



# Ergonomic Properties of Traditional Malay Furniture

Nabilah Zainal Abidin<sup>1\*</sup>, Raja Nafida Raja Shahminan<sup>1</sup>, Fawazul Khair Ibrahim<sup>1</sup>

<sup>1</sup> Department of Architecture, Faculty of Built Environment, Universiti Teknologi Malaysia, 81310, Skudai, Johor, Malaysia

\*Corresponding author E-mail: nabilah.nbza@gmail.com

## Abstract

Furniture is part and parcel of everyday life in any population. Therefore usage of furniture is considered a significant factor in improving one's health and lifestyle. This paper studies on the ergonomic properties that can be found in various Traditional Malay furniture, inside Traditional Malay Houses of Malaysia. The objective of this study is to calculate anthropometric measurements of the Traditional Malays, in order to define the ergonomic properties of Traditional Malay furniture. Primary data for this study were taken from measured drawings of selected houses archived in The Centre for the Study of Built Environment in the Malay World (KALAM), Universiti Teknologi Malaysia (UTM). The method used in this study comprises of three dimensional (3D) rendering of the houses recreated using the program 3DStudioMax. 3D models of humans and interiors of the houses were created to help in defining and calculating the ergonomic properties of the furniture found inside each houses. The findings of this study will help in defining a standard of ergonomics that can be used in the production of furniture in Malaysia, which in turn will significantly increase the status of living and longevity of the people.

**Keywords:** Traditional Malay Furniture; Ergonomic; Range of Motion; Traditional Malay House.

## 1. Introduction

In today's world of advanced technology and fast paced lifestyle, the correct furniture used in everyday activities significantly influences productivity and the quality of life. Hence furniture that are ergonomic to its users are increasingly sought after throughout the furniture market. To achieve an ergonomic furniture, the anthropometry or measurements of the human body, of the user has to be understood on a deeper level. Thus, a Standard of Ergonomics is needed. Malaysia currently does not have its own standard of ergonomics. The standard used is a carbon copy of the International Standard of Ergonomics which is based on Western anthropometric measurements. To be using this Western standard for Malaysia, which is in the East, defeats the purpose of ergonomic furniture, as it is a known fact that the human measurements for Europeans greatly differ to that of Asians. Usage of furniture is also greatly influenced by culture, therefore, the definition of what equipment are considered as furniture varies based on cultural differences, throughout different regions around the world.

The purpose of this study is to identify the ergonomic properties of Traditional Malay Furniture, by calculating the anthropometric relationship between the furniture and the user, in order to develop an Asian Standard of Ergonomic that can be used in the manufacturing of furniture in Malaysia. Figure 1 below demonstrate the category in which this study is mainly focusing on; which is in the dimensions of the furniture as well as the human interaction in order to finally get the anthropometric measurements and the ergonomic properties of the furniture.

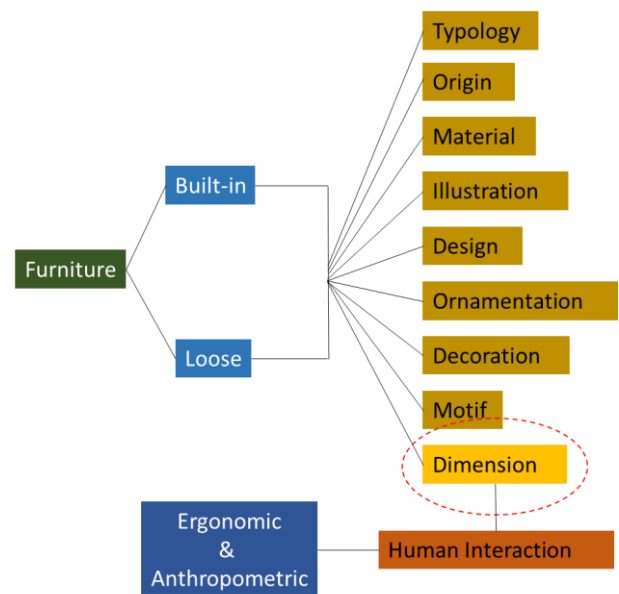


Fig. 1: Main focus of study

## 2. Literature Review

Since this study is done on the Traditional Malays and furniture found in their traditional houses, the next part will quickly brief on the spaces inside a Traditional Malay House (TMH) and their uses. Since the Malay-Islamic culture is predominant in Malaysia, TMH becomes a functional object that reflects the needs of the family and expresses a strong symbolic meaning [1]. As a domestic domain, TMH are built and designed by the inhabitants themselves, not only to reflect their needs and lifestyle, but also their creativity and aesthetic skills. Therefore, the TMH consists of

spaces that have their specific uses which in turn influences the interiors and furniture used, making the house a site for many cultural practices and traditions [2].

The TMH is the vernacular architecture of the Malays before the colonial period. Its most distinctive vernacular attributes are the raised floor construction, the flexibility of spaces and the use of readily available rain forest materials to counter the hot-humid climate. There are three parts of the house – pillars, walls and roofs. These parts have been interpreted as three stages in man's life – birth, life and death. The Bugis Malay in Johor believed the house represents the human body such as head, ribs and legs [3]. The uses of interior spaces of the TMH may vary. Spaces in the house are multifunctional and the use of the space changes during the day and year. There are minimal interior walls and partitions within the house, allowing for flexible use of space and good ventilation and lighting of the interiors. Minimal furniture is used and most activities are done on the floor.

The main spaces and areas in TMH includes; *anjung* (porch), *serambi* (dining), *rumah ibu* (main area), *selang* (passageway), and *dapur* (kitchen). Starting at the front of the house is the stairs that leads to the covered porch. Sometimes unfamiliar guests are entertained here and the porch is the favourite area where the owner of the house usually sits while watching the goings-on happening in the village. It also acts as the focal point for the entrance. The porch leads to the next space which is the dining area. This space acts as the main area where male guests are entertained, as the low windows allows for good ventilation and lets the breeze come in, effectively cooling the area.

From the dining area and onto the main space, which is considered as the main female domain and is the core of the whole structure of the house, and to express its importance, this space has the highest head room and the largest of all the other spaces inside the house. This area is where most activities are conducted which includes sleeping, sewing, praying, studying, and feasting. Moving forward is the passageway, which is a closed walkway that acts as a link from the main house to the kitchen. It's also used as a circulation space where the women of the house spend their time chatting and socializing with each other. Other than that, it is also considered as an effective linking device that leaves an open space between two portions of spaces, while at the same time providing good ventilation and lighting.

The last main space is the kitchen which is always situated at the very back of the house. It has the lowest floor level of all the spaces and this is where most of all the food is prepared. Other than that, cooking, eating, and washing are all done within this space. The kitchen is another favourite area where the women like to chat with each other. Table 1 below summarizes the main spaces with its daily usage.

**Table 1:** Main spaces inside a TMH

Space	Uses
<i>Anjung</i> (porch)	Where unfamiliar guests are entertained. A relaxing area where the owner sits and watches the goings-on happening in the village.
<i>Serambi</i> (dining area)	Male guests are entertained here. Equipped with low windows which allows for ventilation and effective cooling.
<i>Rumah ibu</i> (main area)	The main female domain and core structure of the whole house. To express its importance, it has the highest head room and is the largest of all the spaces in the house. Where most activities are conducted and includes the bedrooms.
<i>Selang</i> (passageway)	A closed passageway that acts as a link from the <i>rumah ibu</i> to the <i>dapur</i> .
<i>Dapur</i> (kitchen)	Situated at the very back of the house. Where meals are prepared and cooked.

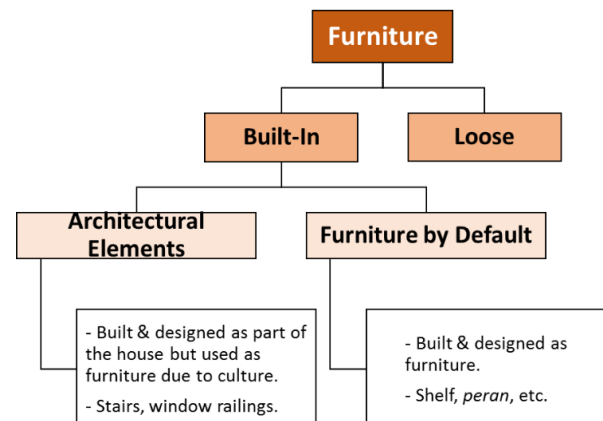
## 2.1. Terminologies

There are three major terms that are described in this study. The first and foremost is Ergonomic; which the combination of two

Greek words which are 'ergo' meaning 'work', and 'nomos' meaning 'laws'. Ergonomic can be defined as the study of how equipment and furniture can be arranged in order so that people can do work or other activities more efficiently [4]. When studying ergonomics, it automatically includes Anthropometric. Anthropometric on the other hand, is also a combination of two Greek words which are 'anthropos' meaning 'human' and 'metron' meaning 'measure'. From this it can be gathered that Anthropometric is the science dealing with measurements of the human body in determining the differences in various individuals or groups [4].

Another significant term in this study is the word Furniture. Looking back, A few studies have underlined that furniture is an important part of human life. Built-in seats and sleeping-place were incorporated in a Neolithic house at Skara Brae in the Orkneys [5]. Based from archaeological findings and artefacts in museums, we know that from the beginning of time when man lived a nomadic life until they gradually settled down, each household had specific equipment and products to hold or store their properties. With the development of human civilization, discoveries of different and exotic materials such as gold, bronze, metal and ivory, furniture became the symbol of social status and power. Furniture is above all, functional. It is an essential part of the home, and its specific purpose is to the many activities – meals, entertainments, recreation, study and so on - and the in-activities; sleep and rest-of domestic life [6]. Architecture and the decorative background are intimately related to furniture, and any integral study of furniture must always be judged in relation to its architectural environment [7].

Hence, culture plays an important role in influencing the usage of furniture for any groups of people. Some might define a specific equipment or tool as a furniture while others may not. Therefore, to understand what the Traditional Malays defined as furniture, a deep and rooted understanding of their culture is needed. Many previous studies stated that the Traditional Malays had no furniture because of their 'floor-culture', which means that they carry out every day activities on the floor; such praying, eating, sewing etc. This notion contradicts what [6] states that every civilization has their own furniture. The reason for the misconception that the Malays had no furniture, as it turns out, is because a majority of studies done on the Traditional Malays were carried out by Western researchers, therefore there were biases in their understanding. The Traditional Malays had a similar floor-culture as the Japanese and yet not many Traditional Malay Furniture are known whereas Japanese furniture is acknowledged and known around the world. For this study however, a comprehensive definition of furniture defined by the Traditional Malays are as follows; 'an equipment used by the people in their daily lives whether for storage, utility, or as a tool, characterized by their functions, usage, and types, that are available both externally and internally of a TMH [8]. Figure 2 below further illustrates the categories and sub categories of furniture as perceived by the Traditional Malays.



**Fig. 2:** Categories of furniture of the Traditional Malays

### 3. Methodology

First and foremost, the sample for this study comprises of primary data from measured drawings of selected TMH of Malaysia archived in The Centre for the Study of Built Environment in the Malay World (KALAM), Universiti Teknologi Malaysia (UTM). The process flow of this study is firstly to collect anthropometric data for the representation of the population, then was to establish the standard or relationship for the basis of comparison. After that, was obtaining the required data – measure the furniture dimensions and extract the necessary anthropometric data, which later, would be compared to the furniture dimensions and the requirements established from the anthropometric data. Lastly, was identifying any existing mismatches to determine ergonomic suitability of the furniture. Figure 3 shows the process flow of the study. 3-Dimensional tools are then used to recreate the TMH where human 3D models are applied in order to evaluate the ergonomic properties of the furniture available. In order to achieve a standard anthropometry for the Traditional Malays, some calculations were done on past research of Malay adults with the comparisons on standard of anthropometry on the Western adults. An average is then calculated and the final results used in this study as the

Standard Anthropometry for the Traditional Malays are shown in Figure 4 below, while Figure 5 shows the recreation of the internal and other spaces of the selected houses with the activities carried out in them, by using the tool 3DStudioMax.

The method of analysing the data is by using a method which is often used by the National Institute of Occupational Safety and Health (NIOSH) Malaysia in order to analyse ergonomics. This method is called the Rapid Entire Body Assessment (REBA) method. A worksheet is developed in order to calculate the scoring of the activity carried out with the furniture. The users’ neck, trunk, and legs are analysed by what position they are in by looking at the angle of the limb. The bigger the angle, the higher the score. The next steps include locating the position of the upper arm, lower arm, and the wrist. Similarly, the bigger the angle, the higher the score. Both of the scores are then added together with the force/load score of the furniture/equipment being carried. The results would range from score 1 until score 11+ (where 1 is at negligible risk, and 11+ is at a very high risk, where change is implemented). The REBA worksheet would help in analysing whether the Traditional Malay Furniture available are ergonomic or not.

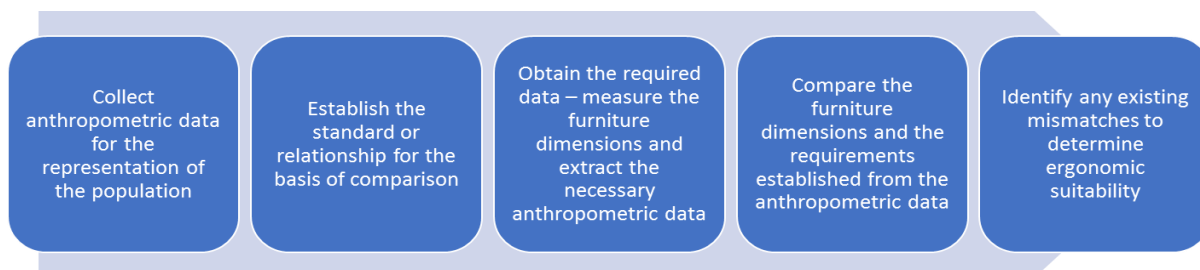


Fig. 3: Process flow of Study

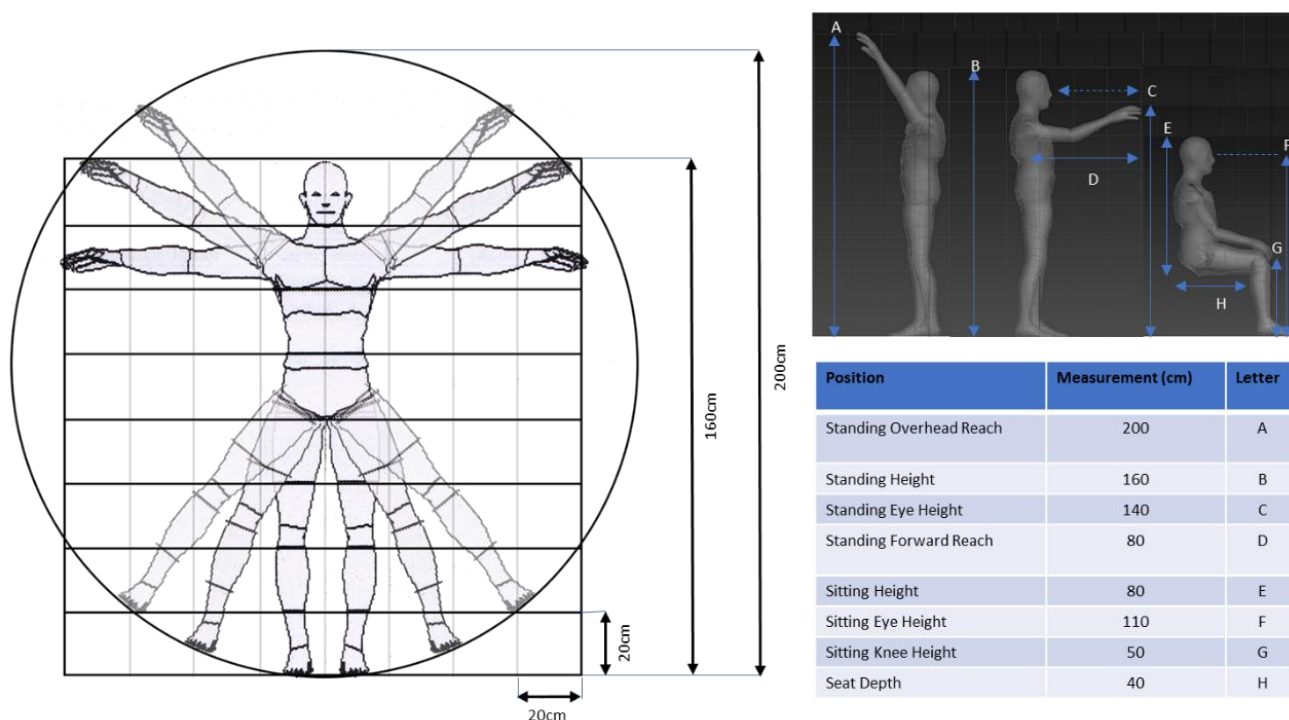


Fig. 4: Standard of Anthropometry of the Traditional Malays

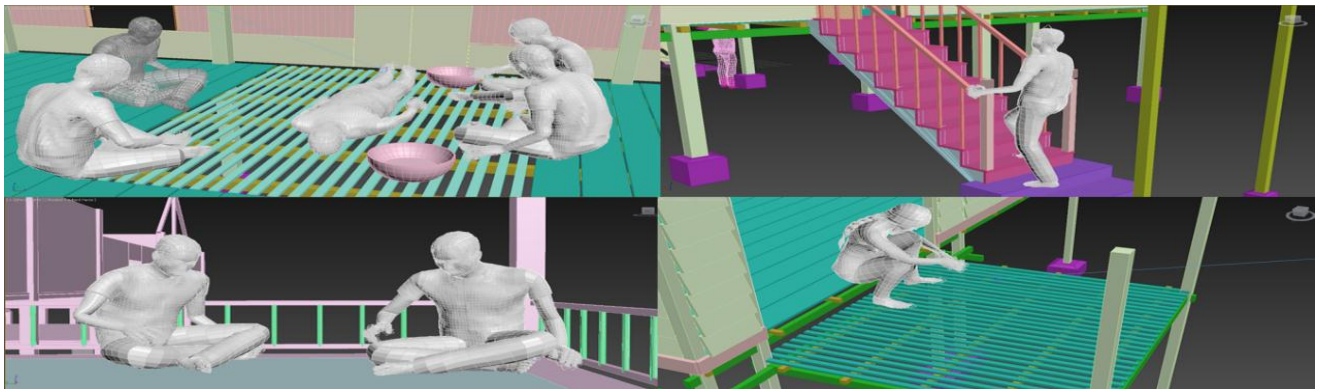


Fig. 5: Activities carried out in the spaces of the recreated selected houses

Table 2: Position of user, carrying out activity in the kitchen

Position (putting things back on front shelf)				
Angle	Shoulder flexion: 87.67°	Elbow flexion: 31.12°	Neck Flexion: 12.59°	Shoulder adduction/abduction: 0°
Position (putting things back on top shelf)				
Angle	Neck extension: 32.51°	Shoulder flexion: 131.66°	Elbow flexion: 27.37°	Shoulder abduction: 13.83°

### 4. Results and Findings

The results shown here are samples from the kitchen area of a house located in the state of Perak, Malaysia. The house was built in the year 1910 and is over 100 years old. Table 2 illustrates the position of the user when placing an equipment back on the para/shelf on a wall of the kitchen and putting equipment away on a top shelf. Based on these human range of movements, it shows that the design of the TMH were originally very ergonomic towards its users. Placements and locations of available furniture are still within easy accessibility and doesn't put a strain on the user while carrying out the essential activity.

### 5. Conclusion

The internal structures of the TMH are built according to the measurements of the mother. Therefore making everything inside the house very ergonomic to its users. Culture and traditions play a very important role in the usage of furniture in any civilization. An Asian Standard of Ergonomics should be applied in the production of modern furniture, as it has been shown that the floor-culture of Malays and Asians can beneficially improve health, flexibility, balance, etc.

### Acknowledgement

This research is funded by the Zamalah Award provided by Universiti Teknologi Malaysia (UTM).

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