Ergonomic endocrinology

Sanjay Kalra,[1] Atul Dhingra,[2] Nitin Kapoor[2]

Abstract

In this opinion piece, we introduce the concept of ergonomic endocrinology. Ergonomic endocrinology is defined as the bidirectional and multifaceted relationship between endocrine health and dysfunction on one hand, and ergonomic design and engineering on the other. We describe the various domains of ergonomic endocrinology, using the classification rubric of physical, cognitive and organizational ergonomics. We highlight ways in which endocrinology can contribute to the enhancement of ergonomics

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Ergonomics

Ergonomics is a well-established scientific field "concerned with the understanding of interactions among humans and other elements of a system, and "the profession that applies theory, principle, data and methods to design optimal human well-being and overall system performance."[1] (International Ergonomics Association)

Ergonomics, therefore, is similar to the noble field of medicine. Both are evidence-based sciences which appreciate the relationship between human health and the environment, and aim to "optimize human well being". Ergonomic engineering aims to increase productivity and reduce human error, while enhancing safety and comfortable at work. Ergonomics includes not only engineering, but psychology, sociology and physiology as well.[2]

Both fields are characterised by super-specializations. Ergonomics is classified into three main domains: physical, cognitive and organizational ergonomics.[2] Physical ergonomics studies our anatomy, and its relationship with the design of consumer and industrial products. The aim of this branch is to prevent or minimize work- related musculoskeletal disorders. Cognitive ergonomics analyses mental processes, like memory, thinking and reasoning, to correlate them with work productivity. Organizational ergonomics deals with the socio-technical platforms, policies and processes of work organizations, so as to optimize their efficiency.

[1]Department of Endocrinology, Bharti Hospital, Karnal, India; University Center for Research & Development, Chandigarh University, Mohali, [2]Department of Endocrinology, Gangaram Bansal Hospital, Sriganganagar, India, [3]Department of Endocrinology, Diabetes and Metabolism, Christian Medical College, Vellore, India; Non communicable disease unit, Baker Heart and Diabetes Institute, Melbourne, Victoria, Australia

Correspondence: Sanjay Kalra, **Email:** brideknl@gmail.com

ORCID ID: 0000-0003-1308-121X

Ergonomics and endocrinology

Medicine is classified into different branches, including endocrinology, the science of hormones. Endocrinology, similar to ergonomics, is a rapidly expanding field of knowledge.

In this opinion piece, we conceptualize and create the field of ergonomic endocrinology. We define and describe ergonomic endocrinology, expound upon its scope and spectrum, and discuss the usefulness and utility of the subject as a means of "optimizing human well-being". We use the tri-dimensional structure of ergonomics - physical, cognitive and organizational - to highlight the bidirectional relationship of endocrine health and disease with work and work productivity.

Definition

We define ergonomic endocrinology as the bidirectional and multifaceted relationship between endocrine health and dysfunction on one hand, and ergonomic design and engineering on the other. It can also be described as the science which studies, and utilizes, the multifaceted links between ergonomic design and endocrine health in order to optimize well-being and productivity. We describe the various domains of ergonomic endocrinology, using the classification rubric of physical, cognitive and organizational ergonomics. This structure highlights ways in which endocrinology can contribute to the enhancement of ergonomics. One may also view this term as an opportunity to address occupational hazards of endocrinologists, by using ergonomic tools and techniques: we hope to address this in a future communication.

Bidirectional association

Table 1 describes some of the potential influences of work

Table-1: Endocrine Ergonomics.

Domain	Endocrine Impact Of Work	Endocrine Impact On Work
Physical endocrine ergonomics	• Sedentary behaviour/prolonged sitting is associated with obesity, diabetes, metabolic dysfunction • Exposure to heat may lead to heat-associated endocrinopathies • Work-related heat emissions contribute to global warming and associated ill health • Exposure to environmental disruptor chemicals is associated with endocrinopathy • Gonadal damage can occur due to mechanical/heat exposure	• Rising obesity levels call for designing of furniture, other infrastructure • Rising diabetes rates call for provision of small frequent meals; regular beverages; more washrooms • Understanding of transgender rights calls for gender-inclusive/diverse facilities
Cognitive endocrine ergonomics	• Prolonged work without food or beverage, with exposure to heat, may lead to dehydration, dyselectrolytaemia, and cognitive dysfunction • Inappropriate dietary patterns, with mismatched drug intake, can precipitate hypoglycaemia and neurocognitive dysfunction	• The possibility of hypoglycaemia in persons being treated for diabetes calls for snack stations in convenient locations • The need for insulin in type 1 diabetes requires facilities for insulin storage, injection and sharps disposal at work
Organizational endocrine ergonomics	• Exposure to varied influences at work may impact endocrine health care seeking acceptance and persistence • Allowance for women's health-related challenges, e.g., menstrual hygiene, menstrual leave should be considered	• Inclusive, person-first, nonjudgmental and non-discriminatory language should be used at work • Human resource policies should address diversity in its entirety, including persons irrespective of gender identify, weight, or endocrine/metabolic status

Table-2: Use Of Endocine Intervention For Enhancing Ergonomic Performance.

Domain	'White hat'	'Black hat'
Physical ergonomics	• Hormone replacement/supplementation in person with documented deficiency, e.g., Vitamin D, growth hormone, testosterone • Sarcopenia prevention.	•• Hormone abuse in persons without deficiency, e.g., misuse of anabolic steroids, other hormones
Cognitive ergonomics	• Avoidance of hypoglycaemia, dyselectrolytaemia • Provision of healthy snacks, beverages, to ensure metabolic health	• Use of unproven nootropic drugs
Organizational ergonomics	• Provision of occupational health services • Focus on primary and secondary prevention of endocrine disease as a part of occupational health services	• Use of unproven therapies for endocrine metabolic health

place and work on endocrine health, as well as of current endocrine health-related trend, on the ergonomic design. While this list is by no means comprehensive, it illustrates emerging challenges and concerns that ergonomic engineers need to consider. It also highlights the need for ergonomics to expand its interaction with the medical field, going beyond conventional connects with orthopaedics and physiotherapy,[3] and ensure cross talk with endocrinology and metabolism. This will help enhance understanding of the bidirectional, and multifaceted link between ergonomics and endocrinology, and foster the development of ergonomic endocrinology, or endocrine ergonomics, as a distinct specialization.

Endocrine enhancement of efficacy

Another aspect of ergonomic endocrinology, discussed in Table 2, is the use of endocrine interventions to enhance

physical and/ or cognitive prowess and productivity. We use 'White hat' and 'black hat' terminology, from hacking (credit: Aarav Dhingra and Pranav Arora), to classify the rational, and irrational, role of endocrine interventions.

Evidence-based optimization of endocrine health incorporating the concepts of endocrine hygiene[4] and glycaemic hygiene, also contribute to ergonomic efficiency. As the prevalence of endocrine disorders such as diabetes, obesity, polycystic ovary syndrome and thyroid disease increases,[5] the need to focus on these aspects of occupational and preventive health will continue to rise. At the same time, use of irrational and potentially dangerous 'ergotropic' medications, such as anabolic steroids, cannot be condoned.[6] Such practices must be actively discouraged.

Summary

Ergonomic endocrinology represents an exciting interface between ergonomics and medicine. This field has significant individual as well as public health significance. More attention should be paid to this field, so as to ensure that we are able to optimize the well-being of our working population.

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