Quality of Life and psychophysiological burden of ceramic production workers from the far South of Santa Catarina

Qualidade de Vida e carga psicofisiológica de trabalhadores da produção cerâmica do Extremo Sul Catarinense

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ABSTRACT In the Southern region of the state of Santa Catarina are concentrated the largest ceramic companies in the Country. The objective of the study was to diagnose the psychophysiological burden and the Quality of Life of these workers. This is a cross-sectional study with 189 production workers. It was used NASA-TLX and WHOQOL-brefs. The total cognitive load was high for the vast majority. The Quality of Life proved to be regular for 60.8%. The environmental domain proved to be the most unfavorable. By knowing the work constraints, the stimulus for the implementation of health promotion actions and prevention of grievances, with the worker as an actor in his life and work condition, becomes more tangible.

KEYWORDS Quality of Life. Occupational health. Workload. Ceramics.

RESUMO *Na região Sul do estado de Santa Catarina concentram-se as maiores empresas de cerâmica do País. O objetivo do estudo foi diagnosticar a carga psicofisiológica e a Qualidade de Vida desses trabalhadores. Trata-se de um estudo transversal com 189 trabalhadores da produção. Utilizou-se o NASA-TLX e o WHOQOL-bref. A carga cognitiva total foi alta para a grande maioria. A Qualidade de Vida mostrou-se regular para 60,8%. O domínio meio ambiente mostrou-se o mais desfavorável. Ao conhecer as condicionantes de trabalho, o estímulo para a implementação de ações de promoção da saúde e prevenção de agravos, tendo o trabalhador como ator de sua condição de vida e trabalho, torna-se mais palpável.*

PALAVRAS-CHAVE *Qualidade de Vida. Saúde do trabalhador. Carga de trabalho. Cerâmica.*

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Introduction

Brazil is one of the world's largest ceramic coating centers, being considered the fourth largest producer in the world, accounting for about 8% of production (SESI, 2009).

According to the National Association of Ceramic Tile Manufacturers Coating (Anfacer), the sector in the Country is constituted by 93 companies, with the largest concentration of them in the Southeast and South regions, showing growth in the Northeast of Brazil. Because it is a large capital movement, it is considered a huge generator of jobs, with around 25 thousand direct workers and 200 thousand indirect workers (ANFACER, 2017).

The largest ceramic companies in the Country are located in the southern region of Santa Catarina state (SC). Most of these coatings companies are in the city of Criciúma (SC), considered the most modern in Latin America (COSTA *ET AL.*, 2013; FERRARI, 2000).

The precarious and unhealthy conditions, sometimes present in work environments, can expose workers to the most different occupational risks, depending on the function, the sector of activity and the weather conditions. These risks are: physical, chemical, of accident or mechanical and ergonomic risks (SESI, 2009).

Exposures to the determinants of work may confer a psychophysiological burden to a greater or lesser extent that needs to be understood, as well as the impacts on the lives of workers (LONGEN; PEREIRA; MATTIA JUNIOR, 2016).

The workload can be understood as internal or external to the body of the worker. External workloads involve the demands of the workplace in terms of physical, toxicological, biological, and accident. The internal loads involve the physiological ones linked to the physical efforts to perform the tasks and psychic ones involving tension, stress, imposed rhythm, collection by production, permanent attention in the work activity (ROCHA *ET AL.*, 2015).

Most of the publications with workers in the production of ceramic coatings have focused attention on the lung condition of these individuals, involving the chemical risk (MEHRPARVAR *ET AL.*, 2013; SALICIO *ET AL.*, 2013). Regarding the empowerment and direction of the inspection segments, the regulation of the sector and the health care in the region, it is obvious a lack of information based on extended studies that deal with Quality of Life (QL) and the psychophysiological condition of potters.

Actors in the field of the health of the worker aim to act in the search for positive changes in work processes. In this sense, investigations about these working populations can help the region to adopt effective actions, such as health promotion and disease prevention (LACAZ, 2010). Hence, this study aimed to diagnose the psychophysiological burden and the QL of workers in ceramic production.

Material and methods

This is a cross-sectional, exploratory and observational study, with workers from the ceramic production of the Santa Catarina coal region, using quantitative methods based on two validated tools and a complementary questionnaire. The study was carried out in two ceramic industries of the Criciúma coal region.

The target public of this study was made up of workers who work directly in the operational area of the companies. In general, workers perform tasks related to the production process of ceramic coatings. The number of workers in the production sectors of the two industries is 370. After the minimum sample size was approximated, with a sample calculation considering a 5% error and a 95% confidence level, a result of 189 workers was obtained. The formula proposed by Medronho (2004) was used, where P refers to the proportion that maximizes

the sample size (0.50); zα, the value of z tabulated for α = 0.05, defined as 1.96; 'p – P', the maximum sampling error used, 5%; and n0, the first approximation of the minimum sample size (SANTOS, 2017), which resulted in 189 workers.

The procedures necessary for the referral and approval of the study to the Research Ethics Committee (REC) were adopted, including the authorizations to carry out contact with the workers. The study was initiated after approval by the REC of the University of Extremo Sul Catarinense, under the number 1.158.482, based on Resolution nº 466/12 of the National Health Council. The subjects of the research were invited to participate in the research, authorizing its accomplishment by means of a Free and Informed Consent Form.

To evaluate the psychophysiological burden, a subjective analysis was chosen, that is, the subjects answered a questionnaire considering evaluation criteria and personal perception. One of the methods for subjectively measuring the psychophysiological work burden is the adapted instrument of the NASA-TLX, originally, created to evaluate the mental workload (CARDOSO; GONTIJO, 2012).

However, studies adapted by Diniz and Guimarães (2004) propose that this instrument does not only measure the mental burden, but the workload in general, since it considers several factors that cause work impact, including the physical burden. Emphasis is given to information about how people formulate opinions about workload and how they express their subjective assessments through continuous scales (LUXIMON; GOONETILLEKE, 2001).

The adapted version results in a general workload score perceived by workers based on the measurement of six subscales, where three of them refer to aspects imposed by the subjects (mental, physical and temporal), and the other three refer to the interaction between subject and task (effort, frustration and accomplishment), in the choice of fifteen possible combinations of pairs. Initially, workers chose which factors affect the workload most by comparing the components to their peers. Then, the worker was asked to demonstrate the intensity of each factor on a continuous scale of 15 centimeters (cm), where it says 'little' (corresponding to the zero number of the scale) and its opposite, 'very' (corresponding to the number fifteen of the scale), marking the intensity of each of the factors, according to how they perceive the influence of such factors on their work. The scores range from 0 to 15, with values above 7.5 corresponding to the high workload, while values below 7.5 show a low workload (HART; STAVELAND, 1988).

To carry out the evaluation of the QL, it was used the questionnaire World Health Organization Quality of Life (WHOQOL-bref) adapted (FLECK *ET AL.*, 1999). To evaluate the psychophysiological burden, it was used the questionnaire National Aeronautics and Space Administration/Task Load (NASA-TLX) adapted (DINIZ; GUIMARÃES, 2004), and a supplementary questionnaire of information about the worker.

The WHOQOL-bref questionnaire was created by the QL Group of the WHO to provide a brief, short-term instrument in its application, maintaining satisfactory psychometric characteristics in relation to the original (WHO, 1998). The abbreviated version is composed of four domains: physical, psychological, social relations and environment. The questionnaire was applied only once, after the subjects were recruited, and followed their specific instructions.

The WHOQOL can be used both for healthy populations and for populations afflicted by chronic grievances and diseases and has a cross-cultural character, valuing the individual perception of the person, which allows to evaluate QL in several groups and situations (FLECK *ET AL.*, 1999).

Data analysis

The QL and the psychophysiological burden represented the dependent variables, and the age and the maximum service time involved the independent variables.

The data obtained in the evaluations were duly tabulated, analyzed and evaluated by the statistical program SPSS 17.0 for Windows. The questions that obtained $p < 0.05$ were considered as statistically significant.

To evaluate the correlation between the measurement of the NASA-TLX psychophysiological burden and the WHOQOL-bref QL questionnaire, initially, it was observed whether the variables had a normal distribution through the analysis of simple graphs generated by the software. After observing the non-normality, the Spearman correlation coefficient was chosen, which consists of a measure of the degree of association or dependence between two variables. It is a nonparametric alternative. As a criterion for classification of the correlation, it was considered: $r_S(0.00 - 0.19)$: very weak correlation; $r_S(0.20 - 0.39)$: weak correlation; $r_S(0.40 - 0.59)$: moderate correlation.

Results and discussion

The functions of the production sectors of the ceramics involved in the study, such as other companies in the field, include: enameling auxiliaries, industrial mechanics, atomizer operators, pressing auxiliaries, industrial operators, mass preparation operators, maintenance supervisors, operators of paint preparation, modeling auxiliaries, production supervisors, suppliers, enameling leaders, loader operators, quality inspectors, inspectors, sorting operators, electricians, operators of choice, mass station operators, process/polishing auxiliaries, furnace regulators.

Additional data were collected, such as age and basic anthropometric characteristics of workers. These data showed that the age of the workers of the study ranged from 23 to 57 years old, with a mean concentration of 40.57.

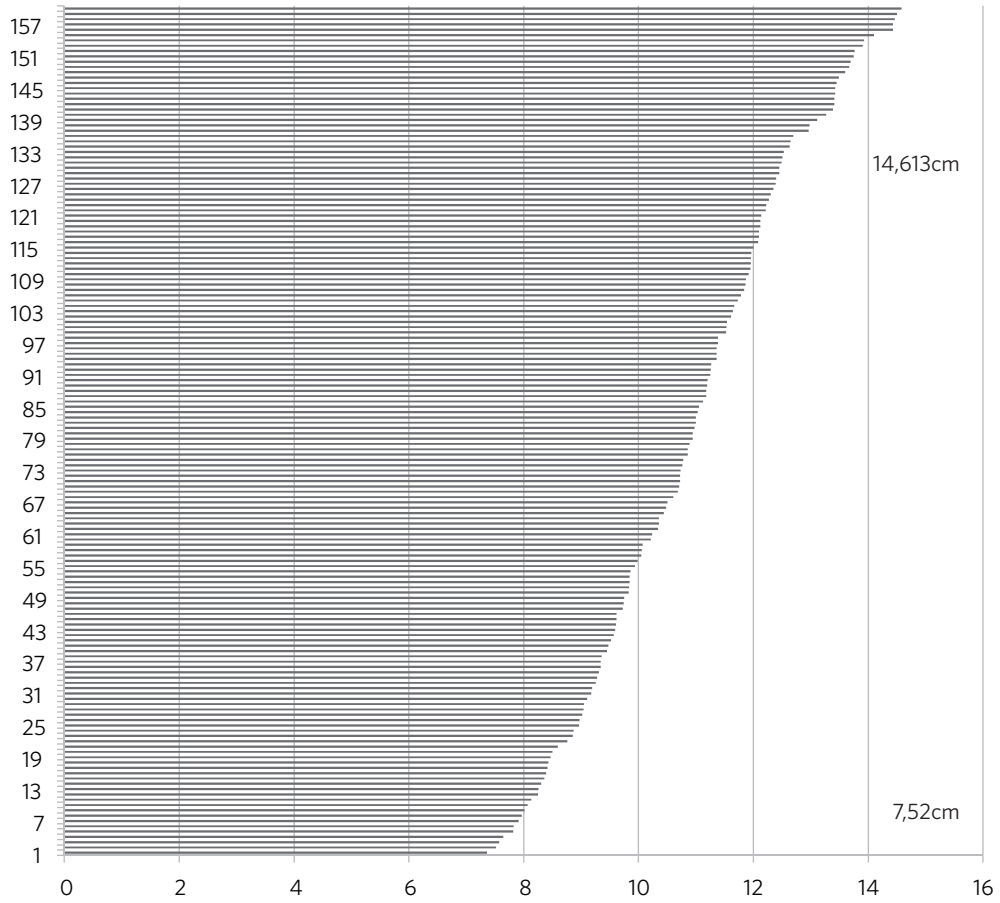
Regarding weight, the minimum variation was 56 kilos, and the maximum of 106, with a mean of 80.94 kilograms. And, on the question of height, the average remained at 1.74 m, with a minimum of 1.57 and a maximum of 1.89.

Information regarding the level of training indicated that all workers in the study have, at least, completed elementary school, ranging up to postgraduate, with the great majority concentrated among those who have completed high school.

In addition, the service time in the company was explored, presenting the minimum variation of 1 year, established as minimum criterion of time of service for inclusion, up to 35 years, with an average of 12.49.

The psychophysiological burden of the ceramic production workers was analyzed by the sum of the demands: mental, physical, temporal, performance, physical and mental effort and level of frustration of the NASA-TLX, which presented the total cognitive load in the workers perception, with scores ranging from zero (0) to fifteen (15). The data indicated 29 workers with values below 7.5 cm, with a low workload, and 160 with values above 7.5 cm, characterizing a high workload (*graph 1*).

Graph 1. Distribution of workers regarding the psychophysiological burden with findings above 7.5 cm (NASA-TLX) (Criciúma, 2016)



Note: Total cognitive load of workers in ceramic production, representing the other 160 workers who presented values above 7.5.

The QL of the workers of the ceramic production denoted that, for 60.8%, it is regular; to 38.6%, is good; and to 0.5%, is bad. None of the employees had reported very good QL. Among the domains, the environment was the most unfavorable, and, for 72.4%, it was regular; to 5.3%, bad; and 23.3% consider it good. The domain that presented the most favorable was the one of social relations, being that, for 72.5%, this dimension was good; to 14.3%, was regular; and to 1.6%, was bad *(table 1)*.

Table 1. Quality of Life of workers in ceramic production (Criciúma, 2016)

	Physical	Psychological	Social relations	Environment	General
Bad	1,1	0,5	1,6	5,3	0,5
Regular	35,4	42,3	14,3	72,4	60,8
Good	60,8	56,1	72,5	23,3	38,6
Very good	2,6	1,1	11,6	0,0	0,0

Note: Results are represented with number of workers and in parentheses in percentage (%). The last column represents the general values including all dimensions of the instrument.

A correlation between the measures of psychophysiological burden measurement, through NASA-TLX, and the domains of QL, of the WHOQOL-bref was carried out. It is observed that domain 1 (physical domain) had a moderate and statistically significant correlation in relation to the findings of the measurement of the workers' NASA-TLX (rs=0,480;p=0,000). Domain 2 (psychological) had a weak and statistically significant correlation (rs=0,233;p=0,000). Domain 3 (social relations) did not show statistical correlation (rs=0,119;p>0,05). Domain 4 (environment) had a weak and statistically significant correlation (rs=0,179;p=0,000). It is observed that the domain that most influenced the psychophysiological overload for these workers was the physical domain, followed by the psychological domain and the environment *(table 2)*.

Table 2. Correlation between NASA and Whoqol-bref (Criciúma, 2016)

	r_s	p
Domain 1	0,480*	0,00
Domain 2	0,233†	0,00
Domain 3	0,119	0,11
Domain 4	0,179‡	0,00
Quality of Life	0,039	0,60

* Moderate Correlation, † Weak Correlation; ‡ Very Weak Correlation.

The general index and the domains of the WHOQOL-bref are two important aspects that should be analyzed regarding the variable QL. According to the first aspect, it is observed that 60.8% of the sample pointed to the general index of the evaluation of the QL as 'regular'. Regarding social relations, it was verified that most workers in ceramic production remained with 'good (72.5%)' QL. However, the environmental domain was 'regular (72.4%)' in the workers' perception, and the dimension was the most unfavorable.

Work activities in the ceramic industries require a healthy environment and satisfactory physical conditions. Workers and organizations are influenced by environmental awareness, the challenges of local and global markets and the

flexibilization of work relations. In this global and technological scenario, there is a need to act more effectively in improving working conditions, re-evaluating organizational practices and processes, work environment and relationship patterns (SCHIRRMEISTER; LIMONGI-FRANÇA, 2012).

In a study carried out with workers from the ceramics industries located in the municipality of Várzea Grande (MT), it was found that workers categorized as production operators, servants and suppliers were those with the highest occupational risks. It is emphasized that workers are exposed to dust and smoke during the work day, which obliges the company and its employees to correctly use the Personal Protective Equipment (PPE) to minimize possible damages found in this work environment. It is observed that in recent years there has been a significant increase in the number of complaints and symptoms related to precarious work conditions, which has intensified the process of illness affecting the working class (PRAZERES; NAVARRO, 2011).

This result may be related to the need to share the sufferings, the anguishes, the disappointments, the failures with the work colleagues, which reinforces and expands the ties and the affective bonds with the companions, thus promoting the strengthening of the interpersonal relationships. It is not enough to do the work well, there must be good communication. Communicating well is knowing how to listen and perceive the other, but, first of all, perceiving yourself. The most unfavorable domain of WHOQOL-bref in this study was the environment, with 72.4% of workers considering it as regular. In this sense, a study showed that even in a little favorable working environment, in the perception of 61% of ceramic workers, they were resilient, since most of them presented good QL, good work capacity and evidenced to be satisfied with their health status (DUARTE, 2015).

In a work involving 30 workers from the production of ceramics industry in the city of São Carlos do Ivaí (PR), it was possible to identify that the factor that caused the most discomfort to the workers involved the noise in the environment (MARREGA; ARAÚJO, 2014).

It seems relevant to deepen the notion of what a working environment is. For this, initially, it is necessary to define environment, which is a rather difficult task, considering it is an open legal concept. However, as provided for in item I of article 3rd of Law nº 6.938/81, the environment is the set of conditions, influences and interactions of a physical, chemical and biological nature, which allows, shelters and governs 'life' in all their forms (SANTOS; FERREIRA, 2014).

In the physical and psychological domains, the findings were similar, with the highest percentages between 'good and regular'. In a study carried out in Croatia, with other professional categories, it was found that the physical domain was perceived as being higher, perceived before pain, by the need for medical treatment, by the perception of energy to perform daily activities and satisfaction with the sleep in relation to the capacity to perform the work (MILOSEVIC *ET AL.*, 2011).

Satisfaction with what one does is one of the determinants of Quality of Life at Work (QLW). The main factors that influence satisfaction with work are related to the management characteristics of the companies, the type of work, the groups and the people. Satisfaction is a concept that is difficult to understand due to its discretion, because it conceives the experiences and perceptions of the collaborator, with aspects of his/her individual life that interfere in the working conditions and repercussions on his/her functional life (FIGUEIREDO, 2012). This shows that satisfaction is closer to the individual's affective attachment to work. Besides QL and QLW, there are studies that relate satisfaction as an important health indicator (CALDAS *ET AL.*, 2013).

The NASA-TLX method subjectively analyzes the mental load, considering other

burdens exerted in the development of the task that intervene in each component. Most of the potters obtained scores above 7.5, characterizing a high level of requirement for the work in the production sector.

A study carried out with dockers from the Southern region of Brazil indicated that 58.8% were submitted to high workloads, identified by the scores attributed by the workers to efforts that were higher than 70 on the scale of zero to one hundred (VAZ *ET AL.* 2016). This contributes to the notion that knowledge about the determinants of work can help in the elaboration of joint strategies between workers and the management of work, to increase the well-being in the accomplishment of their functions, qualifying the working conditions (SANTOS; FERREIRA, 2014).

It was possible to have a better understanding that the workload is part of the mental and physiological effort resulting from the work execution and its reactions, so it is defined in this study as a psychophysiological work burden. That is, this burden verifies global and systemic changes according to the workload to which the individual is exposed, with strong relationships with the disease health process (CARDOSO AND GONTIJO, 2012).

Data analysis showed a correlation between the variables psychophysiological burden and QL. The physical domain was the one that prevailed with a moderate and statistically significant correlation, followed by the psychological and environmental domain, which indicated a weak and statistically significant correlation. The social relations domain showed no statistical correlation between the two questionnaires.

The work environment has a very broad definition, comprising not only machines and equipments used to transform materials, but, also, every situation in which the relationship between man and his work occurs. This covers not only the physical environment, but also the organizational aspect of how the work is programmed and controlled to maintain the health of its employees and, consequently, to produce the desired results. Thus, the real analysis of the work situation, the understanding and comprehension of the complaints of the workers, contextualizing them in their work environment is important (BATIZ; NUNES; LICEA, 2013).

By relating the physical and psychological demands on the pottery work, both have demonstrated that the health risks are the most diverse. The main symptoms presented are: deformities in the fingers of the hands by manual loading of bricks; varicose veins due to prolonged standing in the erect position; respiratory diseases caused by inhalation and direct exposure to the smoke emitted in the burning process and by the inhalation of dust from the clay; eye irritation caused by direct exposure to smoke; spinal diseases due to manual loading of bricks and wood; physical discomfort; muscle fatigue; cramps; stress; exhaustion and dehydration from direct exposure to furnace heat; hearing loss due to exposure to the noise emitted by the machinery; dermatoses by direct contact with the various materials handled; and prolonged exposure to the sun (GOMES, 2010).

Faced with the facts, the issue of health and safety at work has become a matter of major concern for some decades, but the discussion on progress and preventive action is much more recent.

In this way, it is believed that QL is a complex goal that encompasses a permanent search for self-improvement and continuous overcoming. It concerns exactly the way in which the individual interacts in society, as it influences the environment in which he/she lives and is influenced by him/her (SILVA *ET AL.*, 2016).

The QL involves good working conditions, which encompass besides the physical environment, the organizational aspects that preserve the forms of relationship between the actors involved in the work. The collaborator should be valued through any position he/she holds (LIMONGI-FRANÇA, 2012).

It is noticed that, through investments in programs related to the QL of the worker, the institution has the possibility of constructing a more humanized environment, aiming to perceive the individual and collective needs, that allow the development of specific skills and competences of the worker, considering factors such as health, moral, physical and psychological integrity and the impact of work on social life (SILVA *ET AL.*, 2016).

Health and work are integrated and concern the lives of all, presenting themselves in an inseparable way in daily life and work routines. It is difficult to determine when the work ends and personal life begins, since health belongs to life and goes beyond the profession/occupation/work (BRASIL, 2015).

To act in health promotion in the work of the production's potters, it is essential to place resistance, to review old practices and to redesign the performance with a view that working conditions are not always favorable to health. It should be promoted the awareness of managers and workers to seek options that provide better working conditions, changes in habits and care with the health condition that make possible an increase in the QL and capacity for work. The biggest heritage of a company is certainly its working mass. The greatest asset of the salaried worker is his/her full capacity to work.

As prospective actions for health promotion and prevention of injuries to workers in the category:

It seems relevant to create and maintain the spaces of dialogue in companies in which and through which the inclusion of differences and tolerance can be strengthened, promoting the modification of the forms of management for a communicative action that promotes the construction of co-responsible pacts;

Special attention to the forms of organization should be provided, aiming at the promotion of a rational and global critical vision of the organizational processes, within the preventive perspective in health that minimizes the reasons related to the suffering and the mental illness;

It is observed that the environment domain is associated to the dissatisfaction with the economic difficulties experienced in relation to self-realization, being the main purpose for survival. It is advisable that companies establish policies and promote actions that allow better accessibility to public transportation, meals, gratuities, opportunities to acquire new skills, especially at a time when the worker is fragile, providing security and protection;

The work environment in ceramics must be the object of constant attention, aiming at the exploitation of all possible measures of forms of collective protection and, when necessary, of individual protection;

The development of Ergonomic Work Analysis (AET), which explores, in addition to the current legislation, the environmental, physical, biomechanical and organizational aspects of the workplace, has the potential to implement important improvements in the conditions of work;

The discussion and analysis of the internal actors of the companies responsible for health and safety, such as the Specialized Work Safety and Medicine Service (SESMT) and the Internal Commission for the Prevention of Accidents (Cipa), as surveys and their results, as parameterization, aiming at adopting measures of occupational health care, it is recommended.

The communication with the Unified Health System (SUS), through the basic attention of the municipalities, as well as the specialized service, such as the Regional Reference Center for Occupational Health (Cerest), among other representations, must be a constant and have an anticipatory,

preventive and cultural character and empowerment of the subjects in the integral care of their health. This is to the detriment of the punitive model in which contact with public health agencies is restricted to, for example, monitoring, remedial and less constructive potential;

It is incumbent upon the public sectors to be attentive to living and health conditions, including the work of these populations, using indicators for their actions, as well as promoting and stimulating research on the working and health conditions of workers, providing feedback on significant public policies in this field about the collective health.

Conclusions

The analysis of psychophysiological burden surpasses the technological interface involved, considering the influence of social factors in its constitution. A number of factors contribute to the current configuration of a picture of greater psychophysiological overload, such as: physical insecurity, lack of sense of protection and care with the health condition, the working environment with contaminants and air pollutants, the noise, temperature, climate, pain and discomfort, fatigue, stress, dependence on medications, negative feelings about life and work. Add to this the current social security crisis and the fear of unemployment, against the high indices observed in the Country.

Through the study, identification and prior evaluation that involves the health of the workers, there is a probability of implementing in the company educational actions, health promotion programs and prevention of diseases related to QL, and reduction of the psychophysiological burden at work, prioritizing the worker's health logic as a field of collective health, with the worker as an actor and author of his/her condition of life, work and health.

Collaborators

TEODORO, Daniela Leandro and LONGEN, Willians Cassiano participated in the conception of the project, the design of the research, the data collection, analysis and interpretation of the results, writing and critical review of the intellectual content of the manuscript and approval of the final version. ■

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