



ANALYSIS OF THE NEW CONSTRAINTS INTRODUCED BY THE CHANGE IN THE ACTIVITY OF GARBAGE COLLECTORS WITH THE IMPLEMENTATION OF THE 1000-LITER CONTAINER IN A MEDIUM-SIZED CITY IN THE INTERIOR OF SÃO PAULO

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Summary

From an ergonomic point of view, every resource induces dynamics in the work activity and in the operating modes adopted. In this article, the activity of urban waste collectors in a medium-sized city in the interior of São Paulo was used as the object of study. The objective of this study is to identify new constraints in the urban waste collection work activity after the implementation of the operational resource (1000 liter container). A case study was carried out, guided by the perspective of Activity Ergonomics, in which data collection took place through free observations, filming, construction of a task description form, interviews and questionnaires applied to both collectors and the population served. The results obtained explained the real activity and its intrinsic and extrinsic variabilities exposed by the movement of the deployed container. It was concluded that the main differences between the previously existing situation and the current one are the excess weight caused by the misuse of containers by the population and the difficulty in moving containers on the roads.

Keyword: Activity Ergonomics, Urban Waste Collection, 1000 Liter Container, Work Organization.

1. Introduction

The management of urban solid waste is a complex issue that involves different actors, such as municipalities, private companies, society, cooperatives and industries. In this management, the

The municipality has a central role, provided for in the National Solid Waste Policy (PNRS) (BRASIL, 2010), and must guarantee means that enable the collection, treatment and correct disposal of waste.

In order to guarantee the collection of common and recyclable waste, city halls seek to hire private and cooperative companies, a practice already highlighted by some authors such as Santos et al., (2009) and Luvizoto; Fontes and Salomão (2014). Santos et al., (2009) in particular, highlights that the logic present in the work of waste collectors in outsourced companies that provide waste collection services do not allow them to develop strategies to regulate their work and thus reduce the burden present on the activity.

To ensure continuity of service provision and better income, companies hired by municipalities seek to develop means that enable the reduction of operational costs. However, the logic present in the process of designing or incorporating these new products or processes tends to consider only issues of efficiency and productivity, leaving aside the logic of those who carry out the waste collection activity.

In this context, this article aims to analyze the work process of waste collectors in a city in the interior of São Paulo and understand the impacts of a restructuring of the work process on the activity carried out by the collectors. The company selected for the study is an outsourced company made up of 300 collectors divided into two work shifts, daytime with 24 sectors and nighttime with 22 sectors served. The restructuring took place in only six sectors and its central aspect was the replacement of the collection of plastic bags and 240-liter containers with 1000-liter containers. The methodological approach for this study included a case study operationalized by stages of ergonomic work analysis (GUÉRIN et. al., 2001).

In the six sectors, the work dynamics were changed abruptly, not preparing the environment to accommodate the containers and their use by residents, as in everyday life each actor has different rationales for the different dimensions (socio-cultural environment, company, customers and the collectors themselves).) that integrate the presented context.

1.1 Waste collection activity

The task described by Guérin et al. (2001, p. 15), it is not the work, but what is prescribed by the company, it is defined based on determined conditions and expected results, or as Falzon (2007) also states, conditions of achievement and objectives, the conditions of achievement are the constraints present in the work process such as procedures, work rhythms, means of work, characteristics of the environment, among others; the objective is the desired final state, the results fixed in advance from the task (FALZON, 2007; GUÉRIN et al., 2001).

The activity is the work carried out in a real situation, it is the set of actions mobilized by the subject to seek previously defined results in the face of variations in working conditions and their personal objectives (FALZON, 2007; GUÉRIN et al., 2001).

The notion of work operates in this dialectic (and in the gap), between the dimension of the prescribed and the dimension of the real (SIMOES et al., 2012), and that the activity is dynamic and uncertain given the variability of men and work situations (ABRAHÃO et al., 2009).

In the garbage collection routine, the four collective dimensions of the activity are evident (VASCONCELOS, 2007), as they sometimes work in cooperation, sometimes in collaboration, sometimes with forms of interaction and sometimes even coordination. Cooperation, defined by operators working on the same work object, in a relationship of mutual dependence (ABRAHÃO et al., 2009), becomes the most important dimension, as the collector is unable to move the full 1000 liter container alone. .

It can be said that grouping waste into larger containers introduces the question “How will workers be able to work in the different situations they will encounter?” (GUÉRIN et al.,

2001). In this work, emphasis will be placed on interindividual variability, since the objective of studying variability, stated by Abrahão et al. (2009, p. 61) is not to suppress it, but to understand how workers face diversity and variations in situations, and that people are often not alone, and the environment is shared with other individuals and that there is a variability in the characteristics, experiences and actions of each worker, such as fatigue, reasoning, efforts, height, age, gender, personal history.

2. Methodology.

Data collection took place through systematic and unsystematic observations, behavioral records, inquiry through interviews (MORAES, 2000) and whose objectives and means used are described in table 1. As a source of analysis of the activity, the form was used task description (FDT) (CAMAROTTO, 2008) which included the following work stages: journey to the neighborhood; jump from the stirrup; run to the container; open the container lid; move the container; position the container for tipping; activate the levers to tip the trash into the lame; return the container in place; run to the truck; get on the truck and stay in the truck. For the interview, a questionnaire was prepared based on Vasconcelos (2007) applied in Belo Horizonte, including the discomfort assessment by Corlett (1996). To present the results and facilitate the analysis, the specialized domains of physical, cognitive and organizational ergonomics were considered, as explained by Iida (2005, p.3) in Table 1

Table 1: description of the methodology used.

Tip	Goal	Amount of interviewees	Duration	Medium used
Free Observations	Panoramic view of the work and the conditions under which it is carried out	4 people	1 hour and 20 minutes	Free notes
Systematic Observations	Identify operating modes, record the actual activities in their stages, quantify the variabilities through video analysis and construction of the FDT	1 sector with a 12 km route	7h and 10 minutes	16Mpixel camera and full HD recordings
Individual interviews	Identify subjects' cognitive work strategies Validate the working data of the observations. Systematic	31 sample collectors	15 minutes on average each interview	Manual notes using the perception questionnaire technique.
Individual interviews	Identify extrinsic elements: level of knowledge of correct use of the container, adherence, satisfaction, restrictions. Validate extrinsic characterization of the inappropriate use of the container due to the discomfort perceived by collectors	50 residents from the same sector	4 hours	Questionnaire with manual notes

Source: Authors

3.Results

When comparing activities before and after the introduction of the container (see fig. 1), the changes in activities were analyzed by comparison, which is represented in table 2.



Fig.1 – Photo showing the comparison of garbage collection activities before (on the left) and after the implementation of the container (on the right). Source: Authors

Table 2: Comparison of changes perceived before and after the container

Category	Previous situation	Current situation	Differences
Garbage movement	Repetitive trunk flexion and rotation	Trunk inclination	Lower frequency of trunk flexion and rotation
Physical overload	Predominance of overload in the shoulder region when carrying and throwing garbage bags from a distance with smaller and varied weights	Predominance of physical overload in moving the heavier container, dragging it and/or lifting it in the wrist, elbow and shoulder regions	Requires greater general physical effort to move the container, concentrating on the shoulders, wrists and elbows
Rhythm	Run longer distance and faster	Reduced speed with the possibility of walking to the container	Significant reduction in energy expenditure from running less and stress on joints of the knees
Accessibility	Greater flexibility by handling smaller distribution units with the breaking of garbage bags and contact straight to the trash	Irregular flooring interferes more with the movement of the container and obstacles that increase the travel distance	Mitigated direct contact with waste and greater dependence on container positioning considering obstacles
Activity regulation	Greater freedom to choose the operating mode	Dependence on another collector to move the container	Mental load increased by restriction in decision making
Social interaction	Less dependence on partners that make up the team	Greater interaction in negotiating the effort distribution strategy with partners	Stress increased by the demand for greater individual capacity in cognition shared
Mental overload	Fear of contamination and accidents when in contact with garbage, dogs, motorcycles and cars	Contact with garbage is practically non-existent, but it requires more attention so that the very heavy container does not fall on collectors	The embarrassment of having an accident in contact with garbage decreased, but increased with the requirement for more attention and care for the container.

Relationship Partner – technicians	Relationship with the population, marked by present discrimination and labeling of the population: “here comes the fedo”	Inappropriate use by the resident with inappropriate materials such as earth and rubble, camouflaged in the trash.	Social labeling has decreased, with “cleaner” work, but the need for communication in training residents in correct use has increased
Cooperative system	Lowest degree	Greater demand for synchronized group work programming	Most susceptible activity in the division of work overload.
Resources available	Collection with bags and 240 liter mini containers, appearance of dirt spread across the city	Choice of 1000 liter volume for cost reduction	The aspect of greater cleanliness in the urban environment and the company's greater ease in controlling fewer containers resulted in moving larger loads

Source: authors.

As results of the interviews, some unique elements of the collectors in the city of Sorocaba in 2015 were revealed: the average age was around 33 years old, the average work experience was 4 years, 18% had a low level of education (primary); 27% medium education (high school) and 46% high education (high school); demonstrated high concern about accident risks (safety and health) featuring a high level of cognitive demand with mental load.

Of the discomforts and what they like least, the collectors explained the excess of care and overload with the heavy weight of the container through statements: “be careful so the team doesn't get hurt, constant attention with the car/motorcycle, so the container doesn't hit the partner, dog bite”; “I grab it by the handle, pull it and it fits, be careful not to tip over when the sidewalk is high, the wheel fits and gets tangled with a lot of weight”; “safety from being run over by a motorcycle when placing the container on the sidewalk”; “running and not having time to pay attention to everything and a car or motorcycle catches you”.

It was identified more frequently in the interviews that what they like most about this work is freedom and collegiality, and the purpose translated by the words “doing it well is leaving the city clean, you know that the person is doing it well, we look So bring it and see everything clean, it gives you satisfaction...”; “the friendships, salary, my agreement benefited them, everything” and “the community and joy among colleagues, you're on the street, everything's fine, you're laughing, the friendships”; “because there is no other profession, no one is in charge, there is more freedom, an open place”; “open air, freedom, street”.

Of the 28 types of discomfort of the Corlett degree classified, the incidence perception questionnaire showed the presence of 21 types, that is, 75%, characterizing varied requests and efforts throughout the body in general. The five most cited body regions and their percentage are the lumbar spine (12.9%), right knee (12.1%), neck (9.1%), left shoulder (8.0%) and right thigh (7.6%).

We observed that from the FDT, the collectors are mostly right-handed and when getting out of the truck they jump with their right leg, confirming the higher incidence of discomfort in the right knee and right thigh and also the bending of the trunk with flexion and rotation movements that give more discomfort in the lumbar spine, more present in the activity prior to the container. Regarding the knowledge profile of residents in the correct use of the container

It was observed that: 42% of people put out their rubbish 1 day before collection day and 36% put out their rubbish almost daily and that 80% do not know what type of material can be placed in the container, and that 96% did not receive no guidance on how to correctly use the container. This confirms the constant concern that collectors have, with the excessive weight

and lack of knowledge among residents in their use.

4. Conclusion

There is a tendency to transfer physical problems from the lower back and knees to the joints of the upper limbs, wrists and elbows, which must be monitored carefully. Mental discomfort, amplified by the present requirement and characteristic of reducing the margin of maneuver in freedom and action at work, requiring greater team interaction and cooperation. It was possible to identify the main differences, and the most relevant one, in this task is excess weight, mainly motivated by the misuse of containers by the population and the scarcity still available that make their easy movement impossible, confirming that the organizational elements exert influence on the activity and that the continuation of this study with actions to minimize the effect of these changes on health must be further explored.

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