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Applying medical discourse in ergonomics courses for students of technical sciences

ABSTRACT

The present paper explores the role of medical terminology in the teaching of ergonomics to students of technical sciences. It aims to describe and encourage certain positive practices in teaching "Ergonomics and ergonomic design" (EED), a course for students of technical sciences in Bulgarian universities, the Technical University of Varna in particular. The observations are based on the textbook and study aids for EED used by industrial design students who, in their second year at university, are enrolled in the course "Ergonomics and ergonomic design."

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Introduction

As a science that studies in their entirety the human functional abilities in the processes that take place at work or at home, ergonomics cross-pollenates with various sciences – medical (anatomy, physiology, hygiene) and technical (industrial design, cybernetics, etc.) (figure 1).

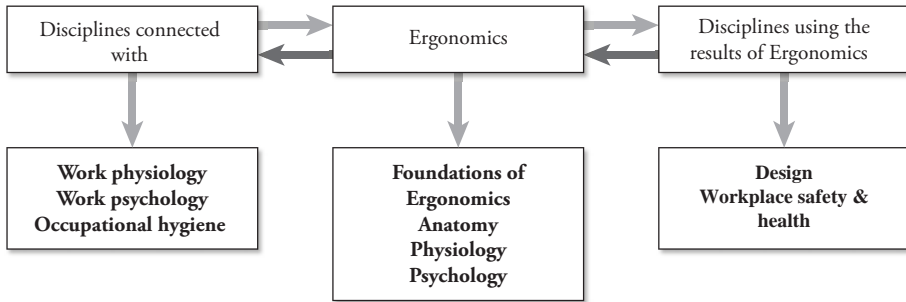


Figure 1

Purpose

The present paper focuses on the role of medical terminology in the teaching of ergonomics to students of technical sciences. According to specialized literature, the term *discourse* is conceived of as a synonym of terms with two different meanings: "situational speech" and "text" (Pachev 1993:42). For the purpose of this study, by *medical discourse* we designate the medical terminology, pertaining to the human factor, embedded in the academic discourse of ergonomics.

This project aims to describe and encourage certain positive practices in the teaching of students in the discipline "Ergonomics and ergonomic design" (EED), which involve the recontextualization of terminology from medical discourse and its application into the academic discourse of ergonomics as an interdisciplinary scientific field. The object of study is the utilization, definition, and clarification of the terminology and concepts included in the topics pertaining to the human factor in the EED course for students of technical sciences in Bulgarian universities, the Technical University of Varna in particular.

Our observations are based on Aleksi Momov's *Ergonomics and Ergonomic Design*, the most widely used Bulgarian coursebook in this interdisciplinary field, as well as on the study aids for EED students (Momov 2003: 15). In their second year, the students majoring in Industrial design at the Technical University of Varna are enrolled in the course "Ergonomics and ergonomic design" (EED). The object of EED

is the human work activities in the process of interaction with technology under the influence of environmental factors. According to De Montmollin (Montmollin 1973:35), the development of ergonomics becomes possible and necessary when the problems with the introduction and usage of new technology cannot be met by the means and methods of either the medical or the technical sciences.

The students enrolled in the Industrial design program, where the language of instruction is Bulgarian, are Bulgarian and Turkish. The teaching of specialized language in the program is needed for the students' successful advancement into an interdisciplinary field, as well as for developing their habits and skills for professional communication in their future work.

Future industrial engineers ought to master the medical terminology which pertains to ergonomics's conceptual apparatus. However, both Bulgarian and Turkish students encounter difficulties with acquiring medical terms. We relate these difficulties to:

- an inadequate educational foundation prior to university
- a poor general knowledge
- the qualities of individual students
- the lack of ample explanations/ illustrations of the subject matter in study materials

As future specialists in ergonomics and design, students ought to be able to plan the material environment in which humans live and work. The task of the designer is to align the workplace to people's characteristics in terms of anthropometry, age, race, sex, and health in view of their health and safety at work. Furniture at the workplace should be constructed in accordance with the Bulgarian State Standard (BDS) so that the worker, pupil, or student be protected from occupational diseases. In this regard, the relationship human-workplace-health constitutes a priority for designers and they should be sufficiently competent in projecting the material environment.

Medical discourse is indispensable for the instruction of EED students majoring in Industrial design, because:

- the human-machine-environment system (HME) represents ergonomics's central subject
- ergonomics is concerned with human health, work capacity, and productivity
- human work activities are related to microclimatic conditions (humidity, temperature, lighting)

Being in an engineering field, students are not familiar with the medical terms which encapsulate much of ergonomics' cognitive content and are present throughout their course. This creates problems with their instruction as well as with their ability to communicate on themes related to human anatomy, physiology, and oc-

cupational hygiene. It is therefore necessary to allot additional time for the clarification of medical conceptual apparatus. Students are assigned a course project – to make a presentation on a relevant topic, for example "ergonomic shoes." The purpose of the project is that students investigate the topic, familiarize themselves with basic terminology, and deliver an oral presentation. Students analyze the kinds of shoes, the types of feet (figure 2), and the possible diseases caused by non-ergonomic shoes. The next phase of the assignment is the preparation of a design of an ergonomic shoe suited for a certain type of foot.



Figure 2



Figure 3

The diseases caused by poor working posture among workers and students (figure 4) represent another interesting topic in the instruction of students of design. A sample task is to examine the types of spinal curvatures – kyphosis, lordosis, and scoliosis. The task is not random. It is based on our study "Ergonomic issues of school furnishings", which looks into the rise in recent years of spinal curvatures among students from 1st to 4th grade owing to school desks that do not correspond to the anthropometric features characteristic of the students' age (Dobрева 2011: 69). All in all, the assignment prompts future engineers to explore and collect the basic medical terminology necessary for the upgrade and enrichment of their professional language.

Specialized medical vocabulary in the textbooks is represented by:

- simple terms – *flexion, adduction, abduction, pronation, supination*
- compound terms formed from two Greek roots – *somatography, ergonomics*

Terminological phrases are presented through certain models:

- N1-P-Art.-N2: *phalanx of the thumb, rotation of the foot*
- Adj.-N: *corrective movements, reflex activity, dynamic stereotype*
- Adj.-Adj.-N: *simple sensorimotor reaction*
- Adj.-P-Adj.-Adj.-N: *functional and dynamic anthropometric parameters*
- Adj.-N-P-Art.-N2: *anthropometric points of the head, sagittal plane of the head*

Grouped thematically, most simple terms in the ergonomic discourse correspond to:

- anthropometry – *pronation, supination*
- anatomy – *lordosis, kyphosis*
- physiology – *analyzer, receptor, reflex, induction (CNS)*

In ergonomic discourse, medical terms are introduced in the following ways:

- written in Bulgarian, according to the anatomical nomenclature, as part of the definition: "The *olfactory analyzer* is an information pathway accepting information that is important for the worker's health." (Momov 2003: 64)
- written in Bulgarian and Latin:
 - The main term is written in Bulgarian and designated by a Latin letter: "The *ninety-fifth percentile (P95)* is the value of the indicator which characterizes the large individual, with higher values being measured in only 5% of the cases observed." (Momov 2003: 29)

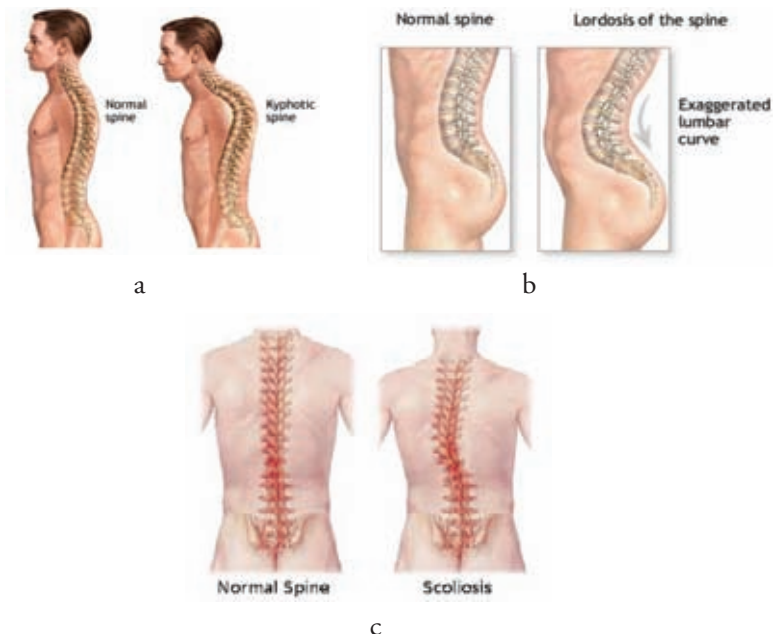


Figure 4

- The main term is written in Bulgarian and Latin: "*Metatarsalgia* [*метатарсалгия*] is a general term denoting pain in the foot just before the toes, commonly referred to as the ball-of-the-foot."
- Latin terms are only transcribed into Bulgarian, usually with no specifying notes: "High-heeled, narrow-toed, and tight-fitting shoes, as well as awkward gait are the most common causes of *bunion* [*буншон*]."

The conclusions from the present study will improve the effectiveness of EED courses. They also raise questions about the role of the Bulgarian university instructors in interdisciplinary areas like Ergonomics. In American universities – trendsetters in higher education across the world since the World War II – students of ergonomics or biomedical engineering (a discipline roughly equivalent to "medical equipment" in Eastern Europe) are prepared to meet the interdisciplinary challenge by rigorous training in the fundamental sciences on which ergonomics or biomedical engineering are based.¹ By contrast, while leading students into an interdisciplinary field, at the Technical University of Varna, we devote much of our energies and creativity to devising ways for filling in the gaps in their fundamental knowledge. Yet, under the current curriculum, certain steps and supplementary activities could facilitate instruction and enhance learning in EED courses. We recommend that a glossary with explanations of medical terms be compiled for the specific needs of the ergonomics courses for engineering students. Thus, students could get acquainted with the terminology that is essential for their discipline. In addition, the texts in the manuals used in EED courses should be supported with clear and plentiful illustrations.

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¹ For further information on ergonomics and biomedical engineering curricula, refer for, example, to Lithgow's (2012) comparative review "Biomedical Engineering Curriculum."