

DECREASING MUSCULO-SKELETAL DISORDERS OF SEATED WORKERS

WHAT WAS THE PROBLEM?

The level of musculoskeletal disorders, after redesign of the workstations and work system, in a group of sitting workers who perform repeated upper limb and trunk movements with some force.

CRITICAL ISSUES

The challenge was to design a fitness program that produced positive results and was acceptable to the workers and the company. It was done in work time.

RESPONSIBLE FOR THIS PROJECT:

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WORKING SITUATION AND PURPOSE

This intervention study was the third level of an action plan intended to decrease the musculoskeletal injuries and to improve the well-being in the workplace. The first level consisted of adapting the workstations using a multidisciplinary team: meetings on the workstation with worker's recommendations. The workstations were regularly evaluated especially by workers who offered suggestions for adapting the environment including modification of order picking carts, depalletizing of cartons with automatic height-adjustable stackers, and so on. The second level was a training in movements and postures. These 2 first levels were set up over a period of approximately 3 years. Then, the third level of the action plan, described in this study, was conducted between April 2015 and June 2015. It included:

- 1) the introductory meetings on the project with the administration board, the human resources department and the workers,
- 2) the analysis of the ergonomic risk factors of the workplace (BRIEF survey),
- 3) the development of the warm-up exercises and
- 4) the execution of the warm-up exercises program lasting 4 weeks.

An evaluation of the physical fitness and complaints of musculoskeletal injuries took place at baseline (PRE-intervention) and at the end of the intervention (POST-intervention, i.e. 4 weeks later).

WORKERS CHARACTERISTICS

The workers were employed in the company for in average 3.0 ± 2.1 years and were subject to repeated upper limb and trunk movements requiring moderate to high force. A hundred and thirty-three of them (age = 31.5 ± 8.5 years, height = 1.68 ± 0.08 m, body mass = 70.7 ± 14.7 kg) completed this study, randomly assigned in control (n=63, no intervention) or warm-up (n=70) groups.

WARM-UP SESSIONS

The participants of the warm-up group performed a 4-week program of workplace exercises for 5 x 6-8 minutes a week. They were not obliged to participate but the few reluctant workers progressively incorporated in the group. The exercises were performed at the workplace upon the arrival of the workers and thus, they were included in the work time. Specific stretching and strengthening exercises were incorporated from the analysis of the ergonomic risk factors of the workplace having highlighted the joint stress. The instructors (final-year physiotherapist students, HELHa, Montignies-sur-Sambre, Belgium) were placed on a raised platform and gave some posture corrections during the warm-up. The warm-up should not be exhausting but stimulating. Music was played during the session and participants applauded each of them at the end of the session.

EVALUATION

First, anthropometric measures were collected (body height, weight and body mass index). Then, musculoskeletal pain was assessed by a modified Nordic questionnaire with questions about troubles or pain in the past 7 days (“not at all” = 0, “a little” = 1, “somewhat” = 2, “much” = 3) in seven body regions (neck, shoulders, elbows, wrists/hands, lumbar region, hips and knees). Finally, the physical fitness was evaluated with the following tests: Ruffier-Dickson, grip strength, Apley scratch test and sit-and-reach (Fig. 1)

The Ruffier-Dickson consists of doing 30 squats (i.e. 30 flexions-extensions of the lower limbs) in 45 seconds (Fig. 1A). An index < 0 corresponds to a very high level of cardio-vascular endurance while an index > 10 corresponds to poor exercise tolerance. The grip strength test (Fig. 1B) measures the maximal isometric force of the forearm and hand muscles. The Apley scratch test (Fig. 1C) evaluates the shoulder mobility in internal and external rotation. The shorter the distance between the 2 hands, the more the shoulder flexibility is high. The sit-and-reach (Fig. 1D) is used to measure the flexibility of the rear muscles chain.

OUTCOMES

6 to 8 minutes of physical activity are sufficient to improve the physical fitness of sedentary workers, which could indirectly induce an improved well-being of workers and a decrease of the musculoskeletal injuries and work absenteeism. However, this specific intervention should be included in the action plan only if interventions, like adaptations of the workstations and training in gestures and postures, have previously been realized.

During the intervention study, some workers were trained to give the warm-up sessions. One year later, warm-up exercises are still performed.



Figure 1. Ruffier-Dickson (A), grip strength (B), Apley scratch test (C) and sit-and-reach (D).

RESULTS OF MEASURES

The results of the anthropometric measures and physical fitness at baseline (PRE) and at the end of the intervention (POST) are summarized for control and warm-up groups in Table 1. We observed a greater increase in physical fitness for the participants of the warm-up group.

Table 1. Anthropometric and physical fitness measures before (PRE) and after the warm-up program (POST).

	Control group		Warm-up group	
	PRE	POST	PRE	POST
BMI (kg.m ⁻²)	24.3±4.6	24.2±4.2	25.5±5.0	25.3±4.9*
Ruffier-Dickson index	9.8±3.5	9.0±2.8*	9.4±3.1	7.6±2.3*
Sit-and-Reach (cm)	21.8±7.9	21.4±8.2	20.6±8.0	22.6±7.2*
Apley scratch right (cm)	9.7±6.9	7.5±7.0*	13.4±6.3	7.1±6.5*
Apley scratch left (cm)	12.9±8.1	10.8±8.1*	16.3±6.6	10.3±7.3*
Grip strength right (kg)	31.1±8.9	31.8±9.6	33.1±10.5	34.6±11.3*
Grip strength left (kg)	30.8±9.5	30.8±10.0	32.6±10.5	34.4±11.7*

Data are presented as mean ± standard deviation. Values in bold with * indicate a significant modification ($p < 0.05$).

We also observed a slight decrease of the complaints of musculoskeletal injuries (-0.1 à -0.5 points for a maximal score of 3.0) observed in neck, shoulders, elbows, wrists/hands, lumbar region and knees, only for the workers who followed the warm-up sessions.