

# An Anthropometric Measurement Of Cerebral Palsy Children For Developing Product Design

Nur Nabilah Binti Wazir, Dr. Musdi Shanat, Dr. Shahrol Mohamaddan

**Abstract:** In ergonomics fields, anthropometric data can be used and applied in product design and used to develop design process. The research was conducted to study application of anthropometric data in product design for children with special needs. The research focused on anthropometric measurement of the children's hand with cerebral palsy. However, no specific data of cerebral palsy (CP) children in Malaysia that could be obtained. The objective of this research is to apply and analyze an anthropometric database of cerebral palsy children (aged 12 month – 15 years old) for product design. The data analyze is using descriptive statistic method producing mean, percentiles and standard deviation (S.D) value for anthropometric variables. 30 children with cerebral palsy are involved in this study and 19 hand dimensions have been measured. The subject was informed before data collection started, that the study was to develop an anthropometric database which can be used to improve product design or other ergonomic consideration for cerebral palsy. The result of the study will provide guidelines for product design process.

**Index Terms:** Anthropometric data, Ergonomic, Cerebral Palsy Children

## 1 INTRODUCTION

Anthropometry is a key element in ergonomics for identifying and addressing a product's problems according to user characteristics [2]. For example, features of users with physical disabilities such as cerebral palsy require an ergonomic product design that can help them do things comfortably and easily. Anthropometry in ergonomics includes product designs and workplaces that involve humans to understand and control things such as turning on doorknobs, ability to grasp, pressing light switches, and so on [2]. For example, features of users with physical disabilities such as cerebral palsy (CP) require a product design that can help them do things comfortably and easily.

## 2 LITERATURE REVIEW

Anthropometry is an important element in many different fields. It is widely used in product design primarily to determine the product design that is appropriate and safe for users [1]. Hand anthropometry data can be obtained by measuring every hand dimensions and hand posture of spread hand [3]. Hand anthropometry consist of measurement of fingers length and width, palm width, grip diameter etc. [8]. Hand dimensions measurement can be considered when designing a product which focusing on hand usage. Purpose of ergonomic design for hand related tools are to optimize hand function to be more effective in doing activities which can minimize burden to the muscle, tendon etc. So, hand anthropometry measurement is very crucial in producing databased which can be refer when designing a product. This is because every human hand posture and size is different especially cerebral palsy children. Cerebral palsy children are generally smaller and thinner compared to normal children, especially cerebral palsy quadriplegics [4].

### 2.1 Cerebral Palsy

The most common cases of disability among children in a developing country are cerebral palsy (CP), and it often associated with poor growth approximately 2 per 1000 live births. Cerebral palsy (CP) can be defines as a group of disorders in the development of movement and posture which can cause limited activities. Cerebral palsy disorder often accompanied by disturbances of sensation, cognition, communication, perceptions or behavior by epilepsy disorder [5]. Cerebral palsy (CP) can be separated into 4 categories; which is monoplegia, hemiplegia, diplegia and quadriplegia.

Differences between these four categories are which part of the body is affected [6]. Special needs children such as cerebral palsy children which have physical disabilities requires more specific attentions in all aspect, especially their sensory ability development which cover gross and fine motor skills development and sensory integration. All this skill is correlated to each other and vital to allow cerebral palsy children to explore surrounding to play with their friends and to adapt new routine. It is crucial in order to improve physical and attention abilities together with their learning capability.

### 2.2 Significance of anthropometric database in design

Anthropometry data that has been measured can be compile into one database, and it is called anthropometric database. Anthropometric database can be widely used by engineer, architect, designer and product manufacturer which can allow special needs people to undergo their life comfortably [7]. Collected anthropometry measurement can be made as a guideline for designer in various application such as product design. It also can be used to design facilities that can help people especially special needs people, in order to improve their mobilities which cause by their limitation compared to normal people. For example, Asian population need to have their anthropometry measurement to ease designer to design an ergonomic furniture which can result to comfortability, safety and increase satisfaction level and ultimately reduce Musculoskeletal disorders (MSDs) [8].

## 3 RESEARCH METHODOLOGY

This research is carried out at various location around Sarawak. The study and data collection were carried out for about 12 months. Limitation of funds and resources had limited the location to obtain the subject; which is only at Sarawak. The next limitation is no collectable information of whereabouts the location for the cerebral palsy children. Hence, only 30 people of subject is obtained; age ranging from 12 month to 15 years old. For comparison, 30 normal children also obtained; age ranging from 4 to 6 years old. As for the gender, 15 male and 15 females are obtained for both normal and cerebral palsy children.

### 3.1 Measurement Procedure

A total of 19 anthropometric dimensions were chosen. These dimensions were chosen on the basis that they were standard anthropometric used for design purpose as specified by