



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**THE STUDY OF SEATING PRESSURE ON NATIONAL CAR
(PROTON AND PERODUA)**

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Engineering Technology Manufacturing (Product Design) (Hons.)

by

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DECLARATION

I hereby, declared this report with title “The study of seating pressure on car seat between national cars (Proton Saga and Perodua Myvi)” is genuine results obtained from the experiment that I have conducted except for cited statement in my literature review.

Signature :

Author’s Name : TAN WEN HONG

Date :

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment for Degree of Bachelor of Engineering Technology (Product Design) (Hons.).
The member of the supervisory is as follow:

..... (Project Supervisor)

ABSTRAK

Postur memandu dan tekanan tempat duduk adalah agak penting untuk meningkatkan keselesaan pemandu semasa memandu kereta. Teknik-teknik memperbaiki reka bentuk tempat duduk kereta dan dimensi kerusi kereta telah dikaji untuk mengekalkan keselesaan pemandu terutamanya bagi pemandu yang sentiasa memandu perjalanan yang jauh. Dalam kajian ini, dua jenis kereta tempatan Proton Saga dan Perodua Myvi telah digunakan untuk membandingkan tekanan tempat duduk bagi setiap individu semasa sesi memandu. Setiap responden menggunakan laluan yang sama semasa menjalankan sesi memandu. Tekanan objek di sepanjang perjalanan itu direkodkan menggunakan perisian CONFORMat Penyelidikan 7.60. Tambahan pula, tekanan objek berbanding antara enam kategori berat badan yang berbeza, taburan tekanan untuk tempat duduk kereta juga telah dibincangkan dalam kajian ini untuk menunjukkan kepentingan sama rata pemandu tekanan badan ke arah tempat duduk kereta. Akhir sekali, keputusan yang dianalisis akan dibincangkan pada akhir laporan ini, kekangan yang dihadapi dalam kajian ini telah direkod dan cadangan telah diberikan untuk penambahbaikan pengajian pada masa hadapan.

ABSTRACT

The driving posture and seating pressure are relatively important to enhance a comfortable driving experience. Several techniques have been promoted to improve the car seat design and adjustment to reduce the risk of driving fatigue especially for driver who always conduct long distance driving. In this study, two types of national cars, Proton Saga and Perodua Myvi were selected to compare the seating pressure of each individual during the driving session. Twelve respondents conducted driving session with Tekscan CONFORMat (model 5330) setup in both national cars. The object pressure along the journey was recorded using CONFORMat Research 7.60 software. Furthermore, object pressure was compared among six different weight categories, pressure distribution for both car seat has also been discussed in this study to show the importance of evenly distributed of driver body pressure towards the car seat. Lastly, the analysed results were discussed at the end of this report, limitations faced in this study were recorded and suggestions have been given for future improvement.

DEDICATION

This project dedicates to my parents, who gave me unconditional love since and raise me to become the person I am today. They always be there for me and give mental support allow me to achieve my goal without fear. Through their guidance and support I am confident with doing anything I put in my mind. Thank you for everything.

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CHAPTER 1

INTRODUCTION

1.0 Background

Automobile car seat, a seat that provides good support to driver and passengers in a vehicle throughout the travel journey. It is designed commonly based on human anthropometric data from different body parts in order to accommodate big variability body shapes and size of human. Moreover, fabric and leather are usually used as automobile car seat material as both of these material enhance the aesthetic properties and comfort level of the car seat. Before car seat undergo mass production, the automobile car seat has gone through several development processes such as designing, prototyping and testing. All these useful development process are important to increase and improve the quality of automobile car seat which benefit driver during driving or travel for a long distance journey. Recently, the comfort level of automobile car seat has become one of the main concern of consumers when they are selecting a suitable future car. Discomfort may develop at different body parts of driver after driving for a long period of time if the car seat did not provides good support to driver.

In this project, two different types of car seat design of national car, Proton Saga and Perodua Myvi were compared in terms of driver seating pressure (object pressure) develop throughout the travel journey. The pressure development on back and buttock of driver after a long journey is relatively important to study the comfort level of car seat

because a good car seat is able to evenly distribute driver's body pressure at the same time reduce the risk of fatigue and ulcer development on driver's body. Furthermore, vibration acted on driver caused by uneven road condition may also cause fatigue and discomfort to the driver. Apart from that, most of the driver will experience two common symptom after conducted a long distance drive which are Musculoskeletal Disorder (MSD) and numbness on Ischial Tuberosities (IT).

The seat contour of both types of national car were compared using data collected from CONFORMat Research 7.60 software. The collected data is viewed in numerical data using Microsoft Excel and visualize using 3-D graphical method using the software. In conclusion, collected data was compared based on range of weight and types of car seat from different type national cars.

1.1 Problem Statement

Automobile car seat comfort level has become the main concern of consumers when selecting their future car, body pressure distribution on a car seat is the key point to determine car seat comfort. The car seat of national car Proton Saga and Perodua Myvi have significantly difference in terms of shape, surface contour and dimension, all these properties may affect comfort level of car seat. Moreover, different weight may exert different amount of pressure towards the car seat. To the author knowledge, currently has no related study on car seating pressure for national car Proton Saga and Perodua Myvi in Malaysia. To date, Tekscan CONFORMat system has not been adopted as a method to measure and analyse car seat pressure for national car Proton Saga and Perodua Myvi.

1.2 Objectives

The main objectives of this project are:-

- Conduct a study to determine the seating pressure for two national cars Proton Saga and Perodua Myvi by using Tekscan CONFORMat system.
- Analyse pressure distribution from different categories of respondent based driver's weight and type of car seat for both national cars.

1.3 Title

The study of seating pressure on car seat between national cars (Proton Saga and Perodua Myvi).

1.4 Scope

The scope of this project is focus on car seat of national cars (Proton Saga and Perodua Myvi). Both of the national cars shared the same features in terms of car seat material (fabric material), type of car transmission (automatic) and car features specification (standard). The body pressure distribution measuring system used in this project is known as Tekscan CONFORMat system. The model of device used for this system is known as Model 5330 (CER2) and a laptop with installed CONFORMat Research 7.60 software. In addition, the Model 5330 (CER2) consists only two separate sensor mat (seat front and back top) to apply on the car seat. Furthermore, only six males and six females were participated in this experiment. CONFORMat Research 7.60 software was used for visualization the changes of body pressure distribution during experiment and collect data throughout the whole journey. All respondents traveled through the same route which is from SPA highway to Tangkak Toll. Each participant completed the journey by maintaining driving speed at the range of 80 to 100 km/h. All

drivers were required to stay only on the left lane except for over taking vehicle driving less than 80 km/h. The toll's lane for each driver is fixed for every trip. The distance from SPA highway to Plaza Toll Tangkak inbound was estimated 36.6km based on results shows in Google maps in Figure 3.3. Weather was considered for every trip, experiment was terminated on rainy day. In this case study, drivers were required to maintain relax and comfortable driving posture throughout the whole journey.

1.5 Expected Result

The result expectation for the project:

- Object pressure based on driver's weight and type of car seat for both national cars.
- Comparison results of the comfortability of car seat for both national cars.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter is a compilation of several literature reviews from books, journal articles, and websites. These literature reviews helped to understand and improve this study further by exposed useful information regarding to this study. A few terms used in this study has been reviewed such as Musculoskeletal disorders (MSDs), type of car seat, Proton Saga and Perodua Myvi, Vibration, Ischial Tuberosity (IT) and Body Pressure Measurement System (BPMS) by Tekscan. Besides that, recent study of driving posture and sitting pressure on automotive seat also has been included at the end of this chapter.

2.1 Musculoskeletal Disorders (MSDs)

Musculoskeletal disorders (MSDs) are conditions that affect musculoskeletal system. The human musculoskeletal system includes bones, muscles, tendons, ligaments, bursa, nerve and blood vessel. All these body elements are important to human as they help to carry out human daily activities especially maintaining individual body posture and help in engaging body movement. MSDs usually happened to individual who engage repetitive work, maintaining the same posture for a long period of time. Apart from that, individual

who handle heavy material or using incorrect posture (awkward posture) may also cause musculoskeletal fatigue, pain and ulceration[1]. Figure 2.1-2.4 below show the difference between neutral posture and awkward posture [2].

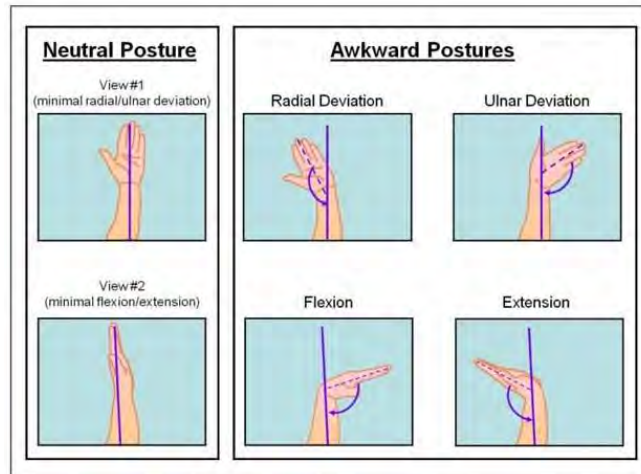


Figure 2.1: Radial/Ulnar deviation, flexion and extension.

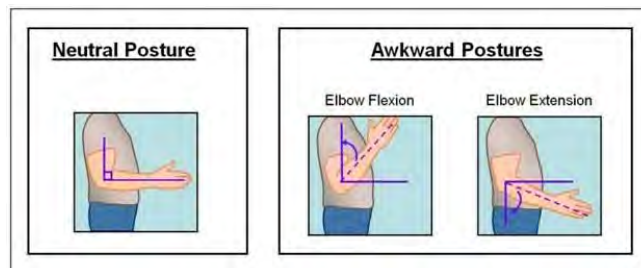


Figure 2.2: Elbow flexion and extension.

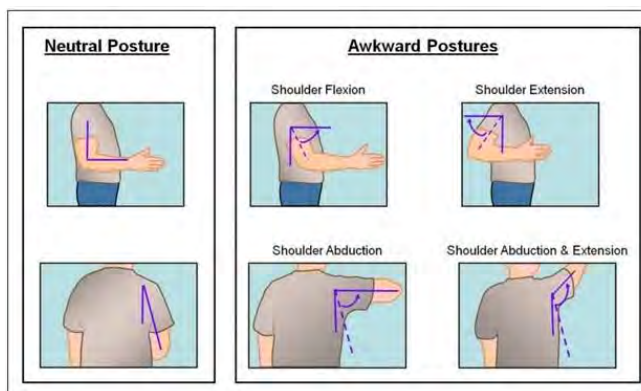


Figure 2.3: Shoulder flexion, extension, abduction, and abduction & extension.

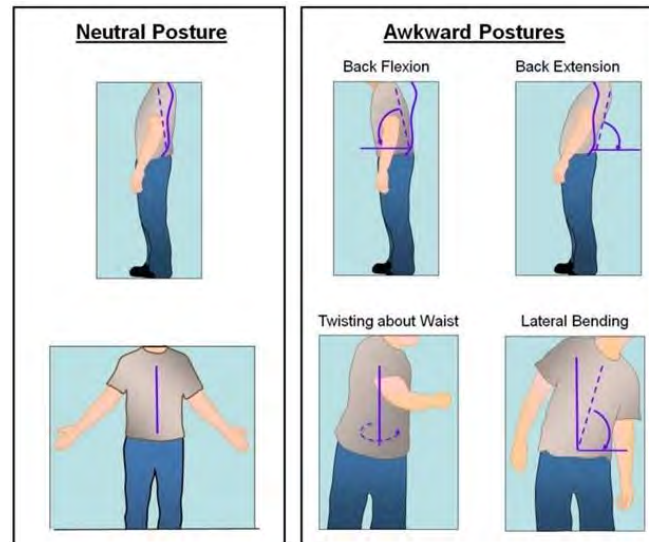


Figure 2.4: Back flexion and extension, twisting about waist, and lateral bending.

From the figures above, it is clear that MSDs can be avoided by practicing neutral posture. Neutral posture can be achieved by positioning body muscle in resting position and body joints must be naturally aligned without deviating from its neutral position.

2.1.1 Musculoskeletal Disorders (MSDs) for driving

MSDs may also appear in individual who used incorrect driving posture during driving long distance driving. Vehicle has limited space for individual to move around, driving forces driver to sit in constrained position. There are several studies by Walsh 1989, Porter and Gyi 2002, Chen 2005 and Sakakibara 2006 states at living in a city driver who faced traffic congestion almost daily, placing commuter drivers with high annual mileage driven at increased risk of developing musculoskeletal disorders [3]–[6]. To prevent this common disorder faced by drivers, standard driving posture can be practice by adjusting the car seat to optimal angle or height for driver to reduce the risk of MSDs. Figures 2.5-2.11 shows few cars seat adjustment guide for driver [7].



Figure 2.5: Raise car seat as high as possible at comfortable level to have better vision of the road.



Figure 2.6: Move car seat forward until driver's feet can fully depress three pedals such as clutch, accelerator and decelerator.



Figure 2.7: Adjust car seat pan angle to ensure driver's thighs can fully supported by the car cushion.