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## Ergonomic analysis of a clothing design station

Ivaniria Tecilla Guimarães Souza, Célia Roberta Buss Buski, Eduardo Concepción Batiz,  
Ana Lucia Berretta Hurtado\*

*Production Engineering Professional Master's Program, Centro Universitário UniSociesc, Joinville SC 89205-100, Brasil*

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### Abstract

The conditions of the furniture used to develop school activities are not always ergonomically appropriate, what may lead the students to adopt uncomfortable postures and thus the occurrence of diseases and pains in different parts of their body. Students at different levels of education are not exempt from these situations, since they remain for long periods in classrooms adopting inadequate postural habits, and besides, school furniture may not have the proper conditions to let them adopt correct postures. This research aims to identify ergonomic risks in clothing modeling activities. A descriptive research was performed by case study, in order to verify the adequacy of furniture to the physical type of the students, so that they could carry out their activities without suffering from musculoskeletal pain. In addition, the research was classified as quantitative and qualitative, and the REBA method was applied to assess whether the adopted postures could be the cause of musculoskeletal problems. We used the Nordic questionnaire to establish at what extent the postures were harmful to the health of students. It is noteworthy that 98.2% of the analyzed positions of students are between medium to very high risk, 46.7% have complaints of pain in the hips and thighs, 40.0% in the neck, in the dorsal region, in the lower back and ankles and/or feet, 33.3% in the knees. Equally important is the fact that 8 students (26.7% of the total) have complained in the past seven days about pain in the lower back and hips and/or thighs; 23.3% in the knees and 20.0% in the dorsal region and ankles and/or feet. It can be concluded that the school environment can lead to the adoption of bad postures due to both the disagreement of furniture to students' anthropometric measures and to inadequate postural habits.

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\* Corresponding author. Tel.: +55-047-3461-0277; fax: +55-047-3461-0277.

*E-mail address:* [ana.hurtado@sociesc.org.br](mailto:ana.hurtado@sociesc.org.br)

## 1. Introduction

Children and adolescents spend many hours of their day in the classroom, mostly in the sitting position [6, 19, 9, 14]. This situation can cause pain, discomfort and harm in learning, especially if the school furniture is not in accordance with the anthropometric measurements of these students [20, 21, 15, 8, 16].

Postural problems that directly affect the spinal column are related to growth phase and body development, which coincides with the beginning of children's scholar phase [6, 7, 18]. Children are exposed to inadequate habits and behaviors for years in this environment, which can result in serious risks to the structure of their spinal column [15].

Posture can be defined as the position that individuals adopt to perform daily static or dynamic activities, using the musculoskeletal system at the workstation and following postural methods to adapt themselves to the environment [1].

There are factors that enable musculoskeletal disorders such as loading heavy backpacks, sitting for several consecutive hours, and adopting incorrect postures [13, 1]. Scholar furniture must be in accordance with physical characteristics of students in order to avoid the adoption of incorrect postures, which can lead to the development of illnesses such as lordosis, kyphosis, scoliosis and herniated disc, and their irreversible consequences [4, 5, 12].

The adoption of poor posture is considered one of the factors that cause musculoskeletal pain in the classroom [6,14]. The chair should be adapted to the individual height in a way that the column stays in the correct position, what demands less physical effort [17, 6]. The backrest should fit for the column height, letting the back muscles relax for some periods, it is important to adapt the workplace to humans [10].

So, ergonomics is important in every daily activity, it is necessary to adapt it to the psychophysiological characteristics of human beings in search for comfort, health and safety [6, 13]. All working conditions must be analyzed as a whole once humans are unique, and then all activities performed during the day must be adequate to ergonomics principles [9, 16]. Workplace, and specifically workstation, must meet basic requirements of safety and comfort when searching for the complete wellness of individuals [7].

This study aims to develop a workstation for the students of clothing design classes, demanding an anthropometric study for postural ergonomics analyses.

## 2. Methodology

This case study was carried out with students of a technical designing course at an institution in the south of Brazil. The postures adopted by the students in the classroom were evaluated using ergonomics tools and specific techniques such as interviews, questionnaires, photography and video recording of postures in sitting and standing positions.

The studied sample consisted of 30 students, all females between 16 and 35 years old. The age distribution of the students is showed in Table 1.

Table 1. Age distribution of sample.

Age (years)	Number of students	Age (years)	Number of students
16	1	23	1
17	9	24	2
18	3	25	4
19	3	28	1
20	1	31	1
21	2	35	1
22	1	TOTAL	30

According to Table 1, the average age of the students is 21, thus characterizing a very young sample. This group was chosen to be part of the sample because these students use more frequently the drawing tables.

The study was divided into five stages: Direct Observation; Nordic Musculoskeletal Questionnaire (NMQ); Video recording and photographs; Rapid Entire Body Assessment Method (REBA) and Diagnosis.

In a first step, the researchers performed the direct observation during the classes of designing in which the

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