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Delivery drivers and low-back pain: A study of the exposures to posture demands, manual materials handling and whole-body vibration

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Abstract

The exposures of drivers to posture demands, manual materials handling (MMH) and vibration as risk factors for LBP were investigated. A validated questionnaire was used to obtain information about driving experience, driving (sitting) posture, MMH, and health history among 64 drivers in short-haul delivery jobs. Twelve persons were observed and videotaped during their work and vibration measurements were obtained for three types of delivery vehicles (Van, articulated truck and tipper truck). The results indicated that systematic observation of the driving activity and MMH is necessary alongside questionnaire assessments if the exposures are to be accurately characterised and that delivery vehicles generate acceptable levels of average r.m.s. acceleration. Transient (lasting less than a week) low-back pain was found to be prevalent among the drivers.

Relevance to industry

Persons who drive occupationally or for prolonged periods of time suffer low-back pain and other musculoskeletal problems. Accurate description of the exposures to risk factors is essential if the causal and aggravating factors are to be identified quantitatively.

Keywords: Exposure; Vibration; Posture; MMH; Low-back pain

1. Introduction

Various studies indicate that exposure to intense whole-body vibration (as may occur during driving) is associated with musculoskeletal complaints and disorders, which tend to have grave repercussions in economic terms and disability (Meyer et al., 1998). In these regards, the European Directive (European Parliament and the Council of the European Union, 2002) places a duty on employers to manage and minimise (control) the risks from exposure to whole-body vibration (WBV). However, aside of WBV, occupational driving also often involves sitting and some drivers may, in addition, perform considerable manual materials handling (MMH) tasks during their work. Prolonged sitting in the same posture and MMH are also two well-known risks for back pain (Van der Beek and Frings-Dresen, 1995; Kuiper et al., 1999). Invariably, if safety and health of occupational drivers is to be effectively encouraged, clear appreciation of these three risk factors is necessary as a minimum requirement and, depending on how they are present, different strategies for control may be required for different groups of drivers (Hannerz and Tuchsen, 2001).

Delivery drivers are a group subject to WBV and their work almost always also includes stress from awkward sitting and manual handling of loads. For them, various studies have found positive associations between lorry/truck driving and low-back pain, (Boshuizen et al., 1992; Hedberg, 1988; Magnusson et al., 1993; Miyamoto et al., 2000; Van der Beek et al., 1993). However, the efforts have

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been focused on inter-city long-haul drivers and exposure to the risk factors has often been investigated only in terms of subjective self-reported measures, which tend to correlate weakly with reality (Leijon et al., 2002; Wiktorin et al., 1993). The studies that applied mixed methodologies, i.e., subjective self-reported measures as well direct observations and/or measurements (Hedberg, 1985; Nygard and Ilmarinen, 1990; Van der Beek and Frings-Dresen, 1995), were concerned with evaluating one risk factor (often MMH) with little or no consideration for others. The present study was conducted to investigate the typical exposures of short-haul delivery drivers to driving posture demands, MMH and vibration as well as the prevalence and nature of LBP.

2. Subjects and methods

2.1. Study design

There were three parts: self-assessments by a questionnaire, systematic observation and direct measurements. Inclusion criteria for the questionnaire assessments was a minimum of 5 years in present job or 5 years delivery driving experience, while the volunteers included in the observation study constituted a convenience sample. Persons (male and female) who did intra-city (short-haul) deliveries and drove such vehicles as trucks, vans and lorries represented the source population. Short-haul drivers were chosen because this group of workers had often not been the subject of previous studies. Contact was made by telephone with transport or health and safety management staff of commercial haulage companies within the Aberdeenshire area of Scotland, and articles were published in newspapers and professional newsmagazines to explain the purpose of the study and request for volunteers.

2.2. The study group

One hundred and ten drivers volunteered participation or were volunteered for the study as follows: 30 from two city councils (all maintenance deliveries driving staff), 50 from a commercial haulage company (randomly selected in consultation with health and safety manager), 10 from a printing press (all delivery driving staff) and 20 independent drivers. Of these, 70 returned completed questionnaires (58% response ratio), but data for 64 (62 male and two female), which met the inclusion criterion were analysed. Twenty-four of the analysed questionnaires came from the city councils, 21 from the commercial haulage company, five from the printing press and 14 from independent volunteers who had responded to one or other press release. These persons were aged between 28 and 66 years (mean 46.9, SD 10.98), they weighed 85.9 kg on average, SD 14.78 (range 57.3–133.6 kg) and stood between 160.0 and 195.6 cm in stature (mean 176.4, SD 6.67).

2.3. Questionnaire assessment

A validated questionnaire (Pope et al., 2002) with the questions grouped into four sections, General information, Job satisfaction, Work environment information and Musculoskeletal health information, was used to obtain information about LBP in the last 12 months, driving experience, driving (sitting) posture and MMH. This was administered to the volunteers by post or directly by hand, including a freepost envelope for return when completed. The questions regarding driving experience were in terms of years of driving and daily driving hours, surface and environment of travel and discomfort from different modes of vibration. The questions regarding sitting posture were in terms of five different possible configurations of the torso (torso against backrest, torso straight, torso bent, torso twisted, and torso bent and twisted simultaneously) and three possible frequencies of occurrence (never, occasionally, and often). The questions regarding MMH were in terms of the weight of load (light load <5 kg, medium load 5–10 kg, heavy load >10 kg) and frequency (self reported) in a typical workday, for lifting and pushing tasks, and whether handling was done immediately after driving (never, sometime, often).

2.4. Observation study

Twelve drivers (three from the printing press and nine from the commercial haulage company) were observed and videotaped during their work. They were observed in respect of the frequency of sitting postures adopted during driving (i.e., torso against backrest, torso straight, torso bent, torso twisted, and torso bent and twisted simultaneously). The durations of twisted posture were also noted whenever they occurred. MMH performed as well as type of road surface driven on. Each driver was observed over a typical work period (i.e., 4 h in the morning before lunch break or 4 h in the afternoon after lunch break). The driving posture was noted once in every minute of driving for an accumulated 1 h of continuous driving while the number of lifts and pushes performed and the weights of the loads handled were noted whenever the driver disembarked and physically moved delivered items. Furthermore, note was made of the durations over which continuous driving occurred.

2.5. Direct measurements

Whole-body vibration (WBV) measurements in the three orthogonal axes (x-fore and aft, y-lateral and z-vertical) were carried out for typical vehicles used by the drivers under actual delivery conditions (when moving) according to the recommendations of the ISO 2631 (1997) standard. Vibration from two vans [van] (Mercedes Benz Sprinter model), six articulated trucks [artic] (DAF 85 model) and one tipper truck [tipper] (DAF 85 model) were measured. All the vehicles were relatively new (in service for <3 years