

# Ergonomic evaluation in a values transportation company in Venezuela

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**Abstract.** The objective was to analyze the work activity and identify risk factors that could account for musculoskeletal disorders in the upper extremities, shoulder and neck of workers of a transport values company in Venezuela. The methods used were: collective interview, tasks observation, evaluation of posture with RULA method and evaluation of repetitive motions with the OCRA method. Five workstations were evaluated. Main problem perceived by workers was: exposure to chemical and biological hazards when handling paper money and coins; inadequate chairs and close supervision. The postures level risk was 1 or 2 for the RULA scale. Only two workstations showed light and medium risk level by OCRA method. Conclusion: The factors identified that could explain the musculoskeletal changes were: wrist repetitive flexion and extension, shoulder elevation, lifting weight above shoulder height, elbow repetitive flexion and extension, neck flexion, extended work journey, work overload, high responsibility and strict supervision by a video camera.

Keywords: activity, postures, repetitive movements, transportation of values

## 1. Introduction

The analysis of work activity is considered the worker's response to the variety of conditions. In order to do their activity, employees are committed in the accomplishment of the organization production objectives, in order to do so, they must adapt their own features and capabilities depending on the demands of work (Guerin et al, 1991), therefore, the importance of their study.

The objective of this research was to analyze the work activity and to identify risk factors that could explain musculoskeletal disorders in the upper extremities, shoulder and neck of the workers of a transport values company in Venezuela.

## 2. Material and methods

Collective interviews were conducted and the DEPARIS method was applied (Malchaire, 2009), homogeneous groups. To determine areas of pain at the end of the workday body schema was used (Escalona et al., 2002). Observations were performed to analyze tasks, postures and repetitive movements of the upper limbs. The observations of the tasks were performed during a typical work

week. The positions were assessed using the RULA method (McAtamney, L. and Corlett, 1993). To evaluate repetitive movements of upper limbs was used OCRA checklist (Colombini, Occhipinti, and Grieco, 2000).

## 3. Results

### 3.1 Group interviews

Group interviews were conducted on five homogeneous groups of workers in the following workstations: Vault Chief, vault Assistant, Selection of paper money, the opening of financial and commercial remittances (see Table 1). The employees participated in groups of 2 or 3 for a total of 11 workers. The average age was 32 years (range 26 to 42 years). The predominant sex was male with 72% and 27% female. In all groups homogeneous exposure to chemical and biological\* hazards perceived as unsatisfactory (red), designated as the presence of dust problems in handling paper money and invoices. In particular, the financial remittances

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group said (standing, chairs can't be adjusted and constant monitoring by the video camera, pointing to this as unsatisfactory). The work areas, the risks of accidents, repetitive psychosocial work environment and thermal environment were assessed as unsatisfactory, with the exception of financial openers' accountability group which considered the last element as satisfactory. As for the question; what do you like about your job? The workers agreed on the following aspects: to work overtime, the work environment, companionship and economic benefits. In relation to those things they dislike about the work: the cold in the office, the sort of safety shoes that are uncomfortable, poor ventilation and dust of the paper money.

Table 1. Summary of the work situation in homogeneous groups collective interview. Transport company values. Venezuela, 2010.

ITEMS	OF HEAD VAULT	OPENING REMITTANCES	ASSISTANT VAULT	FINANCIAL REMITTANCES	BILLETES SELECTION
1.- Workspace.					
2.- Technical organization the posts					
3.- The adaptations of the work					
4.- Risk of accidents					
5.- The commands and signals					
6.- The tools and work materials					
7.- The repetitive work					
8.- The manipulations					
9.- The mental load					
10.- The lighting					

ITEMS	OF HEAD VAULT	OPENING REMITTANCES	ASSISTANT VAULT	FINANCIAL REMITTANCES	BILLETES SELECTION
11.- The noise					
12.- The thermal environments					
13.- The chemical and biological hazards					
14.- The vibrations					
15.- The working relationship perators					
16.- The local social environment and general					
17.- The work content					
18.- The psychosocial environment					
19.- Areas of pain in the body at the end of the workday					

Source: Research data

### 3.2 Overview of the work activity observed

Respecting the tasks observed, receive and prepare Commercial Remittances of currency, control the number of containers (money) and the administrative forms and introduction of information into a computerized recording system (see Table 2). The work involves a great responsibility, requiring constant attention and if mistakes are to happen, workers must pay the difference of the missing money. All activities are recorded by a video camera and workers must identify aloud the contents of the consignment. The workstations are isolated from one another and must work without communicating with other workers.

Table 2. Task observed by post. Transport company values. Venezuela, 2010.

Workstation	Main Task
Vault Chief	Report packaging control each cashier.
Opening remittances	Inventory control of the money received.
Assistant vault	Receiving remittances from different commercial enterprises.
Paper Money selection	Preparation of financial remittances
Financial remittances	Select tickets in good condition and arrange containers in 10 batches of 100 paper money and 2 batches of 500.

### 3.3 Assessment of upper limb repetitive movements (OCRA Method).

The job requires repetitive movements of the upper extremities in all jobs. Predominantly flexion and extension of the wrists, both elbows, neck flexion. Table 3 presents the results of the application of the OCRA method. Five jobs are only two of them have higher level of risk associated with repetitive motion. workday is 09 hours a day. They have 60 minutes for lunch and a break of 10 minutes in the afternoon when they change the security video. Also were observed 5 minutes breaks in the middle of the morning and one at the end of the day.

Table 3. Evaluation of repetitive movements of upper limbs per job. Transport company values. Venezuela. 2010.

Workstation	index OCRA	Risk OCRA	Level
Vault Chief	8,5	Very light	
Opening remittances	8,5	Very light	
Assistant vault	8,5	Very light	
Paper Money selection	12,75	Light	
Financial remittances	20,25	Means	

Source: Research data

Table 4. Evaluation of positions with RULA score and according to level of performance for each job. Values Transport company. Venezuela, 2010.

Workstation	Valuation of postures			
	N° observed posture	Rating	Level	Performance
Vault Chief	03	4	2	change the task
		4	2	change the task
		2	1	Acceptable
Opening remittances	03	2	1	Acceptable
		2	1	Acceptable
		2	1	Acceptable
Assistant vault	02	2	1	Acceptable
		2	1	Acceptable
Paper Money selection	02	2	1	Acceptable
		4	2	change the task
Financial remittances	05	3	2	change the task
		4	2	change the task
		6	3	redesign of the task
		4	2	change the task
		3	2	change the task

Table 4. features 15 variations of postures observed in the five work stations. The workstation financial remittances received the highest score in the RULA assessment, ranging from 3 to 6 points, for a 2 to 3 level of risk. These workers alternate between sitting and standing posture with the trunk in flexion and performing repetitive movement of the upper limb, elbow flexion and extension and pincer grip. During the organization of remittances the weights manipulated most frequently was 11 kg.

In the workstation selection of paper money, predominantly upright posture and result OCRA index 12.75 (low risk). The rest of the workstations reached OCRA index of 8.5 (very low risk).

## Discussion

The security transport companies require a high level of security for its customers, a situation that requires high demands and responsibility of their employees, requiring constant care and supervision as well as the physical demands.

This study confirmed the presence of the following risk factors that could explain the skeletal muscle disorders in upper limbs, shoulders and neck were as follows: the repetitive motion of flexion and extension of the wrist, shoulder elevation, lifting above height of the shoulders. Repetitive flexion and extension of elbow, neck flexion and stress due to the work requirements.

Finally, the root cause is due to the organization of work (long hours), short rest, work-overload, mental demand, high responsibility and having to work under strict supervision by a video camera.

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