



DESIGN IMPROVEMENT OF A BETTER AND HEALTHIER TOILET STOOL

This report is submitted in accordance with requirement of the University Teknikal Malaysia Melaka (UTeM) for the Bachelor of Mechanical and Manufacturing Engineering Technology (Product Design) with Honours.

By

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DEDICATION

This thesis is dedicated to my beloved parents and sister who supported me all the way during my ups and downs. Their supports and encouragements were what had held me for who I am today and kept me working when I wanted to give up.

ABSTRACT

Human posture is the arrangement of body parts where they interact with each other to perform any action or task. This indicates that any posture can result in different consequences towards the parts altogether as they are connected and interacted to each other. This same goes to the sitting posture applied for using sitting toilet during bowl elimination as they are reportedly causing invisible threat to human health such as constipation, hemorrhoids, colitis, appendicitis and colon cancer. Even though Squatty Potty has contributed to solve the problem by granting their user to perform squatting posture when using sitting toilet, a better and healthier squatting posture than normal squatting posture can be implemented if it is proven beneficial. A field survey on the squatting stool also reveals that almost half of the objects agreed to use the stool if it is proven useful and in a situation where the stool is designed for user to use comfortably in sense of user-friendly and easily applicable as first priority. It was also found out that acrylonitrile butadiene styrene (ABS) is more suitable than polypropylene homopolymer to fabricate the toilet stool as it can withstand more weight and pressure that act upon it.

ABSTRAK

Posisi manusia adalah susunan bahagian-bahagian badan di mana mereka berinteraksi antara satu sama lain untuk melakukan apa-apa tindakan atau tugas. Ini menunjukkan bahawa setiap postur boleh menyebabkan akibat yang berlainan ke arah bahagian-bahagian sama ada ia bersambung dan berinteraksi antara satu sama lain. Ini sama dengan postur duduk yang digunakan untuk menggunakan tandas duduk semasa penyingkiran mangkuk kerana dilaporkan menyebabkan ancaman yang tidak dapat dilihat pada kesihatan manusia seperti sembelit, buasir, kolitis, usus buntu dan kanser kolon. Walaupun Squatty Potty telah menyumbang untuk menyelesaikan masalah ini dengan memberi pengguna mereka untuk melakukan posisi berjongkok apabila menggunakan tandas duduk, posisi yang lebih baik dan lebih sihat daripada posisi berjongkok yang biasa boleh dilaksanakan jika terbukti bermanfaat. Kajian lapangan di bangku setingga juga mendedahkan bahawa hampir separuh daripada objek bersetuju untuk menggunakan bangku jika terbukti berguna dan dalam keadaan di mana bangku itu direka untuk pengguna untuk menggunakan dengan selesa dalam hal mesra pengguna dan mudah digunakan seperti yang pertama keutamaan. Ia juga mendapati bahawa acrylonitrile butadiene styrene (ABS) lebih sesuai daripada homopolimer polipropilena untuk membina najis tandas kerana ia dapat menahan lebih banyak berat dan tekanan yang bertindak ke atasnya.

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LIST OF ABBREVIATIONS, SYMBOLS, AND NOMENCLATURE

Et al	-	Et alia
BC	-	Before Christ
AD	-	Anno domini
GI	-	Gastrointestinal
3D	-	Three-dimensional
CAD	-	Computer Aided Design
PBUH	-	Peace Be Upon Him
ABS	-	Acrylonitrile Butadiene Styrene
PVC	-	Polyvinyl Chloride
PP	-	Polypropylene
PE	-	Polyester
PBT	-	Polybutylene Terephthalate
PETG	-	Polyethylene Terephthalate-Glycol Modified
PC	-	Polycarbonate

- p - Force
- < - Less than
- STL - Stereolithography
- REBA - Rapid Entire Body Assessment
- RULA - Rapid Upper Limb Assessment
- Pa - Pascal

CHAPTER 1

INTRODUCTION

1.1 Project Background

This chapter outlines the project background, problem statement, objectives and the scopes of the study. In general, it conveys an idea of this study by providing an initial overview to summarize the entire contents regarding the title of “Design Improvement of Good and Healthier Toilet Stool”. Human posture has always been a well-known topic as all of our daily activities and tasks involve posture to carry out, yet having a moderate to severe postural problem can affect health and performance. Posture is the arrangement of body parts where they are aligned to react to each other in any particular moment. Posture incorporates with the complicated connection and movement between the bones, joints, connective tissues, skeletal muscles and the nervous systems where they interact with each other when performing any action (Posture, 2012). This implies that any posture can result in different consequences towards the parts mentioned above altogether as they are chained and interacted to each other. A good posture indicates that the assisting muscles and ligaments less likely to suffer from straining when a body is performing basic position. In practical, good posture should equate with standing, sitting, lying or moving comfortably. On the other hand, bad posture implies insufficient use or frank misuse of joints and associated muscles and ligaments, with progressive and, ultimately, irreversible injurious effects, with associated physical, and possibly painful disability.

1.2 Problem Statement

Generally, human should be trained to maintain their good posture while performing tasks to avoid unnecessary injury or health problem, and this includes toilet posture as well. Toilet is a sanitation facility where it allows users to urinate and defecate conveniently. However, there is a concern regarding the toilet design where it develops a posture which is believed to pose danger on human health. In this modern day, sitting toilet is considered as the most common and popular toilet type that has been used by human to urinate or defecate comfortably, even for the past decades, are reported to possibly cause several ailments to human, such as constipation, hemorrhoids, colitis, appendicitis and colon cancer. Although there is a squatting toilet which can actually solve the modernized toilet problem, but human nowadays tend to dispose their urine and feces in a sitting toilet as it is more comfortable to use, excluding for public toilet case which is reported that public squatting toilet is more favourable than sitting toilet due to sanitary condition (Scientific Eye, 1984). Despite of a solution has been proposed to solve the problem above as the Squatty Potty is granting their user to eliminate their feces in a sitting toilet while performing squatting posture, yet an incorrect squatting posture could also lead to crucial injury to human body in ergonomic and biomedical aspect.

1.3 Objective

The objectives of this project are as follow:

- a) To study on the problem of current existing toilet bowl design and toilet posture to human health for a better elimination.
- b) To study the current design of toilet stool based on ergonomic and biomedical aspect.

- c) To design a toilet stool that can improve current existing toilet posture to achieve a better and healthier bowl elimination.

1.4 Scope of Study

The scope of this project is to design an improvement on current existing toilet stool mainly based on two major aspects, which is ergonomic and biomedical.

- a) Ergonomic

- Concentrate on the interaction between product and human lower body which includes hip joints, knees, feet and ankles
- Suitable angle of human body parts during performing the toilet posture will be taken into consideration when designing the toilet stool

- b) Biomedical

- Focus on the analysis of human anatomy structure especially in gastrointestinal tract and anorectal junction
- Comparison of interaction between the toilet posture and human anatomy structure will be taken into account of designing the toilet stool