



Evaluation of the Burnout Syndrome of Workers of Industrial Processes and Its Operative Yielding in an Electronic Industry of Tijuana, Baja California, Mexico

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Abstract - In this investigation was made an analysis of the presence of the Burnout Syndrome (BS) in workers of manufacturing activities of an electronic industry installed in the Tijuana city, where was presented an increase of persons that make its functions in the industrial processes of this industrial company evaluated, to the medical visits, both inside of the industrial company evaluated, where this scientific study was made, and outside with medical visits to public health institutions in the city of Tijuana. This was, due to work exhaustion, generating poor work performance and thus the generation of errors and defective products, and actions of rework, originating economic expenses not contemplated and therefore economic losses. To improve this situation was made active breaks with periods of 10 minutes with motivational pop music, two times a day, by each four hours in periods of work activities of 12 hours, by four days a week. This action reduced the visits to medical places of the industrial company evaluated, and with this were increased the productivity and quality levels and improved the health of workers of the manufacturing areas. This investigation was made in 2023.

Keywords: Burnout Syndrome, electronic industry, manufacturing areas, active breaks.

1. INTRODUCTION

The operational performance of the personnel of any work area (administrative or manufacturing) of industrial companies, such as those located in the city of Tijuana in the northwest of Mexico, is of great relevance to obtain high levels of productivity and quality of manufactured products. To achieve this objective, it is necessary to have the appropriate personnel for each industrial operation and with the ability to work under stress (Fernandes et al, 2017). Only sometimes, some health symptoms may occur, such as Burnout Syndrome, which can generate actions that can counteract the operational performance of industry personnel, sometimes causing errors in their functions, defects and, therefore, products defective. This causes the rework action to be generated, reducing the productivity and quality indices of the operational personnel of any work area of the industries, especially the one located in the Tijuana city, where this investigation was made. In figure 1, is illustrated the main factors of influence of the presence of the Burnout Syndrome (La Torre et al, 2018).

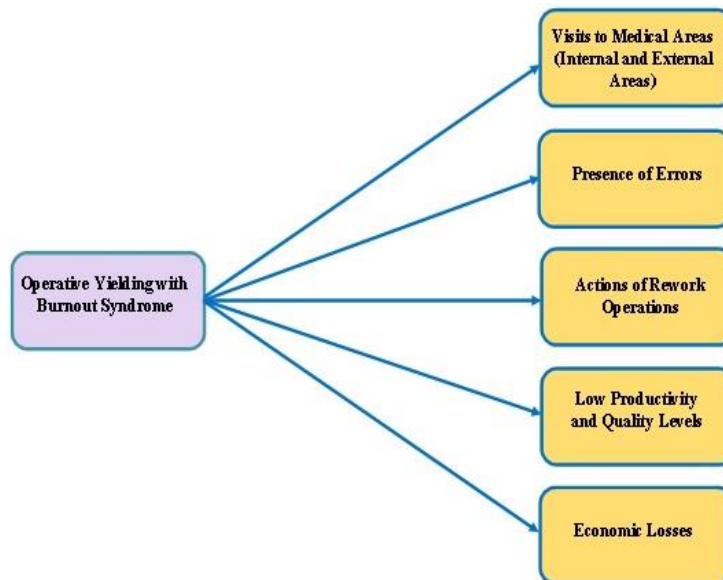


Fig -1: Main factors occurred in the operative yielding with the presence of Burnout Syndrome

Source: Analysis of the information

Figure 1 shows the principal aspects that can occur in the operative yielding with the presence in the operative personal of manufacturing areas of the Burnout Syndrome, where was observed that the presence of errors and defective manufactured products, with low productive and quality levels (Dike et al, 2021).

1.1 Electronics Industry in Tijuana

Is an important type of industry at the worldwide, being installed around 400 of this type of industries (AIMT, 2023), generating great quantity of employments, where are specialized and general persons to the diverse industrial operations, and fabricating different electronic products, which are utilized frequently by persons every day, and being principal products cell phones, computer systems, electro domestic with high technology and tablets. In tablet 1 is showed the principal products manufactured in the electronics industry, where was made this scientific study (Wu et al, 2018).

Table -1: Type of electronic products manufactured in the Tijuana city

Characteristics of Functionability	Cost	Durability	Functionability	Necessity
Types of Products				
Cell phones	Low-Medium-High	Low-Medium	Low-Medium	High
Computer systems	Low-Medium-High	Low-Medium	Low-Medium-High	High
Tablets	Medium-High	Low-Medium	Low-Medium-High	High
TV	Medium-High	Low-Medium	Low-Medium	High

Table 1 illustrates the main characteristics of the principal electronic products manufactured in the electronics industry, where was showed the dimension as low, medium and high levels in the four characteristics evaluated. In this evaluation was observed that in the analysis of cost was presented in two products (cell phones and computer systems), the three type of levels (low, medium and high), as same in functionability, but in computer systems and tablets, and with two indices (low and medium) in the durability factor and only with one level as high in the necessity.

1.2 Burnout Syndrome

The Burnout Syndrome, which is also called Professional Burnout Syndrome, occurs constantly in industrial activities, where personnel in both administrative areas and manufacturing areas (Aranda et al, 2015). This type of syndrome can occur very frequently, in any type of personnel in industrial companies of any type of product manufactured or developed, who have high degrees of responsibilities for their functions. This syndrome could cause headaches, fatigue, drowsiness, high blood pressure and anxiety, as the main health symptoms, generating wear and tear in people and reducing their operational performance, and with it the presence of errors, defective products and mainly levels low productivity and quality (Marcelo et al, 2022). This research carries out an analysis in the manufacturing areas of an electronic industrial company installed in the city of Tijuana, where rates of around 60% of visits to the medical area of the industry were presented, where the scientific study and visits were carried out. to the health clinics external to the industrial company, where the research was made, and is located in various areas of this important and industrial city in the northwest of the Mexican Republic. In figure 2, is showed the main characteristics of workers of the manufacturing areas, which changed its behavior and influenced in the productivity and quality of the electronics industry evaluated (Yu et al, 2015; Bartholomew et al, 2018).

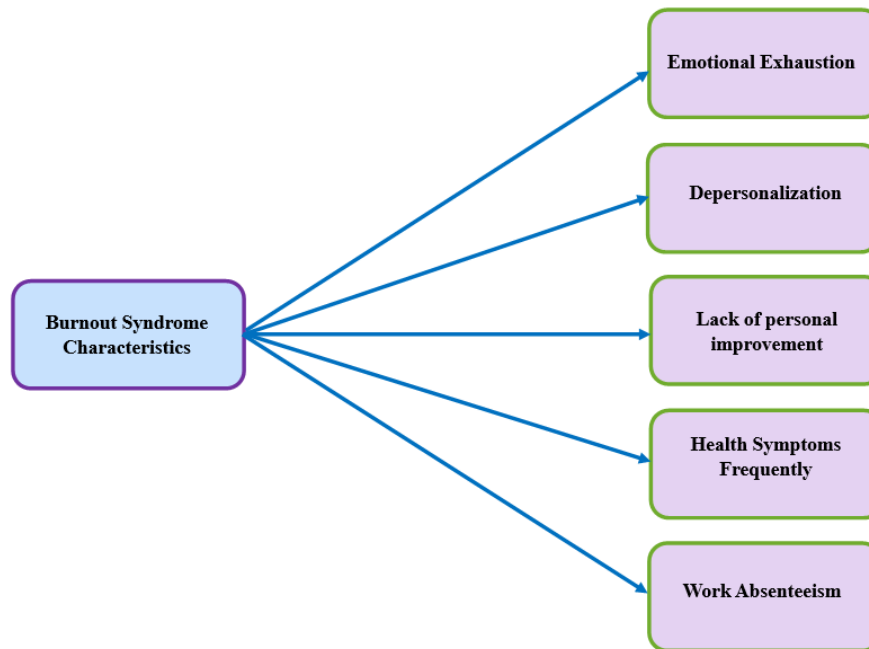


Fig -2:Principal characteristics of the Burnout Syndrome

Source:Analysis of the information

Figure 2 shows main characteristics of the presence of the Burnout Syndrome (Borrello et al, 2022), with the five principal aspects of the behavior of operative personnel of the manufacturing areas of the electronics industry, where was made this scientific study. The presence of these characteristics influenced in the operative yielding of the workers of this area and in the productive and quality yielding (Porto, 2020).

2. MANUFACTURING OPERATIONS

These actions are relevant in the fabrication of industrial products of any type of industry in any place of the world, which are diverse that depends of the type of industrial product manufactured. In table 2 is illustrated the main relation of the manufacturing properties and the types of process flow in the electronics industry, where was made the investigation (Houtman et al, 2018).

Table -2: Type of industrial processes in the manufacturing areas of the electronics industry evaluated (2023)

Principal Aspects	Productivity	Quality	Reliability	Velocity
Types of Industrial Processes				
Lineal	High	Low-Medium	Low-Medium	High
U-line	High	Low-Medium	Medium	Medium-High
T-line	Medium	High	Medium	Low-Medium
G-line	Medium	High	High	Low-Medium

Table 2 presents the principal aspects of the relation of the industrial operations and the type of flow process, illustrating the levels (low, medium and high) of each relation between each characteristic, observing that the lineal and U-line are flow process with high productivity and velocity, but low or medium in the quality and reliability aspects, being important in the quality indices in the final products manufactured and satisfaction of customers. In change, when was used the T-line and G-line, the quality of the products fabricated in this electronics industry evaluated, was increased, being important in the final products manufactured.

3. METHODOLOGY

This investigation was made to determine if the presence of the Burnout Syndrome was relevant in the operative yielding of the workers of the manufacturing areas of the electronics industry where was made this scientific study. To determine this relation was made two activities, which are exposed now:

- a) Analysis of the operative yielding and correlated with the presence of the Burnout Syndrome in the workers of the manufacturing areas of this industrial company evaluated.
- b) Evaluation of the productivity and quality of the products manufactured in the electronics industry where was made this investigation.

4. RESULTS

This scientific study was relevant to determine the correlation of the parameters involved as is presented in the next sections.

4.1 Correlation analysis of operative yielding of workers and production factors

A comparative evaluation of operative yielding of two manufacturing areas with the same quantity of workers (25 in each area), same quantity of industrial machines (10 in each area) and same quantity of fabricated products (1000/shift of 8 hours/day in each area). This part of the investigation was made to evaluate the application of active breaks in one manufacturing area and not was applied active breaks in other manufacturing area.

Table -3:Evaluation of operative yielding of workers in the electronics industry evaluated (2023)

Production Factors	Operative Yielding		Production Factors	Operative Yielding	
Months	Area 1, WOAB, %	Area 2, WAB, %	Months	Area 1, WOAB, %	Area 2, WAB
1	57	79	7	60	80
2	58	82	8	59	83
3	62	80	9	57	80
4	60	81	10	55	82
5	56	79	11	59	80
6	58	80	12	60	81

WOAB. Without Active Breaks, WAB. With Active Breaks

Table 3 illustrates the operative yielding of workers of two manufacturing areas, elaborating a comparative analysis, where was applied in one of a manufacturing area, observing that in the manufacturing area where was applied the active breaks, was improved the operative yielding. This was relevant, because supports to improve the productivity and quality indices of the fabricated products in this electronics industry evaluated. The use of active breaks, supported to reduce the labor stress and the Burnout Syndrome and workers were little more relaxed in their work activities and realized his functions with great passion.

5. EVALUATION OF OPERATIVE YIELDING WITH ACTIVE BREAKS

This part of the scientific study, was made to determine the efficiency of the necessity of apply the active breaks in any type of industrial process and industrial company, where was observed in this investigation that was increased the operative yielding and was reflected in the increase of productivity and quality indices. This was important to reduce the labor stress and the symptoms of the Burnout Syndrome, being expressed in figure 3, and showing that in the begging if this scientific study, the operative yielding was low around 54%, and conforms advanced this investigation, in the medium of the 2023 year was increased about of 86%.

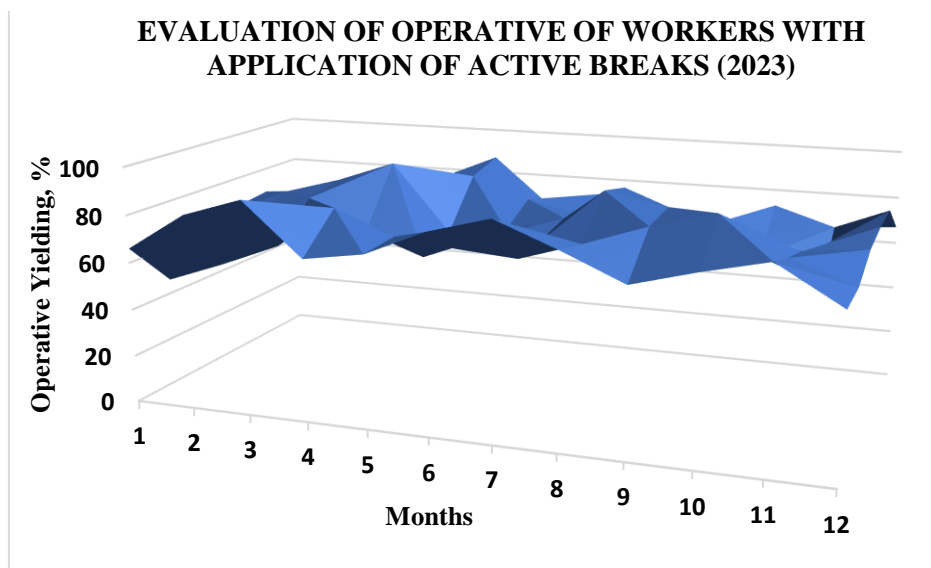


Fig -3: Analysis of operative yielding of workers of manufacturing areas with application of active breaks

6. CONCLUSIONS

This investigation is very important in all type of labor activities as commercial and industrial operations, where was in were, sometimes, and in some manufacturing areas, very hard activities. The application of active breaks supported to reduce the labor stress and was observed that the workers of the industrial processes were with less labor stress and his functions were made with great passion and operative yielding. This type of scientific study is very important because supports to avoid the tired very quickly, and the presence of health symptoms, which reduce his operative yielding and avoid the presence of errors and for this reason the defective products manufactured in this industrial company evaluated.



REFERENCES

- [1] Aranda C., Pando M., Salazar J. (2015). "Síndrome de Burnout en trabajadores de diversas actividades económicas en México", *Rev. Iberoam. Psicol. Cienc. Tec.*,8, 23-28.
- [2] AIMT–Asociación de la Industria de Tijuana (2023). "
- [3] Bartholomew A., Houk A., Pulcrano M., Shara N., Kwagyan J., Jackson P., Sosin M. (2018). "Meta-analysis of surgeon burnout syndrome and specialty differences", *Journal of surgical education*, 75(5), 1256-1263.
- [4] Borrelli I., Santoro P., Fiorilli C., Angelini G., Buonomo I., Benevene P., Moscato U. (2022). "A new tool to evaluate burnout: the Italian version of the BAT for Italian healthcare workers", *BMC Public Health*, 22(1), 1-7.
- [5] Dike I., Onyishi C., Adimora D., Ugodulunwa C., Adama G., Ugwu G., Iremeka F. (2021). "Yoga complemented cognitive behavioral therapy on job burnout among teachers of children with autism spectrum disorders", *Medicine*, 100(22).
- [6] Fernandes L, Nitsche M., De Godoy I. (2017). "Síndrome de burnout em profissionais de enfermagem de uma unidade de terapia intensiva Burnout syndrome in nursing professionals from an intensive care unit. *Revista de Pesquisa Cuidado é Fundamental Online*, 9(2), 551-557.
- [7] Houtman I., Jettinghoff K., Cedillo L (2018). "Sensibilizando Sobre el Estrés Laboral en los Países en Desarrollo, un Riesgo Moderno en un Ambiente Tradicional de Trabajo", pp. 35-46.
- [8] La Torre G., Sestili, C., Mannocci A., Sinopoli A., De Paolis M., De Francesco S., Rapaccini L., Barone M., Iodice V., Lojodice B. (2018). "Association between Work Related Stress and Health Related Quality of Life: The Impact of Socio-Demographic Variables", A Cross-Sectional Study in a Region of Central Italy. *Int. J. Environ. Res. Public Health*, 2018, 15, 159.
- [9] Marcelo M., Farah F., Bustamante-Teixeira M., Ribeiro L. (2022). "Prevalência da síndrome de Burnout em enfermeiros de um hospital público", *Revista Enfermagem UERJ*, 30(1), 66860.
- [10] Porto C. (2020). "Semiología Médica. (8ª Ed.). Editora Guanabara Koogan.
- [11] Wu X., Li Y., Yao Y., Luo X., He X., Yin W. (2018) "Development of Construction Workers Job Stress Scale to Study and the Relationship between Job Stress and Safety Behavior: An Empirical Study in Beijing", *Int. J. Environ. Res. Public Health*, 15, 2409.
- [12] Yang T., Shen, Y., Zhu M., Liu Y., Deng J., Chen Q., See L. (2016). "Effects of Co-Worker and Supervisor Support on Job Stress and Presenteeism in an Aging Workforce: A Structural Equation Modelling Approach, *Int. J. Environ. Res. Public Health*, 13, 72.
- [13] Yu X., Wang P., Zhai X., Dai H., Yang Q. (2015) "The Effect of Job Stress on Job Burnout Among Teachers: The Mediating Role of Self-efficacy", *Soc. Indic. Res*, 122, 701-708.