

Human Performance and Comfort in Protective Clothing and Sportswear

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Ever since people have clad themselves, clothing has become an important feature of nearly all human societies. People's clothing is influenced by their work, gender, age, culture and traditions. Given that people are involved in a variety of work, sports, activities and hobbies, clothing design and technology have become very specific and intricate. This is so evident in Protective Clothing and Sportswear design.

First, since the cloth is used to clad the human, a good knowledge and detailed understanding of the human anatomy, physiology, psychology and human limitations are essential. The bones and joints provide the human with a frame to support other structures and to enable locomotion. The muscles provide the forces to create locomotion. The muscles also give shape to most part of the human body. Contraction and relaxation of the different muscles can drastically change the human shape. The human skin, the largest organ, is flooded with nerve cells and blood cells. They provide an interface with the environment. Human have many organs which work in synchronism to enable us to do our everyday job effectively. In addition, because of the complex nature of the brain processes, subjective is part of human decision making. The human body work within very limited range of the natural world. Without any protection, people cannot stay alive in extreme places. Depending on the level of hazard, the design and construction of the Protective Clothing and Sportswear will be affected.

Protective clothing, garments or personal protective equipment are designed to protect the wearer from hazards. The hazards include physical, electrical, heat, chemicals, biohazards, and airborne particulate matter. Protective clothing aims to impose a barrier between the wearer and the environment. The human may be in a hazardous environment due to work requirements, sports activities or entertainment. Given that, protective clothing are not completely seamlessly integrated with the human body, they are somewhat intrusive. They create some level of strains on the wearer. They might affect work performance. In addition, they may create significant level of discomfort. The negative effect of protective clothing may sometime discourage the wearers from using protective clothing completely or using protective clothing correctly, leading to injury, ill-health and in some cases death. Understanding of the human body, human limitations, working environment, environmental conditions, and using good ergonomic design principle can help to minimize discomfort, strain and improve performance. In addition, improvement in new materials such as E-textiles and clothing technologies are redefining how we address the design of the protective clothing. In some cases, protective clothing not only protect the wearer but also enhance and extend the human capabilities.

On the other hand, sports are essential. Most people play some sort of games and sports. For normal people, who play sports for enjoyment, sportswear and sports gear provide protection against injuries and unexpected strain of the given sports. Of course, they also need to be comfortable and esthetically pleasing. For professional athletes, who are involved in sports activities every day, clothing is used for protection while still maintaining optimal performance. Sports injuries can be instantaneous injury or cumulative injuries. Protective sportswear should protect the wearer. With better understanding of sports dynamics and biomechanics, sportswear designers are pushing

the boundaries of human performance and limitations. Sportswear not only protects the wearer, but is also required to be comfortable. In some cases, sportswear enhances performance with the use of engineered material, ergonomic and biomechanical considerations. And processes are critical in the design of sportswear. Human Performance and Comfort in Protective Clothing and Sportswear is very important and in this special issue, there are four very important papers addressing problems ranging from sports to space.

The first paper by PA Bishop, G Balilonis, JK Davis and Y Zhang, provide a brief review of the comfort in protective and sports clothing. Performance as well as comfort in industrial and sports protective clothing are affected by various factors. This paper discusses the various factors and then presents some potential direction for future research. The second paper by P Hur, KS Rosengren, GP Horn, DL Smith and ET Hsiao-Weckslar addresses the functional clothing of firefighters. They simulated a firefighting activity and evaluated body posture and balance while wearing different personal protective equipment. This study is essential to create functional clothing without affecting the active duties of the service personnel. The third paper by K Tanaka is related to the development and evaluation of glove for space travel. Space travel is becoming a very important aspect of functional clothing design. Space creates new dimensions to the protective clothing design problems. K Tanaka has considered the minimal pressure to avoid decompression sickness in order to propose and create an elastic glove suitable for extravehicular activity suit. The fourth paper by S Bae, K Kamiyo and H Masaki have focused on aerobic exercise. The study focuses on the cognitive and mood state while wearing a pair of core-supporting gym shorts. All these four papers add new knowledge to our understanding of the Human Performance and Comfort in Protective Clothing and Sportswear. More active research is needed in this Area.

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Received April 02, 2014; **Accepted** April 03, 2014; **Published** April 10, 2014

Citation: Luximon A (2014) Human Performance and Comfort in Protective Clothing and Sportswear. J Ergonomics S2: e001. doi:[10.4172/2165-7556.S2-e001](https://doi.org/10.4172/2165-7556.S2-e001)

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