91 - ANALYSIS OF THE SYMPATHETIC AND PARASYMPATHETIC LEVELS IN WORKERS OF DIFFERENT TURNS THROUGH THE BIOEXPRESS

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INTRODUCTION

The knowledge of the causes and origins of stress it and the used ways and instruments to face affect it the companies, in all levels, of the high steps of direction and presidency to the workers. Each individual has a way of if locating in relation to this world-wide problem. E, in accordance with its action, will be able to create an environment of productive work or not 1,2.

Selye 1952 (3), used the term stress for the first time with the connotation that if knows nowadays: "stress is the way the organism answers to any stimulation - good, bad, badly or imaginary - that modifies its state of balance". The current concept of "stress" is considered as a process bio-psycho-social, by the ways of manifestation, dependent of individual characteristics with social environment 1,4,5,6.

The Autonomous Nervous System (ANS) is divided in two parts: Sympathetic Nervous System (SNS) and Parasympathetic Nervous System (PNS). The first one can be seen as a stimulator, preparing the body for the expense of energy, stressing situations and emergency. It controls the cardiac increase of the blood pressure, beatings and the emission of blood for the muscles, besides being also a biological marker of age. In the antagonist form, the PNS can be seen as a depressor or conservative way of energy and is active in rest situations. It contra balances the effect of the SNS and restores the body for the relaxation after a stressing experience. For example, during an emergency, the SNS will cause an increase in the frequency of the cardiac beatings and breath; after this situation, the PNS will diminish these activities 7,8.

The Bioexpress is a computerized system, completely automatic and not invasive assigned for the quantitative analysis of the Autonomous Nervous System and the general states of the body health, based on the analysis of the Variability of the Heart Beat (VHB). It is the first and only available system nowadays for practitioners and researchers in this field 7.

The Bio-Express® software (the USA © 2002, Heart Rhythm Instruments Incorporation the USA, 173 Essex Avenue Metuchen NJ 08840) uses two methods of measuring the vital functions of the body: the "physiological Nerve Express", that it analyzes the emotional tensions, states and the level of stress, and the "Health Express", that evaluates the level of the physical performance and organic reserves 7.

It is important to give say that the Health- Express is not a substitute for the traditional functional diagnostic and laboratorial methods of examination; it only complements them with new critical information on the functional state of the human body 7.

Nowadays, it is sufficiently common the existence of services and production functioning 24 hours per day. According to Pallone (2004)9, this can imply in health problems in those who work in the night shift besides causing difficulty in the relationships. This because sleeping during the day it is not the same thing than sleeping at night, mainly between the women, who in general take care of the daily tasks at home. The sounds of the house and the street and the clarity don't allow the person to "disconnect" to sleep and fulfills all the sleep stages, basic for the replacement of the energies.

Many psychophysiologics and physiological effects during the exposition to the noise can be considered as recurrent of the sympathetic activity and hypothalamus - hipophysis secondary to a general reaction of stress (Oak, 1996)10.

Analyzing what was described and taking in consideration that the people who work at night can not have an effective rest and consequently bigger physical and mental stress, our work had as proposal to analyze the state of the ANS in the employees of different turns of work verifying the levels of stress through the Bioexpress program.

METHODOLOGY

1- Population

Were evaluated 9 employees of each turn (morning, afternoon and night) of the production section of the Ticket company Services S/A, totalizing 27 employees, all of the masculine sex with ages between chosen 25 and 45 randomly.

2- Material

- Table for rest
- Polar Machine
- Sensor
- Computer
- Connection Cables
- Software Nerve- Express
- Water or gel for coupling
- Sleep Scale of Epworth

3- Method

The present work was carried through in the medical clinic of the Ticket Company Services S/A in an only day. It is about a field research where the employees had been evaluated before and after its turn of work, one at time, being that the work turn is of 8 hours.

Initially the Epworth sleep Scale was applied that evaluates the quality of the sleep of each employee. Through simple questions related to the daily activities, the person quantifies its possibility of sleeping during the following situations: seated and reading; seeing television; seated in public place without activity (room of wait, theater, cinema, meeting); riding a train, car or bus during one hour without stopping; lying to rest in the afternoon; seated and talking with somebody; seated calmly after the lunch without alcohol; in the car while stopped for some minutes in the intense transit. The following scale is used to choose the most appropriate number for each situation:

0 - No chance of sleeping
1 - Small chance of sleeping
2 - Moderate chance of sleeping
3 - High chance of sleeping

In the total addition, will have good quality of sleep of 1 the 6 points; 7 to10 points are in the acceptable limit; above or equal 11 points will have a bad quality of sleep.

The second step was to carry through the analysis of the state of the ANS. The chosen modality of test inside of the method Nerve- Express was the Orthostatic Test or Orthotest that is simply the transition of a lying position to a standing position. It is considered the initial method for the provocation of the ANS. Moreover, the Health- Express uses the Period of

Transition of the Orthotest for its measurement that supplies them one more result (fig. 1).

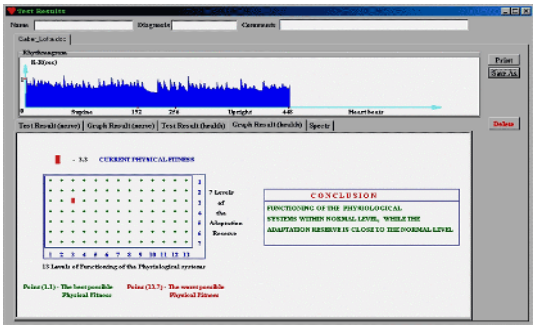


Figure 1- Illustration of an analysis of Bioexpress software

For the statistic analysis, it was carried through the Test - T of Student with the level of significance 95% statistics where $p < 0,05$, for the program Microsoft Excel® 2000.

The employee remained lying on the table in supine with relaxed legs and arms along the body and closed eyes (fig. 2 and 3). The Polar one was located in its body to the level of the xifóide process and the sensor was imprisoned to its waist and hardwired to the microcomputer through a handle. This sensor sent to the microcomputer the information of the cardiac beatings that were caught by the Polar one and there they were interpreted by the Bioexpress software that went forming a graph in the screen. This procedure lasted 4 minutes approximately and after this period the micron emitted a signal that meant the moment to change to the standing position. The employee remained, thus, relaxed, for other 4 minutes approximately and without doing a specific activity. At the end of the process, Polar and the Sensor were removed from the employee and he was set free to initiate its activities in the Company. At the end of its turn of work the employee went one more time for the analysis of the state of the ANS, but it was not necessary answering the Epworth sleep Scale again.



Fig.2-Analysis with Bioexpress

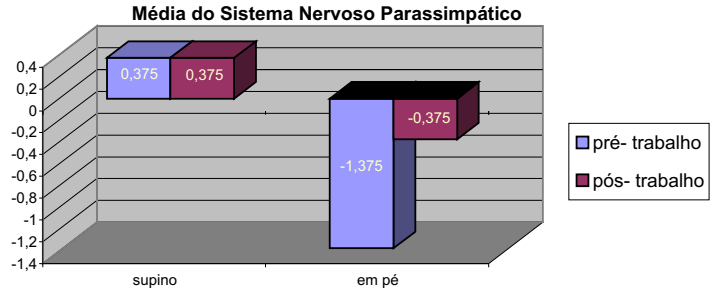


Fig.3- Positioning in supine

RESULTS

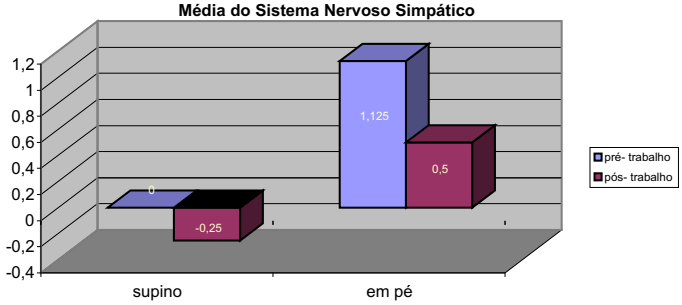
This study presents information for the question of stress through the state of the autonomous nervous system in workers before and after its hours of working.

In graph 1, we observe that the average of the parasympathetic nervous system in morning workers, in the supine position, before work was of 0,375 and after work kept in 0,375, reaching a probability statistics with $p = 1$. In the standing position, the average before was of -1,375 and after it had an increase for -0,375, reaching a probability statistics with $p = 0,018452$.



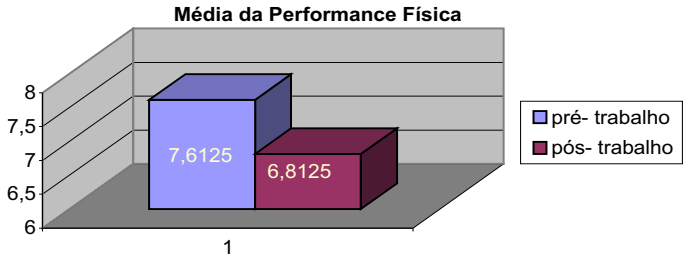
Graph 1: The parasympathetic NS before and after the morning shift

In graph 2, we observe that the average of the sympathetic nervous system in morning workers, in the supine position, before was 0 and after work had a reduction for -0,25, reaching a probability statistics with p=0,170471. In the standing position, the average before was of 1,125 and after had a reduction to 0,5, reaching a probability statistics with $p = 0,049173$.



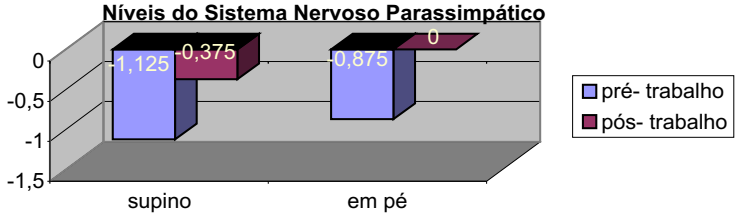
Graph 2: Sympathetic NS before and after morning shift.

In Graph 3, we observed that the average of the index of the physical performance in the morning workers before work was of 7,6125 and after work had a reduction in the value to 6,8125 (knowing that in the Bioexpress how much bigger the value of this item, worse is the picture of the physical performance). The probability statistics reached $p = 0,013383$.



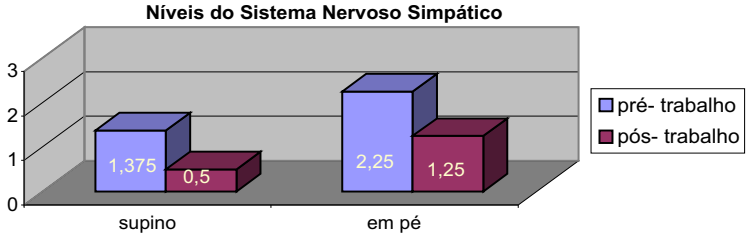
Graph 3- Physic performance before and after morning work

In graph 4,we observe that the average of the parasympathetic nervous system in night workers, in the supine position, before work was of -1,125 and after work had an increase for -0,375, reaching a probability statistics with p = 0,197022. In the standing position, the average before was of -0,875 and after it had an increase for 0 (zero), reaching a probability statistics with p = 0,087459.



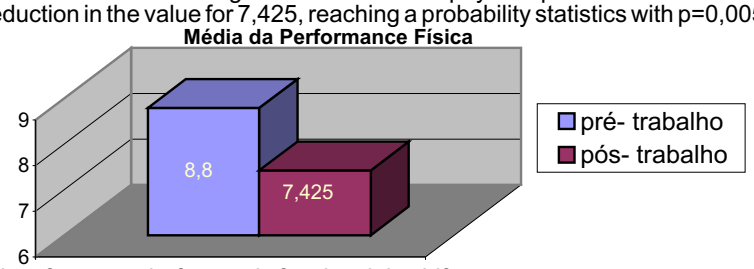
Graph 4-Parasympathetic NS before and after the night shift

In graph 5, we observe that the average of the sympathetic nervous system in night workers, in the supine position, before was of 1,375 and after work had a reduction for 0,5, reaching a probability statistics with p=0,154972. In the standing position, the average before was 2,25 and after had a reduction to 1,25, reaching a probability statistics with p = 0,018452.



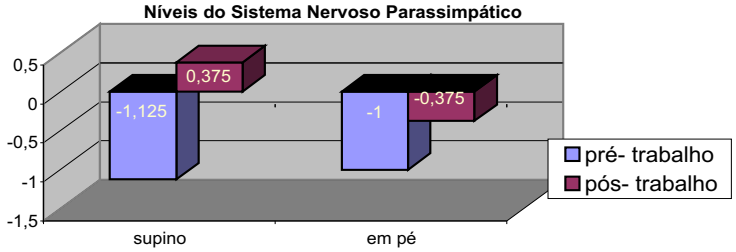
Graph 5- The Sympathetic NS before and after the night shift

In Graph 6, it is observed that the average of the index of the physical performance in the night workers before was of 8,8 and after work had a reduction in the value for 7,425, reaching a probability statistics with p=0,005551.



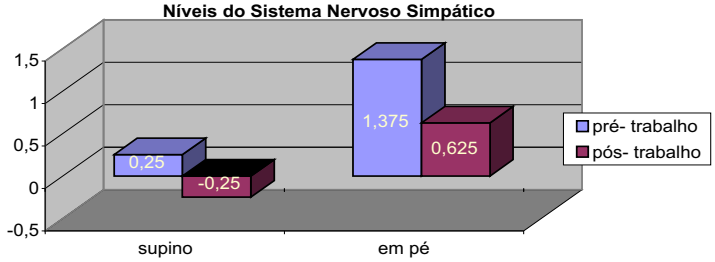
Graph 6: Physical performance before and after the night shift

In graph 7, it is observed that the average of the parasympathetic nervous system in afternoon workers, in the supine position, before was of -1,125 and after work had an increase for 0,375, reaching a probability statistics with p = 0,156433. In the standing position, the average before was -1 and after it had an increase to -0,375, reaching a probability statistics with p = 0,216838.



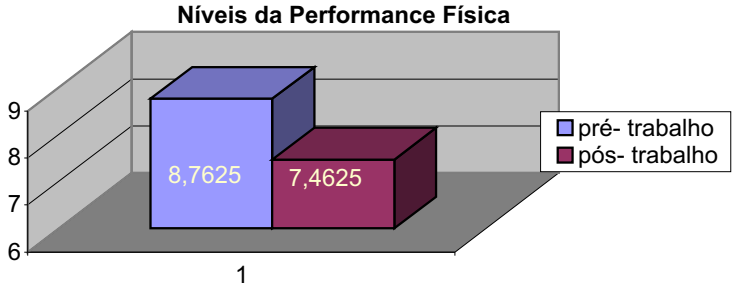
Graph 7- Parasympathetic NS before and after afternoon work

In graph 8, we observe that the average of the sympathetic nervous system in afternoon workers, in the supine position, before was of 0,25 and after work had a reduction for -0,25, reaching a probability statistics with p = 0,170471. In the standing position, the average before was of 1,375 and after had a reduction to 0,625, reaching a probability statistics with p = 0,047945.



Graph 8: Sympathetic NS before and after afternoon work

In Graph 9, it is observed that the average of the index of the physical performance in the afternoon workers before was 8,7625 and after work had a reduction in the value to 7, 4625, reaching a probability statistics with p=0,189589



Graph 9: Physical performance before and after afternoon shift.

DISCUSSION

The ANS is composed by two opposing subsystems: sympathetic and parasympathetic. These subsystems work in opposing way, being that the sympathetic one acts to activate the body and the parasympathetic acts to calm it (Kobb & Whishaw, 2002)11.

The Bioexpress program evaluates the ANS from the cardiac electrophysiology, having as base, the measurement of the rhythm, identifying as the physical/psychological capacity of the individual intervenes with the ANS, causing a loss or gain of performance. It is through the peaks of high and low frequency of the variability of the cardiac frequency that it corresponds to the activity of the sympathetic one and the parasympathetic, which, applied to the quadrants of the Bioexpress, shows the state of the ANS. When they are balanced or in a "special physiology", the individual is in excellent physical, emotional and physiological conditions to execute definitive task in its day-by-day. The Bioexpress is a precise tool of measurement and research in a professional and personal.

The results of this study show that the level of the SNS is higher in the first examination in all the employees disclosing a bigger level of stress before work. The PNS is shown higher in as the examination in all the employees disclosing the ANS balanced after work (homeostasis). The average of the index of the Physical Performance also improved after work. This shows that work environment did not provoke an increase of the stress.

The stress is directly related with the homeostasis, which is the state of balance of the systems of the organism between itself and the organism as a whole with the environment. Cannon in 1939 suggested the name "homeostasis" to assign the effort of the physiological processes to keep a state of internal balance in the organism. Selye, using itself of these concepts, defined stress as a break in this balance 6.

The fact that the employees reached balance after work, in this case, puts in contradiction the affirmation of Ferraz and Nascimento1, when says that the work environment is currently the factor of bigger influence in the occurrence of stress. Despite this, the 0 variable of amount and pressure at work had not been controlled in this study (phase of "peak"). The causes of an increase in the sympathetic activity before work can be several, among them: the traffic and the big city noise, the lack of time, bad sleep and even the anxiety ahead of the examination. However, this increase still is considered light close to very stressing situations and, therefore, one is considered a positive stress 1,12,13. The positive "stress", called eustress, as well as the negative, called distress, cause similar physiological reactions. In the emotional level, however, the reactions to "stress" are sufficiently different. The eustress motivates and stimulates the person to deal with the situation. In contrast, the distress discourage the individual, making him intimidated and run away from the situation, since it represents a set of relations where the organism develops to being submitted to a situation that demands effort of adaptation (Fiamoncini & Fiamoncini, 2003) 1,6,14.

When compared the night employees with the afternoon and morning, the first ones had more presented the average SNS higher (bigger stress) that the last ones, as much before work as after work. The most likely cause of this can be an bad quality of sleep 15,16,17,18. One significant part of the sleeping problems of the night workers occurs due to the social factors of the half disturber, mainly the day noise that is generally bigger (Fruhstorfer et al, 1985 apud Carvalho, 1996) 10. According to Pimentel (1998)19,20, the sonorous pollution worsen significantly the absolute quality of sleep, causing worse physical performance, mental and psychological, bigger fatigue during the day and alert probable loss of hearing.

However, the results of Epworth Sleep Scale disclose that the majority of the employees presents good quality of sleep or are in the acceptable limit.

CONCLUSION

With this research we try to show an analysis of the state of the ANS of the employees of different turns of work verifying the levels of stress through the Bioexpress software that is a necessary tool of measurement and research of the state of the ANS, as much for personal and professional use. We conclude that the analyzed employees had initiated its activities of work under state of eustress (the good or physiological stress) with the level of the sympathetic activity a little raised. To the end of each turn, these same workers had reached the balance state or homeostasis reducing the activity of the sympathetic and increased the parasympathetic, showing that work takes to an alteration in the levels of these two systems, however nor always this alteration is for worse. This result differs from many researches that say that the work environment is currently the factor of bigger influence in the occurrence of stress.

Sleep also was not the main causer of the increase of the sympathetic activity before work, being necessary future inquiries regarding the causes, since this was not the specific objective of this work.

Thus, we wait that future researches are carried through with other groups of workers, other sectors and also other companies in order to compare the results, since carried through research of this type with the Bioexpress does not exist.

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ANALYSIS OF THE SYMPATHETIC AND PARASYMPATHETIC LEVELS IN WORKERS OF DIFFERENT TURNS THROUGH THE BIOEXPRESS

The main goal of this research consisted of the analysis of the ANS before and after the work of employees in different turns, verifying the levels of stress. The sample was composed for 27 employees divided in three turns of the sector of production of a company, of the masculine sex with ages between 25 and 45 randomly. The analysis was carried through the Bioexpress program that identifies, from data of the cardiac electrophysiology, the ideal levels of the sympathetic and parasympathetic nervous system that compose the autonomous nervous system. Applied the Epworth Sleep Scale as a coadjutant diagnosis. The observed results had been that the level of the SNS was presented higher in the first examination in all the employees disclosing a bigger level of stress before working. The PNS was higher in as the examination in all the employees disclosing the ANS after working (homeostasis). However, the increase of the sympathetic activity before work can be considered light translating the state of eustress (good stress or physiological). The Sleep Scale showed that the majority of the employees have good quality of sleep or is in the acceptable limit. Ahead of these results it was perceived that the work environment did not cause an increase of the stress and that sleep was not the main cause of the increase of the activity of the SNS before work concluding that the work leads to an alteration in the levels of SNS and PNS, however nor always this alteration is worse.

Key-words: Bioexpress, Nerve Express, independent nervous system, stress, quality of life.

ANALYSE DES NIVEAUX DU SYSTÈME NERVEUX AGRÉABLE ET DU PARASSIMPÁTICO DANS LES OUVRIERS DE DIFFÉRENTS TOURS PAR LE BIOEXPRESS

L'objectif principal de cette recherche était le travail d'analise d'american national standard des employés avant et après dans différents temps de travail, en vérifiant les niveaux d'effort. L'échantillon s'est composé par 27 employés masculins avec des âges entre 25 et 45 qui était aléatoire choosed et se sont divisés dans trois fois différentes de travail dans le secteur de production d'une compagnie. L'analise a été fait par le programme de Bioexpress qui identifie, basé sur des données cardiaques d'électrophysiologie, les niveaux idéaux du système nerveux sympathique et parasympathique qui composent le système nerveux autonome. Aplied à la "balance de sommeil d'Epworth" en tant que diagnostic coadjuvant. Les résultats donnés prouvent que le niveau de SNS était plus élevé dans le premier examen pour tous les employés manifestant un niveau plus élevé d'effort avant travail. D'autre part, le PSNS a présenté des niveaux plus élevés sur le deuxième examen pour tous les employés manifestant une SNA plus pondérée après travail (homéostasie). Cependant, l'augmentation de l'activité sympathique pré au travail peut être considérée effilée traduisant l'état d'eustress (bon effort ou physiologique). Le demostrate de balance de sommeil que la majorité des employés ont une bonne qualité de sommeil ou sont dans une limite acceptable. Les résultats prouvent que l'enviroment de travail n'a pas causé l'augmentation des niveaux d'effort et que la somnolence n'était pas causer principal de l'augmentation d'activité de SNS avant travail, concluant que le travail peut changer les niveaux de SNS et de PSNS, toutefois ce changement n'est pas toujours pour plus mauvais.

Mots-clés: Bioexpress, nerf exprès, système nerveux autonome, effort, qualité de la vie.

ANÁLISIS DE LOS NIVELES DEL SISTEMA NERVIOSO AGRADABLE Y DE PARASSIMPÁTICO EN LOS TRABAJADORES DE DIVERSAS VUELTAS CON EL BIOEXPRESS

El objetivo principal de esta investigación era el trabajo del analise de la American National Standard de los empleados antes y después en diversos tiempos del trabajo, comprobando los niveles de la tensión. La muestra fue compuesta por 27 empleados masculinos con edades entre 25 y 45 que era aleatoria choosed y se dividieron en tres diversas veces del trabajo en el sector de la producción de una compañía. El analise fue hecho con el programa de Bioexpress que identifica, basado en datos cardiacos de la electrofisiología, los niveles ideales del sistema nervioso comprensivo y parasimpático que componen el sistema nervioso autónomo. Aplied a la "escala del sueño de Epworth" como diagnóstico coadjuvant. Los resultados dados demuestran que el nivel de SNS era más alto en el primer examen para todos los empleados que manifestaban un nivel más alto de la tensión antes de trabajo. Por otra parte, el PSNS presentó niveles más altos en el segundo examen para todos los empleados que manifestaban una SNA más levelheaded después del trabajo (homeostasis). Sin embargo, el aumento de la actividad comprensiva en pre el trabajo se puede considerar tenue traduciendo el estado de los eustress (buena tensión o fisiológico). El demostrate de la escala del sueño que la mayoría de los empleados tiene una buena calidad del sueño o está en un límite aceptable. Los resultados demuestran que el enviroment del trabajo no causó el aumento de los niveles de la tensión y que el sleepiness no fuera el causer principal del aumento de la actividad de SNS antes de trabajo, concluyendo que el trabajo puede cambiar los niveles de SNS y de PSNS, no obstante este cambio no está siempre para peor.

Palabras-claves: Bioexpress, nervio expreso, sistema nervioso autonómico, tensión, calidad de la vida.

ANÁLISE DOS NÍVEIS DO SISTEMA NERVOSO SIMPÁTICO E PARASSIMPÁTICO EM TRABALHADORES DE DIFERENTES TURNOS ATRAVÉS DO BIOEXPRESS

O objetivo principal desta pesquisa consistiu na análise do SNA antes e após o trabalho de funcionários em diferentes turnos, verificando os níveis de estresse. A amostra foi composta por 27 funcionários divididos em três turnos do setor de produção de uma empresa, do sexo masculino com idades entre 25 e 45 escolhidos aleatoriamente. A análise foi realizada através do programa Bioexpress que identifica, a partir de dados da eletrofisiologia cardíaca, os níveis ideais do sistema nervoso simpático e parassimpático que compõem o sistema nervoso autônomo. Aplicada a Escala de Sonolência de Epworth como coadjuvante diagnóstico. Os resultados observados foram que o nível do SNS se apresentou mais elevado no primeiro exame em todos os funcionários revelando um maior nível de estresse antes do trabalho. Já o SNPS se apresentou mais elevado no segundo exame em todos os funcionários revelando um SNA mais equilibrado após o trabalho (homeostase). Porém, o aumento da atividade simpática no pré- trabalho pode ser considerada leve traduzindo o estado de eustresse (stress bom ou fisiológico). A Escala de Sonolência mostrou que a maioria dos funcionários possui boa qualidade do sono ou estão no limite aceitável. Diante destes resultados foi percebido que o ambiente de trabalho não provocou um aumento do estresse e que o sono não foi o principal causador do aumento da atividade do SNS no pré- trabalho concluindo que o trabalho leva a uma alteração nos níveis do SNS e SNPS, porém nem sempre esta alteração é para pior.

Palavras-chave: Bioexpress, Nerve Express, sistema nervoso autônomo, estresse, qualidade de vida.