DISTRICT VETERINARIANS WORKING ENVIRONMENT IN AND AROUND THE CAR

Rose L. &, Larsson, T.J.
The Royal Institute of Technology, School of Technology & Health; Design, Work, Environment, Safety & Health Group, Mariekällgatan 3, SE-151 81 Södertälje, Sweden
e-mail:linda.rose@sth.kth.se

A survey and a field study were carried out to study the Swedish District Veterinarians (DV's) working environment (WE) in the car. The results show that 47% have physical problems that they connect to the work in the car. All 12 DV's participating in the field study suffered from pain and spent 2-4 hours a day in their car. Several very unfavourable postures in manual material handling situations and computer work, leading to high strain and increased injury risks, were identified,. It is concluded that improvements would decrease long-term injury risks. Suggestions for design criteria for improving the WE are presented.

***Key-words**: veterinarians, work environment, car, injury risks*

1 Introduction

This paper describes a study of the work environment of the Swedish District Veterinarians (DV's) in and around the car. It was carried out in co-operation with The Swedish Board of Agriculture (SJV) and The Swedish Veterinary Association during 2005-2006 and was financed by The Development Council for the Government sector.

The DV's carry out a considerable part of their work in and around their official car. This includes driving, handling of equipment, loading and unloading the car, making phone calls, writing case-books and other administrative work and these tasks represent a large part of the veterinarians working time.

The design and equipment level of the existing official car has been criticized by several users. In connection with the procurement of the DV's next official car, the SJV stated that empirical and scientifically based requirements and specifications, developed in consensus with employee representatives would represent a rational way to secure a safe and productive work environment (SJV, 2005).They also stated that with considerable physical variation in the profession, flexibility in the driving work environment design should have priority. In the project directive (SJV, 2005) the background for the project is described in more detail. A detailed project report is available in Swedish (Rose & Larsson, 2006).

2 Objectives

The overall objective of the study was to contribute to the improvement of the DV's work environment related to work tasks in and around the official car. The aim has been to:

- map the DV's work environment in and around the car
- produce a basis for criteria for the procurement of the official car and included work-related equipment for the car.

3 Methods

A survey regarding the DV's work environment in and around the car was sent to all Swedish District Veterinarians (DV's). This was developed in co-operation between researchers at KTH and staff at SJV and was carried out during 2005.

In addition, a *field study* was carried out at six local Veterinarian Stations. Here, twelve veterinarians (8 women and 4 men) were interviewed and their work in and around the car was analysed. The following aspects were included in the field study:

Physical ergonomics:

- Physical strain / exposure time
- Physical factors: lighting and climate

Cognitive ergonomics:

- Man- Machine- System: computer programs, telephone, heating system
- Work psychology – stress, tiredness

Systemergonomics:

- Risks/safety: driving characteristics, disease control, hygiene
- Work organization: staff rosters, distribution of cars, on duty systems.

Subjective methods - Borg's CR-10 scale (Borg, 1982) and VIDAR, a video and computer based work analysis (Arbetslivsinstitutet, 2005), and interviews as well as objective methods - weight measurements, biomechanical calculations and electromyographical analysis of the upper extremities/back and neck - were used. The results from the analysis were compared to recommended and regulated limit values.

A *literature review* was also included. Here the focus was *i*) earlier relevant studies found in the databases Medline and Arbline, *ii*) the survey carried out 2005, *iii*) injury statistics (AFA) and *iv*) traffic safety data (Folksam).

Based on the results from the survey, the literature review and the field study a suggestion for specification for the DV's future official car was produced.

4 Results

4.1 Results from the survey

Ninety-five percent of the active Swedish DV's responded to the survey on work environment aspects in and around the car. The results show that 91% of the participating DV's state that they are content or quite content with their job, but 47% state that they experience physical problems that they relate to working in the car.

The results further showed that *i*) 67% of the Veterinarians drive on the job every day, *ii*) 40% jump in and out of the car more than 10 times a day, *iii)* they drive between 10000-80000 km/year, with a median of 30000 km, i*v*) 59% use a computer in the car and *v*) 86% drive a VW Passat.

4.2 Results from the field study

The number of Veterinarians in Sweden was assessed to be 800-1500 between the years 1997-2005 (SCB, 2005). Injury statistics show that 356 work-related injuries were reported and compensated between 1990-2004 (AFA, 2006). The traffic accidents made up about 4% of these, while the rest had other reasons. The existing official car, VW Passat, is considered by the participating DV's as safe, but is not classified to be so safe that Folksam Insurance recommends it.

In summary, the results indicated several deficiencies in the DV's existing official car and the work-related equipment in the car, as well as some very unfavourable working postures in manual material handling situations and in computer work. At times tiredness and stress added to the strain, which tend to increase injury risks. Some examples are:

- the car is experienced to be too small and narrow and with insufficient loading capacity,
- the low hatch restrains a straight upward posture for tall individuals when loading and unloading from the back,
- the entrance in-step into the car and the driver's seat are low,
- the lighting in the car is insufficient, especially for telephone and computer work,
- equipment in the car is often not secured during travel,
- there is no space for passengers or trainees in the car,
- the office equipment (computer & printer) often discharges the car battery,
- the postures while working with the computer are unsuitable,
- manual material handling consists of several unfavourable working postures often combined with relatively heavy loads,
- in addition, psychologically stressing factors such as problems with the equipment and time pressure were identified,
- tiredness and stress is mostly experienced on duty.

In Figure 1 some examples of the unfavourable work situations are illustrated.

Figure 1: Examples of situations with increased injury risks a) equipment not secured during journey as well as the twisted working posture during computer work, b) installation of computer as well as c) manual material handling lead to unfavourable postures and d) unfavourable postures in combination with insufficient vision adds to the strain.

All participating DV's had musculoskeletal problems and suffered from pain from muscles or joints.

The participating DV's spent between 2 and 4 hours a day in their car. The long exposure time in the car while driving, often up to half of the working time, leads to increased risks for overexertion injuries. This implies that high demands should be put on the car and especially on the driver's seat. Several of the participating DV's stated that they connected the problems they experience in the neck-shoulder-back region with driving and computer work in the car.

The static computer work with exposure times around half an hour in unfavourable postures is common; often twisted and bent, with a high working height, with joints in or near their range of motion and often without support for the forearms. This leads to increased injury risks. The visual ergonomics generally has deficiencies with insufficient lighting in the cargo space and poor lighting conditions for computer and telephone work.

During manual material handling, when loading and unloading the car, factors as vision, weight, reach, height, distance and frequency and exposure time influence the loading situation. The frequency is a few times per hour and the duration for each handling between some and some tens of seconds. Certain handling tasks are directly unsuitable and exceed existing limit values and increase the injury risks.

Other examples of factors increasing injury risks are tiredness and stress (which may lead to erroneous actions). The participating DV's stated that they feel stress and tiredness mainly on duty. Use of telephone while driving increases the risk of car accidents. This is accentuated when no hand-free is used, when the phone has an unsuitable position and its display and buttons lead to poor cognitive ergonomics. Thus, vision, handled weight, posture and stress are some factors influencing the strain.

4.3 Criteria and design suggestions

A number of suggestions for design criteria and solutions that would improve the working environment and reduce the injury risks are proposed. These include aspects regarding traffic safety, comfort, the computer work station, lighting ergonomics, manual material handling, hygiene and power supply and are reported in more detail in the report by Rose and Larsson (2006). Some of them are listed below:

4.3.1 Traffic safety

The car should have four-wheel drive, have good road and off-road qualities and driving characteristics. Regarding the need to negotiate dirt roads and some times off-road conditions, four-wheel drive is recommended. Ground clearance should be high, but not extreme, considering comfort when entering and exiting the car. The interior safety of the vehicle should be high, front and side airbags should be included. Whiplash protection should also be included. Modifications potentially impacting on personal safety should not be allowed. Extra lighting for increased sideways vision and a movable searchlight/spotlight should be considered. Requirements on visual ergonomics in the driver's seat imply that all equipment (incl. phone) should be easily readable from

a normal driving position. A hands-free should also be easy to manoeuvre from the normal driving position.

4.3.2 Computer work station

Good and flexible lighting in the driver's seat and computer work station should be required as well as a computer placed so that ergonomic requirements are met (monitor, key-board, posture, etc). For reasons of ergonomic design, computer work should not be combined with the driver's seat. The printer should be installed beneath a seat and fastened in a secure way. Cordless solutions are suggested. Special space for storing office material is favourable. A lap-top computer that safely can be fastened in a docking-station/replicator is suggested. Strongly improved, or separately arranged, electric power for computer work is suggested.

4.3.3 Veterinary work

Good lighting for preparation - dressing up, collecting and preparing medication, picking up tools and equipment, packing case, putting in pockets - and other tasks performed at the back of the car should be installed. Well designed work areas and support surfaces should be available when preparing equipment and medication. A roof or weather-shelter placed so that it enables an upright posture during work around the car is suggested. However, roof or hatches must be reachable for all. Loading and unloading systems with pull and push solutions are recommended. Special solutions for hygiene and disease control separation of receptacles, clothes, shoes and equipment are important. The cargo space must neither be placed too high nor to low, and part of it should be heated preventing substances and equipment from freezing. Also, a cold storage for preparations and equipment is needed. Power supply has to be improved to secure energy supply for heating and cooling.

4.3.4 Comfort

The driver's seat should be cup-shaped**,** provide good support for the thighs, be ventilated and have a good neck support (with whiplash protection if possible) and be flexible to adjust. The noise level in the car shall be low, and the noise protection in the range of high quality passenger cars. The air-conditioning should be of high quality and designed to handle extreme winter conditions. An automatic gear-box is recommended. The power steering should be of good quality and provide easy handling. There should be space for passengers (customers or trainees) in the car in a seat with normal car safety. A safe space for accompanying pets is desirable.

5 Discussion

The exposure time is maybe the most important factor when considering the importance of the car in the DV's work. The DV's spend many hours in their car, approximately 2-4 hours a day. Counting with 1/3 of the working time spent in the car they drive about 3 months full time per year. It is important that the driving seat of the DV car is chosen according to high ergonomic requirements.

Although the risk of being involved in a traffic accident as a DV is relatively low compared to other injuries, the official car should have both a high level of road safety and good driving characteristics.

The ergonomics regarding the DV's work in and around the car would profit from technical and ergonomic improvements both regarding the choice of official car and its equipment. The participating DV's had several suggestions of how the work environment could be improved. Among the components that should be considered are the computer work station, driver's seat, access and reach regarding loading and unloading the car with manual material handling involved and the controls on the telephone etc., security, hygiene/disease control, lighting and space for passengers.

When specifying a new official car technical as well as ergonomic and economic aspects have to be considered. A car with a larger and better arranged cargo space, a well designed computer work place, a better driver's seat, higher entrance/in-step etc., does not have to be more expensive than the existing official car. In many professions official cars designed for a combination of transport of persons and cargo with integrated systems for material handling are used. A transport vehicle might fulfil the requirements in a better way than a passenger car.

A driver's seat with improved ergonomics and easily adjustable for individuals should decrease the strain. The existing seat is placed fairly low which implies that the DV's have to enter into and from a low level, leading to "unnecessary" physical strain a couple times per hour. A placing of the driver's seat at a higher level would decrease the physical strain.

Improved ergonomics regarding manual material handling, computer work, drivers seat, cargo system, access and reach, vison, would enable better working postures and lead to lower strain levels. This and improved hygiene/disease control systems would decrease the injury risks for DV's.

5 Conclusions

The main conclusion is that a high percentage of the DV's report that they are content with their job, but a large proportion suffer from physical problems that they relate to work. The work environment for the DV's in and around the official car has several clear ergonomic deficiencies which lead to increased injury risks. Computer work and manual material handling are two such examples. Further it is concluded that there is room for improvement and a base for criterions and design suggestions are presented. These would improve the work environment and decrease the injury risks for the DV's.

6 References

AFA (2006) Specific data about reported injuries from Veterinarians. Personal information.

Arbetslivsinstitutet (2005) VIDAR Computer program for assessment of work environment.

Borg, G. A category scale with ratio properties for intermodal and interindividual comparisons. *I* Psychophysical judgement and the process of perception. VEB Deutscher Verlsg deer Wissenschaften, Berlin, DDR, 1982.

Folksam (2005) Hur säker är bilen? (How safe it the car?) 2005 Report. Available at the homepage: http://www.folksam.se/resurser/pdf/sakrabilar2005.pdf.

Rose. L. & Larsson, T. J. (2006) DiB, Distriktsveterinärer i Bil: Arbetsmiljöenkät, Fältstudie, Underlag till fordonsspecifikation. (District Veterinarians working environment in and around their car) KTH School of Technology and Health, Report (in Swedish). KTH, Stockholm.

SCB (2005) Arbetskraftsundersökningen. Report in Swedish.

Statens Jordbruksverk (2005) DiB Distriktsveterinärer i DiB. Projektdirektiv. (District Veterinarians in their car.) Project directive in Swedish.