106 - EVALUATION OF THE POSTURE ADOPTED FOR METALLURGICAL INDUSTRY WORKERS

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INTRODUCTION

The metallurgical sector represents an important component of the world economy considering its contribution in Global GDP. Employing about 70 million people worldwide, which represents nearly half the goods produced in the industrial sector and more than half of all goods exported globally (FITIM, 2010). In Brazil, in November 2010, the metallurgical branch accounts for 5.2% of the total employed and 26.4% of industrial employment (DIEESE, 2011).

According to a survey conducted in 2008, which mapped the main injuries that cause work absence in Brazil, 4% of 32.5 million Brazilian workers became injured for more than 15 consecutive days. One of the main reasons is from musculoskeletal injuries (LOPES, 2008). According to Monteiro and Bertagni (1998), work-related Musculoskeletal disorders (WMSD) are an injury that afflict much of the working population.

The metallurgical sector can be considered as an example of what the Division of labor has produced since the workers perform their activities in shifts, performing the same tasks every day. Performing this type of work causes mental tiredness do to high physical demands (LIMA, 1997).

Opposed to this outlook, ergonomics have been investigating aspects of the job that can cause harm to workers and proposing changes in the working conditions to make them more suitable for the worker. It uses techniques of job analysis and knowledge from other sciences, singling out working conditions that are not in accordance with the physiological and psychological functioning of human beings. It falls on the employer to provide adequate work conditions, with ways to improve performance, reduce absenteeism and consequently increase productivity (POLETTO; RAMPINELLI, 2012).

This study presents an analysis of postural activities in the painting sector of painters and production assistants in the metallurgical industry, located in the city of Ponta Grossa, Paraná. It proposes improvements in postural and ergonomic aspects of the job.

METHOD:

The studied population consisted of 92 workers from the painting sector of a branch of the metallurgic industry in the city of Ponta Grossa, Paraná. To collect the data, was first applied the Nordic Musculoskeletal Questionnaire (NMQ), to all employees in the painting sector, with the goal of identifying the ergonomic demand of musculoskeletal pain/discomfort according to the job performed. It was verified that the jobs of Production Assistant and Painter were the most affected. From this, a sample of 6 professionals (30 painters and 38 production assistants), whose average age was 33 years (± 10.6 years) was assessed using the methodology Rapid Upper Limb Assessment (RULA) for diagnosing ergonomic movements adopted by the workers, which identified inadequate postures being proposed improvements and adaptations to the activities performed.

RESULTS

The NMQ showed that the jobs painter and painter assistant were the ones that showed pain (Figure 1).

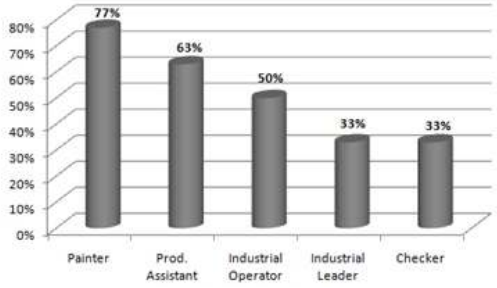


Figure 1 - Jobs most affected by the occurrence of pain

Ergonomic evaluation of activities

Activity 01: The Painter performs his/her job with feet flat, back straight, flexion and extension of the neck and upper limbs. Their posture is static, with repetitive flexion motions such as horizontal abduction of the shoulder, depending on the height of the painter or the part to be painted. The movements occur above the level of the shoulder making it an aggravating position to be in (Figure 2).



Figure 2 - Painter Activity

PONTUAÇÃO FINAL DO MÉTODO RULA: 7

PONTUAÇÃO	NÍVEL DE AÇÃO	INTERVENÇÃO
1ou 2	1	Postura aceitável
3 ou 4	2	Deve-se realizar uma observação. Podem ser necessárias mudanças.
5 ou 6	3	Deve-se realizar uma investigação. Devem ser introduzidas mudanças.
7	4	Devem ser introduzidas mudanças imediatamente.

Figure 3 - RULA Diagnosis

Activity 02: The Assistant Painter hangs hooks on the painting bar (figure 4), Arm Curls at 180°, aggravation to the shoulder to do elevation and bending the wrist, which causes compensatory movements of nearby joints. The cervical spine is Hyper extended, lower limbs are badly supported, due to the bar height.



Figure 4 - Hanging the hooks on the bar

PONTUAÇÃO FINAL DO MÉTODO RULA: 7

PONTUAÇÃO	NÍVEL DE AÇÃO	INTERVENÇÃO
1ou 2	1	Postura aceitável
3 ou 4	2	Deve-se realizar uma observação. Podem ser necessárias mudanças.
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Figure 5 - RULA Diagnosis

Activity 03: When hanging the pieces on the hooks there is manual lifting of weight (10, 7 kg), made by two workers. At this point the same flexion above 90 degrees is realized with wrist flexion to fit the pieces onto the hooks and neck extension. (Figure 6).



Figure 6 - To hang the pieces on the hooks

PONTUAÇÃO FINAL DO MÉTODO RULA: 7

PONTUAÇÃO	NÍVEL DE AÇÃO	INTERVENÇÃO
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3 ou 4	2	Deve-se realizar uma observação. Podem ser necessárias mudanças.
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7	4	Devem ser introduzidas mudanças imediatamente.

Figure 7 - RULA Diagnosis

Activity 4: Unloading the pieces, the employee carries approximately 12 kg (6 pieces), holding the same amount to take them to the storage box, performing flexion and shoulder abduction between 45° and 90° and extension of the neck (Figure 8).



Figure 8 - Unloading of the painted pieces

PONTUAÇÃO FINAL DO MÉTODO RULA: 7

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Figure 9 - RULA Diagnosis

Activity 5: The worker puts the pieces in storage boxes for later transport (Figure 10). During this activity a back flexion of greater than 60 ° occurs, aggravated a load of about 12kg (6 pieces).



Figure 10 - Storage of the painted parts

PONTUAÇÃO FINAL DO MÉTODO RULA: 7

PONTUAÇÃO	NÍVEL DE AÇÃO	INTERVENÇÃO
1ou 2	1	Postura aceitável
3 ou 4	2	Deve-se realizar uma observação. Podem ser necessárias mudanças.
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7	4	Devem ser introduzidas mudanças imediatamente.

Figure 11 - RULA Diagnosis

Activity 6: Workers separate and store the hooks used to hang the parts, in their own boxes. It was observed that the

workers remained for a long time with a back flexion greater than 60 degrees while separating these hooks, and remain with a neck flexion greater than 20 ° (Figure 12).



Figure 12 - Separating and storing the hooks

PONTUAÇÃO FINAL DO MÉTODO RULA: **7**

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1 ou 2	1	Postura aceitável
3 ou 4	2	Deve-se realizar uma observação. Podem ser necessárias mudanças.
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7	4	Devem ser introduzidas mudanças imediatamente.

Figure 13 - RULA Diagnosis

DISCUSSION

All the tasks were considered inadequate and require immediate changes. The recommendations were proposed on the basis of ergonomic knowledge from research, based on literature studies of ergonomics practices and manuals of ergonomics (WEERDMEESTER, 2004; KROEMER, GRANDJEAN, 2005; ROCK, 2008; FORBES, FORBES, LIMA, 2012).

a) Activity 01 - painting the bars - Because it is a static activity with very repetitive movement of the upper limbs, the indication is the automation of the gun movement being controlled by the worker.

b) Activity 01 - hanging hooks on the painting bar - One possible adaptations and more correct way for this activity was the development of a height adjustment device for the paint belt (paint bar) allowing adjustments to be made according to the height the part to be painted and the height of the worker. Another alternative would be the relocation of taller workers in the industry to perform this task.

b) Activity 03 - hang parts on hooks - development of a device for height adjustment of the paint belt (paint bar) that allows for adjustments to the height of the part to be painted and the height of the worker. In addition to scheduled breaks of 15 minutes for every two hours worked, which consists of an important recommendation for jobs that require effort to limit the worker.

c) Activity 04 - unloading of the painted parts - standardization of the maximum number of pieces to be loaded at four pieces each totaling 8kg. Implementation of scheduled breaks of 15 minutes for every two hours worked.

d) Activity 05 - recommended packaging guidelines to the worker, as the correct way to perform the movements. It is also recommended increasing the storage box about 40 cm higher than what is currently used; this will improve the movements (Figure 14).



Figure 14 - Proposal for support for the storage box of painted parts

e) Activity 06 - separating and storing hooks - It is recommended that this task be interspersed with tasks in the sitting or walking position, in addition, for the activity it is considered important that the hooks to be separated are closer for the worker to reach. It has been proposed to manufacture new storage box, which have the measurements that allow them to be at below the elbow height and above the knees in front of or immediately next to the worker (Figure 16). With the manufacture of the new box to separate and store the hooks, it will also help the worker avoid tilting the head at the moment the hooks are separated in the bottom of the box; it will decrease the tension of the neck muscles that cause pain in the neck and shoulders.



Figure 15 - Separating and storing the hooks



Figure 16 - Proposal for a storage box

No posture or repetitive motion should be maintained for a long period of time, since they are extremely stressful postures (FOO, FOO, LIMA, 2012), and may cause long-term damage to muscles and joints. Therefore, it is recommended for all

assessed activities that static postures are alternated with dynamic activities through periodic rotations of jobs between functions.

As a way to reduce the risk of muscle fatigue, it is also recommended for all activities evaluated to have short breaks distributed throughout the workday. Therefore, it is recommended the implementation of fifteen minute breaks for every two hours work. This break should be for the rest of the muscles and individual stretching exercises, with the goal of increasing the mobility of these body segments, reducing the strain on tendons and performing the tasks with higher quality and safety (Kroemer, GRANDJEAN, 2005).

It is also suggested for all workers assessed to be prepared based on the ergonomic evaluation of work, a procedures manual for the job for the painter assistants, contemplating each job activity and postural recommendations for its implementation as well as training of stretches to be performed in the previous recommendation.

CONCLUSION

Was found that none of the positions taken in the painting activities of the painter and Production Assistant are adequate or are considered acceptable therefore intervention based on the RULA evaluation are required. By submitting recommendations it is possible to see that machines and equipment currently produced are not suitable for the workers that use them. It causes physical problems to the worker that can cause work-related musculoskeletal disorders (MSDs). This can be avoided with the development and acquisition of machinery and facilities to enable adaptations that can adapt to the jobs performed by the workers. Such measures not only reduce injuries and improve labor productivity but also eliminate sick leave.

The present study shows the immediate need of improvements, with important recommendations regarding the adequacy of equipment and tools for the improvement of the posture adopted by the worker during the performance of their activities. This includes implementation of the recommendations and the training of workers in order to reduce pain and occurrence of musculoskeletal injuries to the workers.

It is also worth noting that during the evaluation of the activities of this job, it was important to identify ergonomic problems related to running two activities in the painting sector, this being only one of the 28 sectors of the company. Thus, was suggest the following academic work not only in other functions of this sector, but also in other industries, as the branch of metallurgy has national relevance and provides jobs to many workers.

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OCCURRENCE OF THE OSTEOMUSCULAR SYMPTOMS IN WORKERS IN THE METALLURGIC INDUSTRY

ABSTRACT

The absences from work from sickness have increased considerably in recent years in Brazil and among the main causes are musculoskeletal injuries. This study is an investigation of the occurrence of pain in metallurgical industry workers in the State of Paraná. Was used initially the Nordic Musculoskeletal Questionnaire (NMQ) for the identification of symptoms of musculoskeletal pain and/or discomfort. Was also used the methodology Rapid Upper Limb Assessment (RULA) for ergonomic evaluation and diagnostics of movement adopted by the workers. It identifies postures and proposes improvements and adaptations to the activities performed. Overall it was realized that the musculoskeletal requirements are originated by the inadequacy of machinery and equipment used to perform the tasks, causing inadequate movements with high physical demands, causing pain and possibly evolving into musculoskeletal injuries.

KEYWORDS: Posture, Labor, Industry.

ÉVALUATION DE LA POSTURE ADOPTÉE PAR LES TRAVAILLEURS DANS L'INDUSTRIE DU MÉTAL

RÉSUMÉ

Les absences du travail et les maladies de l'aide, ont considérablement augmenté au cours des dernières années au Brésil et parmi les principales causes sont des maladies musculo-squelettiques. Ce travail est une enquête sur la situation de la douleur chez les travailleurs de l'industrie métallurgique dans l'État du Paraná, en utilisant principalement le questionnaire nordique musculo-squelettiques (QNSO) pour l'identification des symptômes musculo-squelettiques liés à la douleur et / ou inconfort, et plus tard la méthode Rapid Upper évaluation des Limb (RULA) pour l'évaluation et le diagnostic des mouvements ergonomiques adoptées par les travailleurs, les postures d'identification et de proposer des améliorations et des adaptations aux

activités exercées. En général, il a été constaté que les exigences sont émis par l'insuffisance musculo-squelettique de machines et d' équipements utilisés pour accomplir les tâches , générant des mouvements insuffisance de la demande physique élevé, provoquant une douleur et peut-être l'évolution des maladies musculo-squelettiques.

MOTS-CLÉS: Posture, Travailler, Industrie.

EVALUACIÓN DE LA POSTURA ADOPTADA PARA TRABAJADORES DE LA INDUSTRIA METALURGICA

RESUMEN

Las ausencias del trabajo y las enfermedades de ayuda , han aumentado considerablemente en los últimos años en Brasil y una de las principales causas son las enfermedades musculoesqueléticas. Este trabajo es una investigación de la aparición de dolor en los trabajadores de la industria metalúrgica en el estado de Paraná, utilizando principalmente el Cuestionario Nórdico Musculoesqueléticas (QNSO) para la identificación de los síntomas musculoesqueléticos relacionados con el dolor y / o malestar, y más tarde la metodología Rapid superior evaluación Limb (RULA) para la evaluación y diagnóstico de los movimientos ergonómicos adoptadas por los trabajadores , la identificación de posturas y proponer mejoras y adaptaciones a las actividades realizadas. En general, se encontró que los requisitos son originados por insuficiencia musculoesquelético de maquinaria y equipo utilizado para realizar las tareas, generando movimientos inadecuados con alta demanda física, causando dolor y, posiblemente, la evolución de las enfermedades musculoesqueléticas.

PALABRAS CLAVE: Postura, Trabajo, Industria.

AVALIAÇÃO DA POSTURA ADOTADA POR TRABALHADORES DA INDÚSTRIA METALÚRGICA

RESUMO

Os afastamentos do trabalho, bem como auxílios doença, têm aumentado consideravelmente nos últimos anos no Brasil e entre as principais causas estão às doenças osteomusculares. Este trabalho faz uma investigação da ocorrência de dor em trabalhadores da indústria metalúrgica no estado do Paraná, utilizando primeiramente o Questionário Nórdico de Sintomas Osteomusculares (QNSO) para a identificação de sintomas osteomusculares referentes a dor e/ou desconforto, e posteriormente a metodologia Rapid Upper Limb Assessment (RULA) para avaliação e diagnóstico ergonômico dos movimentos adotados pelos trabalhadores, identificando posturas inadequadas e propondo melhorias e adaptações para as atividades desempenhadas. De forma geral percebeu-se que as exigências osteomusculares são originadas pela inadequação de máquinas e equipamentos utilizados para cumprir as tarefas, gerando movimentos inadequados, com alta exigência física, ocasionando dor e possivelmente evoluindo para doenças osteomusculares

PALAVRAS-CHAVES: Postura, Trabalho, Indústria.