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Job rotation as a legal requirement: analysis of the participatory approach in acceptance and workers' perception at a meatpacking plant

Rodízio de postos de trabalho como exigência legal: análise da abordagem participativa na aceitação e percepção de trabalhadores em frigorífico

Iracimara de Anchieta Messias[1], Adelaide Nascimento[2], Raoni Rocha[3]

[1] Universidade Estadual Paulista "Júlio de Mesquita Filho" – UNESP, Faculdade de Ciências e Tecnologia, Núcleo de Estudos e Pesquisas em Ergonomia – NEPErg, Presidente Prudente, SP, Brasil. E-mail: iracimara.messias@unesp.br

[2] Conservatoire National des Arts et Métiers – CNAM, Paris, France. E-mail: adelaide.nascimento@lecnam.net

[3] Universidade Federal de Ouro Preto, Departamento de Engenharia de Produção, Administração e Economia, Ouro Preto, MG, Brasil. E-mail: raoni@ufop.edu.br

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Abstract: This article presents an experience of a participative approach prior to the implementation of NR-36, which regulates work in meat and meat byproduct companies. Although the regulations provide for worker participation in the processes of implementing job rotation, they do not explain how to do it. This study was developed in 2017 in the livestock slaughtering sector of a company with 79 workers, using two complementary methods: systematic and analytical observation of the real work (totaling 32 hours of observation) in order to select the jobs that were primarily eligible for rotation, together with a survey of the workers' perception of the level of acceptance of rotation in the selected jobs. At first, 72% of the workers refused to accept the rotation. After inclusion and participation in the implementation process, 86% of the workers in the dirty area and 64% in the clean area agreed to the rotation. The advantages of rotation that most stood out included: the variability in work (30%), learning and gaining experience (40%), changes in movements (35%), and physical rest (32%). By contrast, the disadvantages included: the fear of accidents (30%) and the fear of change and of the unknown (25%). It can therefore be concluded that the participatory approach prior to changes in organizational design contributes to the understanding and perception of workers about the advantages and disadvantages of the rotation process, indicating improvements that comply with legal requirements.

Keywords: Participation; Job rotation; Slaughterhouse; Labor standard; Worker's health.

Resumo: Este artigo apresenta experiência de abordagem participativa preliminar à implantação da NR-36, que regula o trabalho em empresas produtoras de carne e derivados. Apesar da normativa prever a participação do trabalhador nos processos de implantação de rodízio de postos, não esclarece como fazê-lo. O estudo foi desenvolvido em 2017, no setor de abate de bovinos com 79 trabalhadores, utilizando dois métodos complementares: observações sistemáticas e analíticas do trabalho real (totalizando 32 horas), para seleção dos postos elegíveis ao rodízio, e

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levantamento da percepção dos trabalhadores sobre o nível de aceitação de realização do rodízio nos postos selecionados. A princípio, 72% dos trabalhadores não aceitavam realizar o rodízio. Após a participação no processo de implantação, 86% dos trabalhadores da área suja e 64% da área limpa concordaram em realizar. Dentre as vantagens em realizar rodízio, a variabilidade no trabalho (30%), aprendizado e ganho de experiência (40%), mudanças de movimentos (35%) e descanso físico (32%) se destacam. Como desvantagens, sobressaem o medo de acidentes (30%) e o medo da mudança e do desconhecido (25%). Concluímos que a abordagem participativa contribui para a compreensão e percepção dos trabalhadores sobre as vantagens e desvantagens do rodízio, indicando melhoria dos processos no cumprimento das exigências legais.

Palavras-chave: Participação; Rotação; Frigorífico; Legislação trabalhista; Saúde do trabalhador.

1 Introduction

Assembly line work corresponds to an organization in which the worker must work at a rhythm determined by machines. It is also defined by the repetitive work on a product in constant movement (Molinié & Volkoff, 1981). This kind of labor organization involves several demands of a psychosocial and biomechanical nature (repetition of movements, intense rhythm, concentration of strength to be applied, uncomfortable positions, and insufficient micro-breaks), which may increase the risk of work-related musculoskeletal diseases (WRMD) (Falardeau & Vézina, 2004; Sormunen et al., 2006; Sundstrup et al., 2013; Vogel et al., 2013). Job rotation usually appears in this context as one of the solutions for reducing the risks of WRMDs. In the meatpacking sector in Brazil, job rotation has become a legal demand since the ratification of Regulatory Norm 36 (NR-36) - Work Safety and Health in the Processing and Packaging of Meats and Byproducts (Brasil, 2013), published on April 19, 2013. This norm was created based on inspection reports conducted by Labor Fiscal Auditors, on scientific progress, and in response to labor union complaints and political pressure, among other factors (Oliveira & Mendes, 2014). NR-36 lists 15 main items ranging from workplace furniture and job positions, to information and training in health and work safety, and establishes minimum requirements to evaluate, control, and monitor the risks (biological, physical, chemical, risk of accidents, ergonomic risks) in the activity (Brasil, 2013). Those risks cause problems for the workers' health, since the production progress in slaughterhouses/meatpacking plants is organized in such a way that the probability of health grievances is quite high (Marra et al., 2013).

Therefore, one of the principles of NR-36 is to reduce exposure to risks "by the alternation of tasks between work that has a rhythm defined by machines, conveyors, and wheels, and other tasks in which the worker can define the work rhythm" (NR-36, 3.14.7.11) (Brasil, 2013).

According to Ouellet & Vézina (2003), job rotation is a frequent practice in the meatpacking sector, since it is usually perceived as a way to increase workers' multipurposeness and to reduce WRMDs. The study by Falardeau & Vézina (2004), for instance, demonstrates that both supervisors and workers are in favor of job rotation in a pork meat packing plant. An ergonomic intervention, carried out by Barth & Guimarães (2008), indicated that workers at a poultry plant reported less pain and discomfort after the implementation of job rotation. On the other hand, some studies demonstrate that the effects achieved with job rotation are usually below the expected results, and that job rotation alone is not the solution for WRMD (Coutarel et al., 2003; Chatigny et al., 2003; Neiva & Silva, 2012; Padula et al., 2017). In reality, the conditions

in which job rotation is implemented are determining factors for its success or failure (Falardeau & Vézina, 2004).

Although the publication of NR-36 was an important regulatory milestone for the meat packing industry in Brazil, we observed that, without participative analysis and the knowledge of the real determining factors of the job, the norm may be no more than a simple *regulatory* element (Vilela et al., 2012).

A recent bibliographic review (Burgess-Limerick, 2018) highlights the efficiency of a participatory approach in the context of WRMD prevention, confirming findings related to the meatpacking sector in Brazil (Vilela et al., 2012). Nascimento & Messias (2018), in an empirical survey using focus groups and collective confrontation techniques, identified dimensions to be considered in the design of job rotation at beef meatpacking plants. Beyond the collective work, such dimensions cover the competences, the work rhythm, and the contradictory prescribing sources.

Considering the context hereby defined, the aim of the present study is to present an understanding regarding the acceptance and perception of the workers in terms of the barriers (or barriers) and in terms of the facilitating elements in job rotation as defined by NR-36. This study used two complementary methods: systematic observations and real work analysis for selecting the jobs which are a priority for rotation, as well as the gathering of information, using a semi-structured questionnaire aimed at investigating the augmented perception of the workers regarding the advantages and disadvantages of job rotation, and its level of acceptance, in both general and specific terms. Therefore, the present study can be included in the perspective of a participative approach prior to the design of job rotation in meatpacking plants, based on the activity's ergonomics. In general, participative approaches are evident in ergonomic interventions (Wilson, 1995); however, there is no definition of a standard practice through which it should occur, since that depends on the context and on the objectives of each intervention (Van Eerd et al., 2010). The challenge is to show the importance of that activity, and its understanding by the workers, in order to perceive it, not only through a structural prism (as the organizers perceive), but also from the myriad of multiple interactions among the different workers within the organization. We believe that a preliminary approach to the implementation of job rotation is essential to improve working conditions and reduce the WRMD.

2 Methodology

2.1 Context and population

The facility examined in this study is a family business that has been operating for 20 years and uses the facilities of another meatpacking plant that previously existed in the location. Adjustments were done to comply to international norms, not only in terms of physical structure, but also in terms of addressing several requirements of the meatpacking process, since the objective has been, from the beginning, to exclusively meet the demands of the export market; in other words, it refers to production for exporting.

There are around 500 people working at the company, including 70% in the production sector and 30% in the administrative sector. The operational and production area is divided into 13 sectors, with the slaughtering sector being the objective of this study. This is the sector in which the work cycle begins, with the

slaughtering of cattle. In this sector, the workers are considered experienced, since they perform activities which demand specific competence and abilities. In other operational sectors, there is considerable rotation, and the workers do not need previous knowledge to perform the activities.

The cattle slaughtering sector has 104 workers, 91% of whom are male, aged 40 to 54 years. There are five tasks to perform: skinning (removal of the leather), cutter (responsible for the cutting and reduction of big parts), trimmer (responsible for cleaning up leftovers and remains from the parts), production assistant (general tasks which do not involve using a knife), and saw operator (responsible for cutting large parts with a pneumatic saw. The work happens in a single eight-hour daily shift, which may be increased by overtime when there is an increase in demand. Production begins with the arrival of the livestock. The cattle must remain in confinement on a hydric diet for at least one day, according to regulations, before the beginning of the slaughtering procedures. The sector is divided into two work areas: (i) “dirty area”, which begins in the corral with the preparations for slaughtering, the slaughtering itself and the complete removal of the leather and (ii) “clean area”, where the skinned cattle goes through the sawing of the carcasses, removal of the heads, entrails, washing, weighting, labeling, and stamping of the parts, and then sent to the refrigerated chamber for storage and later transportation.

2.2 Material and methodology

The proposal developed in the initial project of job rotation presented in this article is related to techniques of actual work observation, and to semi-structured interviews, using an instrument adapted from Ouellet & Vézina (2003).

After a preliminary stage of free observation, another stage of systematic observations was conducted in eight job positions, which are considered as high risk for the development of WRMDs due to the repetitive aspects of the movements and the use of machinery, such as pneumatic saws, as well as by the work on platforms and the presence of psychosocial risk factors (Nascimento & Messias, 2018). The selected dirty area jobs were the following: *exsanguination* (the aorta artery of the cows is cut and the blood is removed; *labeling and transfer* (where the carcass receives an identification and is moved to where the cuts will be performed); *dehiding* (the leather is mechanically removed); *cutting open* (the carcasses are cut open, using a pneumatic saw). The jobs selected from the clean area were: *carcass splitting* (in half, by a pneumatic saw), *pelvic cleaning* (evisceration of the pelvic region); *stomach cleaning* (evisceration of the animal’s abdomen); and *stamping* (where the carcasses are registered and stamped, authenticating the sanitary conditions and characteristics such as weight and origin).

These jobs were submitted to an analysis using, during the individual interviews, an instrument aimed at collecting data on the acceptance and perception of the workers regarding the advantages and disadvantages of the rotation. In that stage, all of the workers from the slaughtering sector were invited to participate, and 80 of 104 agreed. Of those, one worker was fired by the company, and 79 workers remained in the study, corresponding to a 76% participation. In a two-month period, 30-minute interviews were conducted with each worker, in an individual and voluntary format, before the beginning of a work shift.

The instrument (questionnaire) was divided into two parts; The first contains open-ended and closed-ended questions covering: (i) the identification of the workers; (ii) the length of employment in the position and the identification of the working area (dirty or

clean); (iii) if the worker was currently in a rotation system; (iv) if the worker has ever worked in a rotation system; (v) if the worker agrees or disagrees whether rotation is a good solution for preventing musculoskeletal trauma, informing the reasons; (vi) if the worker is willing to work in rotation and why. In the open-ended questions, the workers were able to indicate the reasons for accepting job rotation or not, expressing their perception regarding the advantages and disadvantages of the practice, and indicating the facilitating and barriers for the implementation of job rotation.

After the application of the first part of the instrument, all of the workers were called, in small groups (up to 8 workers in each) for meetings with the researchers before the beginning of the work shift, when the workers were informed about the purpose of the study and signed the terms of consent agreeing to participate. In those meetings, we presented the sequence of the study and explained every stage in detail. The workers were also informed about their active participation during the entire process of the implementation of job rotation. That was the condition for participating in the study, agreed upon by the managers, and complying with the prerogatives of NR-36 (item 36.14.7.2) (Brasil, 2013). For a better understanding of the research process, the researchers used data from other participative studies and from the legislation regarding the implementation of changes in operational processes, which were presented to the workers, considering the importance of their active participation in each stage of the process. Actions of planning and mobilization of the management actions also took place, enabling the creation of conditions for the participation of workers and researchers in small group meetings. Such factors, associated with the collective discussions after the comprehension of each stage of the study (detailed understanding of each stage of the process; guaranteed participation in decisions; collective exchanges and transfer of tacit knowledge amongst peers for the implementation of job rotation; among others) led to a change in perspective for the acceptance (or not) of the rotation system by the workers. Due to the discussions that originated in those meetings, we could notice a change in the way the workers expressed their acceptance or not of job rotation. Question (iv) from the previous stage, about workers' willingness or not to participate in the rotation, was once again applied, now with the second part of the instrument. That part of the study, with interviews and meetings in small groups and the application of the second part of the instrument, took place over the course of two months.

The second part of the instrument, represented by Table 1, consists of four positions previously chosen from each of the areas (dirty and clean), considering eight variables and the subdivisions of the columns. On the first column to the left, four jobs selected from each area are presented, as mentioned earlier. After the workers answered whether or not they had worked in the referred job, they answered if they would do it, explaining the reasons for accepting the job or not, based on different variables. Lastly, the participants were informed, by answering open-ended questions, which job(s) they agreed to participate in the job rotation, explaining their choices; and which job(s) they would never accept job rotation, also explaining their answers.

Based on observations of current work, four jobs were identified in which the rotation was already happening, although not in a formal manner. Data was collected related to the workers' perception and used the Actograph software (ActoGraf, 2016) to systematize the analysis of the activity.

This study was approved by the Human Research Ethics Committee from FCT/UNESP, CAAE number 24268713.0.0000.5402, according to resolution number 196/1996 from the National Health Council.

Table 1. Part of the questionnaire developed [based on the instrument by Ouellet & Vézina (2003)] to understand the acceptance of job rotation previously selected in the clean and dirty areas, and reasons for accepting those jobs or not.

			REASONS													
JOBS			**Force applied**		**Pace**		**Posture**		**Learning Process**		**Pressure/ Psychological stress**		**Possibility of time management**		**Relationship with coworkers**	
	Would do	**Would not do**	**Weak**	**Strong**	**Slow**	**Fast**	**Comfortable**	**Uncomfortable**	**Easy**	**Difficult**	**Weak**	**Strong**	**High**	**Low**	**Good**	**Bad**
CLEAN AREA																
Splitting carcass																
Cleaning up pelvic region/filet mignon																
Evisceration																
Stamping																
DIRTY AREA																
Cutting open																
Hyde removal																
Tagging and transfer																
Bleeding																

3 Results

3.1 Low initial acceptance of job rotation

Concerning the acceptance of job rotation, 28% of the workers interviewed initially stated that they were willing to accept it. Of those, 30% claimed that it would be a good solution to reduce the risks in the workplace, 30% claimed that they would learn new activities and 20% believed that it would provide relief for repetitive physical efforts. The remaining workers (72%) were against the rotation, and mentioned as the most frequent reasons, insecurity in performing activities without the specific abilities to do so, and insecurity regarding having or not adequate training to perform these activities (35%); part of the workers also mentioned concerns with more frequent exposure to accidents (30%).

As explained in item 2.2, it was observed that, after being informed of the stages of the study, and that they would have guaranteed participation during the entire process of implementation, 86% of the workers from the dirty area and 64% from the clean area changed their minds and were willing to accept job rotation, considering that the practice would be a good solution to prevent health hazards. Several factors contributed to this change: the thorough sharing, with the workers, of information on the stages of the process through which the rotation would be implemented, as well as the fact that their concerns would be considered and they would actually be included in collective discussions during stages 1 and 2 of the interviews. The workers also mentioned the perception that management would ensure that they would have time and space to be heard in individual and collective interviews. Moreover, the knowledge that the regulations propose legitimizes the workers' inclusion in the organizational project and the monitoring of its results.

3.2 Advantages and disadvantages of job rotation from the workers' point of view

Table 2 shows the advantages and disadvantages in doing job rotation, which were more often mentioned by the workers.

Table 2. List of advantages and disadvantages of job rotation, more often mentioned by the workers - from the clean and dirty areas - who were interviewed (Adapted questionnaire (Ouellet & Vézina, 2003).

DIRTY AREA (n=42)	
Advantages of rotation	**Disadvantages of rotation**
Work variability (30%)	**Fear of accidents (30%)**
"Because you already know what to do' "You do not need to make things difficult" "I would not be alone" "Changes places" "Because it does not stop the work"	"It is dangerous to have inexperienced people" "You have to have the right profile to do what I do"
Moving up in the job (28%)	**Fear of the unknown (25%)**
"You learn a different job" "Because you learn different jobs" "You learn different things and it is good for the work"	"It changes the way you work, it is bad" 'It is bad to do a different thing each day" "I am used to being in my place"
Relief from physical effort (22%)	**Feels insecure (18%)**
"It helps me rest" "My job is hard" "It is very tiring here"	"It depends on the place you go to" "Depends on the work, one job is easy and the other, more difficult"
Relief from repetitive movements (20%)	
"It is like therapy, the work is very repetitive" "You change the kind of movement"	
CLEAN AREA (n=37)	
Advantages of rotation	**Disadvantages of rotation**
Learning and gaining experience (40%)	**Insecurity (12%)**
"I gain experience and improve my work" "I get to know everything that is going on" "You do not stand still in one place" "You learn another task" "You learn another job"	"Because you do not have a right place" "I think that if I go to another place, it is worse, because the movements are worse"
Change of movements (35%)	**Difficulty of the Job (10%)**
"Because you do not keep doing repetitive stuff' "There is change in the movements" "The work does not get repetitive" "You exercise different parts of the body"	"Difficult, very difficult to do another job" "Very tiring and heavy"
Physical rest (32%)	
"It rests the body" "Reduces tiredness from work" "Relief for the pains" "What I do is rushed and tiring, changing would be good to rest"	

The percentages for each of the categories in this table refer to the group of workers which verbally expressed elements in this category.

It can be seen, for instance, that "good relationship with coworkers" and "possibility of time management" are among the criteria used to fill the jobs. Meanwhile, the "amount of strength required", "fast cadence", and "psychological pressure" are among the main reasons for not wanting to work in the jobs. Thus, positions such as "Cutting open" and "Splitting carcass" were the most rejected positions, with half of the workers claiming that they would not accept these jobs.

3.3 Acceptance of job rotation according to different jobs

In relation to jobs, eight positions were selected during the analysis stage (four in the dirty area and four in the clean area) mentioned by the workers as jobs that have a

high risk of accidents and to develop WRMDs. The jobs require specific abilities related to the work to be performed in each. Table 3 presents the approximate percentages and frequencies of the reasons more often mentioned by the workers (no.=79) for accepting to work or not in these positions, and the barriers and facilitating aspects (negative and positive aspects) of those positions.

Table 3. Percentage (approximation) and frequency of the answers reported by the workers (no.= 79) as reasons for accepting to work or not in the selected positions (from the dirty and clean areas) and specific reasons that are facilitating factors for the job or not.

JOB	Would do the job	Would not do the job	Did not answer	Positive Aspects				Negative Aspects			
				Not too much strength	Comfortable posture	Time management	Good relationship with coworkers	Too much strength	Fast cadence	Difficult to learn	Psychological pressure
Dirty Area Jobs											
Cut Open	50% (39)	44% (35)	6% (5)	20% (16)	40% (32)	80% (63)	90% (71)	70% (55)	75% (59)	58% (46)	60% (47)
Hyde removal	75% (59)	20% (16)	5% (4)	NM	45% (35)	85% (67)	90% (71)	75% (59)	85% (67)	60% (47)	70% (55)
Tagging and transfer	55% (43)	25% (20)	20% (16)	NM	60% (47)	70% (55)	95% (75)	70% (55)	90% (71)	40% (32)	45% (35)
Bleeding	60% (47)	25% (20)	15% (12)	NM	65% (51)	75% (59)	95% (75)	80% (63)	90% (71)	45% (35)	65% (51)
Clean Area Jobs											
Carcass splitting	40% (32)	50% (39)	10% (8)	NM	45% (35)	60% (47)	90% (71)	75% (59)	70% (55)	55% (43)	65% (51)
Filet Mignon cleaning and pelvis cleaning	60% (47)	25% (20)	15% (12)	NM	45% (35)	65% (51)	100% (79)	45% (35)	70% (55)	55% (43)	55% (43)
Evisceration	40% (32)	30% (24)	30% (21)	NM	45% (35)	70% (55)	90% (71)	55% (43)	60% (47)	55% (43)	70% (55)
Stamping	99% (78)	1% (1)	0% (0)	65% (51)	70% (55)	75% (59)	100% (79)	35% (27)	30% (24)	30% (24)	70% (55)

Key: NM - Not mentioned.

In terms of the positive and negative aspects of working in the eight job positions, the 79 workers who answered the questionnaire resulted in the possibility of 632 responses for each category (if all of them responded to each question relating to each of the items in the eight jobs). In general, the results show that the most often mentioned reasons for accepting to work in the jobs were: “Good relationship with coworkers” (592 mentions) and “possibility of time management” (456 mentions). The most often reported reasons for not taking the jobs were: “strength required” (396 mentions), “fast cadence” (449 mentions), and “psychological pressure” (392 mentions).

The jobs in the dirty area were those mentioned more often as requiring an enormous amount of strength and as having a fast cadence, in comparison to the jobs in the clean area. “Hyde removal” was the most accepted job from the dirty area. Among the reasons for that, the workers mentioned “good relationship with coworkers” and “possibility of time management”, although “fast cadence” was the most often mentioned problem in that job. The dirty area job, which was chosen the least, was “cutting open”, as it demanded an enormous amount of strength (55 mentions), had a fast cadence (59 mentions), and produced heavy psychological stress (47 mentions).

In the clean area, the job "Stamping" (putting a stamp on the carcass with its quality and weight) was the job which was accepted by all of the participants. However, even

though positive aspects stood out (such as being a job with a comfortable posture and that provides the possibility of time management), that position produce heavy psychological stress, which is related, according to the workers, to the fact that there is the constant, daily presence of the farmer (owner of the cattle that is being butchered on the day) monitoring the entire process. Such monitoring is allowed by the company because the final weighing of the carcasses is only done after the entire process, before calculating the amount to be paid to the farmer. One of the workers mentioned that *"depending on the stamping, the price is determined - the price that they receive here. When the carcass is damaged, I have to register that; and the price of the beef is lower".*

"Splitting carcass" was a job rejected by half of the workers. Among the reasons, the most mentioned were "strength required" (handling the pneumatic saw on the platform), with 59 mentions, and psychological stress. The work using pneumatic saws requires, besides physical strength, a great deal of cognitive attention because of the high risk of accidents. The saws have a large blade, which must be always sharp, and when needed, the blade must be changed during the shift, which requires close attention and skill. The worker, standing on the platform, needs to use his foot to move the saw up and down, as he handles the saw. Besides coordination to manage the platform-saw, the worker also needs physical strength to keep the blade firmly in place as the carcass is cut through its middle.

3.4 Informal job rotation: perception by the workers involved in the process

3.4.1 Alternating the use of the saw and the platform

The jobs which require the use of the saw (electric or pneumatic) were those which were accepted the least by the workers as a possibility of job rotation. However, it was observed that an informal job rotation had already happened between the job of splitting carcass (Worker T1, 45 years of age, 4.5 years of experience) and the job of head removal (worker T2, 39 years of age, 2 months of experience). Considering the arduous aspect of each job, the workers involved decided to ask permission from management to alternate the two activities. The demand was accepted, and the workers gained autonomy to organize the switches, without having time to dedicate to training and to the planning of the job rotation criteria (time, frequency, duration, etc.). Rotation between the two jobs corresponds to the requirements of NR-36, in the sense that there is alternance between working on platforms and not, and with and without pneumatic saws, since the work of carcass splitting is done on a platform, and the work of head removal is not. The workers organized themselves to do the switches when it was more convenient for both. The strategy chosen was to do the switch based on the number of animals to be worked on, but also considering the collective factor and the organization of the work as an assembly line: *"We prefer to switch after every 250 cows instead of switching every hour. To avoid stopping the production line, we also do the switches when the line is already stopped."* (T1). Both workers agreed, and they prefer not to switch at a predetermined moment so that they do not interrupt production nor risk causing delays. However, the rule of having a target number of cattle (250 as in this case) does not work if it is not associated with breaks in the production line, which may happen for several reasons (lack of maintenance, power outages, delays in the production process, etc.). Therefore, the workers adjust according to the real work and its variability, leading to a second configuration for switches: each one stays in the

original job, and the switch is performed after lunch break, regardless of the number of animals processed before the break. "*Sometimes we switch after lunch, regardless of the number of cows that we did in the morning"* (T2).

Job rotation was perceived as a positive element by the pair of workers, giving them the possibility of varying their activities and, therefore, reducing the grievances of the work. "*It is less tiring, and also less stressful, because you switch from one job to another. I am going to tell my colleagues that they should also practice rotation, switching jobs, because, if everyone switches, in the end everyone would have rested at least a little bit* (T1)". We can see that rotation is seen as a possibility of "a little rest" from the job occupied, even though this rest is not effective, since the worker continues to perform a job in the production line, although a different one. It is important to notice the different forms of informal job rotation established by the workers themselves, with their particular dynamics inherent to each group. Those informal practices are only effective because of the autonomy and the level of participation that the workers have in the process. In this sense, they have initiative to create their own adjustments, affirming that they prefer to "switch at every 250 cows or more", or that they will switch after lunch "regardless of the number of cows they do in the morning", or even regarding the number of participants involved, since in the end, "everyone will have rested a little".

3.4.2 Alternating the work grievances related to space and amount of repeated movements

Filet mignon cleaning (worker T3, 54 years of age, 15 years of experience) and pelvis cleaning (worker T4, 45 years of age, 11 years of experience) are performed by two workers who stay side by side in the production line, working on the same platform. It was observed that an informal rotation was taking place between the two workers, which present similar grievances. The biomechanical demands are more evident in the upper limbs (requires 6 to 8 cuts with the knife for each half-carcass, with the arms raised shoulder high), the movements must be precise and rhythmic, requiring good synchonicity between workers and machines. A rhythm of 3 to 4 carcasses per minute was observed. With such a rhythm, the workers say that they have no time to follow the hygiene rule of washing the knife after each carcass, nor can they sharpen the knife regularly. They must keep up with the constant rhythm (which is not always regular due to stops by power outages or to recover from mistakes), and at the same time, they must follow hygiene and quality rules. Those demands, in face of the accelerated speed of the line, lead to the need for decisions: sterilize the knife or not, change and sharpen the knife when possible. *"Because, in reality, this is a demand from quality control and from the manager, but keeping up with that is complicated, unless there is an inspection going on and the speed of the line is at 90/h, smooth. Then we have time to do things, change normally, but at 120/h it is not possible"* (T4).

Even though the grievances seem to be similar at first sight, after having analyzed the two jobs, we discovered that worker T3 is submitted to a time-space grievance that is different than her colleague's work, since the filet mignon cleaning demands more movements than pelvis cleaning. The chronicity of the activity presented in Figure 1, based on 4'20" of observation of worker T3, illustrates the grievances mentioned and their effects on the actions performed by the worker. In less than five minutes, the worker had cleaned up 14 carcasses, washed her knife twice, and sharpened it twice (sink area). She performed this task when she has enough time between two carcasses (4 and 5, 7 and 8). At those moments, she anticipates and occupies a "C zone" on the production line.

Here, it is important to consider that when the rhythm of production is regular (first four carcasses), the worker remains in the zones where the carcass can be reached (A and B). That is no longer possible, since the carcasses are too close together (from 10 on). In that case, the worker leaves the space of her work post (areas A, B, C) going towards an “external area”, and must lean forward against the protection bar to finalize the task. She is “late” for the next half-carcass, and in an attempt to recover from the delay, she ends up again in an “external zone”.

Considering the grievances of the job, workers T3 and T4 reached an agreement regarding the switches. For each 100 cattle, they switch places (and functions) in order to reduce T3’s exposure to time-space restrictions during “the delays” caused by the rapid concentration of carcasses moving at a fast pace. The switch was proposed by T3 and accepted by the manager and by her co-worker in charge of pelvis cleaning, considered to be less difficult and less tiresome. This, it can be observed that, like in the previous example, job rotation happens in an informal manner and without previous preparation by the managers in terms of an efficient organization that takes into account health, safety, and productivity.

4 Participation beyond the norms

Conducting a literature review about the work activities in the meatpacking industry, Ferreira et al. (2015) identified that nearly all of the activities are related to a musculoskeletal overburdening of the workers. However, more studies are needed in order to allow for analyses of alternatives to prevent overburdening, which is known to affect the workers, or even in the understanding of the workers’ perception regarding the implementation of such alternatives, like job rotation.

In this sense, the workers’ perception of the process of the implementation of job rotation played a key role in this study, allowing us to identify its advantages and disadvantages. Moreover, further investigations on other conditions, such as studies of association and correlation, should be encouraged.

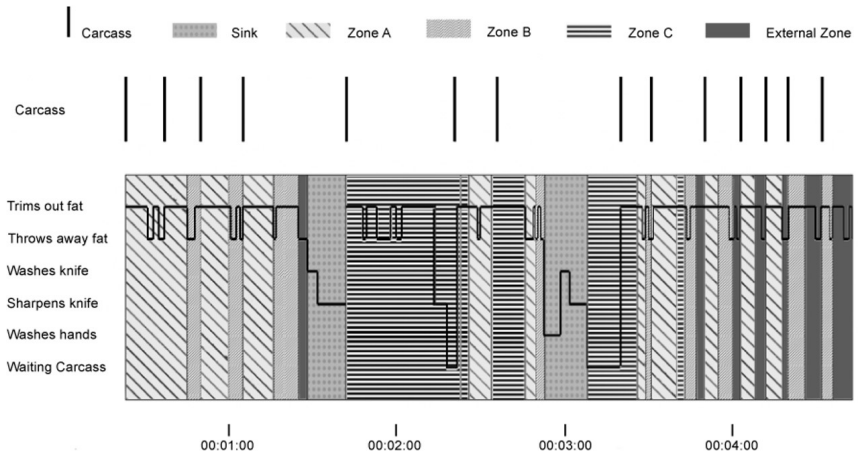
If there are few studies concerning the workers’ perception in the process of implementation of job rotation, there are even fewer studies that value the participation of the subjects in the organization of the rotation. Such a scenario continues, regardless of the demands of NR-36 (Brasil, 2013), which emphasizes the need for such participation. Participation should take place in the evaluation of job rotation, according to the workers' acceptance (item 36.14.7.3); in the choice of tools (item 36.8.10); in evaluating, controlling, and monitoring hazards (item 36.11.5); and in training (item 36.16.5).

In January 2022, a new edition of the regulatory norm took effect (NR-17 Ergonomics), which, in consonance with NR-36, strengthens the workers’ participation in improving work conditions. Several aspects of this new regulation indicate the need for more participation (Brasil, 2021), such as the Preliminary Ergonomic Assessment (PEA) of the working conditions, with the use of qualitative and quanti-qualitative approaches (item 17.3.1.1); the conduction of ergonomic analyses of the work (EAW) with the worker participation (item 17.3.3 line f); an inclusive posture by the management in terms of facilitating the understanding of the functions, keeping open dialogue to answer the workers’ questions, and facilitating teamwork (item 17.4.7 lines a, b and c).

Therefore, considering prerogatives already established by NR-36, and now strengthened by NR-17, future organizational decisions must maintain the premise of workers’ participation in the improvement of all working conditions (and not only those related to job rotation).

The current study brings elements that are quite pragmatic in relation to having the participation of the individuals in the process. This can be seen in the initial consultation about rotation acceptance. As we have shown, if initially 72% of the workers were not keen on participating in the job rotation, once they were included in the process, 86% or the dirty area workers and 64% of the clean area ones changed their minds and agreed to participate. The implementation of job rotation is always a complex question, which must be approached as a systemic process in the company. On the one hand, it requires a deep understanding of the activities developed by the individuals, so that organizational changes can be proposed. As stated by Vilela et al. (2012), if interventions based only on health regulations and workplace safety do show the visible risks, those which are based on ergonomics are capable of identifying much deeper causes, related to organizational aspects. On the other hand, the workers should have a central place in the process of creating job rotation, of which they will be a part, and management must compromise to offer the proper conditions to achieve this. Taking that approach, Coutarel et al. (2003) established some of those conditions, such as the participation of the operators and the gain in terms of their margin of maneuvers, by gaining spaces in the productive chain, by adapting the tools used (knives, sharpeners, etc.) and the development of competences by the participants.

Those conditions, or their absence, may explain why 72% of the workers were initially against job rotation. As the results show, among those who were against it, uncertainty regarding adequate training for the development of new abilities and the fear of a more frequent exposure to accidents were issues for respectively 35% and 30% of the workers. Our study observed that isolated initiatives are not completely efficient in disregarding the global and systematic aspects of job rotation. Moreover, the autonomy to perform the switches in an informal manner does not eliminate the grievances on the job and the repetition of movements.



Key: Zone A: Area of the platform where T3 reaches the carcasses for cleaning; Zone B: Area of the platform where T3 reaches the carcasses with minor adjustments; Zone C: area of the platform where T3 anticipates the arrival of the carcass to begin the cleaning; External Zone: Area of the platform where T3 moves to and leans against the protection barrier in order to finalize the work of cleaning the carcass.

Figura 1. Chronicity of the actions performed by worker T3 in the job of "Filet Mignon cleaning", generated by the Actograph software. On the ordinates, the actions observed, on the abscissas, the time in minutes.

In the activity's chronicity (Figure 1), worker T3 occupies an "external zone" in relation to her work area in order to finalize or to refine the filet mignon cleaning. In that

case, the adequate tool (the knife) and the time to perform its maintenance (sharpening) should be appropriate for the cadence and rhythm imposed by the conveyors. Issues such as adequate training, exchange of experiences, and slowing the cadence are all guidelines that must be taken into consideration collectively, (Coutarel et al., 2003) and not dealt with by isolated worker actions.

5 Conclusion

The results of the current study show that a participative approach prior to changes in organizational design contributes to the workers' understanding and perception of the disadvantages and advantages of the implementation of legal requirements. The understanding of the factors discussed in this study – the barriers and the facilitating elements – in the implementation of job rotation, may be extended to other workers in the meatpacking sector. In fact, it can be concluded that the participative approach prior to legal and organizational improvements may well recover the workers' protagonism in terms of constructing their own work conditions, favoring their perceptions regarding the process. Therefore, the context and objective of each intervention must be considered, since there is no pattern for the interventions (Van Eerd et al., 2010). Management must offer the required conditions so that implementation can take place according to the criteria indicated in other studies (Coutarel et al., 2003; Nascimento & Messias, 2018; Wilson, 1995; Rivilis et al., 2008). By placing the workers at the center of this project and in its attempt to implement change should be considered a fundamental condition for the success of ergonomic interventions in the context of the implementation of regulatory norms. The law, although prescribing the effective participation of the workers, does not bring alternatives regarding how such participation should occur. The current study describes the experience from a participative process that is not common to organizational management in Brazil. Effectively, organizational changes that occur with the participation of the protagonists (Sznelwar, 2015) bring that established in the legal regulations closer to reality, strengthening worker collectivity and improving working conditions, including the reduction of WRMDs.

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Authors contribution

Iracimara de Anchieta Messias; Adelaide Nascimento and Raoni Rocha worked on the conceptualization and theoretical-methodological approach. Iracimara de Anchieta Messias and Adelaide Nascimento were responsible for the theoretical review. Iracimara de Anchieta Messias and Raoni Rocha were responsible for data collection. Iracimara de Anchieta Messias, Adelaide Nascimento, and Raoni Rocha were responsible for the data analysis. Iracimara de Anchieta Messias, Adelaide Nascimento and Raoni Rocha were responsible for writing and final revision of the manuscript.