DAILY LIFE, ANTHROPOMETRY AND BEDROOM DESIGN OF INDONESIAN ELDERLY

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Abstract: Indonesia elders have a choice to stay in residential or live in a nursing home. Effort should be invested to maintain the elderly well-being despite their lives choice. The purpose of this study is to observe Indonesian elderly who live in residential (either lives independently or with families) and nursing home. In addition, this study also describes the anthropometry of Indonesian elderly, in particular in relation to bedroom design for elderly. One hundred and three Indonesian elderly were involved in this study (mean age = 74.4 years, SD= 8.98 year, 82 female). A total of 15 anthropometry body dimensions are measured based on their relevance to the elder's bedroom design. Results show different activities among Indonesian elders based on their dependencies. The bedroom design for Indonesian elderly is proposed.

Keywords: anthropometry, bedroom design, daily life, elderly.

Introduction

Recently, the number of life expectancy in the world is increasing due to the improvement in nutrition, medical technologies, and economic well-being. By 2050, the number of elderly is expected to be reached 2.1 billion worldwide (United Nations, 2017). Therefore, in some countries, the care of older people is now a national priority. Problems arise with the increased number of elderly. Change in socio-economic status and various health problems affect an individual's way of life during old age. Ageing also influences the economic status due to a change from salary to pension or unemployment leading to economic dependency on children or relatives (Lena et al., 2009).

Concerning one aspect of the socio–economic status, that is the choice of way of living, research has been shown various results. In most countries, the increasing mobility of productive age workers causing elderly care in families to be more difficult (Arifin & Ananta, 2009). Also, the number of elderly patients living in a nursing home rose substantially in the late 1980s and the 1990s (Fahey et al., 2003). However, there is a trend that recently most elderly want to live independently in residential because they do not want any support from their children such as the elderly in Korea (Seo-Ryeung & You-Jin, 2004). Although, it should be noted that elderly lives in residential sometimes having economic, social or physical barriers that affect their overall independence, well-being, and quality of life (Berke, 2014). Some researchers are, therefore, focus on various aspects of elderly living in both residential and nursing home (e.g., Fahey et al., 2003).

In particular, for elderly living in residential, they also have more problems getting about in their own homes in many aspects (Chen, 2009). The problems can be seen, for example, from the pictures of home accidents among the elderly. For that reasons, several studies have highlighted human factor design to support elderly live independently such as house designs in South Korea (Seo-Ryeung & You-Jin, 2004) and Malaysia (Md. Dawal et al.,

2015), and bathroom and kitchen design in Brazil (Camara et al., 2010). Thus, the design of the house for the elderly is crucial.

In Indonesia, the percentage of the elderly reaches 9.60 percent or around 25.64 million people in 2019, and 9.38 percent of them live independently (Statistics Indonesia [BPS], 2019). One of the reasons Indonesian elderly are more likely to live independently because they do not always have others to help them (Octavia & Widjaja, 2013). However, many older people choose to stay in the nursing home because there are more facilities and support, such as health facilities and nutrition. In Indonesia, the nursing home operated by the government has the duty to provide guidance and service for neglected elderly in order to live well in the life of self, family, and community. The number of the nursing home, both owned by the government or non-government in Indonesia, is increasing in a significant way as well (Ministry of Social of Indonesia, 2010).

The high number of Indonesian elderly living in resident shows the need of housing facilities that should be designed in accordance with the needs of the elderly to improve their well-being. One of the things that are easily attributed to the design of supportive facilities is anthropometry. Studies of elderly anthropometry have been gaining attention and have been conducted in many countries, both for developed countries (e.g., The US (Pennathur & Dowling (2003), Australia (Kothiyal & Tettey (2000), and Italy (Perissinotto et al. (2002)) and developing countries (e.g., Malaysia (Md. Dawal et al., 2015), India (Reddy et al., 2004), and China (Hu et al., 2007)). However, in author knowledge, no study has been conducted in collecting Indonesian elderly anthropometric data for design purpose, as well as the design for the house of Indonesian elderly. An exception is a study conducted by Setiati et al. (2010) which observed limited anthropometry data of Indonesian elderly in relation to medicine and nutrition; and Hartono (2018) which examined different anthropometry for special population.

This study aimed to observe elderly living in communities and a nursing home in Indonesia as well as the pros and cons of each. The second aim of the

present study is to provide anthropometric data of the elderly based on a sample drawn from the Bandung area. The third aim is to propose bedroom design based on anthropometric consideration for Indonesian elderly.

Methodology

Participants

One hundred and three Indonesian elderly are involved in this study (mean age = 74.4 years, SD= 8.98 years, 82 female). They are between 50 to 94 years of age. Data are collected from 5 nursing homes in Bandung. Participants are chosen by convenience sampling method.

Daily Life observation

An interview is conducted to find out the differences in daily life between elderly live-in resident with elderly living in the nursing home. A total of 103 elderly live in the nursing home, and 41 elders live in their own houses are interviewed about their daily activity and living arrangements. The interviews are divided into two parts that are interview to find out the reasons about the elderly living status (i.e., live independently, live with family and live in the nursing home) and interview to find out the differences in the daily life of elderly live independently, live with family and live in the nursing home.

Anthropometric Measures

Anthropometry data are collected using manual anthropometer, which is calibrated before the measurement. These manual measurements are chosen, instead of the sophisticated one, due to practical reasons. A total of 15 anthropometry body dimensions are selected based on their relevance to the elderly' bedroom design. This dimension is selected based on the previous study done to design the bedroom of the elderly (Rahmawati and

Jiang, 2019), which are crucial in the design of an elderly bedroom. The dimensions are stature, standing eye height, standing shoulder height, standing elbow height, standing vertical grip reach, shoulder-grip length, sitting vertical grip reach, sitting eye height, sitting shoulder height, sitting elbow height, shoulder breadth, elbow span, sitting popliteal height, buttock-popliteal length, and hip breadth.

The anthropometry measurements are conducted by a team from Institute Technology Bandung involving senior researchers and 5 research assistants aged 20-22 years. A training session is conducted as a refresher to the assistants in relation to skill in anthropometry measurement, in addition to their several years of experience in our laboratory. The training session is also intended to minimize inter-observer error (Widyanti et al., 2017). The whole survey is completed in three months.

Bedroom Guidelines Design

The guidelines of the elderly' bedroom are developed from literature study, to support the elderly to live comfortably and safely (the process of development of bedroom guidelines for elderly can be seen in Rahmawati and Jiang, 2019). In short, the bedroom guidelines is proposed based on a rigorous and systematic literature study; such synchronization is conducted based on available international standards as well as on the related empirical studies in developing countries (e.g. Rashid, Hussain & Yusuf, 2008; Dvouletá & Káňová, 2014; Md. Dawal et al., 2015). While the results of anthropometric measurements were applied as a guideline to the bedroom design to adjust to the body dimensions of the Indonesian elderly.

Results

Daily Life of Indonesian elderly

Reason of daily lives choice, whether live in residential or nursing home among a sample of Indonesian elderly can be seen in Table 1. The main

reason of Indonesian elderly for staying in the nursing home is no support from the family. In Indonesia, elderly who live at home either live alone/independently or with families tend to do more in light housekeeping activities and less in exercise activity. In contrast, Indonesian elderly who live in nursing homes tend to do more in exercise activities (because they have a fixed schedule to do the exercises every morning with a coach or nurse) and less in social engagement such as social networks or social activities.

A study by Wreksoatmodjo (2013) among Indonesian elderly' activities is in line with this result. The similar fact also described by Tahrekhani et al., (2015) who reviewed that the most activities performed by older women in Iran were housekeeping, whereas the most activities performed by older men in Iran was in relation to gadget.

Table 1. Reasons of elderly' living status

	Independently	**With Family**	**Nursing Home**
Number or respondents	12	31	103
Age (mean, SD)	67.75 (7.91)	70.77 (8.66)	74.44 (8.98)
Reasons of Living Status (%)			
Do not want any support from family	33	-	27
Family live far apart	58	-	55
No family	8	-	18
Stay with family support	-	87	-
Stay with grandchildren who take care of them	-	13	-

However, another study conducted by Koolhaas et al. (2017) shows that the Netherlands elderly, both men and women spend their most time in sedentary behaviour such as TV viewing, driving automobiles, and reading. It seems that the way the elderly spends their daily times have been influenced by local habit and culture. Knowing the habit and daily activities of the elderly is important because such effort and intervention to reduce elderly' problems are mainly based on the elderly' activities (e.g., Wang et al. 2009). Such problems that are reported by elderly is for example described in the studies by Karakaya et al. (2009) and Scocco et al. (2009) who stated that elderly living in residential shows problems of low mobility, whereas elderly living in nursing home reveals stress and depressive symptoms due to low social engagement. The differences in the daily life of elderly live independently, live with family and live in a nursing home can be seen in Table 2.

Table 2. Differences of elderly' daily life

Activity	Independently (%)	With Family (%)	Nursing home (%)
Morning			
Excercise	8.3	3.2	65.0
Housekeeping	41.7	41.9	15.5
Shopping	16.7	16.1	-
Others	33.3	38.7	19.4
Afternoon			
Do activities of art or hobbies	8.3	12.9	47.6
Farming or gardening	41.7	38.7	36.9
Take a rest	25.0	38.7	-

Activity	Independently (%)	With Family (%)	Nursing home (%)
Others	25.0	9.7	15.5
Evening			
Do religion activities	25.0	25.8	35.0
Take a rest	75.0	74.2	65.0

Anthropometry of Indonesian elderly

Each individual anthropometry data is recapitulated in a piece of prepared paper. Summary of anthropometric data and descriptive statistic (mean and SD) based on gender are presented in Table 3. Rigorous literature study about anthropometry data of elderly in different countries and comparison with Indonesian elderly anthropometry data for the very basic anthropometry data that available in most literature (i.e. stature), can be seen in Table 4. The table shows the importance of anthropometry study of the elderly in many countries with different dimensions and different purposes.

Table 3. Anthropometry data of Indonesian elderly

Dimensions	Male (N = 21)				Female (N = 82)			
	Mean	**SD**	**5th**	**95th**	**Mean**	**SD**	**5th**	**95th**
1. Stature	156.08	7.30	144.07	168.08	144.87	8.36	131.11	158.62
2. Standing eye height	143.31	7.02	131.77	154.85	132.26	7.43	120.04	144.49
3. Standing shoulder height	129.38	4.84	121.42	137.35	119.25	7.00	107.74	130.76
4. Standing elbow height	98.46	4.65	90.82	106.11	90.38	7.54	77.98	102.77

Dimensions	Male (N = 21)				Female (N = 82)			
	Mean	SD	5th	95th	Mean	SD	5th	95th
5. Standing vertical grip reach	174.00	37.37	112.52	235.48	171.55	14.00	148.52	194.58
6. Shoulder-grip length	76.22	24.45	36.01	116.44	64.42	6.13	54.33	74.51
7. Sitting vertical grip reach	145.93	14.95	121.33	170.53	138.73	22.88	101.09	176.37
8. Sitting eye height	107.52	8.11	94.18	120.86	101.91	13.59	79.56	124.27
9. Sitting shoulder height	94.29	7.66	81.69	106.88	87.46	7.60	74.96	99.96
10. Sitting elbow height	65.76	8.07	52.48	79.04	61.74	6.20	51.55	71.94
11. Shoulder breadth	39.43	2.42	35.45	43.41	37.72	3.77	31.52	43.92
12. Elbow span	81.36	8.58	67.25	95.48	70.84	8.33	57.13	84.54
13. Sitting popliteal height	42.90	3.08	37.84	47.97	40.52	2.51	36.39	44.65
14. Buttock-popliteal length	42.33	4.73	34.56	50.11	40.10	3.50	34.34	45.86
15. Hip breadth	34.71	3.61	28.78	40.65	33.90	3.26	28.54	39.26

As expected, similar facts about significant differences in anthropometry data of different race or countries for children and adult (in which anthropometry data of Caucasian is bigger and taller than Asian in general), is also found in elderly anthropometry data. In general, Caucasian lived in developed countries have a high level of income per capita (International Monetary Fund, 2017). Higher income is associated with better nutrition and better medical and social service that leads to an increase in overall stature (Iseri & Arslan, 2009; Widyanti et al., 2017). However, it should be underlined that the anthropometry data from the different countries presented above are measured and published in the different decade. Since there is a possibility that anthropometry data from one country/area might differ due to the different time of measurement, such comparison is worth to conduct (Hughes et al., 2004).

Table 4. Comparison of elderly' anthropometry among different studies and different countries

Author (s)	Nation	Number of subjects		Age range of subjects		No. of anthropometry dimensions measured	Mean stature	
							Male	**Female**
Pennathur and Dowling (2003)	US	Male Female	40 106	All	60 - 85	15	1664	1526
Kothiyal and Tettey (2000)	Australia	Male Female	33 138	Male Female	65 – 92 65 - 92	22	1658	1521
Perissinotto et al. (2002)	Italy	All	5462	All	65 - 84	4	1717	1522
Santos et al. (2004)	Chile	Male Female	411 819	All	60 - 99	4	1646	1498
Coqueiro et al. (2009)	Cuba	Male Female	1197 708	All	60 +	7	1660	1528
Reddy et al. (2004)	India	Male Female	82 65	All	60 +	4	1657	1550
Hu et al. (2007)	China	Male Female	53 60	Male Female	65 – 85 65 - 80	47	1655	1525
Shahida et al. (2015)	Malaysia	Male Female	56 56	All	60 +	38	1611	1499
This paper	Indonesia	Male Female	21 82	All	50 – 94	15	1561	1449

Bedroom guidelines design

In relation to the proposed bedroom design guidelines for Indonesian elderly based on anthropometry approach, a small pilot study to observe ten existing condition of bedroom design in Indonesia has been conducted. Most of the composition of bedrooms in Indonesia has 6 unit areas such as entrance, bed area, storage units, work area, window area, and control units. Indeed, most of the bedroom specifications are not in accordance with Indonesian anthropometry as can be seen in Table 3. The final result of this study is the design of the guidelines for elderly Indonesian bedrooms which are presented in Table 5. The guidelines were developed by adjusting between 6 area units in the bedroom with the results of anthropometric measurements of the Indonesian elderly. The example of the design can be seen in Figure 1.

Table 5. Standard design for Indonesian elderly' bedroom

Items	Based references	The proposed standard	The related anthropometry data
Entrance	Seo-Ryeung & You-Jin, 2004; Ministry of Public Work of Indonesia, 2006; Rashid, Hussain & Yusuf, 2008	Entrance width should be 95.48cm	elbow span, male 95th
		Door style should be sliding or swing doors.	
		Threshold or sill are not recommended.	
		Door handle height should be no higher than 102.77cm	standing elbow height, female 95th
		Door handle style should be lever type or "D" shape (loop handle).	
Bed area	Ministry of Public Work of Indonesia, 2006 ; Dvouleta & Kanova, 2014	Bed height should be min 36.39cm	(standing elbow height, female 95th).

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Items	Based references	The proposed standard	The related anthropometry data
Bed area	Dvouleta & Kanova, 2014	Bed size should be 168.08cm in length and should be 134.5cm in width for double bed and 67.25cm for single bed	(stature, male 95th) (elbow span, male 5th).
Storage units	Ministry of Public Work of Indonesia, 2006; Rashid, Hussain & Yusuf, 2008	Wardrobe size should be 148.52cm in height It should be reachable from the wheelchairs.	(standing vertical grip reach, female 5th).
		Wardrobe depth should be 54.33cm	(shoulder-grip length, female 5th).
Work area	Md. Dawal et al., 2015	Chairs should be 36.39cm in height 34.34cm in depth and 39.26cm in width	(sitting popliteal height, female 5th), (buttock-popliteal length, female 5th) (hip breadth, female 95th).
		Chairs should have armrest and backrest feature to accommodate a rest. The backrest feature should be 99.96cm in height above the floors and 43.41cm in width While the armrest feature should be 51.55cm in height above the floors	(sitting shoulder height, female 95th) (shoulder breadth, male 95th). (sitting elbow height, female 5th).
Window area	Rashid, Hussain & Yusuf, 2008	Window height should be max 154.85cm and min 79.56cm	(standing eye height, male 95th) (sitting eye height, female 5th).

Items	Based references	The proposed standard	The related anthropometry data
	Rashid, Hussain & Yusuf, 2008	Window handle height max 107.74cm	(standing shoulder height, female 5th).
Control units	Ministry of Public Work of Indonesia, 2006	Switch or socket height should be max 107.74cm	(standing shoulder height, female 5th).

Figure 1. Example design for Indonesian elderly' bedroom
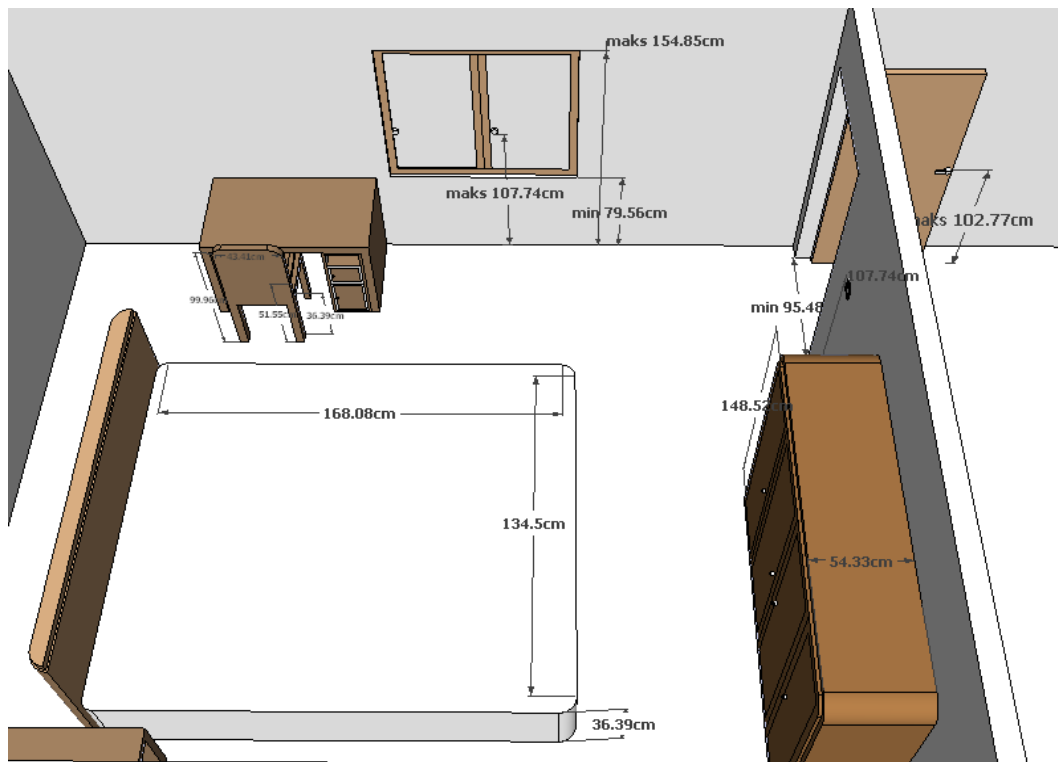
Conclusion

This study gives contribution in giving pictures of elderly Indonesian lives. The information will be valuable for all shareholder such as Indonesian government or other institutions in order to gain Indonesian elderly independently and to increase Indonesian elderly' well-being, for example through the search of options to overcome the existing problems (e.g., the

stress in the nursing home). The anthropometry data of Indonesian elderly is very crucial as a first step in providing a design that compatible with the need of Indonesian elderly. Last, the proposed bedroom design for Indonesian elderly can be seen as a pilot project to standardize other room and facilities for Indonesian elderly. The expected result of the proposed design for the elderly in relation to increasing of elderly' well-being can be applied in other areas in particular in other developing countries.

This study has several limitations. First, the anthropometry dimensions are limited only to 15 dimensions. Although an adequate description of the human body may require over 300 dimensions), the scope of this study was limited to measurement of body dimensions that were considered important for facility design for the elderly, in particular, bedroom design. Second, the number of respondents is limited due to the constraint of the permit in the nursing home. It is encouraged to continue the research about daily activities that support elderly live independently to get a better picture of daily lives of Indonesian elderly, in particular, the study that considers balance number between male and female elderly, as well different age of range of elderly.

Ageing has been recognized as a global issue of increasing importance and has many implications for health care and other areas of policy. Although, it should be highlighted that the issues relatively under-researched, in particular in developing countries. Besides, there is an urgent need for specific policy initiatives at the international level (Lloyd-Sherlock, 2000). Therefore, further research in the elderly must be conducted further particularly considering that generalization cannot be applied since there are different experiences and environment among the elderly in different countries or different area.

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