https://doi.org/10.4322/rae.v13e201821.en

Revista Ação Ergonômica - v. 13 n. 1 (2018)

ASSOCIAÇÃO BRASILEIRA DE ERGONOMIA
Revista Ação Ergonômica
www.abergo.org.br

Assessment and identification of micropauses intertwined in the work Process in an upholstery furniture industry

Cláudia Rafaela Basso
Letícia da Silva Santos
Graciela Maria Scholles
Jacinta Sidegum Renner

SUMMARY

This article addresses the flexibility of breaks during the work process in the cutting sector, in a furniture industry used to manufacture upholstery in Rio Grande do Sul, and the implications for the health and well-being of workers. This is characterized as a descriptive observational study with data analysis under the qualitative paradigm. The analysis tools consisted of observing the activity and carrying out a chronoanalysis of six activities carried out in the cut, tabulating the analysis time in each activity, the number of micropauses present and the total and average time of the micropauses. The results obtained through chronoanalysis indicate the presence of micropause times that vary from one minute and thirteen seconds to thirteen minutes and fifty seconds in an average evaluation time period of three hours. The presence of spontaneous breaks during the process reduces stiffness and allows the worker the physiological benefits of a manageable work pace.

INTRODUCTION

This study was carried out in a furniture industry where an ergonomics management process has been in place for approximately ten years. In management, specific demands are addressed, which generally arise from the presentation and discussion of the results of ergonomic analyzes in “ergo teams” (teams represented by production workers and support sectors) and other actions that contemplate the presence of participatory ergonomics.

Within the company's organization, two breaks are currently formalized during the working day, one occurring in the morning shift and the other in the afternoon shift. Scheduled breaks occur halfway through the workday. It is understood that breaks have a qualitative aspect and that, for a better measurement of these, it is necessary to understand the specificities of work activities and the presence of micropauses (porosities) in the processes that occur during the workday. According to Ferreira apud Lacaze (2005), microbreaks are programmed or can even occur spontaneously within a work activity and their function is to prevent the installation or continuation of disorders due to cumulative traumas that occur in the work environment. Therefore, they have a positive impact on the onset or progression of muscle fatigue processes, which can be defined as “any reduction in the ability to exert force in a voluntary effort” (EDWARDS, 1981).

According to Peres (2003), the purpose of rest breaks is to provide opportunities for the operator to recover so that they can maintain their productivity through the recovery of their physiological condition. And in this context, the company's production engineering sector identified the need to highlight and measure the micro-pauses that exist during the operational cycle of the activities of the cutting subsector within the sewing sector. The objective of this study was to identify and quantify the micro-pauses that exist in the cycle of these activities, since their importance within the production process is understood. These porosities in the process give the worker the possibility of maintaining a more flexible work rhythm and avoiding the onset of muscle fatigue.

THEORETICAL REFERENCE

The transformations in the world capitalist system, according to Schaff (1993) and Coutinho et al. (1995), result from technological revolutions in various spheres, and their effects can be observed in the organization of companies, labor relations and production methods.

In the Fordist system, the division of labor and the fragmentation of tasks were enhanced, in an attempt to reduce idle time, meaning that workers were more easily exposed to the cadence of the machines and the automatic rhythm. In the Toyotism model, the presence of production cells, the rotation of operations and versatility are presented as a means of guaranteeing the continuity and rhythm of production. In these contexts, forms of control, especially over workers' time, are modified. These changes further emphasize time as a relevant factor that will reflect on the pace of production and consequently on the need for breaks at work (MERLO and MENDES, 2009). It is not only expected to seek to reduce workers' idle time in production, resulting from the Fordist production model. Furthermore, we want maximum use of the time available to

workers, so that they are prepared to be the versatile worker that the Toyota model requires.

Therefore, it is necessary, in addition to considering production standards, operating methods and other factors arising from the organization of work, and understanding how the pace of work occurs in production. The work rhythm can be free or imposed by a machine. Considered free when the individual has the autonomy to determine their own cadence, which refers to the speed of movements that are repeated in a given unit of time. And the imposed rhythm, when the rhythm is set by a machine, by the assembly line conveyor and even through production incentives. The pace of work is a determining factor in understanding overload, whether musculoskeletal or even psychological, and consequently in the inclusion of rest breaks during the journey. There is a clear presence of imposed rhythms (assembly line) or even rhythms manageable by the worker himself during his journey, even with the presence of daily production targets. A free rhythm is not always beneficial for the worker's health, as the fact that it is influenced by the type of remuneration, for example, can lead the worker to

fatigue due to self-acceleration. Therefore, the pace of work must be considered and the existence of breaks to recover from fatigue discussed as a way of protecting worker health (NR17 APPLICATION MANUAL, 2014).

Regulatory Standard 17 itself, in item 17.6.3, recommends the inclusion of rest breaks, as a form of protection in activities that require static or dynamic muscular overload of the neck, shoulders, back and upper and lower limbs, and based on ergonomic analysis of work. Generally, in productive sectors, attempts are made to implement a system of prescribed breaks, however, their duration must be evaluated very carefully, as each task has its own particularities and it is very difficult to adopt a general formula that is convenient for everyone. .

According to Másculo and Vidal (2011), a break is a period of inactivity interspersed with periods of activity. The concern of ergonomics is to qualify the type of break in terms of its nature and its opportunity in the work process. Corroborating with the authors when they mention the qualitative aspect of breaks, it is understood that for the best dimensioning of breaks it is also necessary to know the process micro-pauses that occur during the workday. As there are scheduled breaks, which are those structured and programmed by the company; spontaneous breaks that, regardless of the company's wishes, occur naturally because the worker feels the need to take them and breaks during process pores (non-operational time) due to waiting for some input, material, for the next batch of product.

Grandjean apud Peres (2003) state that the work break is an indispensable physiological condition in the interest of maintaining production capacity, according to the author “the rest break is not only a vital need for the body, but also, mainly for mental work, where the dexterity of the fingers and the demands on the sense organs are important”. Works bring the theme of the effects of breaks in work environments. Peres (2003) reports on workers' satisfaction with the system of breaks in teleservice/telemarketing work. Salam and Mejia (2011) report the importance of taking breaks at data entry stations, helping to prevent injuries resulting from three mechanisms: resulting from static muscular effort, high repetitiveness and promoting lubrication of the tendons by synovial fluid.

According to Kroemer and Grandjean (2005), many investigations into the effect of rest

on productivity have been reported in the literature, and in general, the results agree that the introduction of organized rest breaks generally ends up speeding up work to compensate for the time lost during prescribed breaks. However, it is understood that, according to the NR 17 Application Manual (2014), the work rhythm managed by the worker throughout the day, whilst maintaining a daily production quota, classified as a free rhythm, is generally more tolerated by the worker, as it allows incidents to be overcome without reducing production.

MATERIALS AND METHOD

According to the procedures referenced by Prodanov and Freitas (2013), this research is applied in nature and is characterized as descriptive observation. You

Authors characterize applied research as that which aims to generate practical knowledge to solve specific problems. Descriptive observational research is those that aim to collect data, expose the characteristics of a situation and identify the factors that cause it without, however, interfering in it (PRODANOV; FREITAS, 2013).

This research is a case study which, according to Yin (2001, p. 32), "is an empirical investigation that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between the phenomenon and context are not clearly defined." Data analysis and interpretation was carried out under the quantitative paradigm. Creswell (2010) states that quantitative research gives a numerical description of attitudes, opinions and tendencies of a sample, with these data being used to make a generalization about the population.

As a data collection instrument, the study of times and methods was used, using the chronoanalysis and timing tool, enabling the quantification of micropauses. Chronoanalysis has its origins in the study of times and methods, and based on this tool, tabulated parameters are defined in various ways that, coherently, culminate in industrial rationalization. Timing is the technique of obtaining process times that, in a more complete analysis, will become chronoanalysis itself (FELIPPE et al, 2012). Timing, according to Toledo (2004) brings several definitions translated from the A.S.M.E. standardization. (American Society of Mechanical Engineers), of which the following stand out: cycle, element, normal rhythm, rhythm evaluation, normal time, standard time and supplements or tolerances.

In this study, chronoanalysis was used to identify the presence of micropauses within the work cycle and quantify them during an expected time of observation and timing of the activity. Different from the objective for which the time and movement studies were structured, in this research the Engineering sector of the company in question aimed to understand the existence of microbreaks, together with the ergonomics management process as a physiological "gain" for the worker. .

In this way, a chronoanalysis of all activities in the cutting sector was carried out, namely: infesting the fabric, cutting and separating leather, cutting striped fabric, reforming, cutting with a CNC cutting machine and preparation for sewing. Each activity was observed and the number of micropauses present during the analysis time was quantified and the average time of micropauses in an eight-hour day was predicted based on the data collected.

ACTIONS AND RESULTS

In this specific study, it can be inferred from the chronoanalysis that there are several

micropauses during the journey of the cutting subsector. These breaks are both spontaneous and conditioned by work. From the analysis of the activities, it was evident that the micropauses that occur most frequently are:

- Wait for the colleague who is registering the material in the system or who went to collect material from the warehouse, before starting the operation;
- Wait for the machine's processing time;
- Request information from the process preparer.

According to the authors Kroemer and Grandjean (2005), spontaneous microbreaks are the obvious breaks that workers take on their own initiative, to interrupt the work flow for rest. They are usually not long, but they can be frequent. In fact, taking several short breaks has more of a recovery effect than a few long breaks. Work-conditioned micropauses are all interruptions that arise in the operation of the machine or in the organization of work, for example, waiting for the machine to complete the operation phase.

During the evaluation carried out by chronoanalysis, the activities of festooning the fabric, cutting and separating leather, cutting striped fabric, reforming, cutting with a CNC cutting machine and preparing for sewing were evaluated, considering the working day of 8 hours and 8 minutes . It should be noted that in the study carried out by chronoanalysis, although the analysis time for each operation was restricted to an average of 3 hours, this reality is reproduced throughout the entire journey. Table 1 illustrates the analysis time for each activity, the number of micropauses found in the analyzed period, the total and average time of micropauses.

Activity	**Analysis Time**	**Number of micropauses in the analyzed period**	**Total time of micropause (minutes)**	
Infest the fabric	2 hours and 40 minutes	5 micropauses	23 minutes	4 minutes e 36 Segunds
Cut and separate leather	3 hours	4 micropauses	12,1 minutes	3 minutes e 1 Segund
Cut fabric striped	3 hours	6 micropauses	13,2 minutes	2 minutes e 12 Segunds
Make reform	3 hours	3 micropauses	5,4 minutes	1 minute e 12 Segunds
Cut with a cutting machine CNC cutting	3 hours e 20 minutes	6 micropauses	83 minutes	13 minutes e 50 segunds
Preparation for sewing	3 hours	4 micropauses	17,1 minutes	4 minutes e 16 segunds

Table 1: micropauses in cutting work activities.

When observing the results of the activity carried out with the CNC machine (table 1), it is possible to infer that the activities of the cutting subsector are permeated by micropauses that vary from one minute and thirteen seconds to thirteen minutes and fifty seconds. In this case, the worker needs to wait for the machine to process. It is also observed that these microbreaks occur at least once every hour and are repeated systematically throughout the working day. Kroemer and Grandjean (2005) present studies where it was shown that breaks of three to five minutes every hour reduce workers' fatigue and improve concentration.

The microbreaks evidenced throughout the analysis are related to the flexibility of the

process and the pace of work, which is free, as it can be managed by the worker throughout a day, whilst maintaining a daily production quota (goal). According to the NR 17 Application Manual (2014), the free pace is more tolerated by the worker, as it allows incidents to be avoided without reducing production.

Muscle fatigue, according to Másculo and Vidal (2011), is the effect of continuous work that causes a reversible reduction in the body's capacity and a qualitative degradation of this work and, according to Renner (2007) the muscles tend to fatigue from the second for the third hour maintaining the same posture.

Thus, it can be said that the activities carried out in the cutting subsector are dynamic, diversified, with the presence of displacements and micro-breaks, which are beneficial aspects from the perspective of ergonomics. Iida (2005) corroborates this when he says that when performing dynamic activities, such as walking, blood circulation is activated and the muscles receive more oxygen, increasing their resistance to muscular fatigue. In this way, the characteristics of the activities and the presence of microbreaks are crucial to avoid the onset of muscle fatigue, avoiding drops in workers' performance throughout the day.

As stated in the NR 17 Application Manual (2014), the legislation refers to work with electronic data entry regarding quantified pauses. Generally, in productive sectors, attempts are made to implement the same break system, however, this has to be evaluated very carefully, as each task has its own particularities. Kroemer and Grandjean (2005) state that a prudent recommendation regarding the length of prescribed breaks is ten to fifteen minutes in both the morning and afternoon, in addition to an extended break in the middle of the journey. It is understood that it is very difficult to adopt a general formula that is convenient for everyone regarding the duration of breaks, but taking into account the results of the analysis of the activities of the cutting subsector, it is inferred that the evaluation of microbreaks is of utmost importance. It is also important to define the duration of prescribed breaks.

FINAL CONSIDERATIONS

It can be inferred from this study that in the company in question, the presence of microbreaks had not been measured, evaluated and formally recognized. Assessing the presence of microbreaks in the production context is extremely important, as it helps managers to recognize whether the time is sized according to the needs for recovery from fatigue. Furthermore, this company has programmed breaks that occur during each work shift. These can be scaled in line with the breaks naturally involved in processing.

The presence of micropauses that were evidenced throughout the analysis is related to the flexibility of the process and the pace of work, which is free, as it can be managed by the worker throughout a day, whilst maintaining a daily production quota (goal). , bypassing incidents without reducing production, in addition to reducing congestion and allowing workers the physiological benefits of a manageable work pace. Therefore, it can be said that the prevention of fatigue in the work activities evaluated results from the various micro-breaks during the workday and the scheduled breaks in the morning and afternoon.

BIBLIOGRAPHIC REFERENCES

BRASIL. Ministério do Trabalho e Emprego. **Manual de aplicação da Norma Regulamentadora** nº 17. 2 ed. Brasília: MTE, SIT, 2014.

COUTINHO, L.; CASSIOLATO, J. E.; SILVA, A. L. G. **Telecomunicações, globalização e competitividade**. Campinas, SP: Papirus, 1995.

CRESWELL, J. W. **Projeto de pesquisa: métodos qualitativo, quantitativo e misto.** 3ª ed. Porto Alegre, RS: Artmed, 2010.

EDWARDS, R.H.T. **Human muscle function and fatigue**. Londres. Edic. Whelan, 1981.

FELIPPE, A. D.; CUSTODIO, M. R.; DOLZAN, N.; TEIXEIRA, E. S. M.. **Análise descritiva do estudo de tempos e métodos: uma aplicação no setor de embaladeira de uma indústria têxtil**. IX SEGeT Simpósio de excelência em gestão e tecnologia. Rio de Janeiro, 2012.

IIDA, I. **Ergonomia – Projeto e Produção**. 2. ed. São Paulo: Blucher, 2005.

KROEMER, K, H, E; GRANDJEAN, E. **Manual De Ergonomia, Adaptando o Trabalho ao Homem**. 5. ed, Bookmann, 2005.

LACAZE, Denise Helena de Castro. **Efeitos de um programa de exercícios no desconforto músculo esquelético dos segmentos corporais de operadores de telemarketing**. São Paulo, Universidade de São Paulo, 2005. Tese apresentada à Faculdade de Medicina para obtenção do título de Mestre em Ciências.

MÁSCULO, F. S.; VIDAL, M. C. (orgs). **Ergonomia: Trabalho Adequado e Eficiente**. Rio de Janeiro: Elsevier/ABREPO, 2011.

MERLO, A. R. C.; MENDES, A. M. B. P**erspectives of psychodynamics of work use in Brazil: theory, method, and practice**. Cadernos de Psicologia Social do Trabalho. v.12. n.2. São Paulo; dez. 2009.

PERES, CLAUDIO CEZAR. **Satisfação com o sistema de pausas no trabalho teleatendimento/telemarketing.** Porto Alegre, RS, UFRGS, 2003. Artigo para Mestrado em Engenharia.

PRODANOV, C. C.; FREITAS, E. C. **Metodologia do trabalho científico: métodos e técnicas da pesquisa e do trabalho acadêmico**. 2. ed. Novo Hamburgo, RS: Feevale, 2013.

RENNER, Jacinta S. **Projetação de um novo sistema de concepção do trabalho no setor calçadista sob a ótica do sistema sócio técnico**. Porto Alegre, RS, UFRGS, 2007. Tese de Doutorado em Engenharia de Produção.

SALAM, Leandro Gonçalves; MEJIA, Dayana Priscila Maia. **A importância das pausas em postos com entrada de dados.** Goiânia, 2011. Artigo Pós-Graduação em Ergonomia – Faculdade Ávila.

SCHAFF, A. **A sociedade informática**. São Paulo, Unesp-Brasiliense, 1993.

TOLEDO, I. F. B. **Cronoanálise**. São Paulo, 8. ed. Assessoria Escola Editora, 2004.

YIN, R. K. **Estudo de caso: planejamento e métodos**. 2. ed. Porto Alegre: Bookman, 2001.