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Work Accidents from the Perspective of Workers: A Case Study in the Footwear Industry (Rs, Brazil)

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Abstract*— *This research aimed to understand the perception of operators, supervisors, and managers on the causes of work accidents, risk, danger, and human error. In addition, it sought to identify convergent and divergent issues among workers at different positions and functions. We used the case study method with qualitative data analysis, in a footwear company located at Vale do Paranhana (Rio Grande do Sul, Brazil). Although human error is usually considered the cause of work accidents, results showed that there are problems in both the work process and work organization. These impose an accelerated pace dictated by conveyors that does not always allow proper care in order to prevent accidents. Other causes of accidents mentioned are the lack of safety training and the configuration of machines and equipment that allow for failures, errors, incidents, and accidents.

Keywords*— *work accident, footwear industry, work organization, human factors.

I. INTRODUCTION

At the time of the research, Brazilian footwear industry comprised more than 7,200 companies, which produced around 665 million pairs of shoes a year, of which 189 million for export. This industry was, and still is, one among those that create more jobs in the country and employs more people in the state of Rio Grande do Sul (RS) (ABI CALÇADOS, 2014).

Despite the concentration of large companies in Rio Grande do Sul, Brazilian footwear production has gradually expanded to other areas in the Southeast and Northeast regions of the country, especially in the state of São Paulo (cities of Jaú, Franca, and Birigui) and in emerging states as Ceará and Bahia. Footwear production has also increased in the states of Santa Catarina (São João Batista area) and Minas Gerais (Nova Serrana area), in addition to the large-scale migration to China and India in recent years.

In view of the labor size in this industry and its expansion within Brazil, improvements and investments are expected in health, safety and quality of life, which will result in benefits for a large number of workers, since there are several risks of accidents in the footwear industry. Work accidents vary for each branch of economic activity, due to technologies used, working conditions, workforce characteristics, and safety measures adopted, among other factors (COSTELLA, 2012).

As for the definition of work accident, according to the Brazilian Accident Registration Standard (NB18), "[it] is an unforeseen and undesirable occurrence, instantaneous or not, related to work performance, which causes personal injury or results in a near or remote risk of that injury" (ABNT, 1995). In Brazil, companies consider work accidents as a phenomenon that stems from human or technical failures, expressed by unsafe acts and conditions (RIBEIRO, 1999).

Once we acknowledged the reality of the footwear industry, with regard to the number of work accidents, the main objective of this study was to understand the perspective of employees working in different areas of the company and at distinct hierarchical levels - operators, supervisors, and managers -, concerning the causes of work accidents. In addition, we also sought to understand their perception of risk, danger, and human error, as well as to identify and compare potential conflicting situations regarding risks and safety management at that company.

II. RESEARCH METHOD

We chose to carry out a case study, with qualitative data analysis, in a firm of the footwear industry located at Vale do Paranhana, in the state of Rio Grande do Sul, Brazil. We selected employees at random for the interviews, with at least one operator representing each process stage, regardless of gender, age, or profession time. We interviewed eight workers – four operators, two

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supervisors, and two managers. In order to prevent any possible constraint, participants had their anonymity ensured by signing an Informed Consent Form.

As for data collection, we developed a specific questionnaire for the interviews, which was used for the three professional categories. We conducted the interviews individually, in a room next to the production area, which facilitated participants' access. Interviews were recorded, with the participants' consent, in order to ensure full access to all information gathered.

Therefore, the main data collection instrument was the questionnaire used in the individual interviews. The initial questions regarded the personal identification of the interviewees, which allowed their profile creation. Since the study aimed to identify workers' perception of the concepts of risk, danger, accidents, and human error, we grouped the remaining questions in four categories. These were (1) workers' perception of risk in handling machines and equipment; (2) workers' perception of risk throughout the process; (3) workers' perception of personal safety and use of personal protective equipment (PPE); and (4) workers' perception of social climate and work organization. In order to compare these perceptions with working conditions, machines whose operation was considered of highest risk were briefly examined.

III. DATA ANALYSIS AND DISCUSSION

We describe the data in a non-literal way; however, we did not change, interfere or neglect reports that were relevant to the research.

First, we present in Table 1 the four categories of failures, according to the concept of work safety, comparing the perceptions of employees from the three hierarchical levels defined for the interviews. Next, Tables 2, 3, 4 and 5 present the risk perception, distributed among the four previously established categories: perception of risk in machines and equipment, perception of risk in the process, perception of risk in personal safety and use of PPE, and perception of risk in the social climate and work organization.

Table.1: Interviewees' perception regarding safety concepts

Operators	Supervisors	Managers
Risk: distraction, conversation, bare and loose electrical wires, dealing with fire and electricity.	**Risk**: everything that puts human life at stake.	**Risk**: speed of processes and non-use of PPEs.
Danger: lack of care, electricity (3 mentions).	**Danger**: danger and risk are similar terms – the word danger draws more attention.	**Danger**: carelessness, risky machines, electricity and chemicals.
Accident: carelessness.	**Accident**: any unusual situation.	**Accident**: any abnormality or fatality. It happens due to lack of training.
Human error: distraction (2 mentions), lack of care (2 mentions).	**Human error**: it is complex; you need to examine the accident from all angles to conclude.	**Human error**: carelessness, "silly moment", distraction, lack of concentration, too many concerns.

By analyzing interviewees' perception of the concepts related to safety at work, we observed that it was complex to define safety at the operational level. However, all respondents related the concept with facts that happen in daily work.

When comparing the three groups, they were similar about gaps in knowledge and understanding of the basic issues related to safety; regardless of the hierarchical level, nobody was able to clearly define risk, danger, accident, and human error. For example, danger always related to electricity. As for the concept of risk, there were no significant differences among the ideas mentioned by participants of different hierarchical levels; however, all of them tended to correlate risk with behavioral traits such as distraction and carelessness. Finally, managers and supervisors defined risk as everything that puts human life at stake, and related it to the process speed. This indicates that understanding goes beyond the responsibility centered purely on the individual (perception of operators) and extends to the level of work organization (perception of managers and supervisors).

Regarding the concept of human error, there were no significant differences among the ideas provided by different groups. Despite not being defined, human error was considered a distraction, carelessness, or as a "silly moment". There is a strong predisposition of operators to take on a large load of responsibility for the accident. Sometimes, in their own perception, the work accident seems to have a single cause – negligence of the operator.

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Table 2: Interviewees' perception of risks in machinery/equipment

Operators	Supervisors	Managers
Dangerous machines: electric press and rocker cutting machine; lack of mechanical preventive maintenance; foot drive. **Workaround**: witnessed by operators in other firms (3 mentions); the company's safety team does not allow workarounds. **Dangerous equipment**: punch tool, scissors and needles.	**Dangerous machines**: belt sander and toe cap molding machine – danger is higher without preventive maintenance. **Workaround**: witnessed on the rocker cutting machine; the operator may wish to stand out by producing more. **Dangerous equipment**: punch tool (witnessed accidents with it) and scissors.	**Dangerous machines**: toe cap molding machine, outsole press, heel nailing machine, press and belt sander, sole pressing machine. All may be dangerous without preventive maintenance. **Workaround**: did not witness any; understand that workarounds are due to the lack of preventive inspections of machines. **Dangerous equipment**: risk has decreased due to technological developments.

Regardless of hierarchical level, all interviewees understand the risks of accidents related to machinery and equipment, especially of those that represent a real risk. In the workers' perception, presses and rocker cutting are the machines that bring danger, not only because of their conformation, but also due to the compensation mechanisms – workarounds – added by operators, which, in the end, limit the machine even more in terms of safety.

Therefore, the question about adding "workarounds" to the machines is relevant, because, to the workers, it has become a common practice in most companies of the region. Respondents justified the use of this practice, although it should not occur.

A cutter's activity consists of cutting pieces of leather to make up the shoe. The operator receives razors and leather pieces, and must cut these pieces for the best possible use of the leather. He is responsible for checking the leather conditions and the orders that accompany the material. He makes the cut with a hydraulic equipment called "rocker cutting machine" and hand tools (razor and hatchet).

Table 3: Interviewees' perception of risks in the industrial process

Operators	Supervisors	Managers
Dust – "specks" can fall; poorly sized work stations; lack of experience in performing the operation; "borrowed" staff; worker that lacks mastery of the operation and the machine.	Lack of training; repetitive effort; each new model has peculiarities (details); lack of guidance on how to perform the operation; noise exposure.	Lack of training; ignorance of the chemical composition of the products used (glues, solvents); the operators' mood (state of mind) affects safety.

Operators noticed risks related to unsafe machine design. As for the need of training to deal with current risks, all three categories tended to value it. These aspects also appear in the social climate and work organization category.

Table 4: Interviewees' perception of personal safety and use of PPEs

Operators	Supervisors	Managers
One operator did not receive safety training, all the others did. There is a constant demand for PPEs. Everybody wears ear protectors, and only two use cream to protect their hands.	They were informed about safety during the admission process. They wear ear protectors and hand cream as PPEs. One had a minor accident with a punch tool. For him, operators come from other companies with "vices" of not following safety measures.	They were informed about safety during the admission process. One had an accident in the belt sander, but did not get a leave; other had an accident with the heel-nailing machine, and got a 19-day leave. They see risk of accidents when people wear open shoes (because of the sharp objects and chemicals used). They wear ear protection as PPE.

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As shown in the above category, the role of basic education is evident – the prevention of occupational accidents –, which may occur through constant training, not only in the company's admission process. Michel (2000) mentions that none of the machines built, none of the chemical products obtained by synthesis, and none of the social theories formulated have fundamentally changed human nature so far. Different ways of behavior must be considered in the effort to prevent unsafe acts and should always be analyzed comprehensively.

The conditions identified in the field support workers' perception that the risk is in the machine, in poorly formulated projects. In contrast, supervisors and managers are concerned with qualification and training, therefore acting only on the human factor.

It is important to highlight the report of an operator that has worked in the sector for several years. He mentioned that the highest risk of an accident is not at the factory, but on the street, with many bicycles around and too many people in a hurry. A manager also stressed the risk of accidents due to the large numbers of pedestrians, bicycles, motorcycles, and cars in the area. In this scenario, work organization should also receive attention, which brings up relevant questions: must all companies have a lunch break at the same time? If companies provided good, safe and inexpensive public transportation, would it reduce the problem? Is there enough time for the lunch break? (Considering that, in this company, most women go home, prepare lunch, have lunch, and return to work, within one and a half hours).

Table 5: Interviewees' perception of social climate and work organization

Operators	Supervisors	Managers
All interviewed operators reported that social climate is excellent. The relationship among the different hierarchical levels is very good, and they define the climate as familiar. One operator said that the integration is so good that it increases productivity.	One supervisor has already worked in four companies, and this is the best one in terms of social climate. Everyone is treated with equality and respect. Social climate favors the achievement of goals.	One manager made a self-assessment and said that humility and transparency with subordinates are necessary for a good social climate. All emphasized team importance and the priority given to good relationships and social climate in the company.

When analyzing the above table, we notice that interviewees' understanding of work organization was restricted to social climate. Nevertheless, we emphasize that the concept of work organization covers the production mode, in this case the Taylorist-Fordist production system, characterized by repetitive and monotonous work, with the same task performed for months and years. Therefore, it comprises the content and variation of activities, rotation and breaks, period of adaptation to activities, task planning, selection of technologies, equipment and machines, and technical training of workers. Another issue to consider regards the need of spaces for cognitive exchange at the workplace, in order to create safer working conditions (OLIVEIRA, 2002). More than an ideological aspect of capital controlling labor, these spaces allow more effectiveness in the regulation procedures of these groups, while performing their activities.

Some managers and supervisors mentioned the need for increasing technical training, since the lack of training is common in this industry; operators learn the activities they will perform empirically, by simple observation and conversations with colleagues. This approach may leave gaps regarding task performance in a safe and efficient way, especially when considering the speed of the process, which may bring the risk of accidents.

According to a manager, workarounds can increase the speed, making an employee stand out as "different and better". However, it is necessary to consider that performance varies from one person to another, and even in the same person at different moments. A policy that values the worker in a more comprehensive and integrated way, as an individual within a context – in this case, the footwear industry –, must be implemented not only to reduce the number of accidents, but also to decrease occupational diseases, since there is a correlation between psychosocial and organizational factors and the risk of accidents.

The perception of social climate and integration among the company's workers was clear in the three groups. They stressed several times that climate was a motivating factor, thus improving the overall performance, by comparing the company to a large family, where everyone gets along very well. Satisfaction was repeatedly mentioned and, according to the International Labor Organization (1990), regards "interactions between the work environment, job content, organizational conditions, workers' capacities, their needs, culture, and personal extra-

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professional considerations that can, through personal perceptions and experiences, affect health, work performance, and job satisfaction".

IV. CONCLUSION

This research sought to identify the perception of three groups of workers, regarding risk factors for work accidents in the footwear industry, through qualitative analysis techniques. We carried out interviews with operators, supervisors and managers as sources of data.

Interviewees' perceptions confirmed the authors' hypotheses: in most companies, when an accident or incident occurs at work, the concern to find a "culprit", thus attributing the cause of the accident to human error, leads the worker to accept this hypothesis as true over time. Victim's distraction and carelessness are often mentioned. However, even admitting the lack of training as a cause of accidents, operators have the perception that the unsafe conditions of the machines, resulting from their design or spatial arrangement, are also an important cause of accidents.

Some perceptions indicate lack of safety training and capacity building in companies of the sector. This issue involves work conception, because qualifying or training are seen as a waste of time and money in the distorted rhythm of the Taylorist system. It becomes evident that rhythm, journey, breaks, production mode, and work organization are not relevant issues now. The perception of the accident focuses mistakenly on the operator's behavior and on the design of machines and equipment. The use of workarounds to speed up the process, or as an element of individual valuation, in addition to the continuity of operations on poorly constructed machines, clearly show this reality, which in turn leads to the use of workarounds.

Finally, based on this study's findings, this subject deserves more research to clarify the real causes of work accidents, by taking into account human factors and especially work organization.

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