological job demands have been found to predict mental health complaints such as depression and fatigue. The study found that control protects workers from the unhealthy effect of high psychological job demands. Job control affords workers greater discretion in when and how to deal with the demands of the job. More specifically, a worker who has too much work to do will handle the stress better if the job has some flexibility in terms of its allocation of time and energy to tasks. In the case of lorry driving, work situations can be adjusted to the psychological needs and preferences of the driver more efficiently when the driver can determine at what time and in what order he accomplishes his route. The restrictive influence of OBC-systems on lorry driver's job control, then, indicates that these systems may have a stressful impact on lorry drivers. The application of OBC systems was not accompanied by a decrease or increase in the lorry driver's psychological demands. OBC systems more frequently produce reports of **stress, job dissatisfaction and lack of privacy in drivers with a negative attitude towards these systems**. This suggests that the driver's attitude towards OBC technology is an aspect that should be taken into account during the implementation of these systems.

In conclusion, the results of the study indicate that the application of OBC system may negatively affect lorry driver's job control and organizational commitment.

Transport companies therefore should pay more attention to the question of how to implement and how to use OBC system and other intelligent transportation systems. More effort should be in informing the lorry driver about how and why the system is applied (disprove possible prejudices, deal with negative attitudes), and underscore and exploit the advantages of supplied information for the lorry driver.

Fighting fatigue

Since driver fatigue is an important factor in a large number of accidents, most of the intelligent systems in vehicle are supposed to support driver's safety by fighting the fatigue. There is an assumption that by monitoring several fatigue-related indicators (e.g. eye movements, steering patterns or heart rate) the symptoms of driver fatigue can be detected early enough to avoid accidents.

Fatigue is a particular problem for professional drivers, and especially truck drivers. About 20 % of all crashes and fatalities and 10 % of all injuries involving a long-haul truck, occur between midnight and 6 am, the peak period for driver fatigue (Blower et al., 1998). These crashes tend to be more severe than crashes during other periods of the day. Numerous research studies have established that long and irregular work hours for drivers lead to fatigue, reduced alertness, and impaired coordination. The rate of fatigue-related truck accidents increases significantly after drivers have been driving more than 9,5 hours. Restriction of sleep to 4-5 hours per night causes significant deterioration in reaction time performance within three nights; and after a week of partial sleep deprivation, it takes two full nights of sleep for reaction time performance to recover (Belzer et al., 2002).

Truck driver fatigue is responsible for single-vehicle fatal crashes, but when it concerns crashes involving other vehicles, the responsible factor would seem to be fatigue again but of the other driver (not the truck driver). Driving in excess of eight hours increases the risk of crash involvement by a factor of two (Jones et al., 1990, In ROSPA, 2001). Since our society seems to pressure many people to reduce sleep time in favor of other activities, such as working, without being aware of the negative effects this has on their health and ability to drive, professional drivers have to manage with very short time schedules. It is therefore recommended that driver hour's regulations be strengthened in order to take more into account circadian rhythms. Driving accidents related to sleep could be reduced if work and other time schedule would be planned so as to minimize exposure to prolonged driving under monotonous conditions during the more critical times of the day and night (Horne and Reyner, 1999). One study examined the possible relationship between sleep quality and the way commercial drivers balance conflict when they need to rest, due to fatigue, interferes with the obligation to maintain tight delivery schedule (Filiatrault et. al., 1999, In ROSPA). Driving experience also seems to be relevant with regard to sleep quality, as experienced drivers can develop strategies to better cope with stress inherent to the maintain of externally-imposed schedule demands (Filiatrault et. al., 1999, In ROSPA, 2001). Thus, fatigue-related problems while driving seem to be more important for inexperienced professional drivers and highlight the potential value of having a system that checks their vigilance level while driving (ROSPA, 2001).

Among other professional driver categories, there are also taxi and public transport drivers. Although they usually drive in urban environment where the risk of falling asleep at the wheel is reduced, they often work very long hours, and are submitted to work shifts so that in the early hours of the morning, their accident risk is increased (in Czech Republic there was an fatal accident in summer 2004 - the bus driver caused a serious accident and he died; according to his family he was watching television till 4 am, and he woke up for his shift at 5 am).

As reported in ROSPA (2001), bus and coach drivers should also deserve consideration for fatigue-related accidents as they often drive for long distances on monotonous roads, and have to manage with shift work. However, no study specifically addresses the issue of bus and road drivers.

The function of safety system NESPI (which means "Do not sleep!"), developed in Czech company Pracont as a tool for professional drivers is basically to reduce the risk of fatigue

and sleepiness by vibration. The acoustical signal sounds every minute – the frequency is possible to adjust – and the driver has to press the button; if not, the vibration system is activated (Weinberger, 2004). Weinberger points out that the long-term using of this system could have both negative and positive impact. The system is not able to decrease the fatigue itself and the driver should not rely on the system. Another possible risk is the relaxation potential of the system. The positive impact of the system is in the realizing of the fatigue by the driver and short-term keeping of vigilance. Author also mentions the possible health impact – promoting the blood circulation.

The Research Institute for Safety was looking for trucks accidents happening in over-time work. The injuries are increasing from second hour of over-time, from third hour becomes are even more frequent (fatigue). Also by subjective rating was found that professional drivers feel the fatigue after ten hours of driving (Bena et al, 1968).

Fatigue has major implications within the truck driving industry because it compromises the safety of the trucker and others on the highways. In addition, it poses long-term threats to overall health (Lyznicki, 1998, In Reed and Cronin, 2003).

The major sources of sleepiness during nocturnal activity seem to be related to a modification of circadian rhythm and sleep loss/time-awaking adjustment (Křivohlavý, 2003). Many studies have shown that circadian rhythms and sleepawake pattern adjustments are never complete, but partial, or even absent, during nightshift (Farbos et. al, 2000). The consequences of night shift work on sleep profiles affect not only sleep duration but also the characteristics of the sleep-wake patterns. This change and irregularity may cause serious problems: decreased sleep quality, impairment of mood and performance, and lack of energy (Křivohlavý, 2003).

The other factor of fatigue can be driving at night, since the nighttime driving is different for driving in daytime: a driver requires greater concentration because of visibility limitations. Lack of visibility may increase driver's drowsiness and fatigue (McDonald, 1984).

The fatigue management training program was developed in Australia (Machin In Dorn, 2003), that aimed at identifying specific factors contributing to coach driver fatigue and assisting coach drivers to develop more effective coping strategies to manage difficult or stressful work situation. The program consisted of three stages. During the first stage, a survey was conducted of express coach drivers to identify specific factors relating to stress and fatigue and determine the impact of these factors on the emotional and physical well being of drivers. Based on the results, training exercises were developed, and the final stage involved an evaluation of the effectiveness of the training program, which was proved as successful in improving effective coping strategies of the drivers.

Conclusions

It is essential to realize that perceiving the particular degree of workload depends on person's psychological features (stress resistance, level of neuroticism, temperament etc.). Also reactions on stress vary.

Stress is an inherent part of occupation of professional driver and functions as a factor, which under particular circumstances like for instance a combination of overtime, fatigue and responsibility can lead to traffic accidents.

Argument that the fact of increasing number of accidents with fatal consequences caused by professional drivers is caused because there is bigger amount of trucks on Czech roads is relevant. But when we consider serious results of these accidents, we have to take the long view and think about new system regular medical-psychological testing of professional drivers, mandatory continuous education, raising the minimum number of years of experience for performance the job of professional driver. We also have to consider more

strict system of keeping the rest breaks and also specify the legislative frame for application of intelligent transportation systems to vehicle (anti-fatigue systems, limitation of speed, keeping the safe distance etc.).

Transport Research Center in Brno, Section for human and social aspects of transport, currently prepares a proposition for full application of requirements of Directive EU 59/2003 on professional eligibility and improving training and education of drivers into practice. The aim is an effective preparation of professional drivers, cultivating their ability of safe driving and in order to maintain their qualification, drivers should be obliged to undergo periodic retraining in the skills essential for their profession.

Improving global climate on our roads and change of style or driving to less aggressive (defensive style, when driver has to anticipate danger, make allowance for other road users, which goes hand in hand with rational fuel consumption) is – in case of all categories of drivers – the goal much higher. For stable reducing of traffic accident this goal is indispensable though, and will have a positive impact both on society and on the road transport sector itself. The part of Minimum Qualification and Training Requirements (Annex 1 of 2003/95/EU) is, besides of for instance ability to load the vehicle with due regard for safety rules or ability to ensure passenger comfort and safety also awareness of the importance of physical and mental ability (principles of healthy, balanced eating, effects of alcohol, drugs of other substances affecting behaviour, symptoms, causes, effects of fatigue and stress or fundamental role of the basic work/rest cycle. Other objective is an ability to assess emergency situations.

Following points are concluded from the theoretical part of this paper. The aim of these points is to suggest possible solutions and tools how to improve work environment and other conditions of occupation of professional drivers, in order to reduce the stress caused by different factors. Some of the items are adopted from the Manual on stress prevention for bus drivers conducted by International Labour Organization (1996) and from project IMMORTAL report on drivers' fatigue (Milanovic, Klemenjak, 2000), as well as from Fatigue Management Training Programme for Coach Drivers conducted by University of Southern Queensland (Machin, 2001 In Dorn, 2003) and the study of Karazman et al. (2000).

- Short-term increase in the number of checks by the forces of law and order
- Application of electronic tachographs for monitoring driving and rest hours
- Adaptation of the currently valid model of driving and rest hours with respect to human physiological actualities
- Creation of a system as an additional sanction measure for offences concerning driving and rest hours
- Improved route scheduling through state-of-the-art technology, to relieve the driver and as a screening possibility for the forces of law and order (scheduling of the route should be transparent and realistic, and modern technologies such as GPS should allow more flexibility and relieve the driver by providing more information about the respective country etc.)
- Carry out campaigns to alert professional drivers to the dangers of fatigue and how to deal with it (radio, schooling, brochures)
- Improvements in road organization and at rest stations (improved service offers and larger parking facilities, to make breaks and rest hours more attractive)
- Ergonomics of the driver's cabin, with particular reference to the position and adjustment of the seat, steering wheel and pedals, the visibility and marking of the

dashboard, the adaptation of the working space to both large and small drivers and the provision of adequate training, especially where new bus models are introduced

- Timetables, shift schedules and the quality of break periods
- Leisure time activity arranged by employer (sports, physical training, musculo-skeletal exercises, swimming)
- Psychological training: general and special relaxation, focusing, concentration training, how to cope with stress, self-experience
- Stress management and social skills; developing new attitudes towards work-related problems and conflicts with troublesome passengers and other stressors typical for the profession of the driver

Intended study of professional drivers and influence information systems

The upcoming PhD thesis conducted by author of this paper refers to the field of lorry (all groups of professional drivers have very different context of driving, so that it would be very difficult to tackle in them in the same research) drivers' stress with regard on their evaluation of modern information systems. The main aim is to find out how the drivers evaluate the systems with focus on information workload, distraction and feelings of **comfort, satisfaction and safety**. The intelligent transportation systems are intended to support road safety, but the possible consequences of their use is not described in detail yet. The prime challenge is to determine the efficiency, effectiveness and safety of the systems from the driver's perspective.

The question which figures in the dissertation is: do the systems work in a user-friendly manner or not? Do they increase stress and frustration within the driving task? The answer should drivers give through subjective evaluation of the systems and the subjective perceived influence on driving task, safety and comfort. Following methods will be used: VBBA (Dutch Questionnaire on the Experience and Assessment of Work), Driver Stress Inventory, in-depth interviews also will be used. The VBBA questionnaire is evaluating the psychosocial work environment (i.e. psychological job demands and job control), mental health and job attitudes. Driver Stress Inventory (DSI) measures individual's vulnerability to commonplace stress reactions during driving, such as frustration, anxiety and boredom, and moreover provide a comprehensive measure of affective reactions to driving (thrill seeking, enjoyment through risk taking etc.). The DSI consist of five substantial factors (Dislike of Driving, Aggression, Hazard Monitoring, Thrill Seeking and Fatigue Proneness). Wierwille et al. (1996) emphasizes that subjective assessments are expected to have high value as well as high validity is in the area of driver acceptance of the systems. According to this author subjective methods may best be considered a structured means to gauge how the driver who uses it feels about the device being evaluated. Study of this author shows some drivers' responses to an unacceptable system: dis-use (defeating, ignoring, or otherwise failing to employ the device as its designs intended), modification of the task (changes in driving task behaviour to match the needs of the system) and frustration and apathy (drivers who experience frustration and apathy may evidence poor performance). In-depth interview also will be conducted during the research as an important tool for bringing subjective information on stress and satisfaction.

The group of professional drivers will consist of 45 lorry drivers who use positioning and navigation systems (DYNAFLEET from Volvo), the results will be compared with lorry drivers who do not use these systems.

This theoretical extract is going to serve as a background for the research task, since specific needs of professional drivers target group should be taken into consideration.

References

Aty, M. : Driver Training. Technical Clearinghouse for Auto Clubs.
www.catssengr.ucf.edu/aitfia/mai_pages/Driver%20Training.htm

Bajčík, V. Broniš, M.: *Psychická zátěž a bezpečnost při práci*. Práca, Bratislava 1981.

Bakalář, P.: *Bližší analýza psychických nároků na vybrané kategorie řidičů ČSAD a MHD*. Ústav silniční a městské dopravy, 1985.

Baštecká, B., Goldmann, P. (2001): *Základy klinické psychologie*. Portál, Praha.

Belzer, M.H. et al. (2002): *Proposed changes in Motor Carrier Hours of Service Regulation: An Assessment*. Transportation Research Institute, University of Michigan, U.S.

Bena, E., Hoskovec, J., Štikar, J.(1968): *Psychologie a fyziologie řidiče*. Nakladatelství dopravy a spojů, Praha.

Bigert, C.: *Myocardial infarction among professional drivers*. Department of Occupational and Environmental Health, Stockholm Centre for Public Health, Sweden. *Epidemiology*, 2003.

Cordon, I.M. (1997): *Stress*. California State University, Northridge.

De Croon, E. M., Kuijer, P. P. F. M., Broersen, Jake P.J., Frings-Dresen, Monique H.W. (2004): *Information technology and road transport industry: how does IT affect the lorry driver?* Coronel Institute for Occupational and Environmental Health, Amsterdam Centre for Research into Health and Health Care, Academic Medical Centre University of Amsterdam.

DeIVecchio, R (2004).: Urban bus drivers, <http://www.buildingbetterhealth.com/topic.bus>.

Directive 2003/59/EC of the European Parliament and of the Council of 15 July 2003 on the initial qualification and periodic training of drivers of certain road vehicles for the carriage of goods or passengers, amending Council Regulation (EEC) No 3820/85 and Council Directive 31/439/EEC and repealing Council Directive 76/914/EEC.

Dorn, L.: *Driver behaviour and training*. Ashgate Publishing Limited, England, 2003.

Evans, G.W., Johansson, G.(1998): *Urban bus driving: an international arena for the study of occupational health psychology*. *Journal of Occupational Health Psychology*. April, Vol.3, number 2, 99-108 pg.

Evans, G.W. et al. (1999): *Hassles on the job: A study of a job intervention with urban bus drivers*. *Journal of Organizational Behavior*. Vol. 20, Iss.2, pg. 1999.

Horne, J.A., Reyner, L.A.: Vehicle accidents related to sleep: a review. *Occupational and environmental medicine*, 1999, 56 (5), pg. 289-294.

Charbotel, B., Martin, J.L, Gadegbek, B., Chiron, M. (2003): *Severity Factors for Truck Driver's Injuries*. *American Journal of Epidemiology*, Oct 15; 158, 8; ProQuest Medical Library, pg. 753.

Informace o nehodovosti na pozemních komunikacích České republiky za rok 2004. Ředitelství služby dopravní policie Policejního prezidia ČR.

Karazman et al. (2000): *Effects of ergonomic and health training on work interest, work ability and health in elderly public urban transport drivers*. Institute of Occupational Health Promotion, Vienna. Vol. 9, pg. 33-35.

Kloimuller, I. et al. (2000): The relation of age, work ability index and stress-inducing factors among bus drivers. Institute of Occupational Health Promotion, Vienna. Vol. 9, pg. 33-35.

Kostyniuk, L.P., Streff, F.M., Zakrajasek, J. (2002): *Identifying unsafe driver actions that lead to fatal car-truck crashes*. University of Michigan, Transportation Research Institute.

Kruger, H.-P.: *Workload-fatigue-drowsiness: A cognitive-energetic approach*. International Conference on Traffic and Transport Psychology, Berne, Switzerland, 2000

Křivohlavý, J. (2003): *Psychologie zdraví*. Portál, Praha.

McDonald, N. (1984): *Fatigue, safety, and the Truck Driver*. Taylor and Francis, Philadelphia.

Mele, J. (2004): *So safe it's dangerous*. Fleet owner. Overland Park. Vol. 99, Iss. 6, pg.6

Milanovic, Klemenjak (2000): *Psychological Measures to Reduce Fatigue-related Accidents by Long-distance Truck Drivers*. Institute of Traffic Psychology, Vienna.

Raggatt, P. T. F. (1991): *Work Stress among long-distance coach drivers: A survey and correlation study*. *Journal of Organizational Behaviour*. Dec 1991, Vol. 12, pg 565-579.

Reed, D.B., J.S. Cronin (2003): *Health on the road: Issues faced by female truck drivers*. *AAOHN Journal*, Vol.51, Iss.3, pg. 120.

Rydstedt, L.W, Johansson, G., Evans, G.W. (1998): A longitudinal study of workload, health and well being among male and female urban bus drivers. *Journal of Occupational and Organizational Psychology*. Leicester: Mar 1998, Vol. 71 Part 1, pg 35

Stacciorini, J.M. Troccoli, B.T. (2004): *Occupational Stress and Constructive Thinking: Health and Job Satisfaction*. School of Nursing, University of Massachusetts, Amherst, USA.

Švancara, J.(2003): *Strategie zvládání stresu*. Testcentrum, Praha.

Ward, N., Smith, L.: *Shiftwork and driver fatigue: a pilot study*. University of Leeds, School of psychology, 2000.

Weinberger, J. (2004): *Hodnocení systému NESPI z pohledu dopravního psychologa*. Centrum dopravního výzkumu.

Wierwille, WJ, Tijerina, L., Kiger, S., Rockwell, T., Lauber, E., Bittner, A. (1996): Heavy Vehicle Driver Workload Assessment. Task 4: Review of workload and related research. Final Report Supplement. U.S. Department of Transportation. National Highway Traffic Safety Administration.

www.ilo.org/public/english/protection/safework/stress/busdriver.htm: Manual on stress prevention for bus drivers (1996)

www.rospa.co.uk (The Royal Society for the Prevention of Accidents)

www.workhealth.gov/niosh/stresswk.html

Directorate of roads and motorways: oral message