

Establishing a Sizing System for Ready-To-Wear Hijab: A Methodology for Facial Measurement

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Through the years, hijab making industries in Malaysia have witness rapid growth due to increase awareness among Malaysian Muslim women to cover their heads as required in Islam religion. Ready-to-Wear (RTW) hijab has been among the preferences of today's women due to its easy-to-wear character and variety of styles offered. This paper discusses the methodology for measuring facial dimensions in order to create facial anthropometric database for Malaysian women age between 18 to 30 years old. The study aims towards the establishment of a sizing system of RTW hijab for Malaysian market.

Keywords - sizing system, anthropometric, ready –to-wear hijab

I. Introduction

Hijab symbolises the Muslim's woman commitment to Islamic principles. Nowadays, there are many types of hijab available in the market, and among the most popular hijabs is the Ready-To-Wear (RTW). Hijab for Malaysian local market is normally manufactured by the small-medium enterprise (SME) companies. Statistical analysis shows that SME contributed 32% in Gross Domestic Product in Malaysia and *Bumiputera* SME plays the main role towards Malaysian economy [1, 2]. RTW hijab is the most easy-to-wear and convenient hijab for women to wear especially for working women where time is of utmost important. The availability of RTW hijab in many retail outlets also plays an important role in ensuring the popularity of RTW hijab is maintained. Often, people purchase hijab based on general sizes indicated by the sizes S (small), M (medium), L (Large) and XL (extra-large). Although it is common to find these hijab sizes in the market, the sizes differ in dimensions among manufacturers due to unavailability of RTW hijab sizing system particularly in Malaysia. This problem has resulted to dissatisfactory among hijab consumer. As to other ready-made apparels, fit is the most crucial aspect in ensuring consumers satisfaction. Dissatisfaction of consumer with fit aspect of the ready-made apparel can be solved by using advanced technologies [3, 4].

Many studies have been conducted in the area of sizing system for apparel, helmet design [5] and respirator mask [6]. However, none of the study has been reported on the establishment of sizing system for RTW hijab.

Of late, online shopping has been the popular mode of shopping due to the emergence of sophisticated telecommunication gadgets that enable consumers to

conveniently make a purchase without the need to go to the retail outlets. Choices of styles and designs, varieties of color options, and wide range of price levels offered, have contributed to the increase popularity of online shopping. Hijab online shopping is no exceptional, with vast number of online hijab websites offering styles, designs and colors at variety of price range. As to the sizing problem aroused in traditional shopping, no standardization of size among online hijab retailers has created dissatisfaction to consumers.

II. Objectives

In view of the above problems, the first part of this paper aims to investigate the size variation of RTW hijab of different hijab retailers in Malaysian market. A survey was administered by mean of online questionnaire to Malaysian women wearing hijab and interview sessions with some hijab retailers. A survey on hijab dimension variations between different hijab sizes was also conducted to investigate the variations in measurement of the hijab among retailers. The outcome of the survey serves as the ground basis towards the need to establish Malaysian sizing system of RTW hijab. Later in the second part of this paper, the method of measuring facial dimensions towards the development of the hijab sizing system is described.

III. Size Variation in RTW Hijab in Malaysian Market

Problems related to clothing fit have been a major focus among apparel industry players. In recent years when online apparel shopping becoming the popular preferences among consumers, fit satisfaction remains the fundamental aspect. Hijab fit is no exception. Fit problem in hijab is associated with the comfort around the wearer's craniofacial area, be it too loose or too tight to wear. The present online survey explore consumers' perception of current hijab offered through online system, and satisfaction of the hijab purchased online. The survey gathered the views from 103 Malaysian women who have had experienced wearing hijab.

Through the survey, a large percentage of the respondents (77%) have experienced buying hijab from online retailers. With other fashion items, online hijab purchasing has marked a significant growth, where online hijab websites become a common means of trading. However, many respondents experienced dissatisfaction on various aspects of the hijab purchased online (63%). Many of them thought that the hijab they purchased are not comfortable to wear (58%).

Interview with hijab retailers indicated that no standard sizing for hijab was referred when they produce hijab. Some retailers produced hijab sizes through their past experiences and some uses mannequin head as their reference. This scenario has created a non-standardized hijab sizing in the market which has led to consumer dissatisfaction in terms of hijab fit aspect. Hijabs in today’ markets are commonly labeled with different sizes; small, medium, large, and extra-large. However, there are dimension variations within the sizes among different retailers.

Hijab dimension of size small (S) to large (L), from eight retailers were measured a cloth measuring tape. The measurement was taken at the face opening area of the hijab. Since some of the hijabs measured are made of spandex material, the process of measuring was conducted without applying any tension on to the part being measured. The cloth measuring tape was placed on to the hijab on a flat table to prevent any stretch motion.



Figure 1. Measuring the hijab

Table 1 shows the size variations of RTW hijab from eight hijab retailers in Malaysian market. Two retailers (A and E) offer all sizes; small (S) to large (L), while the other six retailers offer only certain sizes.

Table I. Variation of existing RTW hijab based on different company

Retailer	Sizes (cm)		
	Size S	Size M	Size L
Retailer A	59	61.50	62.70
Retailer B	-	59.50	63.30
Retailer C	-	60.10	58.30
Retailer D	-	62.00	59.50
Retailer E	62.70	61.50	64.00
Retailer F	-	57.00	60.10
Retailer G	-	56.30	56.30
Retailer H	64	64.00	-
Mean	61.90	60.21	60.15

Variations in measurement were found in all sizes of hijab between one retailer to the others. For ‘S’ size, the smallest measurement of the face opening is 59.0 cm offered by retailer A, and the biggest is 64.0 cm by retailer H. For ‘M’ size, the smallest measurement of the face opening is 56.3 cm offered by retailer G, and the biggest is 64.0 cm by retailer H. While for ‘L’ size, the smallest measurement of the face opening is 56.3 cm offered by retailer G, and the biggest is 64.0 cm by retailer E. Only two retailers (A and E) were found to have similar hijab dimension of size ‘M’ (61.5 cm). None were found to have similar hijab dimension for size ‘S’ and ‘L’. Retailer G and H used the same measurement of the face opening for all their hijab sizes.

The above findings indicated that size label of hijab in many retail outlets cannot be referred as the indicator of the face opening dimension. This indicates that there is a need to establish the RTW hijab sizing for Malaysian market in particular.

IV. Research Methodology

The study was segmented into two part which are part 1 is survey conducted to identify the overall about Ready-To-Wear Hijab in term of comfort, sizing system, and awareness. Part 2 is the explanation of face measuring technique has been done in order to obtain anthropometric data for establishing hijab sizing system.

A. Survey Conducted (Part 1)

The survey was conducted through online was divide into four categories. Each categories represent different purpose.

Survey Categories:

- *Demographic.* Demographic variables include age and level of education. Both demographic variables emerged as significant characteristic to awareness of consumer on sizing system.
- *Comfort of RTW Hijab.* In this survey, comfort of RTW Hijab is the most important aspect for wearer. Respondents were asked six close-end questions in relation contribute to comfort of RTW Hijab: priority on comfort, design and style, price, priority of comfort in three parts of RTW.
- *Sizing System.* Sizing system in Malaysia in hijab manufacturer is not standardized. Sizing system variable included four questions mostly in experience of respondent when bought RTW Hijab which was measured by close-end questions (Yes or No).
- *Awareness on Sizing System.* Respondent were asked six question in relation contribute to awareness: knowledge on sizing system, perceptions towards Malaysia does not have own sizing system, suggestion to use own sizing system in Malaysia, benefit of own sizing system, consumer satisfaction on sizing system of other countries used by Malaysia and opinion on having own sizing system on hijab manufacturing. The awareness was measured by close-end question (Yes or No).

There are 150 respondents volunteered to answer the online survey given for them. The analysis shows the highest percentage of respondents (68%) is at the age of 21 to 30 years. This is equal to 102 respondents, while 25 respondents (19.3%) have age range below 20 years. There are 19 respondents (12.7%) at the age of 30 years old and above.

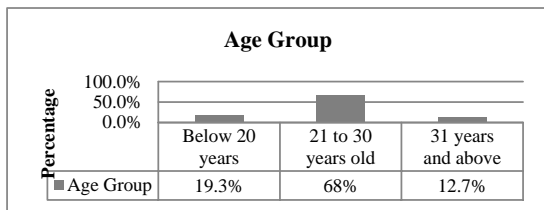


Figure 2. Age Group

Level of education from most of the respondents (71.3%) are from undergraduate student which are diploma and bachelor's degree student that is equal to 107 respondents and followed by 25 respondents (16.7%) are in level of *Sijil Pelajaran Malaysia* (SPM) and the 18 respondents (12%) is postgraduate student.

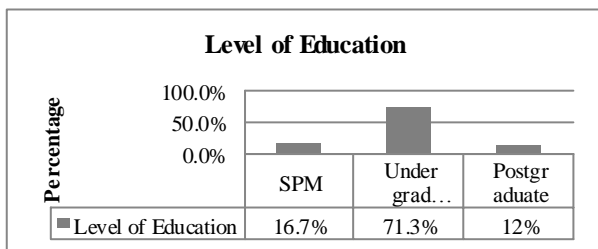


Figure 3. Level of Education

Second part of the online survey is to identify the comfortability of RTW hijab. There are six close-end questions were asked and shows that 76.1% agree that comfort is extremely significant when wearing hijab. In question 3 the percentage between agree and neutral is slightly same because the respondent were asked either they are willing to pay more for comfortable hijab. The price can be factor that can influence the purchasing behavior and decision making. [7-9]. Most of the respondents agree that the length of hijab (86%) has highest percentage providing comfort followed by face opening (83.3%) and hijab's front panel (70.7%).

Table II. Comfortability of RTW Hijab

Option (%)	Question						Overall Percentage
	1	2	3	4	5	6	
Agree	99.3	70.7	46.7	83.3	70.7	86	76.1
Neutral	0.70	26	41.3	12.7	22.7	14	19.6
Disagree	0	3.3	12	4	6.7	0	4.3

Third part of the online survey is to investigate the non-standardized sizing system of RTW Hijab in Malaysia. The first three questions obviously show that RTW hijab doesn't have standardized sizing system. In Question 3 respondents extremely agree the face opening part doesn't have fixed measurement event though the percentage of satisfaction is slightly same (55.3% and 44.7%) in question 4 when discussed about sizing system of RTW hijab provided by hijab manufacturer.

Table IV. Non-standardized Sizing System of RTW Hijab

Option (%)	Question				Overall Percentage
	1	2	3	4	
Yes	87.3	80.7	90.7	55.3	78.5
No	12.7	19.3	9.3	44.7	21.5

Level of education show high significant level ($p=0.033$) towards knowledge of respondent on apparel sizing system. Respondents extremely agree (96.7%) that Malaysia should have its own sizing system to ease consumer when choosing the fit garments instead of using sizing system from other countries. It is also elucidating that Malaysian consumer aware about apparel sizing system in Malaysia.

Table V. Awareness of Malaysian towards Sizing System

Option (%)	Question					Overall Percentage
	1	2	3	4	5	
Yes	47.3	87.3	96.7	41.3	85.3	71.6
No	52.7	12.7	3.3	58.7	14.7	28.4

B. Measuring Method of the Facial Dimension

I. Sampling plan for hijab Sizing

Towards the establishment of the head anthropometric data of Malaysian women and the hijab sizing system, it is of paramount importance that the measuring method of the facial and head part is established prior to the actual measuring activity of the anthropometric survey. In many previous studies on anthropometry survey associated to facial or head part, For designing the helmet and respirator masks, gender factor is important as helmet is worn by both male and female. Since hijab is only worn by female, the population should be sampled only on female. The recommended age range of the samples is in between 18 to 30 years old as this population group has the most buying power and access to internet facilities. Furthermore, the structure of human bone will change with the increase of age [10]. Based on the present online survey, 98% of women aged from 18 to 30 prefer RTW hijab.

II. Dimension Measured

Nine dimensions were identified to establish Malaysian female head anthropometric data (Table 5). However, for the development of hijab size chart, three important dimensions were identified which are the chin cover (CC), front panel (FP), and face opening (FO).

Table V. Dimension for head anthropometric survey

Dimension	Definition
Head circumference (HC)	Distance from <i>glabella</i> (g) to the back of head called <i>occiput</i> (occ)
Chin cover (CC)	Distance between from <i>gonion</i> (go) to <i>gnathion</i> (gn)
Bigonial breadth (BGB)	Measurement between left to right <i>gonion</i> of the jaw
Morphological facial height (MFH)	Measurement from <i>nasion</i> (n) to <i>gnathion</i>
Physiognomical facial height (PFH)	Measurement from <i>trichion</i> (tr) to <i>gnathion</i>
Bitragion breadth (BTB)	Distance from left to right <i>tragion</i> (t)
Front panel (FP)	Measurement from <i>vertex</i> (v) to <i>gonion</i> of the jaw
Face opening (FO)	Length of face opening from <i>vertex</i> to <i>hyoid bone</i> (hb)
Bizygomatic breadth (BZB)	Distance between left to right <i>zygion</i> (zy)

The nine dimensions were measured by referring to ten landmarks in order to establish the head size chart and sizing system of RTW hijab (Figure 4). These landmarks were used as guidelines to start with the measuring activity. Before anthropometry survey was taken, the landmark locations should be marked so that it can be measured repeatedly without error during the measurement. All landmarks were identified by the abbreviations of its' anatomical terms (Table V). By using Nickel's head illustration, location of the landmarks and are shown in Figure 4 [11].

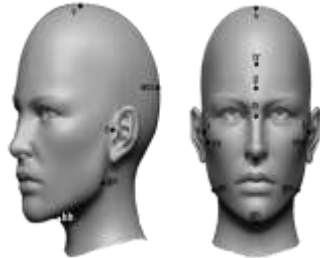


Figure 4. Landmarks on the face for anthropometric survey

III. Measuring Method for the Head Anthropometric Survey

Fig.4 shows the measurement taken for HC. HC is the measurement start from *glabella* until the back of head known as *occiput*. This dimension is used to determine the head circumference of the human subject.



Figure 5. Head Circumference (HC)

Bigonial breadth in Figure 6 (BGB) was used by other researchers to identify the distance between left to right *gonion* of the jaw (Du et al., 2008; Gross & Bradtmiller, 1999; Yokota, 2005; Zhuang & Bradtmiller, 2005), or also known as mandible length [12]. This part was identified as the total width of lower third face [13].



Figure 6. Bigonial Breadth (BGB)

Bitracion breadth (BTB) or the distance between left *tracion* to right *tracion* (Figure 7) was measured to identify the facial projection[14].

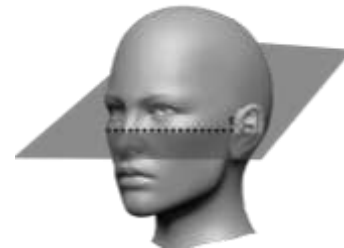


Figure 7. Bitracion Breadth (BTB)

Facial height were measured at two dimensions, which are the morphological height of the face (MFH) (Figure 8), and the physiognomical height of the face (PFH) (Figure 9) [15]. MFH was measured from the *nasion* (n) to *gnathion* (gn), while PFH was measured from the *trichion* (tr) to *gnathion* (gn). Bizygomatic breadth (BZB) (Figure 10) was measured form left to right *zygion* to identify face width of the human subject.



Figure 8. Morphological facial height (MFH)



Figure 9. Physiognomical facial height (PFH)



Figure 10. Bizygomatic breadth (BZB)

As mentioned before, three dimensions were identified to be used in the establishment of the size chart of RTW hijab. The dimensions are the FO, FP, and CC. Face opening (FO) of hijab was measured from *vertex* to *hyoid bone* (Figure 11). *Hyoid bone* is the point where hijab wearer always secure their hijab using brooch or button to make sure the hijab fit to their face (in the case on self-construct hijab).



Figure 11. Face Opening of Hijab (FO)

In many hijab, the front panel is constructed above the *gonion* point. This can results in the face looking wider than usual. The best way is to start the measurement from the *vertex* point, and end it just below the *gonion* point (Figure 12). Chin covering (CC) is an alternative part of RTW hijab for some hijab wearer (Figure 13). The measurement of chin covering was taken from the *gonion* to the *gnathion*.



Figure 12. Front panel of hijab (FP)



Figure 13. Chin Covering (CC)

Basically, all measurements for hijab making were taken based on the design pattern of RTW hijab. Figures 12 and 13 illustrate the connection of the three related dimensions; chin cover (CC), front panel (FP), and face opening (FO); to the hijab construction.

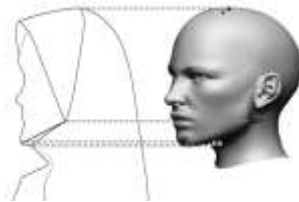


Figure 14. Overview of all landmarks with RTW hijab

v. Conclusions

The measuring method described in this paper is the initial step towards establishing new sizing system of RTW hijab, particularly for Malaysian market. Previous anthropometric studies were conducted on helmet design, respirator mask for child use, and earphone. However, no reported study was conducted on the anthropometric study for the purpose of RTW hijab sizing. Even though the size label is one of the ways to communicated with consumer [16], RTW hijab's size label still can't interact with them just because of the problem regarding non-standardized sizing. Therefore, the outcome of the standard sizing system for RTW hijab can benefit many parties especially hijab manufacturers and the hijab wearer itself. This can overcome the non-standardized sizing issues of RTW hijab in Malaysia like had been told before. The challenge of this research may come from the different face shape of multi-races and ethnicity of Malaysian population.

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