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Design of Work Place and Ergonomics in Garment Enterprises

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Abstract

Work life quality can be evaluated scientifically by considering into account all the factors effecting directly or indirectly the working of the humanly. For system approach, beside the method used during the work; work place planning, design of all the production tools and devices, physical and psycho-social environment are the factors effecting work satisfaction. Beside the physical factors such as noise, lighting, harmful gases and dust, vibrations etc, all kind of psycho-social factors have to be evaluated scientifically. Authorities must know that some recovers based on the experience and common sense may have only limited contribution in scientifically design of the work place. It was tried to evaluate in this study, the work place environments of the business in İstanbul, Bursa and Çorum. It was presented some suggestions underlining their appropriate and won appropriate sides under our evaluation.

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*Keywords:*Design of work place;garment enterprises; ergonomics; working performance; anthropometry

1. Introduction

The garment sector is a sector that plays an important role in the economic development process of countries. The garment sector which contributed significantly to the process of industrialization realized in the 18th century by developed countries also plays a similar role in the economic development of the developing countries today.The acceleration created by the garment sector in the Turkish foreign trade and its contribution to the economy has brought this sector as Turkey's "Leading Sector" and it has continued to be referred to with this adjective until recent years.

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The business area created by the sector with these features and its contribution to the employment are huge. To organize workplace environment and design it ergonomically is also an important issue, particularly in the garment sector with this volume. When determining the volumetric and formal components of the business system in terms of anthropometric aspects, in terms of work physiology, the bodily functions with which the job is done in the best way are also determined. To ensure that, it is necessary to know the employee's personal characteristics on one hand and the shape, hardship, time of the job and environmental conditions on the other hand. Work arrangement with the least difficulty in doing work of the same quality is a successful arrangement. This can only be achieved with ergonomic solutions. These results can be achieved thanks to the arrangements such as eliminating or reducing static muscle work, less force application, choosing the right directions to apply force, changing the work from time to time and, if necessary, giving breaks calculated correctly. As a basic principle, the work and workplace should be arranged so that the employee can be work with maximum efficiency [1,2].

When arranging the workplace work processes and interaction between the work and the human should be taken into consideration, the sum of these relations and the rules constitute the ergonomic rules. A workplace arranged in accordance with the ergonomic rules is a prerequisite for the humane and economical use [3] of the labor. If the workplace is able to be arranged rapidly with the required quality and at low cost so that the production can be done by forcing the employee in a way not to exceed his/her performance limits and ensuring the work safety, two main objectives of the ergonomics which are humane working and economic performance would be achieved.

Workstations and their environments which cause pain especially in wrists, arms, neck and back depending on the type of work performed and in which sufficient improvement activities have not carried out yet in terms of employee's health negatively affect employee productivity and create cost problems [4]. There are occupational health and safety risks in the garment sector such as noise, high temperature, tiring work, manual handling of chemicals, musculoskeletal disorders.

In addition to the risks relating to occupational health and safety mentioned above, other factors threatening the health are mentioned in the garment sector, such as heavy lifting and carrying, poor lighting, fire, movements causing repetitive accidents [5,6]. The formation of these factors can be reduced by simple arrangements and designing appropriate workplace environment.

Work locations are shaped under the influence of human characteristics, job requirements, and job design features. The better ergonomic needs of the individual are met at workplace, the higher their productivity will be and employee's health will be protected as well [7,8].

Because the human cannot be re-designed, machinery and other means of production should be designed so employees can use them easily. Admittedly, equipment and workplace design can make things easier or make it impossible to get things done. In the job design, care must be taken for the factors forming the work environment not to constrain the employees but relieve their work. This is possible by designing tools and environmental characteristics suitable for human features.

In this study, it was aimed at examining the work environments of garment enterprises in Istanbul, Bursa, and Corum provinces and evaluating these in terms of ergonomics.

2. Method

The aim of this study is to evaluate the work environments of garment enterprises in Istanbul, Bursa and Çorum provinces in terms of ergonomics. The quality control, fabric cutting, warehouse and manufacturing departments of 10 different establishments, which are active in 2015, were observed and these departments were evaluated by taking their photos. In this context, ergonomically suitable and unsuitable features of working environments of these establishments were determined and suggestions were made.

3. Findings and Interpretation

The images obtained from the garment enterprises in the survey are shown in Fig. 1-2-3.

Fig. 1. Non-ergonomic Working Locations

Sewing, spreading, cutting workers, who work generally in sitting position, continuously work using their hands, arms, and eyes in the same position and posture during working hours; and it is the most common problem that almost every employee has musculoskeletal complaints due to non-adjustable and non-ergonomic work desks, chairs, height matching problems between sitting chair and work bench (Figure 1b-c-d), poor lighting in the environment, the negativity of the thermal comfort conditions, continuity of the job and obligation to finish the work according to the schedule. Solving these problems is possible with the proper ergonomic work environment design. Standing workers have similar problems as seated workers. It is inevitable for the employees who work sitting or standing and are responsible for continuously doing the same work in accordance with the production speed, to experience hands, arms, eyes, neck, back problems as a result of long working hours and years [9]. If there is not enough space for the standing employee's feet, body movements connected with the work may be prevented. As mentioned by Kaya and Özok [10], providing a more comfortable working position for short and tall employees is possible if height adjustable seats and height adjustable tables are used together. This may allow more people work in harmony at the workplace.

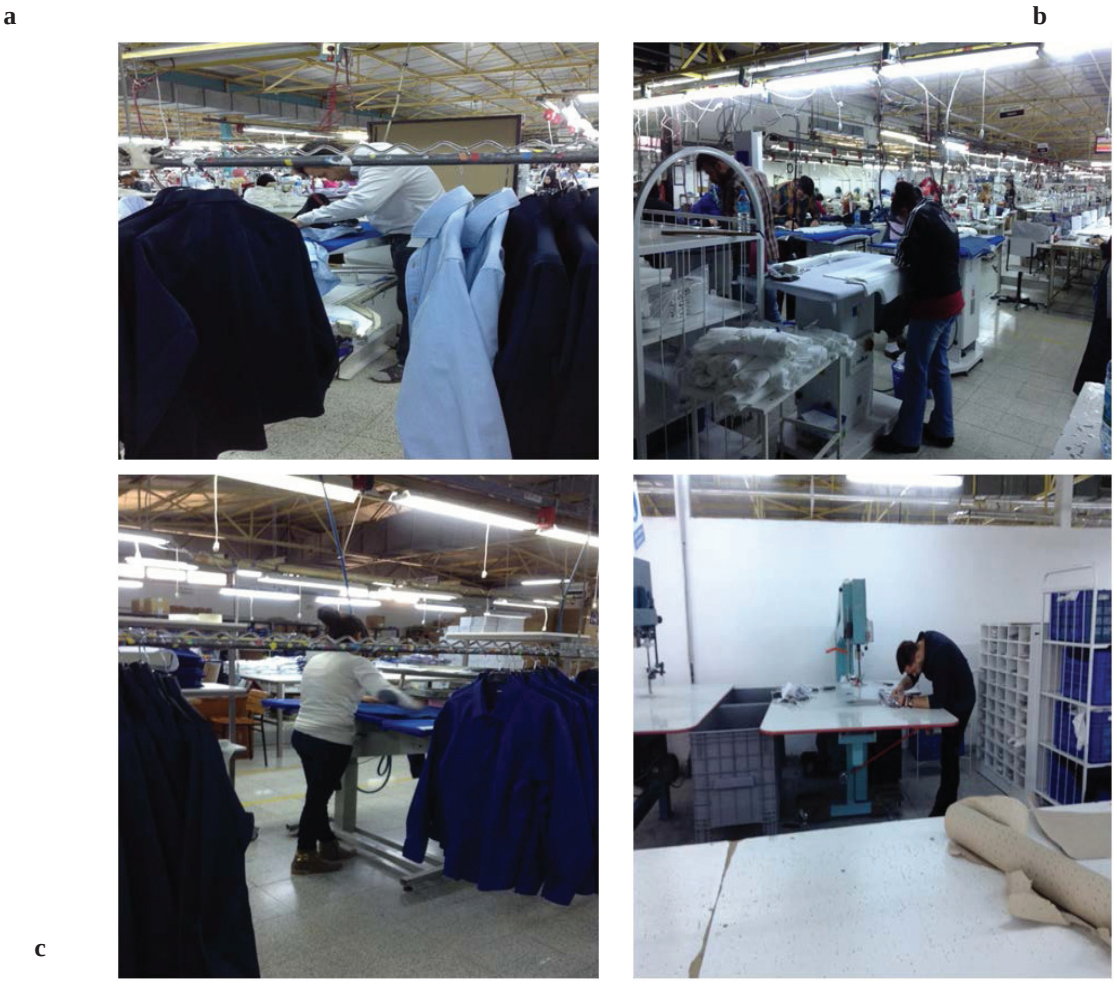

Fig. 2. Non-ergonomic Working Locations

When evaluating the environment conditions in the garment enterprises, another leading factor is the negativity of the thermal comfort conditions. When "Thermal comfort" is mentioned, the factors such as temperature, humidity, and air flow rate come to the mind.These can be dangerous for those working in the establishment. Temperature arising from the employees, working machines, steam/electrical irons, press machines negatively affects the working conditions especially in the summer and reduces the working efficiency (Fig. 2a-b-c). Because of the failure in providing enough ventilation of the environment and air conditioning, thermal comfort is one of the leading factors affecting the work performance and occupational health in the environments where many people work. At this point, the problem can be solved by a good ventilation and positioning and designing the working environment correctly.

Adjustable ground and workspace are used for ensuring physiological characteristics of the individual to fit the work. Non-adjustable quality control, ironing and working desks seen in Fig. 2b-c and d cause major problems for the employees with different sizes. Working at the appropriate height would be possible by placing a support on the floor or adjusting the working area to the appropriate height. Solving this problem is important for the health and work efficiency of the employees. As mentioned by Dul and Weerdmeester [11], the activities of people usually occur in a wider organizational environment. Therefore, how this environment is designed is very important for the employee.

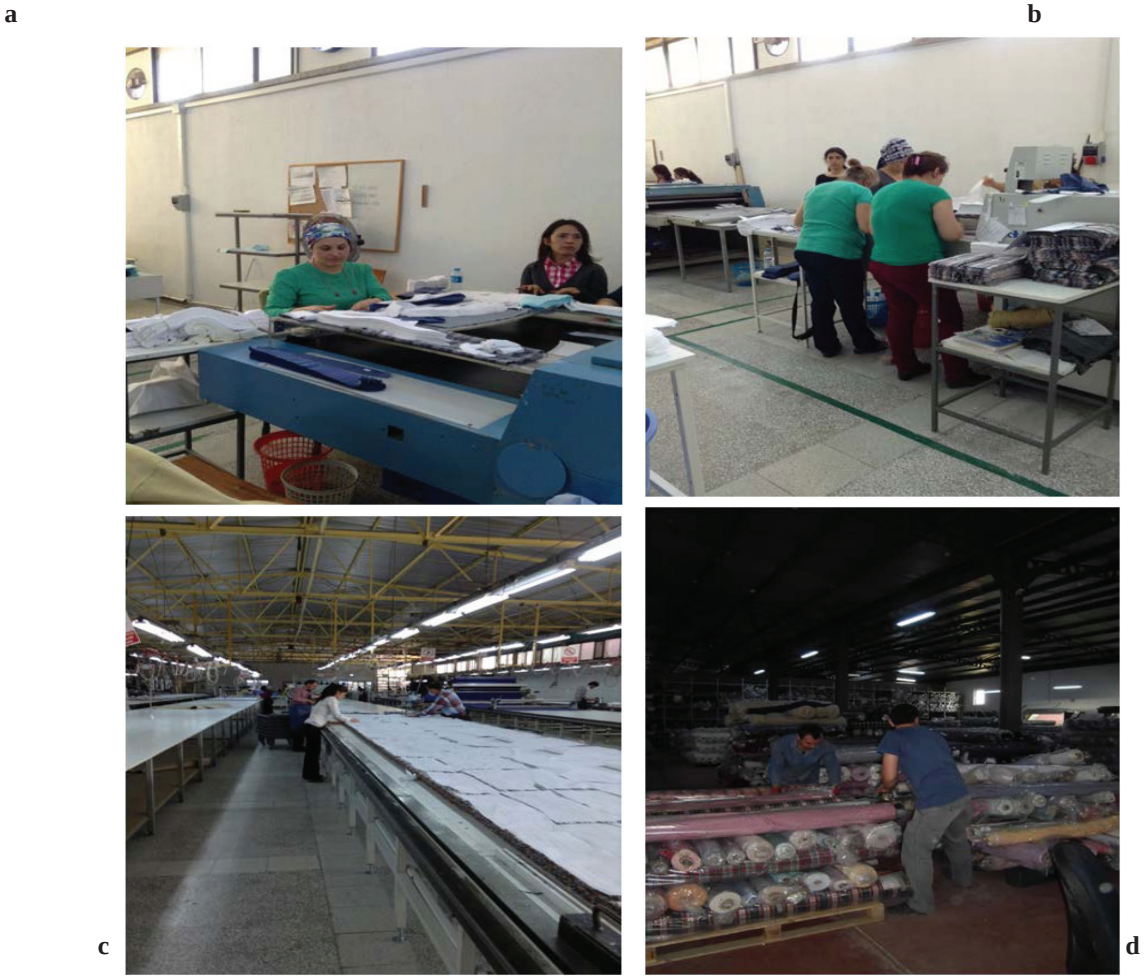

Fig. 3. Non-ergonomic Working Locations

The aim of ergonomics in the design of the workplace is to achieve a transparent interface between the user and the task and prevent the users from being distracted by the tool they use. While working, the distraction may be caused by not having a comfortable workspace. For example, the operators and warehouse personnel who are responsible for moving, stacking and loading the fabric tops to the counter, are exposed to similar ergonomic hazards (Fig. 3d). For that reason, well-designed work areas should not create obstacles to the fulfillment of the task. Therefore, the designers should take into consideration the anatomical, physiological and anthropometric characteristics of the users as well as the requirements of the task. Usability problems usually arise in relation to the amendment to the functions and methods as well as re-design of the workspace.
In figures 3a and c, hitting of the operator by moving parts of the machines used in the garment industry such as press, spreading machines can also cause accidents during the work of the operator. Additionally it can be seen in figures 3a and 3b that the employees are stuck to the wall, mobility of the employees decreased, it is not an appropriate working environment, the entries and exits to and from that point are problematic. Therefore, the ergonomic principles should be observed when designing these areas and determining employee placement.

4. Conclusion and Recommendations

It is a well-known reality known by everyone that human communities in the world vary in terms of physical

dimensions. For this reason, many communities try to determine their physical size and make an effort to produce or design the tools, equipment, machinery, workspace and architectural buildings in accordance with their size.

In this context, the principles of ergonomics should be adopted and implemented by all sectors, particularly the manufacturing sector, in order to ensure that the employees work safer, more comfortable, healthier and, as a result, more efficiently in their workplace. The garment industry has great importance particularly in developing countries, for it plays an important role in both employment and transition to the industrialization process. At this point, ergonomic arrangements must definitely be made, for the garment sector is based on a labor-intensive structure.

The main objective of the examination of the working environment in terms of ergonomic aspects is not only to ensure health and safety of the employees but also create a working environment for them where they can activate effectively their physical characteristics and physiological and psychological capabilities. Thus, it would be possible to increase the efficiency of the employees and the quality of the work. Thus, it will be possible to increase the effectiveness of the employees and the quality of the work done as is specified in the studies of Hassal et al. [12]. As indicated in the study carried out by Colovic [13] and Hoffmeister et al. [14], injuries resulting from poor ergonomic conditions can be prevented with the design of physical working environment around the physical needs of individual employees. Thus, it is necessary to know about physiological, psycho-sociological conditions and anthropometric ergonomic conditions.

As it is known, the main goal of the ergonomics is to increase the productivity and efficiency on one hand and at the same time to make the employees work under humane conditions and within the comfort limits on the other hand. It is inevitable to encounter problems if these limits are not taken into consideration. The leading issues of which employees, who worked for many years in the garment sector, complain are back, waist, shoulder pain, burn and pain in hands, arms and elbows, neck flattening, musculoskeletal problems, pain in the feet and legs, eye problems. As indicated in the study carried out by Gillian et al. [15] occupational diseases, musculoskeletal problems, inefficiency, absenteeism and fatigue are important problems in industrialized countries around the world as well. They stated that epidemiological studies carried out revealed the importance of occupational ergonomic factors in the occurence of these diseases. Especially in the study they carried out, they concluded that the operating surface and abnormal posture lead to muscoskeletal system problems. This support the data we obtained from the enterprises in our study.

Considering the results obtained in this study, it has been observed that this situation is being experienced heavily in the garment sector and the workspaces and the tools used are not ergonomic. In a study carried out by Colovic [16],it was indicated that unhealthy and insecure environments for the employees in ready-wear industry lead to various health problems. Thus, the necessity of what kind of a solution is found in order to reduce health problems of the employees is important.

The leading issues creating difficulties for the employees are the congestion of the working area, the reduction in the mobility of the employees and non-adjustable tables and chairs.

The fact that employees working on machines especially work in very narrow areas is another problem observed. In a study carried out by Colovic [17,18] in this area, it was stressed that the restricted mobility in the legs of the employees especially working on sewing machines and inappropriate posture will affect both the health and efficiency.

When the manufacturing operations are monitored, it has been observed that the employees work continuously either sitting or standing during the normal working period. This situation causes many health problems.

It is aimed at creating these necessary conditions both at the workstations monitored and in all improving arrangements. The following recommendations can be given in the light of the principles specified in the aforementioned workstations:

- Tools that the establishment use such as chairs, tables, lathes should be adjustable.
- The chair and the working surface height (able or lathe) should be adjusted according to the anthropometric dimensions of the employee.
- As indicated in the study of Sutton [19], systems should be designed so as to eliminate the failures of humans. Thus, attention should be paid to correctly design the work stations and systems.
- Efforts should be made to achieve that all kinds of tools are adjustable in terms of anthropometric dimensions and the range of adjustment should be within the required safety limits.
- Standing and sitting positions should be changed regularly.

- Employees and the machines they use should be placed well and unnecessary handling, performance loss and body force should be avoided.
- As mentioned in the study of Kogi [20], it should be noted that ergonomical improvements are only possible through training.
- It should be ensured that the working areas are calculated by taking into consideration the space which the employee covers and enough space is left between two employees.
- It should be ensured that machines, tables, and workspaces are positioned or placed properly so that the employee can easily enter or exit and use them.
- When working either standing or sitting, it is important to keep the spine in a splayed “S” position, which is the neutral position of the spine.
- To avoid static working, it should be taken into consideration that the commonly used objects and materials are not above the shoulder level.
- It should be noted that ergonomics can only be implemented through design.

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