03 - ERGONOMIC ANALYSIS FOR WORKERS OF BACKHOES AND WHEEL LOADERS

BRUNA ELISA SCHREINER[1];
GUILHERME FERREIRA WENCELOSKI[2];
ISABELLA KYANE NISHIYAMA[3];
ISADORA BASSO BADALOTTI[4];
RODRIGO EDUARDO CATAI[5]
UTFPR – Campus Curitiba, PR, Brasil [1,2,3,4,5]
[1,2,3,4] Estudante de Engenharia Civil/UTFPR - Curitiba - PR - Brasil
[5] Professor do Programa de Pós-Graduação em Eng. Civil/UTFPR - Curitiba - PR - Brasil
brunaschreiner@hotmail.com

1. INTRODUCTION

Ergonomics, in summary, it's the study of the adaptation of the work to the worker. Arised thereupon the II World War as a consequence of the interdisciplinary job of a lot professionals. Started to be employed in the warlike industry, on the relation man-machine, where existed the necessary of an accurate work. In the following decades to the war until today, ergonomics continued to develop and to diversificate. Based on several subjects, on human studies and their environments, including anthropometry, biomechanics, engineering, physiology and psychology, ergonomics is divided in three dominions of especialization: Physics Ergonomics, Cognitive Ergonomics and Organizational Ergonomics (IIDA, 2000; VIEIRA, 2000).

It's a part of Physics Ergonomics the relations of the human body to the physic and psychology loads. According to Pinheiro e França (2006) a lot of job areas and machinery aren't appropriate to the humans, and can induce phsycological stress and physics too, that appears as fatigue and muscular pains, thus (IIDA, 2005) came to the conclusion that the ergonomic analysis of the work is one of the ways to apply the correction ergonomic, where must be analyze, diagnose and correct real situations faced by the workers.

Due to the accentuated increase of the civil construction, in one hand there was a rise of the index of employability, on the other hand there was a rise in the health problems of the building workers. Representing one of the most outdated workspace, with low index of ergonomic studies, the workers of this department present high rates of corporal pains. It's important to emphasize that the discomfort caused by the painful symptom, reaches the quality of life that consequently reaches the good performance of the activity, overloading the others workers, because the physical shock from that who is with symptoms of pain (HAUSER et al., 2010).

The ergonomic intervention in the construction has a further difficulty to be deployed than the other industries, due to a lot of factors. Can be quote the low index of scholarityally to the low remuneration generating the high turnover, the frequent change of work performed for each worker, a further point is that a lot of time the workers underestimate the dangers that they are exposed. All this hamper furthermore the implantation of ergonomic in this area.

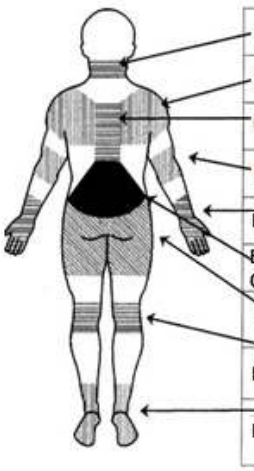
Due this context, these searches have its main objectives: identify the main painful body regions of some involved workers, through the Nordic questionnaire and measure the sound that the workers are submitted on their workspace. From the results, compare with the regulatory standards of these areas, and if is possible look for ergonomic solutions to improve the quality of the work of the interviewee.

2. MATERIALS AND METHODS

Postural analysis for the Nordic Questionnaire was used (Figure 1) which served to identify painful parts of the body operators excavator and loader. The research focus was on private sector workers who perform work in construction. We conducted this interview in a group of ten operators, five and five wheel loader.

Musculoskeletal Disorders

Please answer that questions by placing an "X" in the appropriate box, an "X" for each question. Please answer the questions tods even if you have never had problems anywhere in the body. This figure shows how the body was dividied. You must decide for yourself, which part is or has been affected.

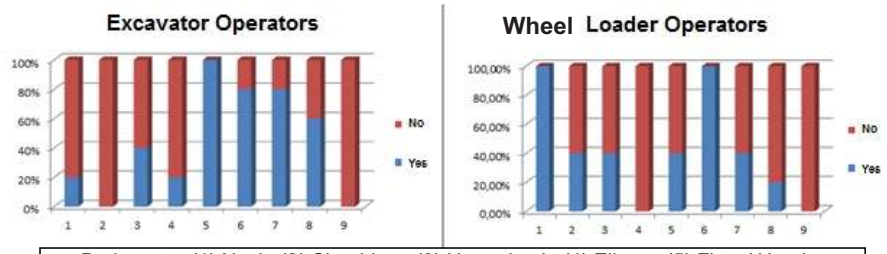


	In the last 12 months, have you had problems (pain, tingling / numbness) in:	In the last 12 months, have you been unable to carry out normal activities because of this problem:	In the last 12 months, have you consulted a health professional because of this condition:	In the last 7 days, did you have any problem:
NECK	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes
SHOULDERS	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes
UPPER BACK	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes
ELBOWS	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes
FISTS / HANDS	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes
BOTTOM OF THE COASTS	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes
HIPS / THIGHS	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes
KNEES	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes
FEET ANKLES	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes	☐ No ☐ Yes

Figure 1 - Nordic Questionnaire Symptom Osteomolecular
Source: VANDERSON (2013)

3. RESULTS

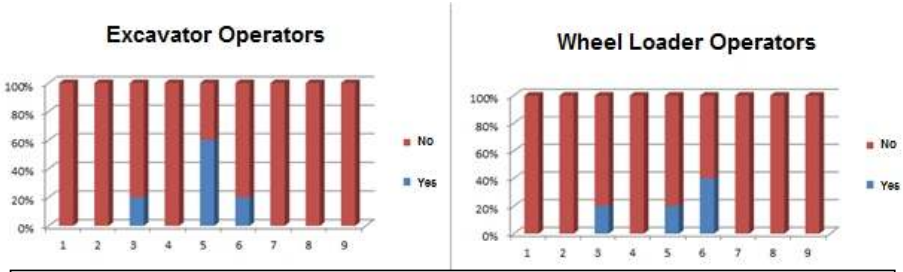
Can be seen through the results of the Nordic Questionnaire shown in Figure 2, all excavator operators Suffered pain or discomfort in the wrist/hands in the last twelve months, and still questioning Indicates discomfort in the hip region in the majority of this group. Analyzing the data Obtained operators loader, it is evident that they have suffered more in relation to the neck in the last year, with some respondents had pain in elbows, too. Comparing the two groups realize that they both felt pain or tingling in the lower back in recent months



Body parts: (1) Neck, (2) Shoulders, (3) Upper back, (4) Elbows (5) Fists / Hands; (6) Bottom of the Costas; (7) HIPS / Thighs; (8) Knees, (9) Feet Ankles

Figure 2 - Pain or tingling in the last year

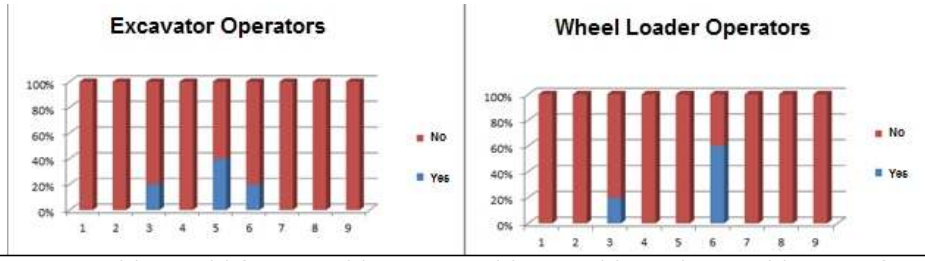
In Figure 3, for the impediment to performing any activity (work, leisure or other) during the last year, the data show in most cases, the pain does not affect the performance of activities. Relating to the places where the workers had discomfort in recent times both in how we operated excavator wheel loader, wrists and back, respectively, are the ones who carry on a greater deterrent activities.



Body parts: (1) Neck, (2) Shoulders, (3) Upper back, (4) Elbows (5) Fists / Hands; (6) Bottom of the Costas; (7) HIPS / Thighs; (8) Knees, (9) Feet Ankles

Figure 3 - Areas affected preventing achievement of activities

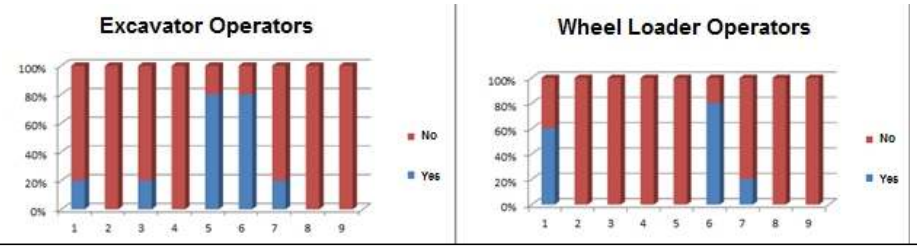
The results presented in Figure 4, with respect to expert consultation, doctor or physiotherapist, because the pain areas raised during the twelve months following the pattern for the two groups of workers, regions that had a greater number of workers affected leading to greater demand for specialists. In the case of operators excavator 40% of respondents visited a doctor because of pain in the wrist/hand, for operators of loader 60% of workers consulted experts for reasons of discomfort in the lower back.



Body parts: (1) Neck, (2) Shoulders, (3) Upper back, (4) Elbows (5) Fists / Hands; (6) Bottom of the Costas; (7) HIPS / Thighs; (8) Knees, (9) Feet Ankles

Figure 4 - Need to go to the doctor due to affected areas

The affected areas in the last 7 days, presents similar regions of pain and tingling in the last year. It is observed in Figure 5 that the group of operators excavator had its greatest results in the wrist and lumbar regions (80% of respondents). For workers who use the loader, the inconvenience was larger in the lower back and neck, 80% and 60% respectively.



Body parts: (1) Neck, (2) Shoulders, (3) Upper back, (4) Elbows (5) Fists / Hands; (6) Bottom of the Costas; (7) HIPS / Thighs; (8) Knees, (9) Feet Ankles

Figure 5 - Areas affected in the last 7 days

4. CONCLUSIONS

Combining the results of the Nordic Questionnaire with visual analysis procedures for equipment operation, rising hypotheses for the areas which operators presented nuisance. It becomes clear that the fact that workers spend hours sitting in one position leaves them exposed to potential discomfort in the back, especially in the lower back, as well as the hip. The maneuvers for the operation of the equipment are the causes of pain in the wrist and hand indicated by the questionnaire.

The main areas with higher rates of pain or discomfort were the wrists / hands and lower back. Solutions such as steering wheel adjustments tilt angle and seat height, periodic intervals during the work shift and gymnastics can mitigate musculoskeletal symptoms presented by these two groups of construction workers.

REFERENCES

BRAZIL, Ministry of Labour and Employment. NR-15 - Unhealthy Activities and Operations. Legislation Manual Atlas, 72nd Edition, São Paulo: Atlas, 2013.

HAUSER, M. W. et al. The construction industry: A case study in the city of Ponta Grossa / Pr of the symptoms of pain and discomfort in workers through the diagram Corlett - Manen. Accessed: 23/06/2013. Available at:
<http://pg.utfpr.edu.br/dirppg/ppgep/ebook/2010/PERIODICOS/The_FIEP_Bulletin/1.pdf>.

IIDA, I. Ergonomics, design and production. Sao Paulo: Edgard Blucker, 2005.

PINHEIRO, A. K. of S.; FRANCE M. B. A. Ergonomics applied to the anatomy and physiology of the worker. Goiania: AB, 2006.

VIEIRA, S. I. Handbook of health and safety. 1st Ed. Florianópolis: Master Publishing, 2000.

Rua Deputado Heitor de Alencar Furtado, 4900 Ecoville
CEP 81280-340 - Curitiba - PR – Brasil – Tel.: 32794577
E-mail: catai@utfpr.edu.br

ERGONOMIC ANALYSIS FOR WORKERS OF BACKHOES AND WHEEL LOADERS

ABSTRACT

In the ergonomic analysis of jobs tied to construction, there is a need for adjustment of some jobs to the employees involved; therefore, the present study aims to identify inadequacies in the field of ergonomics, based on the use of the Questionnaire Nordic workplace characteristic operators for excavator and loader. The questionnaire aims painful body regions than five workers to every outfit. Analysis Nordic questionnaire, it can be concluded that the index is pain in the wrists/hands and back, these problems can be corrected by the worker's awareness, as well as adjusting the steering wheel, the angle of inclination and height bank.

KEYWORDS: Ergonomics; Civil Engineering; Nordic Questionnaire.

ANALYSE ERGONOMIQUE DES OPÉRATEURS ET CHARGEUR D'EXCAVATRICE

RÉSUMÉ

Dans l'analyse ergonomique des emplois liés à la construction, il y a un besoin d'ajustement de certains emplois aux poste de travail qui les concernent, par conséquent, le présente étude vise à identifier les insuffisances dans le domaine de l'ergonomie, basé sur l'utilisation d'un questionnaire nordique caractéristiques du milieu de travail pour pelle et chargeur. Le questionnaire montre les points douloureuses de 5 travailleurs de chaque équipement. Dans l'analyse du questionnaire nordique, peut être conclu que le index le plus élevé de la douleur est dans les poignets , mains et les dos, ces problèmes peuvent être corrigés par la prise de conscience du travailleur, ainsi que le réglage du volant, l'angle d'inclinaison et la hauteur du siège.

MOT CLÉS: Ergonomie; Questionnaire nordique, Construction.

ANÁLISIS ERGONÓMICO DE LOS OPERADORES DE CARGADORES DE EXCAVACION

RESUMEN

En el análisis ergonómico de puestos de trabajo relacionados a la construcción civil, hayuna necesidad de adecuación para estos trabajadores que participan. El presente estudio tiene por objeto la identificación de las deficiencias en el campo de la ergonomía, tomando como base el uso de cuestionario Nórdico en el entorno de trabajo para los operadores de cargadores de excavacion . El cuestionario utilizado avalia los posibles puntos del corpo afectados de 5 trabajadores para cada equipo. Analizando el cuestionario Nórdico, se puede concluir que el índice más alto del dolor es en las muñecas/ manos y lumbar. Estos problemas pueden corregirse mediante la toma de conciencia del trabajador. La regulación del volante, el ángulo de inclinación y altura del asientoson ejemplos de solucion paraminimizar estos efectos.

PALABRAS CLAVE: Ergonomía; Cuestionario Nordic Construcción Civil.

ANÁLISE ERGONÔMICA DE OPERADORES DE ESCAVADEIRA E PÁ-CARREGADEIRA

RESUMO

Na análise ergonômica de postos de trabalho vinculados à construção civil, nota-se uma necessidade de adequação de alguns postos de trabalho para os colaboradores envolvidos. Desta forma, o presente estudo visa à identificação de inadequações no campo da ergonomia, tendo como base a utilização do Questionário Nórdico no ambiente de trabalho característico para operadores de escavadeira e pá-carregadeira. O questionário utilizado apontou as regiões corporais dolorosas de cinco trabalhadores de cada um dos equipamentos estudados. Analisando-se as respostas ao questionário Nórdico aplicado, pode-se concluir que o maior índice de dor se encontrava nos pulsos/mãos e na lombar. Destaca-se que estes problemas podem ser corrigidos por meio da conscientização do trabalhador, assim como no ajuste no volante, no ângulo de inclinação e na altura do banco.

PALAVRAS CHAVE: Ergonomia; Construção civil; Questionário Nórdico.