

Sitting Anthropometrics of Primary School Children in the Rural and Urban Areas in Pahang

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Abstract

Anthropometrics which means body measurements comes from one of the factors in ergonomics. Ergonomics is important to ensure humans perform efficiently. In this study, anthropometrics of 600 primary school children from rural and urban areas were taken to analyse the differentiation of sizes among the two provinces. The state of Pahang was chosen for this study as it is the biggest state in Peninsular Malaysia. Gathering anthropometrics data enable designers to make different sizes of furniture to certain areas to meet the requirements of ergonomics. It is found that there are significant differences in anthropometrics between the rural and urban areas.

Keywords: anthropometrics, children, rural, urban

1. INTRODUCTION

Anthropometrics or also known as body measurements, is one of the key factors of ergonomics. Ergonomics can be defined as an understanding of the interaction of human and other elements in order to achieve humans' full performance ("Definition of Ergonomics," n.d.) Anthropometrics is very important as it is a factor to be fulfilled in order for a product to be ergonomic. In this paper, a study on children's sitting anthropometrics was done to evaluate differentiation of anthropometrics between rural and urban area schools, and simultaneously creating a database for each provinces mentioned. The study was intended to combat the issue of mismatch sizes reported by Raja Ariffin Raja Ghazilla, Zahari Taha, Suraya Kamaruddin, and Iskandar Hasanuddin (2010).

Furthermore, based on a study by Bong ASL and Safurah Jaafar (1996), 9.8% of children in the urban Selangor area were reported to be overweight. This comes to show that there is a need for a re-evaluation of children's school furniture in two different provinces (rural and urban). Once the differentiation of anthropometrics is known, the current sizes of school furniture can be proposed. A total number of 600 students from rural and urban areas in Pahang, Malaysia participated in this study.

2. METHODS

2.1 Sampling

Figure 1 shows a flow chart of this study's methodology. The method for this study starts with data sampling. As cited by Sekaran (1992), Roscoe's rule of thumb stated a minimum number of 30 samples are sufficient for each subsample, as such for gender. Figure 2 shows

anthropometrics samplings for each provinces; rural and urban. For each province, 30 samples from each gender were taken for this study.

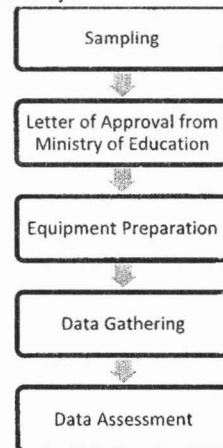


Figure 1: Flow Chart of Methodology

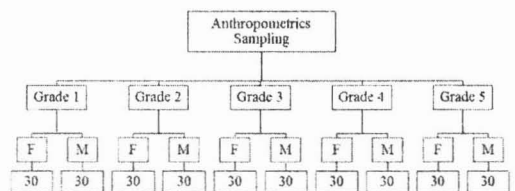


Figure 2: Anthropometrics Sampling for Each Province

2.2 Letter of Approval

For this study, a letter of approval from the Ministry of Education Malaysia was needed before the study can be conducted. The application of this letter was made

through the ministry's website and a letter granted of the approval was later accepted. However, according to the Ministry of Education, Grade 6 was not approved to be studied due to their involvement in "Ujian Penilaian Sekolah Rendah" (UPSR). After having the approval from the ministry, a letter to the District Education Office and selected schools were sent for further approval to conduct study.

2.3 Equipment Preparation

In order to collect anthropometrics data for chairs, a sitting position is the best way to obtain such data. Due to the unavailability of such measurer, a custom made measurer primarily for measuring anthropometrics in a sitting position was made. Plate 1 shows a custom made measurer designed for this study. Other than that, an anthropometer and stadiometer were also used to collect student's anthropometrics.

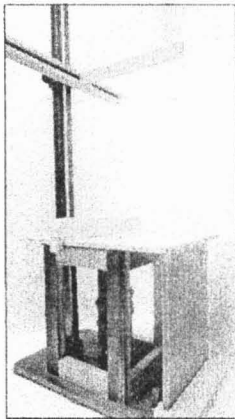


Plate 1: Custom made measurer

2.4 Data Gathering and Data Assessment

For this study, anthropometrics that were gathered are based on the requirements to construct an ergonomic chair. Therefore, eight body dimensions were chosen; these include shoulder to seat, subscapular height, shoulder breadth, elbow grip length, elbow height sitting, hip width, buttock popliteal length and popliteal length. From figure 3, chairs are divided into four parts and anthropometrics for each part is identified.

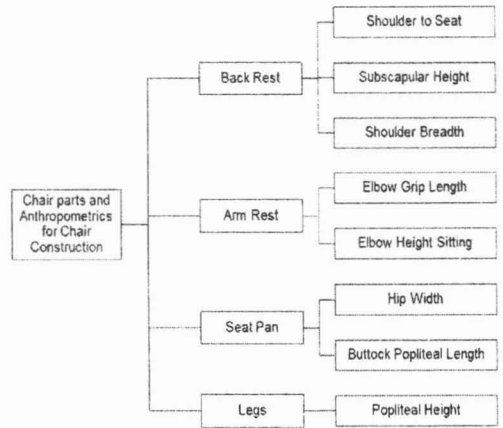


Figure 3: Chair Parts and Anthropometrics

3. RESULTS

3.1 Back Rest

Based on figure 4, significant differences can be seen on all three anthropometrics for back rest between rural and urban areas. Urban area students shown bigger sized than that of rural students; because of this, back rest of the chair for urban area should be taller than that of rural. As for the width for chairs' backrest, shoulder breadth measurements can be used to determine such dimension.

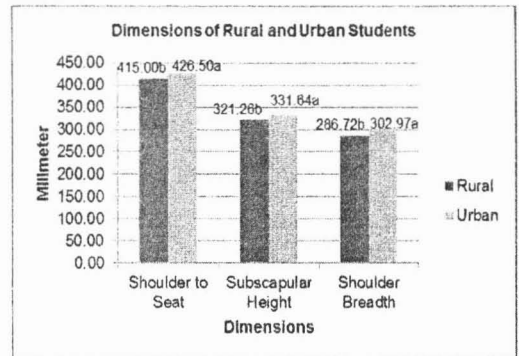


Figure 4: Average Sizes of Children for Shoulder to Seat, Subscapular Height and Shoulder Breadth

3.2 Arm Rest

Figure 5 shows differentiation of rural and urban students for arm rest dimension which are determined with dimensions of elbow grip length and elbow to seat. The length of arm rest, which is determined by the elbow grip length, should be different in sizes as in the result, which showed a significant result. However, the height for the arm rest which is determined based on height of elbow to seat should have the same dimensions for both provinces as according to the result, there is no significant differences between rural and urban allowing height of arm rest should be the same for both areas.

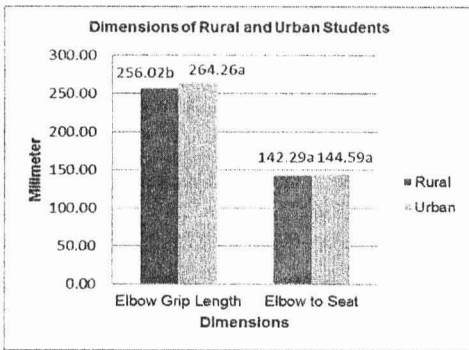


Figure 5: Average Sizes of Children for Elbow Grip Length and Elbow to Seat

3.3 Seat Pan and Legs

In order to know the sizes for seat pan, hip width and buttock popliteal length was looked. For seat width, sizes should be the same for both areas as there were no significant differences between rural and urban children. Meanwhile, different sizes should be allotted for seat's length as result in figure 6 shows a significant difference for buttock popliteal length. As for the dimensions for a chair's legs, different sizes should be used for each province due to the significant output in the result.

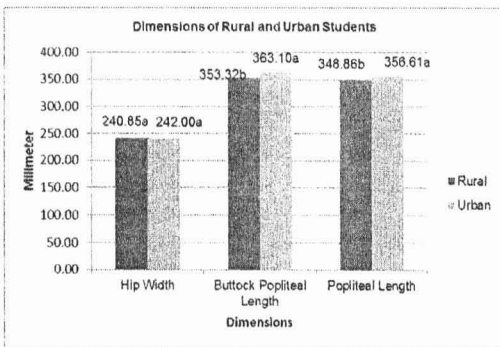


Figure 6: Average Sizes of Children for Hip Width, Buttock Popliteal Length and Popliteal Length

3.4 Anthropometric Database

In this study, anthropometrics database was made to propose dimensions that are suitable for each province. Percentiles of 5th and 95th are used to determine suitable dimensions for chair construction. In table 1 and table 2, bold numbers represents suitable dimensions to use when constructing chairs.

Table 1: Anthropometrics of Rural Students

| Chair Parts | Body Dimensions | Percentiles | |
|-------------|--------------------------|-----------------|------------------|
| | | 5 th | 95 th |
| Back Rest | Shoulder to Seat | 340.50 | 491.90 |
| | Subscapular Height | 271.00 | 384.95 |
| Arm Rest | Elbow Grip Length | 206.00 | 300.95 |
| | Elbow Height Sitting | 102.00 | 182.00 |
| Seat Pan | Hip Width | 176.10 | 341.95 |
| | Buttock Popliteal Length | 292.00 | 417.95 |
| Legs | Popliteal Height | 290.05 | 408.90 |

Table 2: Anthropometrics of Urban Students

| Chair Parts | Body Dimensions | Percentiles | |
|-------------|--------------------------|-----------------|------------------|
| | | 5 th | 95 th |
| Back Rest | Shoulder to Seat | 355.35 | 506.95 |
| | Subscapular Height | 283.00 | 391.90 |
| Arm Rest | Elbow Grip Length | 222.00 | 309.80 |
| | Elbow Height Sitting | 111.05 | 185.00 |
| Seat Pan | Hip Width | 178.15 | 326.00 |
| | Buttock Popliteal Length | 305.05 | 433.00 |
| Legs | Popliteal Height | 302.10 | 414.00 |

4. CONCLUSIONS AND RECOMMENDATIONS

In this study, the significant differences of anthropometrics in the rural and urban areas show that there is a need to re-evaluate primary school furniture in order to achieve ergonomics. Furthermore, the use of anthropometrics database that was composed enables designers to make different sizes of furniture according to provinces. Other than that, another use of anthropometric database is the ability of it to observe children's malnutrition. As a recommendation, different sizes of furniture should be suggested to different areas. A further study of anthropometrics on differentiation between gender and regions should also be done to see the variability of it.

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