54 - ERGONOMICS FOR ELECTRICIANS

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Introduction

The ergonomics is a interdiscipline science. It understands the physiology and the psychology of the work, as well as the anthropometry and the society in the work. The practical objective of the ergonomics is the adaptation of the rank of work, the instruments, the machines, the schedules, the environment to the requirements of the man. the [1] In Brazil ergonomics comes gaining each time more space also wants in the industrial sector and of services. The sector of service of electricity distribution is a sector where the developed activity is of high risk, however the available studies in literature are few.

Beyond the small amount of data on this sector, the motivador of this work was the high index of painful symptom and removal of the workers in the exercise of its profession. Identifying to the main inadequate positions and its correlation of time of service with incidence of the painful symptom in the electricians of the COPEL Company Paranaense de Energia, in the sector of Distribution of the AGCEL - agency of Rattlesnake, who can be influencing the productive capacity of the professionals searched in group 1 (2003) and in group 2 (2004).

Theoretical Recital

The ergonomics is the set of relative scientific knowledge to the necessary man and for the conception of tools, machines and devices that can be used with the maximum of comfort, security and effectiveness. [2] It is inside distinguished of this set of knowledge the movements, as a factor in the project of the devices of command and of control, equipment and instruments that the electricians use in the daily activities of its functions, however, these movements associates to the inadequate positions, take these professionals to a physical overload. To adjust the load of work to the characteristics of the people is the basic point of the ergonomics. From there they derive the main contributions that it can give for improvements in the conditions of health and productivity of the people and the organizations. [3] the work with electricity is of high risk for the eletricians, a time that is vulnerable the occurrence of fatal accidents and is a challenge for the professional of ergonomics, since the product with that if it deals is odourless and invisible. Beyond the risk due to raised tension classroom, the gravity and the probability of the injuries and/or accidents are extended by ambient factors, place (agricultural or urban zone), affective-emotional conditions of the equipment, factors, level of qualification of the employees and behavior of the using population.[4]

The activity of the electricians is characterized for the diversity of tasks, as: to direct, to scale pole and to carry through tasks in the ground, exerting these daily activities in constant inadequate positions, exposing it the factors of biomechanic risks. This diversity of tasks is told by Ranney [5], as being risk factors gifts in the work and the respective decurrent posturais alterations of these. The force exercise is distinguished enters the factors identified for the author in inadequate position; vibration of the hand and arm and static muscular contraction. Still on muscular work static, is defined as being the work that demands contraction it continues of some muscles, to keep one definitive position highly, being a fatigante position because it demands work of the involved all the muscle very to keep this position. [6 7] Another factor of risk is the repetition, or either, the more repetitive the movement during the development of the activity biggest will be the probability of appearance of riots muscleskeletical. Being important to relate with the repetition, the time, therefore the number of occurrences for as increases the risk very. [8]

According to occupational riot, Health department [9] or illness related to the work, mentions a set of damages or agravos to it that happen on the health of the workers, caused, unchained or aggravated for risk factors gifts in the workstation.

Methodology

The research was developed in the period of June of 2003 the December of 2004; with electricians of a company of distribution of energy in Rattlesnake - Paraná - Brazil, totalizing 27 interviewed divided in two samples. The first sample was of 20 employees, totalizing these 100% of the cash. Being all the participants of the masculine sex, with average age of 40 years. The second sample was composed 7 employees, totalizing 100% of the cash, that was not part of the group of electricians of the first sample of 2003, for being new contracted or transferred of other agencies. All the workers of the second sample were of the masculine sex, with average age of 25 years, in its bigger part. The collection of data was carried through of June the December of 2004.

For methodologics ends it was divided research in six distinct stages, being these interdependent interelation and. Each stage was developed in agreement description to follow:

In the initial stage a meeting with the manager became, the coordinator and the technician of responsible security guard for the sector, in June of 2003, so that it exposed which in a general way were the tasks carried through for an electrician, as it carries through them and which the main joined problems. Also the plan of activities was presented to be developed.

In the following stage the individual accompaniments of the electricians in the accomplishment of its more had been initiated varied tasks. After the accompaniment in I lease in the agricultural area and urban, in the daylight and nocturnal, elaboration of a questionnaire for collection was given of data. This structuralized and totalizing 25 questions, closed, approaching characteristic sociodemográficas, complaints of pain and discomfort, difficulties in the manuscript of the tool rack. The data had been collected by 6 researchers, being these academics of thephysical therapy course, distributed in 2 weekly hours. After the elaboration of this instrument, was given beginning to the third stage properly said, with the application of the questionnaire for the 6 researchers of indirect form. Also he was boarded in the questionnaire the difficulties of the electricians with the individual and collective ferramentais that they used. The electricians had been interviewed all who were acting in the period that if developed the research. Excluding in this way the moved away professionals.

In the fourth stage he was carried through to the to weighed of the materials pointed for the electricians, in the third stage, as being of difficult manuscript; for such Kgf of the Crown mark was used of a dynamometer with capacity of 50, and the materials heavy had been: set of aterramento AT; extensible stairs; spur for pole of concrete B; tesourão for handle cut; device of opening of key with load; maneuver pole; stairs singela; e cinturão and talabarte without material and cinturão and talabarte with material.

In the fifth stage it became collection of photographic images of the workers in field, carrying through its more current activities of work, as: scaled the pole, closing and opening of key, linking of consumers, among others. It was effected by two researchers using digital machines of the Sony mark; Dsc-p32 with 3.2 mega pixels, and the Dsc-p51 with 2.0 mega pixels; adding a total of 75 photos. The register of the images allowed the analysis of the main positions of constaint e difficulties told for the electricians.

And the sixth and last stage consisted of the tabulação of the data gotten in the previous stages and of the analysis

of the results through the programs Word and Excell 2000.

With as the group of sampling one followed the stages above with the same described methodology.

Results and Quarrels

The harvested data had approached the following subjects: mapping of the painful symptom and discomfort, topographical distribution of acometimento, relation of pain versus period of sprouting and time of work in the company of energy distribution. In general way they will be presented, argued and compared the results gotten in the two samples of the research.

Of the first searched sample, 75% were executing activities with pains in some regions of the body, being the biggest index of pain in superior members and trunk. In study carried through in another company of electric energy, the gotten results are similar to found in the this research being biggest indices of pain and discomfort in superior members and column. [4] Already in carried through research co electricians of the CEMIG had been found indices differentiated for upheavals of shoulder with only 2.2% of the population pesquisada.14

In second sample 14.3% worked with some type of pain. This if gives, as observed, for inadequate positions, the constant work with repetitions of the movements, and also for the overload with the security materials that the electricians use to carry through its daily activities. 25% of first sample and 85.7% of the second sample, had not told pains at the moment of the interview, however factors of overload and inadequações had been verified that can unchain some patologias related to the activity of work, in case that it does not have a preventive intervention.

The positions adopted in the work and are of it, the positions for the development of activities and for the rest they produce loads in the musculoesquelético system; that they can be adjusted for the maintenance of the health of the musculoesquelético system, or can be extreme or exactly insufficient, taking the riots in this system. [3]

Critical Positions, that generate inadequate loads, can be defined in general way as being: (1) all the static positions in general; (2) neck excessively extended; (3) neck excessively fletido; (4) abduzidos arms; (5) high arms above of the level of the shoulders; (6) suspended superior members for long periods; (7) static lift of the antebraços for the arms; (8) exaggerated flexão of the fist; (9) exaggerated extension of the fist and (10) shunting line to ulnar mantido.[8]

Of the electricians searched in the first sample, the biggest indices of acometimento is in superior members 56% and column 12%; already in the second sample the pain incidence is of 14% in the column, without acometimento in superior members. In work carried through for the initial University of Illinois, in about the half of the LER/DORT cases, symptoms they had been regional pain in the superior members and/or neck, area of the trapezes and cervical region, spreading for other regions of the body, including the lumbar region and the inferior members, after periods of some months. Still according to author, about 25% has previous history of chronic pain muscle-esquelética, mainly in the neck and arms. [9]

For Malchaire [10] the position is a preponderant factor for the development of pathological alterations of origin muscle-esquelética, particularly in the complex to articulate of superior members.

Another constatação of the research was the necessity of postural maintenance and the isométrica contraction, during the accomplishment of the procedures in scaling to a pole some times in the same day, what it is confirmed in a study where, the results indicates positive relation between isométrica force and clutters affecting superior neck and members in the workers in static positions. [11]

Moreover it was verified physical overload in the scaling to the pole, where the same ones went up loading great amount of weight, as: cinturão talabarte (2,5 kg), bucket of canvas material (3,5 kg), tesourão (4 kg), pole of maneuver (8 kg), device of key opening (3 kg), and more the equipment of individual protection, e still, the works carried through in ground, represent considerable physical effort with variation in the rotation positions, flexão and extension of trunk, beyond abdução of superior members, and inferior members in total extension.

The etiológicos factors in an injury for occupational biomechanic overload are related to the organization of the work and involve mainly: inadequate equipment, tools, accessories and movable; disrespect to the positionings, angulações and distances of the same ones; incorrect techniques for execution of tasks; improper positions of work; excess of hours of working; lack of intervals in the work; excess of force used for accomplishment of tasks; static biomechanic overload; dynamic biomechanic overload; use of instruments with extreme transmission of vibration; inapropriadas temperature, ventilation and humidity in the work environment. [12]

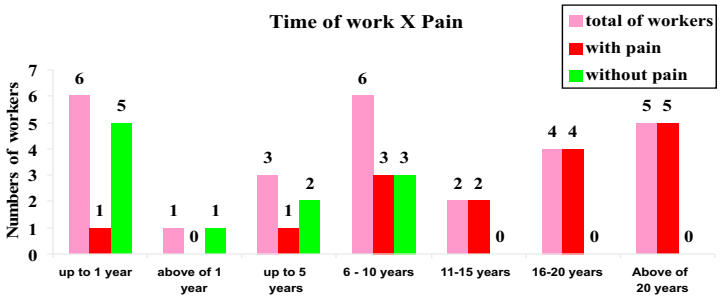
Verified excellent data in the research were to the established relation enter the years of work and the occurrence of pain. As Ranney [5],no work the system to osteomuscular suffers performance from an ample variety of factors, depending on the force and duration, these factors can take the alterations in the health to osteomuscular. As Barbosa [8], how much bigger the time of exposition the repetitividade, greater the possibility of appearance of riots.

Of the first sampling of searched workers 15% it has up to 5 years of company, 30% of 6 the 10 years, 10% of 11 the 15 years, 20% of 16 20 years and 25% above of 20 years of company; e of second sample 86% has up to 1 year of company and 14% above of 1 year. These professionals work constantly in situations of risk, which had to intempéries climatic, as exposition to the sun, rains, winds, colds and also work in inadequate ergonomic conditions, load weight, are in vicious positions, have repetitive gestures e, as if she was not enough, still have accumulation of function, therefore in the majority of the times they also act as drivers during its hours of working and make plantões in ends of weeks and nocturnal services, since, the activities of electricity cannot be interrupted. Of the first sample, 9 electricians with up to 10 years of service, 5 for more than present some type of pain, being represented 50% of them. With more than 10 years of service we have 11 electricians, of these all present pains in some regions of the body, being the most compromised superior members and column. Already in the second sample one has 6 electricians with up to 1 year of service and of these only 1 tells pain in vertebral column; e above of 1 year only has 1 employee, which does not tell pain **(Graphical 1)**.

Of the first sampling of searched workers being that the great majority of the electricians of the second sample had still not developed painful sintomatologia, for if dealing with workers with less than 1 year of activity in the sector; leaving clearly that the manifestations are directly proportional to the time of service and exposition to the risk factors where they are submitted daily.

Conclusion

In this work, could also be observed that it exists a relation between pain and time of service, being evident the increase of the painful incidence with passing of the years exerting the same one função.Verificou-if that this is an activity with great diversity of tasks being of great physical requirement. Ally to this if also observed inadequate positions, repetitividade of movements, high weight of the equipment and difficulties in its manuscript; being necessary a preventive accompaniment, training for one better accomplishment of the activity of the point of view of the ergonomics and ergonomic adequacies in the equipment.



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ERGONOMICS FOR ELECTRICIANS

Abstract

This work was developed in the Company Paranaense De Energia COPEL in the sector of distribution of the AGCEL - Agency of Cascavel/Pr. It had as objective to map the ergonomic conditions of the workers with function of electricians. They had been searched 100% of the professionals who were acting of June of 2003 the December of 2004; divided in two samples, being the first one of 20 and second of 7 electricians. As methodology it was used ergonomic analysis of the work. The used instruments had been: accompaniment and direct comment, anthropometrics interviews, photographs, measures, to weighed of equipment of the individual and collective security. The posture unsuitable in the activities, the great physical requirement of the work and the relation of the increase of pain with the time of service in the same activity had been verified. One evidenced that from 11 years in function 100% of the searched ones they were acting with pains; observing then the necessity of intervention and preventive training. **Word-keys:** ergonomics, electrician, pain

ERGONOMIE POUR ÉLECTRICIENS

Résumé:

Ce travail c'été developper dans la compagnie du Paraná d'énergie - COPEL, dans la section de distribuition de la AGCEL Agence au Cascavel/PR. Avec l'objetif de planifier les condition érgonomiques du életriciens.C"été recherché 100% du professionnels qui était actif en juin 2003 au décembre 2004, divisé en deux grupe; le premier avec 20 et le dusiéme avec 7életriciens. La méthodologie utiliser était: l'analysé érgonomique du travail. Les instrument utilisé était: accompagnement et observation direct, interview, photographie, anthropométrie, pesée des équipament de sécurité individuel et colletif. Se sont vérifier les faiblesse postural dans les activités, aux grand exigence physique du travail et la relation du augment de la douleur avec le temp de service dans la même activité. Se sont constater que a partir de 11 années dans la fuction 100% du recherché était actué avec douleurs; se sont observé la necessité d´intervention et entraînement préventif. **Mot- clé:** érgonomie, électricien, douleurs.

ERGONOMÍA PARA ELECTRICISTAS

Resumen

Este trabajo fue realizado en la Compañía Paranaense de Energía COPEL, en el sector de distribución de la AGCEL Agencia de Cascabel]PR. Tuvo como objetivo analisar las condiciones ergonómicas de los electricistas. Fueron pesquisados 100% de los profesionales que estaban actuando de junio de 2003 a diciembre de 2004; divididos en dos muestras, en la primera de 20 electricistas y la segunda de 7 electricistas. Como metodología se utilizó la analice ergonómica del trabajo. Los instrumentos utilizados fueron acompañamiento y observación directa, entrevistas, fotografías, medidas antropométricas, pesaje de los equipamientos de seguridad individual y colectiva. Se verifico las inadecuaciones posturales, la gran exigencia física del trabajo y la relación Del aumento Del dolor con el tiempo de servicio en la misma actividad, siendo que a partir de 11 anos el la función 100% de los pesquisados estaban actuando con dolores; observándose entonces la necesidad de intervención y entrenamiento preventivo. **Palabras claves:** ergonomía, fisioterapia e electricista

ERGONOMIA PARA ELETRICISTAS

Resumo

Este trabalho foi desenvolvido na Companhia Paranaense De Energia COPEL, no setor de distribuição da AGCEL Agência de Cascavel/Pr. Teve como objetivo mapear as condições ergonômicas dos trabalhadores com função de eletricistas. Foram pesquisados 100% dos profissionais que estavam atuando de junho de 2003 a dezembro de 2004; divididos em duas amostras, sendo a primeira de 20 e a segunda de 7 eletricistas. Como metodologia utilizou-se a análise ergonômica do trabalho. Os instrumentos utilizados foram: acompanhamento e observação direta, entrevistas, fotografias, medidas antropométricas, pesagem dos equipamentos de segurança individual e coletivo. Verificaram-se as inadequações posturais nas atividades, a grande exigência física do trabalho e a relação do aumento da dor com o tempo de serviço na mesma atividade. Constatou-se que a partir de 11 anos na função 100% dos pesquisados estavam atuando com dores; observando-se então a necessidade de intervenção e treinamento preventivo.

Palavras-chaves: ergonomia, eletricista, dor.