

Standing Wheelchair with Built-in Climate Control System

“تقدر – Teq'dar”

Abstract

This project presents an innovation to be developed in nowadays wheelchair to provide its users with better life quality, elevates the level of their ambitious and to enable them to overcome today's special needs obstacles in different fields. As engineers, it's our role to contribute towards the world's dilemmas through applying a detailed analysis to the issue addressed and what are the possible solutions to it based on the knowledge obtained through our academic and experimental experience. Wheelchair users are suffering from discrimination in different life aspects such as work opportunities, usage of public facilities and many other life aspects. The standing wheelchair with built-in climate control system will introduce a new horizon for its users in the seek of social equality achievement. The mechanism to be developed is made of 4 different subsystems that demonstrate different mechanical engineering disciplines which are mainly mechanical mechanisms, control systems, heat transfer, material science, thermodynamics, and mechanical statics-dynamics

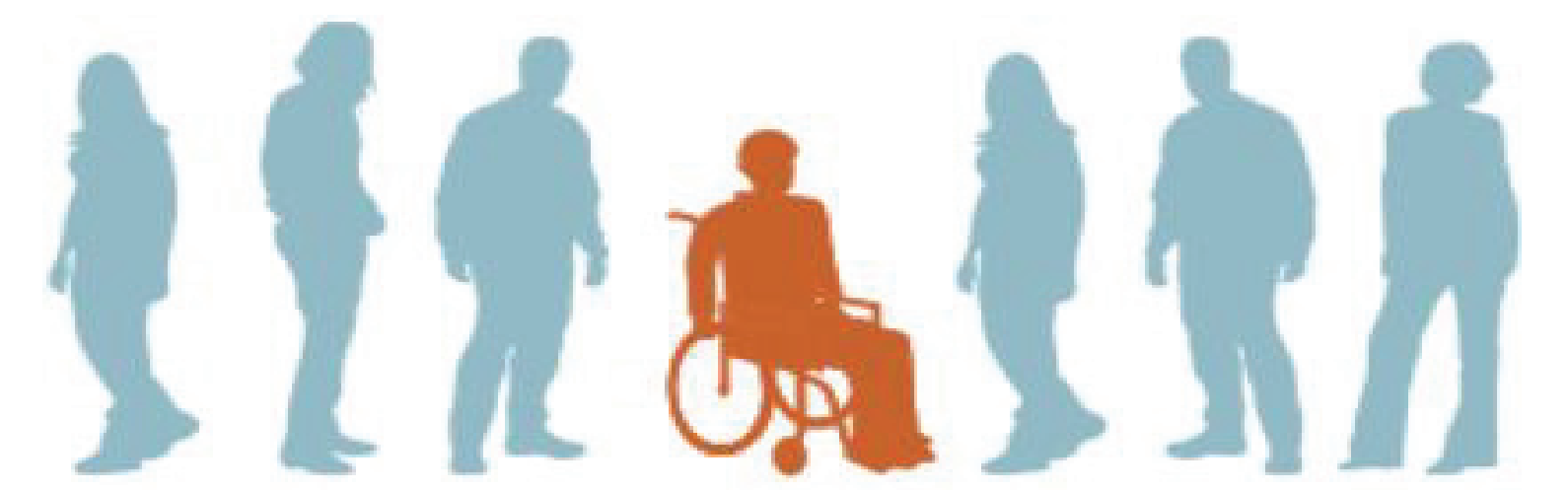
Problem Statement

Now most of you may be wondering what motivate us to choose such a topic? Many wheelchair's users seek to live their life normally on the wheelchair as non wheelchair users do, they require our attention and technological innovations to improve their live quality, which mean allowing them to be equated to all society members and eliminating various obstacles caused by the wheelchair during their daily life. Hence, wheelchair users are interested in the development of their transportation method and to reduce their dependency on other people and their assistance especially that their majority depends on assistance to accomplish their daily activities. From this approach, this project can be illustrated by developing a wheelchair with a modified features that allows the user to be in a standing position with a negligible effort. Moreover, an eco-friendly cooling system will be installed in the wheelchair that targets certain body areas which control the relief feeling as the environment in Qatar is known to be hot across most of the year. These modifications would enhance the wheelchair user's life quality and will provide them with confidence towards achieving their goals.



World Health Organization

Over **1 BILLION** people globally experience disability



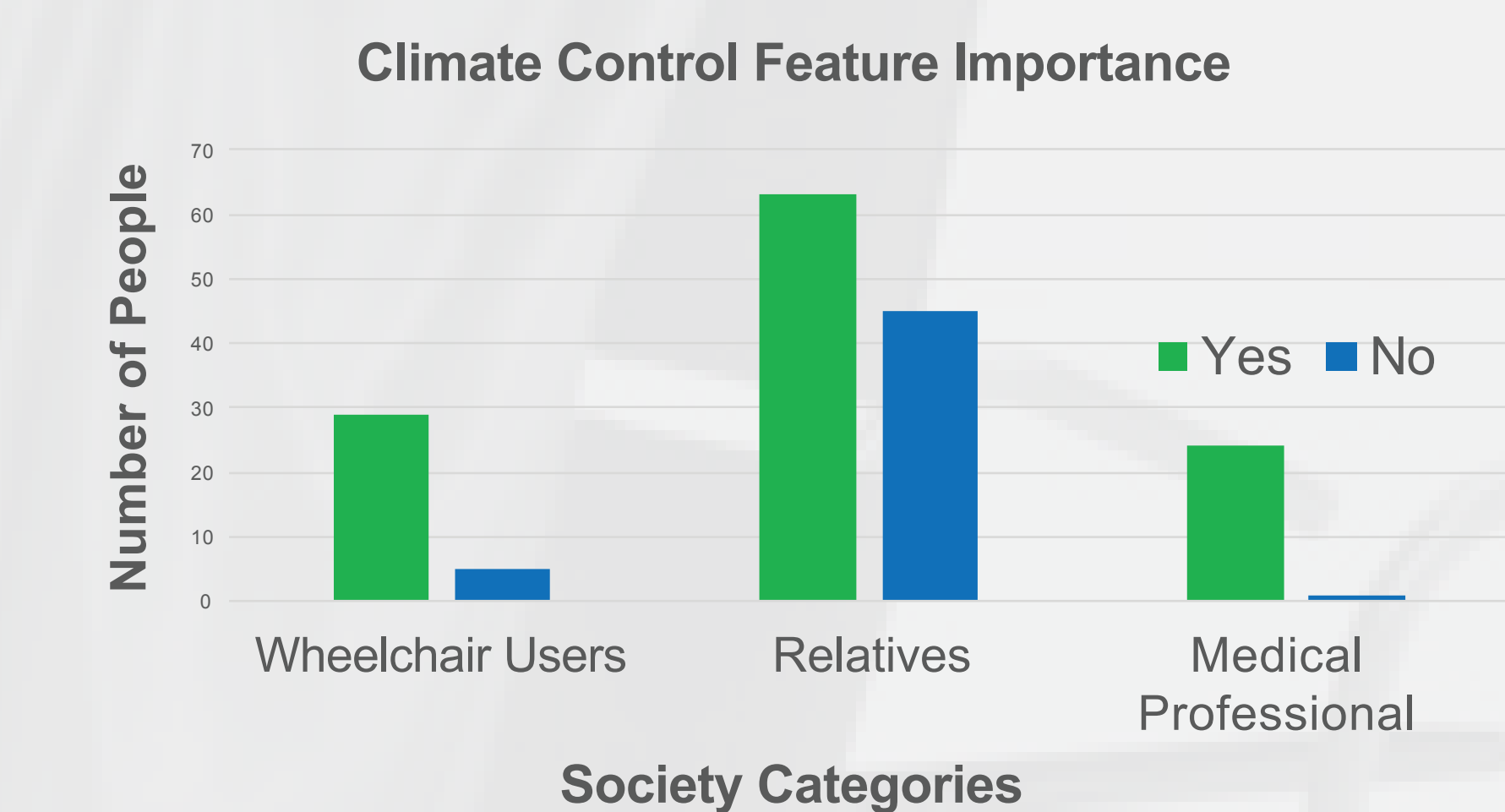
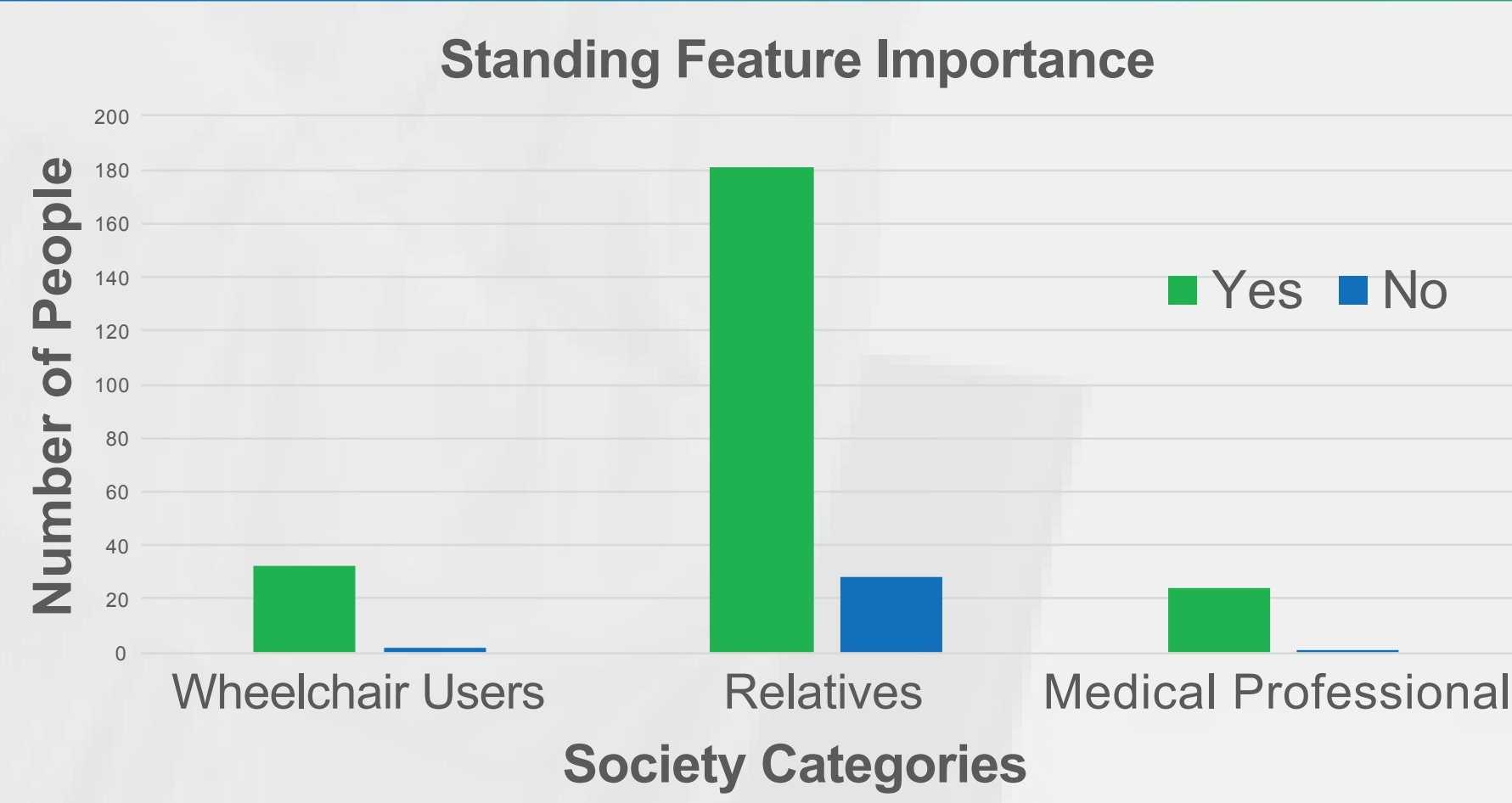
1 in 7 people

Based on the world health organization there are 1 billion globally experience disability 75 million of them require wheelchair. This project will take a step closer in giving this class what they deserve.

Aims and objectives

- To carry out a survey on limitations on current wheelchair and the need for its development.
- To design a wheelchair with a standing mechanism.
- To design a wheelchair with a built-in eco-friendly climate control system.
- To develop controllers for both standing mechanism and climate control system
- To build and test a standing wheelchair with an integrated climate control system.

Survey Analysis



Design Analysis

Several analytical analysis were preformed to obtain optimum design requirements and functionality:

- Statics and dynamics analysis.
- Cooling load calculations.
- Control System and dynamic performance analysis of the closed loop system.

Design Constraints

Numerous constraints are applicable to the design:

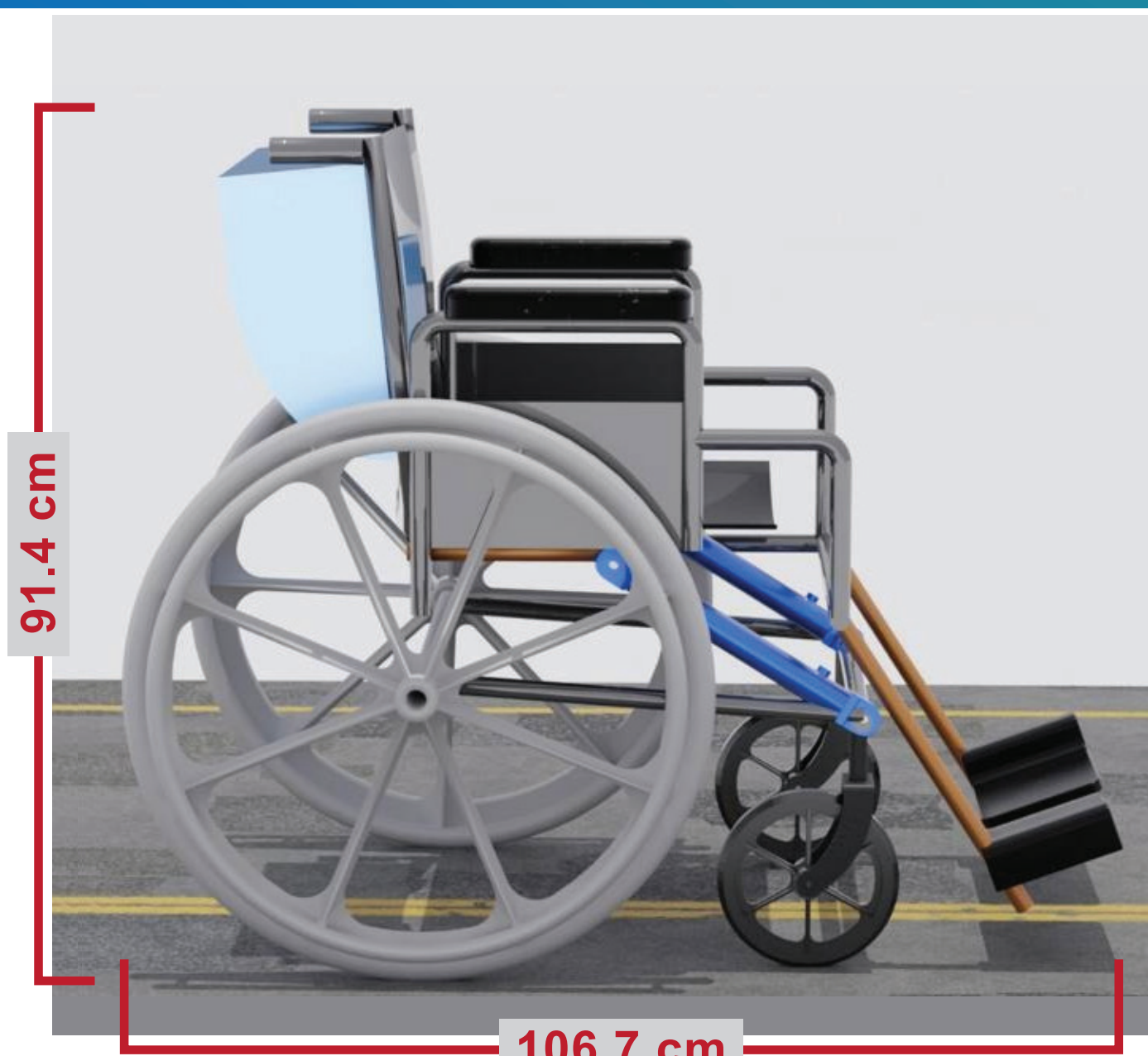
- Cost.
- Health and Safety.
- Manufacturability.
- Social.
- Sustainability.

Stakeholder

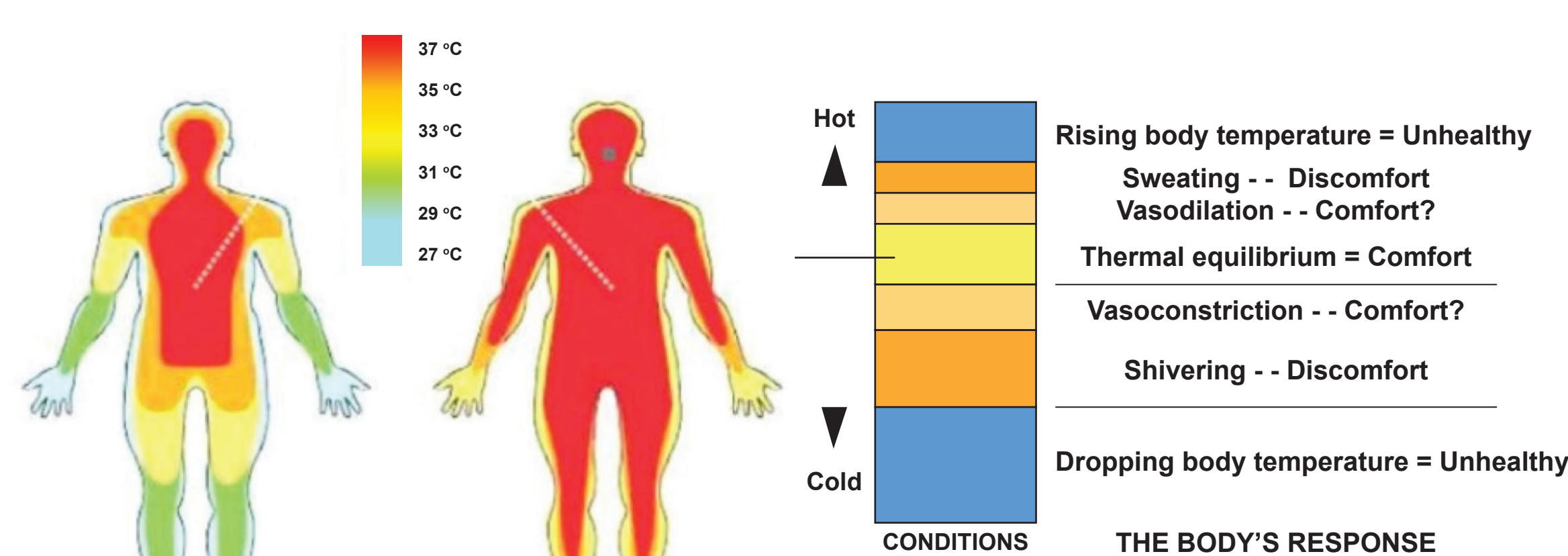
مركز قطر لإعادة التأهيل
Qatar Rehabilitation Institute

عضو في مؤسسة حمد الطبية
A Member of Hamad Medical Corporation

Design Specification



Thermal Comfort



Thermal Comfort is experienced when one's body expends negligible effort to maintain internal body temperature at 37°C

Innovative Specifications:

- Provides the user with an elevation of 100 – 120 cm.
- Provides a compatible ventilation units to provide the user with the required cool/heat.
- An impended control system to facilitate the usage of the standing and cooling feature using closed loop control system theory.
- 12 V DC Power Supply.
- Cooling load in between of 0.25 W/hr and 0.35 W/hr.

Final Design



Scan Me

Watch this video which demonstrates the project.



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