International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 08, 2020
ISSN: 1475-7192

Apparel Design Criteria: Anthropometric Measurement on Standard Sizing for Elderly Women with Physical Disabilities

[1]Juliza Jamian, *[2]Nazlina Shaari

Abstract--- *Smart apparel design considers an anthropometric measurement of normal sizing as significant criteria for the elderly people with disabilities. Stroke or half body paralysis is the prevalent condition sufferers experience and this group appears to have trouble moving through their everyday life due to changes on their body. The aim of this study is to establish standard sizing chart that follows the correct proportion of elderly women with disabilities. A case study was performed in Kajang, Malaysia, at Old Folks Home Centre. In this case, three different sizes of the body with the same state of illness were examined and analysed. It is for the elderly women to obtain an exact standard scale. The aim of this standard sizing study is to produce the correct body sizing chart for the elderly disabled age 65 and above. As a result, this anthropometric measurement provides a standard body sizing chart for elderly women with disabilities that can be used in the development of functional apparel product for another stage of the design process.*

Keywords--- *Design Criteria, Smart Apparel, Anthropometric Measurement, Sizing Chart, Disabled Elderly*.

I. INTRODUCTION

Globally, the number of aging populations in the world is increasing (UN, 2019). Throughout Malaysia's aging population, 5.0 per cent age 65 and above in 2010, which is 14.5 per cent elderly population, increased dramatically in 2040 (Official Statistics of Malaysia). Malaysia age forecast is going to be aging nation country in the future. Malaysia's aging population impacts demographic profile development and Socio economic patterns (Karim, 1997). Health issues are becoming common issues for the elderly. According to Zhao et al. (2018) state that stroke, diabetes, Alzheimer and hypertension is the major chronic disease among elderly. This chronic conditions cause high rate of disabilities (Jenkins, 2002). The disease causes a burden to the elderly who disabilities, in terms of body movement control as for example on handling dressing and undressing apparel. Besides, according to Alrabghi et al. (2018), the fact of third leading cause after cancer and heart disease is stroke, that lead of morbidity and mortality across the world. Apparel is the main issues that need an improvement from the basic design to special apparel for disabled elderly. According to Colombo et al. (2012) said that older person who have physical limitations can remain independent if health and economic burden of disability can reinforced by environmental characteristics. This paper presents a standard body sizing chart suitable for handicapped elderly women's apparel that can be ergonomically and comfortably applied to them. In addition, the long-term goal is to provide a measurement guide in future research for the design development process.

[1]School of Graduate Studies, Faculty of Design and Architecture, Universiti Putra Malaysia(UPM), 43400 Serdang, Selangor, Malaysia.
[2]Research Fellow, Malaysian Research Institute of Ageing (MYAGEING), Universiti Putra Malaysia (UPM), 43400 Serdang, Selangor, Malaysia.
****Corresponding Author Email: nazlinashaari@upm.edu.my***

Received: 27 Mar 2020 | Revised: 20 Apr 2020 | Accepted: 05 May 2020

II. LITERATURE REVIEW

1) Design Criteria

In general, the process of design takes a lot of change, and design requirements are one of the most significant developments in the creation or production of concept. Functional apparel design for the user can be complex and iterative in design process that require body measurement and sizing, pattern cutting and apparel assembling (Gupta, 2011). Figure 1, in this study shows that researcher at the of measurement specification for standard sizing chart cycle. Size and it is dominant issues in apparel, while fashion, taste, situational and functional become less common (Laitala et al., 2015). It is show that, sizing is the first guide in recreate a product.

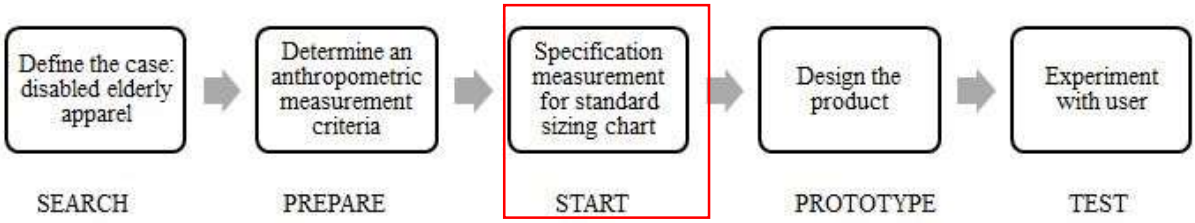

Figure 1: Product development process at the stage of specification measurement

According to Howlett (2018), basic criteria of effective design and designing study can be establish by work on old and new design. It can be defined that the new model of disabled product needs to be improved from the current design. Besides, in terms of relevance sustainable design, there is few strategies for designer, design should be minimal waste, creative product to consumer and society, follow the need, explore better technology, reduce chemical impact or produce ethical product (Laitala et al., 2015). People now eager to have quality of life and dress more efficient intelligent clothing rather than clothing just to cover body and effect of pleasant decoration (Qiu & Hu, 2014).

2) Anthropometric Measurement

Aging and changes of body position is the fact that need to be accepted in life. According to Ellis (2000) state that from an advancing ages, quality of life and health issue may effect because of the changes of body composition. In design context, numerical data of anthropometric measurement that concerned on size, physical characteristics and shape are well used over the past years (Kwok, 2007). From this point of view, some dimension might be assess to measure the right dynamic posture to figure the validity that produce by a body (Chi & Kennon, 2005). So that, identified the critical dimension on a body by propose a simple body size chart and easy to follow can affect garment fit to user (Gupta & gangadhar, 2015).

The scenario of disabled elderly apparel considers a lot of design developing process such as function, ergonomic, values, disabled elderly condition and etc. According to Chih (2006), body measurement standard is the crucial value added in manufacturing process of apparel. It is to shows that, by applying some standard sizing the product can precisely clarify to the care giver or end user. Easier handle by care giver and comfort for end user is the aiming in context of elderly needs based on their physical condition (Caldas et al., 2005). Beside, final quality and reduce waste of material can improve by develop a new sizing data system (Esfandarani & Shahrabi, 2012). Researchers understand

[1]School of Graduate Studies, Faculty of Design and Architecture, Universiti Putra Malaysia(UPM), 43400 Serdang, Selangor, Malaysia.
[2]Research Fellow, Malaysian Research Institute of Ageing (MYAGEING), Universiti Putra Malaysia (UPM), 43400 Serdang, Selangor, Malaysia.
**Corresponding Author Email: nazlinashaari@upm.edu.my*

Received: 27 Mar 2020 | Revised: 20 Apr 2020 | Accepted: 05 May 2020

in this research that anthropometric measurement is a major role in the apparel design sector in ensuring that the product achieves the degree of comfort quality and end-user suitability.

III. METHODOLOGY

1) Apparel Size Code

In this study, the disabled informant was observed based on same cluster of illness, which is stroke or half body paralyse and this illness was common case that happened to our elderly. Table 1 explains about the specific features that should have in sizing chart measurement. According to Takebira, Mohibullah, & Samana (2018) state that provide a flawless dimensional model that possible to all apparel size for end user.

Table 1: Women body measurement chart **Source: (Winifred Aldrich, 2008)*

Women Body Measurement Chart			
Size Code	*S-8*	*M-12*	*L-16*
Bust	80	88	96
Waist	60	68	76
Hip	86	94	102
Chest	30	32.4	34.8
Shoulder	11.75	12.25	12.75
Dart	5.8	7	8.2
Nape to waist	40.2	41	41.8
Front shoulder to waist	40.2	41	41.8
Armscye depth	20.2	21	21.8
Sleeve length	57.5	58.5	59.5
wrist	15	16	17
Waist to knee	57.5	58.5	5.5
Waist to hip	20	20.6	21.2
Waist to floor	102	104	106
Body rise	26.6	28	29.4

2) Body size information

The purpose of this segment is to extract the specific data of body measurement from disabled elderly women. The data collected for this study will be used to construct a new sizing map for elderly people with disabilities. As shown in Figure 2(a), Figure 2(b) and Figure 2(c), is an explanation of body size information based on important characteristics in apparel design. This study also got permission from the care taker in Old Folks Home centre to measure and record the data. Determine the anthropometric feature of sizing that require during the experimental on body (Erkan, 2019).

[1]School of Graduate Studies, Faculty of Design and Architecture, Universiti Putra Malaysia(UPM), 43400 Serdang, Selangor, Malaysia.
[2]Research Fellow, Malaysian Research Institute of Ageing (MYAGEING), Universiti Putra Malaysia (UPM), 43400 Serdang, Selangor, Malaysia.
****Corresponding Author Email: nazlinashaari@upm.edu.my***

Received: 27 Mar 2020 | Revised: 20 Apr 2020 | Accepted: 05 May 2020

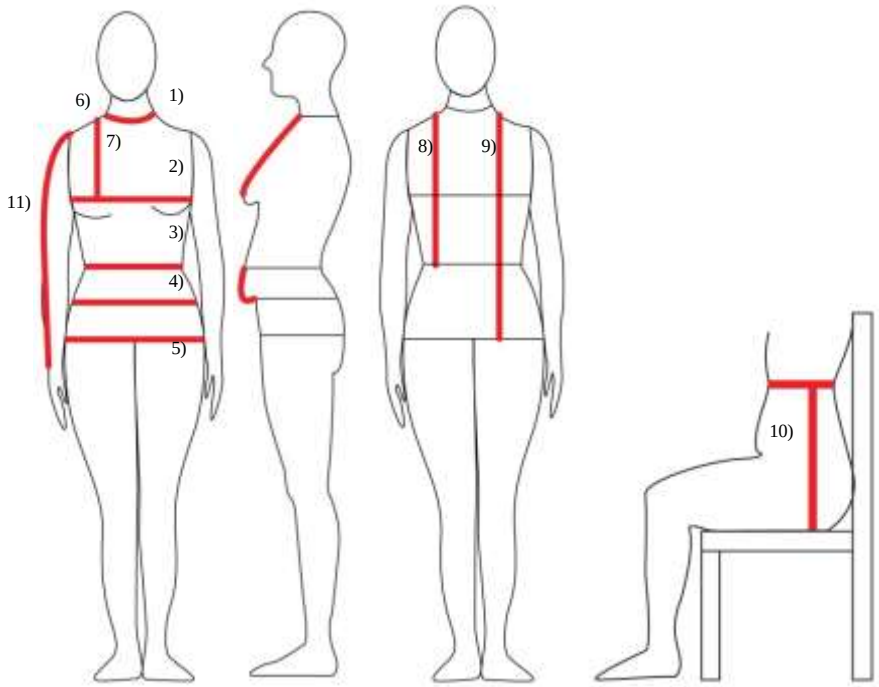

Figure 2(a): Body size information

1) Neck: place the measurement tape around her neck (ask elderly to not squeeze her chin down or crane her neck)
2) Bust: place the measurement tape around her chest
3) Waist: place the measurement tape around her waist
4) Abdomen: place the measurement tape around her abdomen (make sure your elderly in rest position, do not force her to sit straight. It is to measure the maximize of her abdomen)
5) Hip: place the measurement tape gently around her hip (make sure your elderly in comfort position)
6) Shoulder: place the measurement tape from tip of shoulder (right to left)
7) Shoulder to bust: measure the distance from joint shoulder to center of nipples
8) Shoulder to waist: measure the distance from joint shoulder to center of waist
9) Shoulder to hip: measure the distance from joint shoulder to of hip
10) Crotch depth: measure from the centre of waist untill bottom of hip sitting
11) Arm length: measure the distance from tip of the shoulder to the past of her wrist bone.

[1]School of Graduate Studies, Faculty of Design and Architecture, Universiti Putra Malaysia(UPM), 43400 Serdang, Selangor, Malaysia.
[2]Research Fellow, Malaysian Research Institute of Ageing (MYAGEING), Universiti Putra Malaysia (UPM), 43400 Serdang, Selangor, Malaysia.
**Corresponding Author Email: nazlinashaari@upm.edu.my*

Received: 27 Mar 2020 | Revised: 20 Apr 2020 | Accepted: 05 May 2020

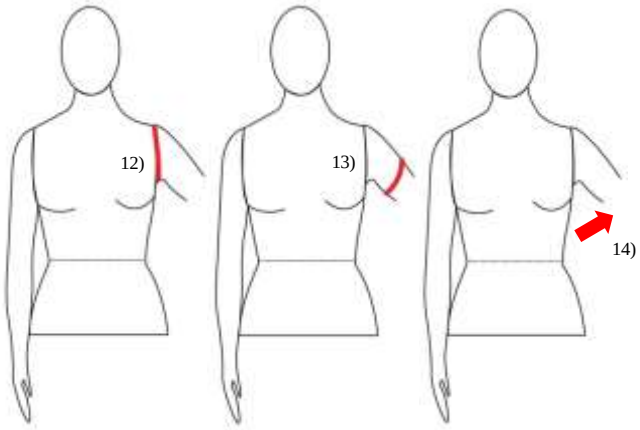

Figure 2 (b): Body size information part

12) Armhole : it is also can call armscye depth, measure from the tip of the shoulder and straight around the edge of bust under the arm until point back at the shoulder tip.

13) Biceps: It is different from the normal people measurement. Basically, they need to forearm up toward shoulder and measure the highest point of biceps. As for the disabled elderly, rest elderly arm on the table, then place the measurement tape in between tip of the shoulder and elbow.

14) Arm lift up: ask elderly to lift up her arm as maximum as she can, and measure the degree between body side and arm.

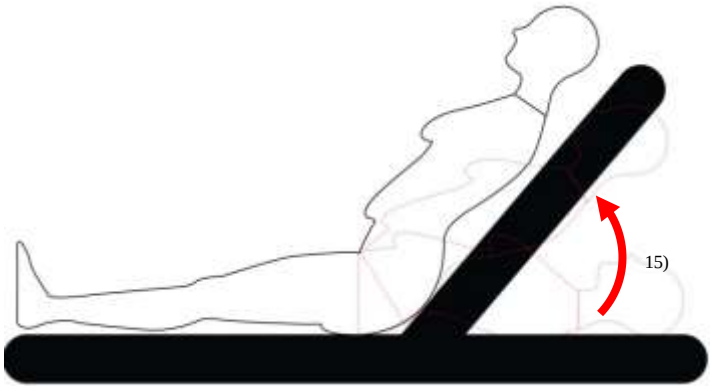

Figure 2 (c): Body size information part

15) Upper body bend: ask elderly to sit comfortably and measure the degree of her body bend from the bed until back body side.

[1]School of Graduate Studies, Faculty of Design and Architecture, Universiti Putra Malaysia(UPM), 43400 Serdang, Selangor, Malaysia.
[2]Research Fellow, Malaysian Research Institute of Ageing (MYAGEING), Universiti Putra Malaysia (UPM), 43400 Serdang, Selangor, Malaysia.
**Corresponding Author Email: nazlinashaari@upm.edu.my*

Received: 27 Mar 2020 | Revised: 20 Apr 2020 | Accepted: 05 May 2020

IV. RESULTS AND DISCUSSION

As for the result, fifteen size code is highlighted as the latest sizing chart that required in apparel design for the elderly with disabilities as seen in (e.g. Table 2). In addition, researchers in this study extrude seven essential size code as the basic code out of fifteen which is bust, abdomen, hip, shoulder, shoulder to hip, arm length and armhole. This code of seven sizes, recognised in this study as the standard basic block for pattern making. Another, arm lift up and upper body bend is an information about stroke elderly condition from this case study. The highest arm lift up and upper body bend is 45 degree. In this research, elderly has been asked to lift up or bend their body as far as they comfort with the position. Researcher have identified three different sizes of disabled elderly people in this study, that is, elderly people with size S, size M and size L. As for new clarification on comfortability issues for disabled elderly, this study will use Size fit to M size, M size fit to L size and L size fit to XL user size and all informants will be measured using centimetre measurement tape.

Table 2: Body measurement chart of disabled elderly women

Disabled Elderly Women Body Measurement Chart			
Size Code	*S fit M*	*M fit L*	*L fit XL*
Neck	35	38	45
Bust	**88**	**94**	**107**
Waist	74	97	105
Abdomen	**82**	**102**	**111**
Hip	**92**	**97**	**105**
Shoulder	**38**	**40**	**42**
Shoulder to bust	23	28	33
Shoulder to waist	36	42	47
Shoulder to hip	**53**	**56**	**59**
Crotch depth	21	22	23
Arm length	**46**	**49**	**51**
Armhole	**46**	**51**	**56**
Biceps	28	33	38
Arm lift up	Max:45*	Max:45*	Max:45*
Upper body bend	Max: 45*	Max: 45*	Max: 45*

The anthropometric measurement for elderly is crucial since there is lack of standard measurement for elderly. This study emphasize that the new sizing chart is a guide for pattern construction of apparel design. Besides, it is also to enhance the correct apparel fitting for elderly with disabilities. However, there is some limitation, especially while conducting the measurement process, researcher need to consider disabled elderly difficulties based on time, pain point, willingness, feelings and etc. It is because the elderly has such a limited movement from their body. Future studies are recommended to validate the effectiveness of sizing chart on pattern making and more research can be conducted to assess the age-related changes in the elderly body posture also the anthropometric scale can be more effectively applicable and the standard sizing method can be adjusted for the elderly.

V. CONCLUSION

In conclusion, standard sizing for elderly women with physical disabilities is one of the most important design criteria in apparel development. In this paper, the result explained an information of disabled elderly women in detailed

[1]School of Graduate Studies, Faculty of Design and Architecture, Universiti Putra Malaysia(UPM), 43400 Serdang, Selangor, Malaysia.
[2]Research Fellow, Malaysian Research Institute of Ageing (MYAGEING), Universiti Putra Malaysia (UPM), 43400 Serdang, Selangor, Malaysia.
****Corresponding Author Email: nazlinashaari@upm.edu.my***

Received: 27 Mar 2020 | Revised: 20 Apr 2020 | Accepted: 05 May 2020

using size code. These anthropometric measurement study are formulated to provide quality of life for disabled elderly and to improve standard disabled apparel in care center. Lastly, this sizing chart can be used by designer, tailor and other researcher in creating disabled elderly product in a future.

ACKNOWLEDGEMENTS

This study is ostensibly supported by the Universiti Putra Malaysia under the (Initiative Putra Siswazah grant) IPS project no: 9549200 which are gratefully acknowledge and we would like to express our appreciation to all the authors and editor for informative contribution and helpful comments.

REFERENCES

[1] Alrabghi, L., Alnemari, R., Aloteebi, R., Alshammari, H., Ibrahim, M. Al, Alotayfi, M., Bugshan, T., Alfaifi, A., and Aljuwayd, H. Stroke types and management. International Journal of Community Medicine and Public Health 2018, 5(9), 3–7.
[2] Caldas, A., Carvalho, M., Lopes, H., & Souza, M. Ergonomic clothing design for care-dependent elderly women, 2005.
[3] Chi, L., & Kennon, R. Body scanning of dynamic posture. International Journal of Clothing Science and Technology, 2005.
[4] Chih, H. H. An empirical study of an internet marketing strategy for search engine optimization. Human Factors and Ergonomics in Manufacturing, 2006, 16(1), 61–81.
[5] Colombo, P. J., Crawley, M. E., East, B. S., & Hill, A. R. Aging and the brain. Encyclopedia of Human Behavior. 2012, pp. 53–59.
[6] Ellis, K. J. Human body composition: In vivo methods. Physiological Reviews, 2000, 80(2), 649–680.
[7] Erkan, I. A system proposal for rapid detecting of anthropometric data and affecting design strategies. Journal of Engineering Design and Technology, 2019.
[8] Esfandarani, M. S., & Shahrabi, J. Developing a new suit sizing system using data optimization techniques, 2012, 24(1), 27–35.
[9] Gupta, D. Design and engineering of functional clothing. Indian Journal of Fibre & Textile Research, 2011, 36, 327–335.
[10] Gupta, D., & gangadhar, B. A statistical model for developing body size charts for garments. International Journal of Clothing Science and Technology, 2015.
[11] Howlett, M. The criteria for effective policy design: Character and context in policy instrument choice. Journal of Asian Public Policy, 2018, 11(3), 245–266.
[12] Jenkins, H. Classification of low back pain. Australasian Chiropractic & Osteopathy: Journal of the Chiropractic & Osteopathic College of Australasia, 2002, 10(2), 91-7.
[13] Karim, H. A. The elderly in Malaysia: Demographic trends. Medical Journal of Malaysia, 1997, 52(3), 206–212.
[14] Kwok, Y. Anthropometric measurement of premature infants. International Journal of Clothing Science and Technology, 2007, 19(5), 319–333.
[15] Laitala, K., Boks, C., & Klepp, I. G. Making clothing last: A design approach for reducing the environmental impacts. International Journal of Design, 2015, 9(2), 93–107.
[16] Qiu, C., & Hu, Y. The research and development of the future fashion design. American International Journal of Contemporary Research, 2014, 4(12), 126–130.
[17] Takebira, U., Mohibullah, A., & Samana, S. M. Standardization of standard size chart (female size 6 to size 18) with secondary sizes. Journal of Fashion Technology & Textile Engineering, 2018.
[18] Winifred Aldrich. Metric pattern cutting for women's wear (fifth edit). Blackwell Publishing, 2008.
[19] Zhao, C., Wong, L., Zhu, Q., & Yang, H. Prevalence and correlates of chronic diseases in an elderly population: A community-based survey in Haikou. Plos One, 2018, 13(6), 1–11.

[1]School of Graduate Studies, Faculty of Design and Architecture, Universiti Putra Malaysia(UPM), 43400 Serdang, Selangor, Malaysia.
[2]Research Fellow, Malaysian Research Institute of Ageing (MYAGEING), Universiti Putra Malaysia (UPM), 43400 Serdang, Selangor, Malaysia.
**Corresponding Author Email: nazlinashaari@upm.edu.my*

Received: 27 Mar 2020 | Revised: 20 Apr 2020 | Accepted: 05 May 2020