35 - ERGONOMIC POSTURAL ANALYSIS AT A DENTIST WORKSTATION

ANA CAROLINA CAVASSIM GUIMARAES1
VINICIUS TREVISAN2
ROSEMARA SANTOS DENIZ AMARILLA3
RODRIGO EDUARDO CATAI4
Universidade Tecnológica Federal do Paraná (UTFPR)
Curitiba - Paraná – Brazil
anacarolina.cg01@gmail.com1
vinicius_trevisan@hotmail.com2
rosemara.deniz@hotmail.com.br3
catai@utfpr.edu.br4

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1.INTRODUCTION

It is considered as science the ergonomics or set of guidelines focused on guidelines and techniques to adapt the space or equipment to the human being (DO RIO; PIRES, 2001).

Everyday activities cause damages to health, among those that give the greatest impact we highlight the musculoskeletal (lumbar) and psychological (stress) including causing absenteeism and inability to perform work activities. The causes are primarily attributed to the bad design and incorrect use of equipment and activities. And according to Dul and Weendmeester (2004), ergonomics can help to minimize such damage.

With the annual development of society, we have seen increasing amounts of materials related to ergonomics whose research and recommendations have contributed significantly in reducing errors and accidents, as well as minimizing stress and physical exertion (IIDA, 2005). Ergonomics was mostly directed to industries and the military and aerospace sectors. However, these assessments, surveys and studies were extended to other sectors even reaching the service industry (IIDA, 2005).

In this situation the economic sector that includes health professionals - specially dentists. Professionals with these inadequate postures, daily working hours and constant stress will favor the damage and problems caused by the non-application of ergonomics, hence the need for a study focused on this sector and activity.

This article aims to provide an Ergonomic Work Analysis (EWA) together with dental professionals in the city of Curitiba, State of Parana. Therefore, we applied a questionnaire to get data such as professional and personal habits.

2.LITERATURE REVIEW

According to Dul and Weenrdmeester (2004), the term ergonomics means ergon (work) and nomos (rules) and in short it is considered as a science applied to machine design, equipment, systems and tasks, whose aim is to enhance work efficiency.

For Do Rio and Pires (2001), the evolutions of this science are related to socioeconomic and technological changes undergone by corporate society. It was noticed throughout history that ergonomics was present in heavy work with or without the aid of animals as well as the adaptation of activity stations.

Iida (2005), States that in 1949 first appeared the ergonomic proposal that acquired status in the 50s; Still are considered as ergonomics participants, the ergonomists and those who perform the planning, project and task assessments, jobs, products as well as analyze people's limitations.

2.1 Ergonomic Work Analysis (EWA)

Ergonomic Work Analysis (EWA) according to Guérin (2001), it's a research system organized by researchers which is based on correction ergonomics when the base is the application of knowledge of science for verification, diagnosis and analysis of the necessary correction in a real work situation. For Santos and Fialho (1997), the completion of an ergonomic work analysis indicates the changes that will culminate in the improvement of working conditions on harmful situations in pursuit of improving the quality of products and services and therefore to expand productivity. According to Iida (2005), the EWA steps are classified into five methods: Demand analysis, Task analysis, Activity analysis, Diagnosis and Recommendations.

Demand Analysis: Demand is the description of a problematic issue or event, which justifies the application of EWA to understand the situation according to Iida (2005). This may also arise from diverse social situations of the company, directly or indirectly linked to problems according to Santos and Fialho (1997). And they can be from the order of formulated demands (recommendation seeking); formulated demands (solving dysfunctions) and formulated demands (identification and constraints).

Task Analysis: For Iida (2005), the analysis task can be characterized as the set of prescribed objectives, in which workers must comply with the work planning. In this situation, the EWA analyzes the prescribed and the effectively implemented. For the development of the task analysis, three steps should be achieved according to Santos and Fialho (1997): Delimitation of man-task system; Description of the elements that compose the system and Evaluation of job requirements.

Activity Analysis: It is considered the manner in which the person behaves before carrying out the activity in the pursuit of their goals. Obviously, it results in an adjustment in the factors involved with this activity (IIDA, 2005). Iida (2005), states that the related factors can be internal or external. Internal factors relate directly to the employee (age, gender, experience, etc.) and external factors relate to the conditions for execution of the activity, as well as organization and means. The achievement of concrete results, come from these realities analyzed according to Santos and Fialho (1997).

Santos and Fialho (1997) divide the analysis methods as follows: analysis in gestural terms (when the motor activity is predominant in completing the task); Analysis in terms of information (analyzes the activities in terms of perception and processing of information and the corresponding actions); Analysis in terms of regulation (guided by objectives, intentions and employee contracts, seen that it confronts the results of his action with the pre-established goals, to adjust its new actions, a process called regulation); Analysis in terms of cognitive processes (more contemporary method of analysis, addresses the human labor from the point of view of the cognitive processes of information detection, information discrimination, information processing, decision-making and action on the controls and commands of the production system).

Diagnosis: It is based on the search for the causes that led to the identified problem described in the demand. And relates to many work factors (IIDA, 2005). Still, the interpretations of the diagnosis are also based on syndromes:

Human errors (the error manifests a kind of deviation from the pre-established norm regarding a work behavior);

Critical incidents (observable event in a work situation which presents an anomalous character in relation to a normal

known development);

· Accidents at work (privileged situations for detecting disorders in man-task systems);

· Breakdowns in the system (incidents affecting the material component of the man-task system, are manifested by an interruption in the operation of the system);

· Production Defects (deviations observed at the level of the manufactured product and in general, the expected work result);

· Low productivity (indicative of a dysfunction of the man-task system, seen that productivity identifies the achievement of a certain level of production to guarantee a certain standard of quality).

Recommendations: Directly related the measures to be taken in an attempt to solve the diagnosed problem. Yet these must be clearly presented with a description of the steps required for the solution and even incorporating images, figures of diagnosed interventions. Also important is the association with ones responsible for the implementation of actions with deadlines (IIDA, 2005).

Workstation: Do Rio and Pires (2001), define workstation as a set of components that constitute the immediate physical environment where one works and with which it interacts directly, including furniture, machinery, tools, accessories, materials and products. According to Iida (2005), jobs can be analyzed by two main approaches, the Taylorist focus and the Ergonomic focus.

Also called "studies of time and motions" as by Iida (2005), the Taylorist approach is based on studies of body movements required to perform a certain activity and the extent of time spent on each movement. By this method, the best working procedure is chosen by the criterion of less time spent accomplishing the task. But the ergonomic approach is mainly based on biomechanical analysis of posture and the interactions between man, the system and the environment. It tends to develop workstations that reduce biomechanical and cognitive demands, trying to place the operator in a good working posture (IIDA, 2005). As defined by Iida (2005), in the ergonomic approach, machinery, equipment, tools and materials are adapted to the work characteristics and workers' skills, to promote a biomechanical balance, reduce static contractions of the muscles and general stress. It also seeks to eliminate highly repetitive activities as well as aiming to ensure satisfaction, worker safety and good system productivity.

As for the design of the job, Iida (2005) classifies five key steps to follow:

Activity Analysis: The task analysis should start as soon as possible before certain system parameters are set and hinder the introduction of corrective modifications. It is classified into three levels: task description, description of the actions and critical review, to correct any problems.

Workstation physical layout: Also called layout, it is the study of the spatial distribution or positioning related to the various elements that make up the workstation. It may be based on the following criteria: importance, frequency of use, functional grouping, use sequence, flow intensity and preferred connections.

Workstation dimensioning: The workstation must be sized so that most of its users have a comfortable posture. For this, several factors must be considered such as the proper body posture, necessary body movements, range of motion, anthropometric measurements of office occupants, lighting requirements, ventilation, machinery dimensions, equipment and tools, and interaction with other workstations.

Construction and test model: You can build a three-dimensional full-scale model to simulate the spatial distribution of the various elements that make up the workstation where the factors mentioned in the previous item will be checked and necessary adjustments will be introduced with lower spending of time and resources.

2.2 Individual adjustments

Posture: In everyday life, at work and outside it, people adopt postures for the development activities and for rest. These positions can produce adequate loads for maintaining the health of the musculoskeletal system or may be excessive or insufficient, leading to disturbances in this system (DO RIO and PIRES, 2001). Iida (2005) presents three basic positions taken by the human body, working and at rest. These positions are lying, sitting, and standing and in each efforts are involved to keep the neutral position of the body, namely, keeping each body part, as close as possible to their natural state.

According to DO RIO and Pires (2001), in ergonomics, we seek to find these neutral positions, aiming to apply the lowest possible load on the joints and musculoskeletal segments, or as close to them. Often, inadequate workstation projects force the worker to use awkward postures, which, if kept for a long time, can cause severe pain located in that set of muscles required for its conservation, as shown in Table 1 (IIDA, 2005):

INADEQUATE POSTURERISK OF PAINSStandingFeet and legs (varicose veins)Sitting with no back supportDorsal extensor musclesSeat too highLower legs, knees and feetSeat too low Back and neckStretched armsShoulders and armsInadequate tool handles ForearmFists in not neutral positionFistsBody rotations SpineInappropriate angle seat/backrestBack musclesVery low or very high work surfacesSpine, shoulder girdleTable 1 - Location of pains caused by poor posture. Source: Iida (2005).

INADEQUATE POSTURE	RISK OF PAINS
Standing	Feet and legs (varicose veins)
Sitting with no back support	Dorsal extensor muscles
Seat too high	Lower legs, knees and feet
Seat too low	Back and neck
Stretched arms	Shoulders and arms
Inadequate tool handles	Forearm
Fists in not neutral position	Fists
Body rotations	Spine
Inappropriate angle seat/backrest	Back muscles
Very low or very high work surfaces	Spine, shoulder girdle

2.3 Working sitting down

According to Do Rio and Pires (2001), the sitting position represents most activities. As by Dul and Weerdmeester (2004), this type of position has advantages over the erect posture, because the body is better supported on many surfaces: floor, seat, backrest, chair arms, table, etc.

However, according to Iida (2005), it requires muscle activity of the back and belly to maintain, and virtually the entire body weight is supported by the skin covering the ischium bone, in the buttocks, and power consumption is between 3% and 10%

higher relative to the horizontal position.

Grandjean (1998), presents some criteria to be followed for work situations in a sitting position: For manual work performed in front of the body, in a seated position the elbow should be kept low and arm bent at a straight angle; When the activity requires very fine precision, great visual distances must be considered and the work surface should be elevated so that the worker can see his work object without forcing too much the curvature of the back or neck; The free space for the knees must consider beyond the worker's average height, verified by anthropometric tables, also the height of shoe heels and consider a minimum clearance for leg movements.

2.4 Diagram of painful areas

A method created in 1980, as shown by Iida (2005), this diagram divides the human body into 24 segments and provided this tool the work analyst can interview workers and obtain through a graphical questionnaire, regions where the professional feels pain after working hours. The discomfort index is classified into eight levels, from 0 for "no distress" to 7 for "extremely uncomfortable".

The big advantage to this method is the ease of understanding, since respondents indicate regions with discomfort as well as the degree of satisfaction achieving significant results (IIDA, 2005).

3. METHODOLOGY

This study was developed with dental professionals in different career periods in the city of Curitiba, State of Parana. In the initial stage, we applied a questionnaire where professional and personal habits were considered in which the practice of physical activity and stretching were considered, in addition to working hours and pains related to poor posture. After the first stage, the criterion used was through the study with a more detailed postural analysis by the OWAS method (Ovako Working Posture Analysing System) of the Ergolândia software.

Survey: Initial assessments to the application of the questionnaire were the postures and their relations with the pain caused by these. Subsequent to this evaluation there was the need to develop a questionnaire that quickly favored the assessment of an overview of the deficiencies, capabilities and constraints of the activity. The questionnaire also showed a diagram of painful areas where professionals could signal the types and pain intensities. With the addition of this information the same were tabulated and analyzed.

Analysis: Was made from 10 questionnaires that were later selected to be evaluated individually. The selected work unit is located in Curitiba, Paraná state and the professional assessed with more specific criteria works in the health area-dentistry for five years, whose journey is 8 hours with breaks free of stretching practices or labor gymnastics. Wear presented by the professional in her activities would be due to the practice of dental extraction, since, she has an approximate time of 30 minutes to 60 minutes in more complex cases, and this professional exercises this function in the same position throughout the activity. Reported pains are in the hands, neck and lower back. The next steps relate to the sequential figures of the activities mentioned herein. With these images, we can see the different attitudes to each activity. The treatment begins with local anesthesia on the patient, such activity is exempt from analysis due to the speed and non-intensity no force or sequentiality.



Figure 2 – Selected workstation
Source: Authors (2016).



Figure 3 - Posture to anesthetize patients
Source: Authors (2016).

After the anesthesia process, a brief rest is suggested for it to take effect and during this step the professional adopts a slightly more relaxed position as shown in Figure 4. According to Figure 5, the extraction process starts and the professional adopts a position with greater intensity followed by the suturing procedure, despite the speed of the process it continues with the same intensity and tension.

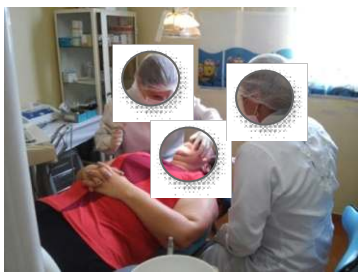

Figure 4 - Posture 2: Rest
Source: Authors (2016).



Figure 5 - Posture 3: Extraction / Suture
Source: Authors (2016).

After these two steps were carried out postures were evaluated by the OWAS method and the results were then presented.

4.RESULTS AND DISCUSSIONS

According to the information presented in the methodology, the idea is reinforced that 10 questionnaires were randomly distributed to 10 health professionals - dental specialty seeking different profiles of working hours, habits and employment length. According to tabulations of age and employment length the following situation was obtained:

It can be noticed that the samples were in the age group below 30 years and 5 years of profession. But in regard to the work habits of the analyzed professionals, one realizes that 50% of these perform activities with more than 8 working hours, ranging between 9 and 11 hours. And 50% of these professionals claim to practice physical activities regularly and only 10% do intervals during calls. Despite breaks being commonplace during the everyday activities of these professionals, only 33% of them perform stretching exercises according to Figure 9. The volume of workers in this area that feel some type of work-related pain is

of the order of 80%. To obtain a more practical and efficient tabulation, the pain diagram was reorganized so that respondents signaled as extreme pain (6-7), bearable pain (4-5) and mild pain (1-3). Furthermore, the diagram was filled in separately for both sides, with the degree of extreme pain prevailing for both sides. The pains often identified were in the neck region with 70% of complaints

4.1 RESULTS OF THE APPLICATION OF THE OWAS METHOD

Through the Ergolândia software the ergonomic analysis took place within the OWAS module. We defined within this system the number of tasks to be analyzed for the activity in question as follows:

Activity 1: corresponding to the first stage of patient anesthesia. Named Anesthesia.

Activity 2: corresponding to the second stage of anesthesia, where the professional checks the effect of it and if a new application will be required. Named Anesthesia B.

Activity 3: corresponding to tooth extraction and completion of the procedure by suture. Named Extraction/Suture.

According to the activities we detailed the postures for the upper body, arms and legs through the OWAS method as well as time related to each activity. Through the OWAS method activities 1 and 3 are characterized in category 3, ie, need for correction as soon as possible. For Activities 2 we ranked then in 2 representing an intervention in a routine check. The software can still provide from a pre-populating previous height of the ideal anthropometric measurements for both standing and sitting activities. For the examined case we are interested in a sitting posture since the activities of this business are done as so

4.2 SUGGESTIONS FOR IMPROVEMENTS

After analyzing the results of the research conducted and (EWA), a concern was seen among professionals regarding their long-term health, since the excessive work hours are constant, associated to the non-practice of physical exercise and labor gymnastics and stretching. Despite the young age and small activity periods already feel impacts due to the pain.

The body regions most frequently cited with the presence of pain are the neck and shoulders followed by head and neck. According to the assumptions presented in this document it is suggested to minimize the problems:

·The constant practicing of physical activities, with the intention to strengthen the muscles of the body and minimizing exhaustion;

·The constant practice of breaks during the work day, associated with stretching and gymnastics

·The adjustment of seat height and office lighting avoiding or minimizing excessive torso bending forward looking for a better view of the work to be performed.

5.CONCLUSIONS

The complaints unanimously observed made evident the importance of this activity. It was also proven through this case study, that the working position of these posts is completely inadequate when not null, according to the ergonomic indications based on biomechanics and anthropometry. The existence of professionals focused on the area of work health in these activities is practically nil, both as a regular and eventual practice as possible to raise awareness of the damage that the profession itself causes, proven in the applied questionnaires. Still, the damage from the sedentary lifestyle of professionals was perceived and their total ignorance of the damage caused to health. After the research and the analyzed results, it was concluded that the workstations of this activity are extremely uncomfortable, with numerous deformities or nonconformity as to the postures. With the intention of solving the postural problems of this service sector whose professionals are unaware of the damage caused by their activity, a study should be carried out surveying proposals for alignment or revision of the furniture and equipment of the activity. If possible, implementing the proposed appropriate pilot activities and movements as well as the needs of the profession. And that these volunteers are selected with heights, weights, shapes, different ages and sexes, for it is believed that this method should reach successfully.

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ERGONOMIC POSTURAL ANALYSIS AT A DENTIST WORKSTATION

ABSTRACT

Everyday activities cause damage to health, among those that give the greatest impact on the lives of workers are musculoskeletal pains (lumbar) and psychological (stress). Therefore, this study is aimed at providing an ergonomic work analysis (EWA) with professionals of the dental area in the city of Curitiba, State of Parana. Therefore, a questionnaire was applied to collect data such as professional and personal habits. In order to enhance the research, we used the OWAS method (Ovako Working Posture Analysing System), for a more detailed postural analysis. The study showed that there is a concern with the professionals regarding their long-term health, since the days of excessive work are constant, associated with no physical exercise and labor gymnastics. It is concluded that the workstations of this activity are extremely uncomfortable, with numerous non-compliances as to postures. Therefore, one should conduct a study and propose an alignment or review of furniture and equipment used by dental professionals

Keywords: Ergonomic Analysis; Dentistry; OWAS method.

ANALYSE ERGONOMIQUE POSTE DE TRAVAIL POSTURAL UN DENTISTE
RESUMÉ

Les activités de tous les jours causent des dommages à la santé, parmi eux, il y a ceux qui causent le majeur impact dans la vie des travailleurs comme les douleurs musculo-squelettiques (lombaires) et les psychologiques (stress). Cette étude a donc pour but principal de réaliser une analyse ergonomique de travail (AET) avec les professionnels de l'odontologie dans la ville de Curitiba, état de Paraná au Brésil. Pour que ça soit fait, on a appliqué un questionnaire pour collecter des données comme les habitudes professionnelles et personnelles. Pour enrichir la recherche, on a utilisé le méthode OWAS (OvakoWorking Posture Analysing System), pour une analyse posturale plus détaillée. L'étude a montré qu'il y a une préoccupation des professionnels concernant leur santé à long terme, étant donné que les journées de travail excessifs sont constantes, associées au manque de pratique des exercices physiques et gymnastiques au bureau. On a fait la conclusion que les postes de travail de cette activité-là sont extrêmement inconfortables, avec beaucoup de discordances en relation aux postures. C'est pourquoi il faut mener une étude et proposer un alignement ou une révision des mobiliers et de l'équipement utilisés pour les professionnels de l'odontologie.

Mots-clés: Analyse ergonomique; Dentisterie; méthode OWAS.

ANÁLISIS ERGONÓMICO POSTURAL DEL TRABAJO DE UN DENTISTA
RESUMEN

Actividades ordinarias causan daños a la salud, entre los que dan el mayor impacto en la vida de los trabajadores son las dolor musculoesqueléticas (lumbares) y psicológicas (estrés). Por lo tanto, este estudio tiene como objetivo realizar una análisis ergonómica del trabajo (AET) con profesionales de la área odontológica en la ciudad de Curitiba, Estado de Paraná. Por tanto, fue aplicado el cuestionario para recoger datos como los hábitos profesionales y personales. Con el fin de enriquecer la investigación utilizó el método OWAS (Ovako Working Posture Analysing System), para una analisis de la postura más detallada. El estudio mostró que hay una preocupación con los profesionales con respecto a su salud a largo plazo, ya que los días de exceso de trabajo son constantes, asociado con ningún ejercicio físico y gimnástica laboral. Se llega a la conclusión de que los puestos de trabajo de esta actividad son extremadamente incómodos, con numerosas no-conformidades como las posturas. De este modo, se debe realizar un estudio y proponer una alineación o revisión de muebles y equipos utilizados por los profesionales del área de la odontología.

Palabras clave: Analisis ergonómico; Odontología; Método OWAS.

ANÁLISE ERGONÔMICA POSTURAL DO POSTO DE TRABALHO DE UM ODONTÓLOGO
RESUMO

Atividades corriqueiras causam danos à saúde, dentre essas as que conferem maior impacto na vida dos trabalhadores são as dores musculoesqueléticas (lombares) e as psicológicas (estresse). Portanto, este estudo tem como objetivo principal realizar uma análise ergonômica de trabalho (AET) junto aos profissionais da área de odontologia na cidade de Curitiba, Paraná. Para tanto, aplicou-se questionário para levantar dados como hábitos profissionais e pessoais. A fim de enriquecer a pesquisa utilizou-se o método OWAS (Ovako Working Posture Analysing System), para uma análise postural mais detalhada. O estudo mostrou que existe uma preocupação com os profissionais em relação à sua saúde a longo prazo, já que as jornadas de trabalhos excessivas são constantes, associadas a não prática de exercícios físicos e ginásticas laborais. Conclui-se que os postos de trabalho dessa atividade são extremamente desconfortáveis, com inúmeras não conformidades quanto a posturas. Portanto, deve-se realizar um estudo e propor um alinhamento ou revisão dos mobiliários e equipamentos utilizados pelos profissionais da área de odontologia.

Palavras chave: Análise ergonômica; Odontólogo; Método OWAS.