# EDUCATION OF ERGONOMICS IN A FASHION DESIGN COURSE

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**ABSTRACT**
This text presents the discipline of Ergonomics Applied to Fashion within the course of Fashion Design, taught at the University Anhembi Morumbi. A brief introduction to the origin of the concepts of ergonomics will be reported, followed by an explanation about the subject creation within the course and, finally, the description of the syllabus, the objectives and the syllabus contents, applied in specific activities throughout the semester. The exhibition of each exercise, which uses the concepts inherent in Active Methodologies, will allow the reader to understand how the discipline of Ergonomics is offered to the student of Fashion Design, enabling him to develop his academic repertoire, using the ergonomic principles of comfort, safety and efficiency as differentials in their professional development.



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## 1 INTRODUCTION TO ERGONOMICS

It is interesting to note how ergonomics has been present in all human-related activities since the earliest days, by making its first tools for hunting and defense, as well as using fur to protect the body from thorns and bad weather or by choosing spaces for the man used empirically the concepts inherent to ergonomics.

Throughout history, it is possible to verify how the concepts of ergonomics were incorporated by the societies due to the concern of doctors and sanitaristas in relation to the quality of life of the workers, Antoine Laville, for example, reports in its text References for a History of Francophone Ergonomics that the conditions of work were decisive for the state of workers' health, and quotes the following passage:

> In the Middle Ages, Armand de Villeneuve became interested in working conditions and in particular environmental factors, such as heat, humidity, dust, toxic substances, for glassmakers, smiths, smelters, dyers, and lighting and sedentarism for notaries. (LAVILLE, 2007, p. 22)

The reports by professionals dealing with the workers of the period of the Industrial Revolution found that the transformation of the means of labor from the craftsmen to the industrial production line aggravated the health conditions of the proletariat.



Doctors such as Bernadino Ramazzini in Italy, considered the father of occupational medicine, Philibert Patissier in France, mentor for the creation of labor inspection, and Louis-René Villermé, also in France, who has set off worker protection laws, are some examples of precursor professionals in investigating the harmful effects that can be avoided with ergonomics studies (LaVille, 2017, p.23).

Throughout the twentieth century, the importance of the study of ergonomics was gradually transformed, as the new technologies were incorporated into daily life and increased searches for better human performance in performing the most varied tasks.

According to Itiro Iida, the first teacher to teach the discipline of Ergonomics in the teaching of Production Engineering at the University of São Paulo,

> Ergonomics has a broad view, encompassing planning and design activities that occur before work is done, and those of control and evaluation that occur during and after that work. All this is necessary for the work to achieve the desired results (IIDA, 2005, p. 2).

Due to the complexity of the areas of ergonomics, it is possible to identify three main domains of the interaction between man and the activities carried out throughout the day.

They are: Physical Ergonomics, which uses the concepts of Anthropometry to study posture, handling, and all movements involving human activities, as well as the design of their physical spaces; Cognitive Ergonomics, which studies the relation of man and his motor reactions promoted, for example, by the understanding of the use of systems by perception, by memory, by examining human-machine interaction; and the Organizational Ergonomics, which analyzes the disposition of the processes of accomplishment of activities as, for example, the development of the collaborative work and the quality management.

In this way, it is possible to perceive that ergonomics is an area of knowledge in constant mutation and improvement, due to the constant changes in the relation of man to the daily activities performed over time.

## 2 ERGONOMICS AND EDUCATION OF FASHION DESIGN



Among the various definitions that can be found on ergonomics, this text will highlight the term postulated by ABERGO, the Brazilian Association of Ergonomics, which defines ergonomics as the study "of people's interactions with technology, organization and environment, aiming at interventions and projects that seek to improve, in an integrated and non-dissociated way, the safety, comfort, well-being and effectiveness of human activities "(ABERGO, 2004).

By observing the definition, it is easy to detect the various areas covered in the activities inherent to Fashion Design that can be highlighted from modeling, through workplaces and sales areas, to the user's attention to their needs and desires.

Aware of the importance of the area of ergonomics for the training of future fashion designers, a select group of professors led by Prof. Ma. Eloize Navalon elaborated the course of Fashion Design of Anhembi Morumbi University in 2007, including in the curriculum the discipline of Ergonomics Applied to Fashion.

The syllabus of the discipline describes in a comprehensive way the fundamentals of ergonomics, providing an update of the subject to be approached as the development of the fashion area, allowing the teacher to work the concept which:

> Studies the adequacy of cultural objects to man, considering the ergonomic studies of physiology, perception, cognition and memory, dynamic and static anthropometry, handling, controls and displays. It analyzes the cycles of interaction and perception, usage scenarios, routines and interpretations. It addresses user-centered evaluation methods and measurement of design projects… the discipline. (discipline menu)

In order to meet the concepts of the discipline menu, relating the area of ergonomics to the activities developed by the fashion designer, the objectives of the course include, in first place, the student's awareness about the relevance of the study of ergonomics, especially in the design of products of the Design of Fashion, clarifying the extent of professional performance. Knowing the emergence of the field of ergonomics and the transformations in the fashion paradigms, the student understands the evolution and interaction that exist between the two areas of knowledge.

Allied to the Modeling discipline, the course provides students with an understanding of the study of Physical Ergonomics from the point of view of the user's body and its concepts in the different visions and basic characteristics of the ergonomic product, offering students an understanding of the interdisciplinarity of the course. In this content of the discipline, the Anthropometry knowledge is directed mainly to the modeling area, but also includes notions of the relation of the human body to the work space in the use of machinery, for example, as well as observations on spaces of exhibition and sale of products.



The concepts of Cognitive and Organizational Ergonomics are contemplated by the objectives of the discipline in proposing to design ergonomic fashion products, attending sustainability and accessibility issues, as well as establishing usability requirements and goals for clothing products, derived from the user experience.

Within the contents of the subject, the teacher seeks to discuss concepts about prototypes and their applicability, observing the production scales, enabling low fidelity models with the intention of discussing ergonomic and cognitive issues, through methods of applying usability tests to the area of Fashion Design. As a way

to awaken the students to the research of new technologies, the teachers guide them to know the ergonomic aspects involved in the interaction with mobile devices - wearables. Finally, the objectives of the course seek to relate the aesthetic, ergonomic and functional issues in the development of projects in the area of Fashion Design, seeking each new semester to update the subject according to the needs of the professional market related to the Fashion Design course.

## 3 THE DISCIPLINE OF ERGONOMICS APPLIED TO FASHION

Within the pedagogical project of Fashion Design course, from Anhembi Morumbi University, the discipline of Applied Ergonomics to Fashion is inserted in the fourth semester of the course, in which the students develop a project related to the macro subject "Fashion Design and Brazilian Culture".

The disciplines that constitute this semester are: Brazilian Culture, addressing anthropological themes based on authors such as Darcy Ribeiro and Gilberto Freire; Contemporary Fashion, which develops the work of reflection on the issues of the national culture related to the future of design and fashion; Project Methodology, in which the student is stimulated to know the various methods for the elaboration of a project within the fashion area; Basic Modeling, which instrumentalizes the future designer in the construction of fashion products through the technical deepening of the various techniques of cutting and sewing, and finally, Ergonomics Applied to Fashion, which promotes reflection on the body, space, area of action and the user (NAVALON, 2010, p.7).



The content of the Applied Fashion Ergonomics course is developed using the Active Methodologies that stimulate the student to acquire his knowledge through his participation and involvement both in the apprehension of what the problem is to be overcomed and in the search for solutions for him, aiming to meet the needs and wishes of the user.

According to Pablo Farias, the use of Active Methodologies in higher education has "the objective of training independent professionals, critics and opinion formers" (FARIAS et al., 2015, p.145), and in this way, the discipline meets the inherent concepts both ergonomics and fashion products.

There are 7 principles that guide Active Methodologies: the Student is the Center of the Learning Process, Autonomy, Reality Problem, Reflection, Teamwork, Innovation and Teacher as Mediator (DIESEL et al., 2017, p.278).

Throughout the semester, the content of the course is presented to the group of students with dialogic expository classes in which the subject is displayed at the beginning of each class and, in the sequence, a problem situation is presented for discussion in small groups, in such a way that students can be agents of their own educational development, applying the theme of the lesson in situations to be faced by future designers.

Employing the principles of Active Methodologies to carry out the activities, students are encouraged to use processes of: a) theoretical research through a bibliographical survey, seeking the theoretical references to base the concepts of ergonomics related to the world of fashion; b) imaging research so that the group can form a library of images about biotypes and understand the importance of (re) construction of forms through the modeling and, c) field research so that the student has knowledge of the user's relations with his design, applying the usability test. All activities envisaged in these processes have the teacher as mediator, acting in a way to "provoke, challenge or even promote the conditions to construct, reflect, understand, transform, without losing sight of the respect, autonomy and dignity of this other (student) "(DIESEL et al., 2017, p.278).



## 4 THE CONTENT OF THE ERGONOMIC DISCIPLINE APPLIED BY THE CONDUCT OF FASHION RELATED ACTIVITIES

Being the term ergonomics unknown to most students, the exercises applied to the fashion area have as main objective to elucidate the student the importance of the study of the body and its relations with space and with the fashionable product.

Although the students of the fourth semester have had experience in the construction of wearable parts, it is during this period that the valuation of the bases of the modeling takes shape in the development of a collection, for which the students are encouraged to work the fashion product, taking into consideration the comfort of its user, the use of raw material and its serial production.

As Cristiane Santos explained,

> If we start from the assumption that clothing is intrinsic to human life and that the main objective of ergonomics is to adapt what is around human beings to their needs, it is also valid to justify the adaptation of clothes, so that they offer comfort, mobility, good trim, safety, and yet are comfortable for the user (SANTOS, 2009: 43).

The discipline Applied to Fashion Ergonomics is composed of six exercises with degrees of complexity graded and differentiated, seeking to bring the student closer to the main issues related to both ergonomics and fashion.

The questions of Physical Ergonomics are addressed in the first and second exercises that use the principles of Anthropometry (figure 1).

Figure 1 – Anthropometry exercise - measurement survey.

Source: by the author.

In the first exercise, titled “The body”, the anthropometric survey of the group of students in the room, divided by men and women, is carried out. A sampling of three people per group is performed, by means of which the lowest, middle and highest measurements of each group are taken. The measures are taken standing and sitting in order to compare to the tables already on the market, verifying if the national measures correspond to the reality of the room. After the anthropometric survey, the percentiles of 5, 50 and 95%, respectively the lowest 5%, the medians and the 5% are calculated, so that the students understand how the tables are elaborated and can use correctly the provided data.

In the Sewing and Modeling Laboratory of the institution, the second anthropometric exercise, called “My Space”, is carried out, whose main focus is to make students aware of the importance of posture in the performance of work, examining in each machinery the relationships of the body during the elaboration of fashion products. As some of the concepts of ergonomics pass through safety, comfort, production processes, among others, in this activity, students, who already perform some professional activity, are invited to give testimonials about the working conditions experienced, discussing how the industry can improve the relation between employees and demands to be fulfilled by the companies.

The third exercise called “Bios”, is directly related to the Modeling discipline, trying to study the biotypes as a way of observing the forms of the bodies of the Brazilian population, using as base the text "Feminine Body: the diversity of Brazilian forms". Following the indications of the Active Methodology, the Inverted Classroom method is used, in which the student is guided before entering the class to relate to the subject that will be approached in his schedule. Thus, the link to the article "Feminine Body: The Diversity of Brazilian Forms" is made available and asked the students to read the text, pointing out impressions and doubts. The text is discussed in class and, assimilated its contents, an exercise of imagery research is proposed in the computer lab, where groups consisting of two or three students look for images of artists, sportsmen and people known in the media to represent each biotype. Although it seems simple, exercise forces students to observe bodies that, because they are known, sometimes do not represent the stereotype to which they are related by the mainstream media, that is, bodies that are disclosed as hourglass, when studied, are perceived as rectangular. Another element studied in this exercise is the relationship of the body to the clothing, which allows the modeling of a physical through cuts and cuts, concluding that the fashion designer, through modeling, can visually alter the silhouette of a person.



The user-centered assessment and measurement methods are studied as from the fourth exercise, dubbed “What is the Criterion?”, based on the text by Pierre-Henri Dejean and Michel Naël, "Product Ergonomics" (2007), in which the seven ergonomic criteria by which fashion products should be evaluated to meet user needs.

For the authors:

> It is not always simple to meet the set of criteria, and this may require an ethical stance. The simplicity of use can not be conceived to the detriment of safety, the impression of comfort that endangers health in the long run, pleasure through ease, satisfaction of one population at the expense of another. Ergonomics has an obligation to participate in sustainable development which only retains solutions that do not penalize anyone, now and in the future (DEJEAN, NAËL, 2007: 396).

The text of Dejean and Naël is presented at the beginning of the class by means of a digital presentation; in it, the teacher emphasizes the main points of the chapter so that the class has repertoire to carry out the activity. For each criteria: Safety, Efficacy, Utility, Error Tolerance, First Contact, Comfort and Pleasure, students should select images that correspond to each item. Since there are pieces that meet more than one criteria, it is necessary that the student uses the concept that best fits the object, because the image can not be repeated. In this way, the student is led to develop arguments that can justify each option.

The fifth exercise, “Affective Part”, relates to Cognitive Ergonomics and to the study of Emotional Design based on the phrase of Donald Norma, in which he clarifies that "cognition interprets the world, leading to increase understanding and knowledge. Affection, which includes emotion, is a system of judging what is good or bad, safe or dangerous. This creates value judgments that allow us to survive better "(NORMAN, 2008, 40). In this exercise, the student must bring to college a garment that he has in the closet and with which there is an affective involvement that prevents him from getting rid of it. According to the size of the class, the teams are separated by no more than six so that all members can present their pieces to others, emphasizing the importance of the object studied. With each presentation performed, the other members write their impressions on the piece displayed under the eyes of a consumer. At the end, the group develops a report describing and interpreting the group's perception for each piece exposed. This work aims to analyze fashion consumption from the perspective of the concepts of emotional design, being, Visceral, behavioral and reflexive, related to behavior and involving the purchase of a fashion product.



And the last exercise performed in the discipline of Applied Fashion Ergonomics is directly related to the user to be served by the work developed by the Interdisciplinary Project of the fourth semester. The purpose of this exercise is to study the usability requirements and goals for apparel products, focusing on user

experience. The choice of piece will depend on when the Interdisciplinary Project is being carried out. If the process of creating the collection of the Interdisciplinary Project coincides with the moment of the usability test of the discipline of Ergonomics, the group chooses a prototype piece idealized for the collection. If the disciplines are not aligned by virtue of holidays, for example, each group should purchase a garment item related to the user for which the collection will be developed. In possession of the piece, the group prepares the questionnaire to perform the usability test with five people who depict the user's profile. In this activity, students need to go to the field to conduct research to verify the behavior of their audience. Interviews should be recorded so that, in addition to the analysis of the responses to the questionnaire, all the user's body expression in front of the part can be evaluated, since in the interviews most of the respondents feel they are under evaluation and, therefore, do not always declare their real feelings, responding according to what they believe to be the desire of the interviewer. With the data gathered by this field survey, students can develop the project based on the yearnings and desires and the audience for which the collection was intended.



At the end of the semester, the students understand the competences of the area of ergonomics and its importance for the development of the professional of the fashion area that seeks comfort, safety and efficiency in the production of its products.

## 5 CONCLUSION

Ergonomics is an area of knowledge that operates in several fields such as Occupational Medicine, Physiology, Psychology, Sociology, Engineering, Architecture and Design, promoting the adaptation of man to all activities performed throughout the day.

The study of ergonomics has accompanied the evolution of the activities performed by man in the use of machines and technologies, always prioritizing safety, efficiency and comfort, aiming the well-being and the improvement of the conditions of accomplishment of processes essential to human behavior.

For the Fashion Design area, ergonomics is directly related to the elaboration of the fashion product, since all activity related to the fashion world seeks

to promote user comfort, as well as the convenience of using machinery, tools and the space for the exhibition of products.

Throughout the discipline of Applied Fashion Ergonomics, the program content explores the niches where the two areas, fashion and ergonomics, have a close and relevant relationship.In a way that future fashion designers can understand how the ergonomic concepts Physical and Organizational applied to diverse areas of fashion, can collaborate to construct more comfortable work environments for the worker in the handling of equipment and in the use of products with health risks, as well as to prioritize store spaces for special users, such as wheelchairs and consumer plus size, for example.

With regard to Cognitive Ergonomics, the exercises promoted by the discipline aim to enable the students to perceive the desires and needs of the user, using the principles of development of a collection with the objective of promoting the satisfaction of the man with his own body.

When working the discipline of Ergonomics in a semester accompanied by subjects such as Basic Modeling, Brazilian Culture, Project Methodology and Contemporary Fashion, the concepts of the discipline are naturally absorbed by the students, since the whole semester the same theme is approached under different perspectives. And, in this way, the processes presented here for the construction of students' knowledge allow the future fashion designer a broad vision of their professional field of activity.



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