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Occupational risk and prolonged standing work in apparel sales assistants

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ABSTRACT

Background: The prolonged standing posture during work affects the risk of developing musculoskeletal disorders of the lower limbs, especially in lack of alternative sitting. While different ergonomic tools are available to assess and manage the postural risk of the back and the upper limbs, there is a dearth of methods relative to the lower limbs.

Objectives: The aim of this study is to assess the postural risk of sales assistants working in a prolonged standing posture, focusing on critical issues for the lower limbs.

Methods: and criteria: 70 sales assistants employed among 9 apparel stores in northern Italy participated in the study. An observational approach was adopted, together with the application of standard ergonomic tools (Rula, Reba, Strain Index, Ocra) to assess the postural risk. Estimates of energy expenditure and movement's patterns were obtained through continuous monitoring with the Sense Wear Armband. Discomfort of the lower limbs was subjectively rated on the Borg's Cr-10 scale at the end of the work shift. The leg circumference was measured on each worker at intervals along the work shift.

Results: The work of sales assistants in the apparel retail sector is characterized by the prolonged standing posture which accounts for more than 80% of the work shift duration; alternation with walking phases occurs according to assigned tasks and work organization.

Activities of the upper limbs and occasional adopted awkward postures are observed, with the postural indexes varying between medium-high level of risk. The average distance walked during the work shift is 3,4 km. The musculoskeletal discomfort of the lower limbs reaches a medium-high intensity (CR 4–5) in 75% of the workers at the end of the work shift. Small but significant variations in the leg circumference were detected between beginning-end of the work shift (increase) and between beginning-end of the break interval (decrease).

Conclusion: Our data suggest that an indefinite level of risk of developing discomfort and musculoskeletal disorders of the lower limbs is real in sales assistants who work in a prolonged standing posture. The lack of specific assessment tool and of preventive measures could aggravate the exposure level.

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Relevance to industry

Sales assistants of the apparel retail sector could be exposed to a risk for the lower limbs in association with the prolonged standing posture and the lack of alternative sitting and of suitable recovery times. The risk could be health-threatening especially for females and the aging workforce. Ergonomics has a major role in identifying the risks, in developing reliable assessment tools, and in defining preventative recommendations to help reduce the risk of exposure, improve the work organization, and design suitable workplaces.

1. Introduction

Working in prolonged standing posture has been recognized as an occupational risk factor (Balasubramanian et al., 2009; Halim and Omar, 2011, 2012; Miedema et al., 1997) emergent in Europe (European Agency for Safety and Health at Work, 2005).

The prolonged standing work is associated with discomfort, fatigue, health problems, including musculoskeletal pain and disorders of the lower back (Callaghan and McGill, 2001; Claus et al., 2008; Marshall et al., 2011; Mendelek et al., 2011; Pensri et al., 2010; Tissot et al., 2009; Xu et al., 1997) and of the lower limbs (Ebben, 2003; Lin et al., 2012; McCulloch, 2002; Sudoł-Szopińska et al., 2011; Tomei et al., 1999; Tüchsen et al., 2005).

The disorders affecting the lower limbs range in severity from perceived discomfort (Messing and Kilbom, 2001) to edema (daLuz et al., 2013), nocturnal cramps (Bahk et al., 2012) and even chronic venous insufficiency (CVI) (Allaert et al., 2005; Shai et al., 2007; Sudoł-Szopińska et al., 2011; Tüchsen et al., 2000), with women especially at risk (Laurikka et al., 2002; Lehman et al., 2001). It has been claimed that musculoskeletal disorders affecting the lower limbs have been hitherto not adequately addressed or underrated in the female population (European Agency for Safety at Work, 2010).

While discomfort of the lower limbs can be subjectively perceived within 1 h of work in prolonged standing posture (Lin et al., 2012), CVI was associated with a standing position maintained for more than 50% of the work shift (Sancini et al., 2010).

Many occupational sectors have been studied that imply the prolonged standing posture: industry and handicraft (Gell et al., 2011; Halim and Omar, 2012; Lehman et al., 2001), healthcare and laundry (Ngomo et al., 2008), catering services (daLuz et al., 2013), retail (Messing and Kilbom, 2001), hairdressing (Blazek et al., 2013). Scarce attention has been devoted to workers in the apparel retail sector, strongly represented by females.

Many methods are available in the ergonomic literature which allow to conduct a postural assessment on-site, from simple observational tools (Hignett and McAtamney, 2000; Karhu et al., 1981; McAtamney and Nigel Corlett, 1993; Moore and Garg, 1995; Niosh, 2014) to questionnaires and psychophysical rating of the postural discomfort (Borg, 1998; Miedema et al., 1997). However, is not yet fully understood how and how much the load on the lower limbs during prolonged standing could determine or contribute to occupational risk, and which preventative measures may contribute to lower the exposure level. In this study the activity of sales assistants in big apparel stores was analyzed, especially considering the postural aspects and focusing on the lower limbs.

2. Material and methods

2.1. Participants

Seventy workers (7 males and 63 females; age 41,5 ± 10 years) (Table 1) employed in nine big apparel stores spread through northern Italy participated in the study. They were employed on a full (39 cases) or part-time (31 cases) basis, with a mean work shift's duration of 5,7 h per day. The participants were staff whose working hours coincided with day of the survey and who gave voluntary informed consent.

2.2. Survey methods

On-site surveys were conducted, one day for each store. The surveys were conducted along a 9-months period (from November till July) with the aim of collecting data that was representative of the average activity level for the work category.

Every effort was spent by the investigators for not interfering with the actual job activities and for allowing the concomitant presence of customers in the store. On the survey day, prior to beginning their shift, workers were informed about the aim and modalities of the study. For each participant, the anthropometric, physiological and psychophysical measures were collected at intervals during the work shift, while representative job phases were video recorded on each worker on duty. The work organization and the dimensional variables relative to workstation were considered in each context.

2.3. Apparatus and procedure

At the beginning (t0) and at the end (t3) of the work shift, and at beginning-end of the break (t1-t2), the leg circumference was measured on the left side of each worker using a Gulick Tape (Zander et al., 2004), the subject sitting with knee bent at 90° and the foot flat. At the same detection times, each worker was also asked to rate the lower limb discomfort on the Borg's CR10 scale (Borg, 1998). Estimates of metabolic (energy expenditure) and movement (walk distance) data were obtained through individual recording portable instrument (Sense Wear Armband) worn on the upper arm throughout the shift. Each worker was video recorded by a video camera (Sony DCR-SR57) for a 15-min cumulative chunk during performance of work tasks. A sagittal-perpendicular view of the subject was kept for consequent postural analysis (Niosh, 2014). The postural variables (angulation, time, action frequency) were analyzed relative to trunk and upper limbs for each worker. As for the lower limbs, time spent in static posture (standing), walking (steps per sequence, cumulative distance), and adopting constrained postures (duration and frequency) were analyzed. The Rapid Upper Limb Assessment (RULA) (McAtamney and Nigel Corlett, 1993), the Rapid Entire Body Assessment (REBA) (Hignett and McAtamney, 2000), the Strain Index (Moore and Garg, 1995) and the OCRA checklist, a simplification of the OCRA Index (Occhipinti and Colombini, 2004), were applied in the aftermath on group data in order to obtain the overall postural scores. A comparison with reference limits for posture provided by the ISO norms is also reported.

2.4. Data analysis

The overall differences in the leg circumference were analyzed through the paired *t*-test (significance level p = 0,005) between time intervals (t0 = beginning of the work shift; t1 = beginning of the break; t2 = end of the break; t3 = end of the work shift). The observative data obtained from direct and indirect records of the activities were considered for a better understanding of the sales assistants' work. The dimensional and organizational aspects were used in the interpretation of each working context.

3. Results

3.1. General aspects

The apparel stores investigated are located in modern buildings and may include single or multi-plane spaces, for a total area of at least 400 square meters.

The sales assistants in the apparel stores are assigned to cashier or sorting roles, according to the work organization. The cashier's tasks occur mostly in the immediate area of the cash desk. The sorting tasks concern the preparation of goods for exposition, and may occur at different spots of the store area. Sometimes different roles are being alternated along the work shift by the same worker. The task's characteristics and the physical layout determine different postural patterns.

3.2. Cashier activity

The cashier sales assistants maintain a static standing posture for 80% of the shift; no seat has been provided at the cash desk (Fig. 1). The tasks include: operate touch-screen and cash register, interact with customers, handle cash and other items. The work area is restricted (about 5 square meters) and the cash desk features a full underside that prevents free space for the worker's legs and feet. Generally, the checkout tasks require a static position with few