

An Analysis of Bathroom and Toilet Interior Design According to the Capacity of the Elderly

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Abstract

According to the World Health Organization (WHO), it is categorized as elderly if a person is 65 years old. At that age, the physical and psychological abilities of the elderly are decreasing. Since 2004, the President of Indonesia through Presidential Decree No. 2 of 2004, the government has aimed to improve social welfare by improving nursing home facilities, one of which is bathroom and toilet facilities. Given the accidents that most often occur to the elderly in the bathroom and toilet. This effort really needs to be done because the elderly's movement ability has decreased a lot due to a decrease in sensory and motor capacity. In addition, the nervous system of the elderly will experience changes marked by the death of cells in the brain continuously, this results in reduced blood supply to the brain. Such conditions cause a decrease in processing capacity will result in slow body reactions and decreased sensitivity of the five senses. Given this trend, there are more and more studies related to the bathroom for the elderly. The results of research from researchers that have been published in journals related to bathrooms and toilets for the elderly, no one has yet complexly analyzed the interior design of bathrooms and toilets for the elderly that are comfortable and safe. For this reason, before redesigning, it is necessary to analyze the interior design that is safe and comfortable according to the capacity of the elderly as users.

Keywords: *Interior Design; Bathroom and Toilet; Elderly; Safe; Comfortable; Elderly Capacity;*

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Introduction

Aging is a physiological process that all humans will experience. With increasing age, human physical and psychological abilities decrease. What is categorized as an elderly person is someone who is 65 years old (WHO).

The proportion of the elderly population from 2010 was around 24 million and in 2020 it is expected to increase to around 30-40 million people (N. K. Andini et al., 2013). By looking at this trend, since 2004, the President through Presidential Decree No. 52 of 2004, which contains the National Commission for the Elderly. To implement the Presidential Decree, the Indonesian government, in assisting the president, feels the need to improve social welfare by improving the facilities for the elderly in each nursing home, one of which is bathroom and toilet facilities.

Bathroom and toilet facilities should receive special attention because elderly accidents are most prone to occur in bathrooms and toilets (Habib, 2017). According to the State (2021), most accidents occur in the elderly, namely in the bathroom.

Seeing so many percentages of accidents that occur especially to elderly women in bathrooms and toilets, it is necessary to think about ergonomic bathroom concepts and designs according to the elderly as users. This effort really needs to be done because considering the elderly's movement abilities have decreased a lot due to a decrease in sensory and motor capacities, Lestari (2020). Considering the very importance of providing bathroom and toilet facilities for the safety of the elderly, many researchers have researched those related to the elderly bathroom. From the research that has been done by several researchers who have journaled, then to find out the suitability and shortcomings of their research results, it is necessary to have a review of journals related to bathrooms and toilets for the elderly.

This review was conducted because there are still limited studies comparing and evaluating specifically regarding ergonomic bathrooms and toilets for the elderly so that they are able to answer all problems and are in accordance with the demands of the elderly's activities. In addition, to find out whether the research results of previous researchers have produced bathroom and toilet interior designs with a total ergonomics approach so that they are able to answer all the demands of the elderly as users.

Result and Discussion

A. Elderly (elderly)

Elderly is a phase of life when a person has reached maturity in terms of function and has experienced a decline both physically and psychologically. The World Health Organization (WHO) stipulates that the age of 65 years has shown real signs of aging and at that time a person can be said to be elderly. The aging process results in many changes in body structure and psychological function, this is due to decreased muscle strength, decreased balance, decreased endurance, and decreased aerobic ability. The decline in the function of the five senses also results in decreased reflexes in the elderly. As a result of these declines, the elderly has a very high risk of falling accidents (Suhardi et al., 2013, 2014).

Habib (2017) in research at PW Hargo Dedali Surabaya showed that of 26 respondents 14 respondents (54%) had an accident falling in the bathroom an average of 3 falls in 3 months. This is due to the lack of ergonomic thinking in designing the interior of the nursing home bathroom.

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Based on the decline in the ability of various organs, functions, and body systems that experience decline at the same time, based on their activeness, the elderly can be divided into three groups:

1) Go Go's or Young Old

This group is 55-70 years old, at this age the elderly can still move actively without of others.

2) Slow Go's or old

This group is 70-80 years old, at this age, the elderly has started to need the help of others in carrying out certain activities and usually at this age the elderly spend time on socializing activities.

3) No Go's or Old-Old

This group of elderly aged 80 years and over, at this age the elderly almost all activities of the elderly are assisted and based on the initiative of others. At this age, the activity level of the elderly is considered passive.

B. Decrease in Physical Conditions

A person's optimal physical ability is achieved at the age of 25-30 years. A person's physical ability will decrease every 1 year 1% after the peak condition is passed. The aging process of a person is characterized by a declining body condition. Body balance decreases and is marked by decreased reaction time (Katuuk & Wowor, 2018). According to Kaunang et al (2019), at the age of 60 years, a person's physical condition will decrease by 25% marked by a decrease in muscle strength, while motor and sensory abilities decrease by around 60%.

C. Decreased nervous system in the elderly

The nervous system of the elderly will experience changes marked by the death of cells in the brain continuously starting from the age of 50 years, this results in reduced blood supply to the brain. Besides, the reduced speed of nerve conduction, this is due to a decrease in the ability of the nerves to convey impulses to and from the brain (Made, 2021) According to Rabbitt (1994) decreased processing capacity will result in slow body reactions. Another effect that is important to note is a decrease in the sensitivity of the five senses, such as:

1. Lowering the balance of the body, so it is strived to reduce the blind-step and stairs.
2. The sensitivity of the senses to the skin decreases, so efforts are made to choose room equipment that is safe for the elderly, such as a water heater with a thermostat.
3. The occurrence of partial blindness, weakening of the speed of focus, and the blurring of the lens which is indicated by the eye lens getting yellow. This makes it difficult to distinguish the colors green, blue, and violet. This situation causes the movement of the elderly in the bathroom to be slower and limited. For that, we need tools that function to make it easier to move such as handgrips or hand grips (Nasrulloh & Wicaksono, 2020). Given this, in general, it is very necessary to pay attention to the selection of materials that are harmful to the elderly. Such as the possibility of slipping due to using slippery materials, and sharp corners that can cause injury. Meanwhile, sensory function in the elderly also experienced a consistent decline in the ability to see objects at low light levels and decreased sensitivity to color. The elderly generally suffers from presbyopia or cannot see far distances clearly, this is due to reduced elasticity of the eye lens. In addition, the elderly experience changes in the structure of the dry and thickened

skin so that the sensitivity of the skin in touch is reduced and is at risk of excessive thermal.

D. Bone fragility

Bone fragility or osteoporosis is a disease of metabolic disorders where the body is unable to optimally absorb calcium and vitamins for normal bone processes. In this situation there is a reduction in bone mass which results in lighter and more brittle bones (Rahfiludin & Pradigdo, 2017). For this reason, in designing bathrooms and toilets for the elderly, sharp corners must be avoided, the floor level is minimized and the selection of slippery materials is avoided to minimize the possibility of accidents that cause fractures.

E. Decreased Body Strength of the Elderly

The decrease in body strength of the elderly usually occurs in the hands by 16-40%, this depends on the level of a person's physical fitness. The decrease in handgrip strength according to 50% and arm strength decreased by 50% (Nasrulloh & Wicaksono, 2020). Bryantara (2016) said that the reduced strength and flexibility of motion in the elderly body was caused by reduced function of the locomotor organs, sensory organ stimulus, motor neurons, physical fitness level (VO₂max), and decreased muscle contraction. The strength of the thigh muscles will weaken faster than the muscles in the hands. Arm muscles are used more intensively than leg muscles in the elderly. For this reason, it is necessary to install railings in the bathroom and toilet to help optimize the use of the elderly arm muscles so that they can move independently. According to Zein (2015), the decrease in body strength in the elderly is caused by a decrease in a motor function where there is a decrease in muscle strength. Decreased muscle strength results in difficulty moving from a sitting to a standing position and vice versa, from standing to squatting and vice versa, and so on. Besides that, there is also a decrease in sensory or sensorimotor function, namely a decrease in balance, coordination, and ability to carry out daily activities.

F. Social Functioning of the Elderly Social

Functioning is a person's ability to carry out their responsibilities according to their status to be able to make a positive contribution to themselves, their families, organizations or society. Social functioning in the elderly can be measured from functional ability, instrument function, and executive function. Functional ability is the ability of the elderly related to personal care such as eating, drinking and bathing, dressing, defecating, and urinating. While instrumental functions such as using the phone, shopping, cooking, doing homework, driving, traveling using public transportation, and being able to manage finances. Executive functions such as the ability to analyze, the ability to make decisions, and the ability to plan. The elderly's ability to perform self-care (functional ability) and instrument functions can be categorized as independent level, requiring assistance, dependence, or not being able to do it at all. The functions of the elderly can be optimized based on the remaining functions and energy so that they cannot be compared with those of productive age and teenagers (Wibowo, n.d.).

G. Elderly Activities in Bathrooms and Toilets

Activities carried out by the elderly in the bathroom include first walking to the bathroom, then entering the bathroom by opening the bathroom door, after that placing the toiletries which are usually placed above the bath, the elderly putting towels on the towel

hanger, the elderly doing bathing activities After taking a shower, take a towel on the towel hanger to dry off, after that take the clothes on the hanger and put on clothes, then pack the toiletries and dirty clothes to the bathroom door to get out. Elderly activities in the toilet include the elderly opening the toilet door then entering the toilet to the toilet to defecate or urinating in the toilet then taking water to wash, after that standing up and flushing the dirt on the closet and then opening the toilet door to leave the toilet room (Suhardi et al., 2014).

H. Complaints of the Elderly in Using the Bathroom

Complaints of the elderly in using the bathroom and toilet include having difficulty holding the bathroom door handle when entering the bathroom. In addition, the elderly cannot stand for long while doing bathing activities, have difficulty taking water from the bath. Having difficulty using the squat toilet, having difficulty rinsing (washing) after defecating because all this time he was still using a scoop. In terms of lighting, the bathroom seems dark so it's a bit difficult to do activities optimally. Another complaint is the difficulty of placing toiletries because special facilities are not provided for placing toiletries (Suhardi et al., 2014).

I. Design Approach and Concept for Elderly Bathrooms and Toilets

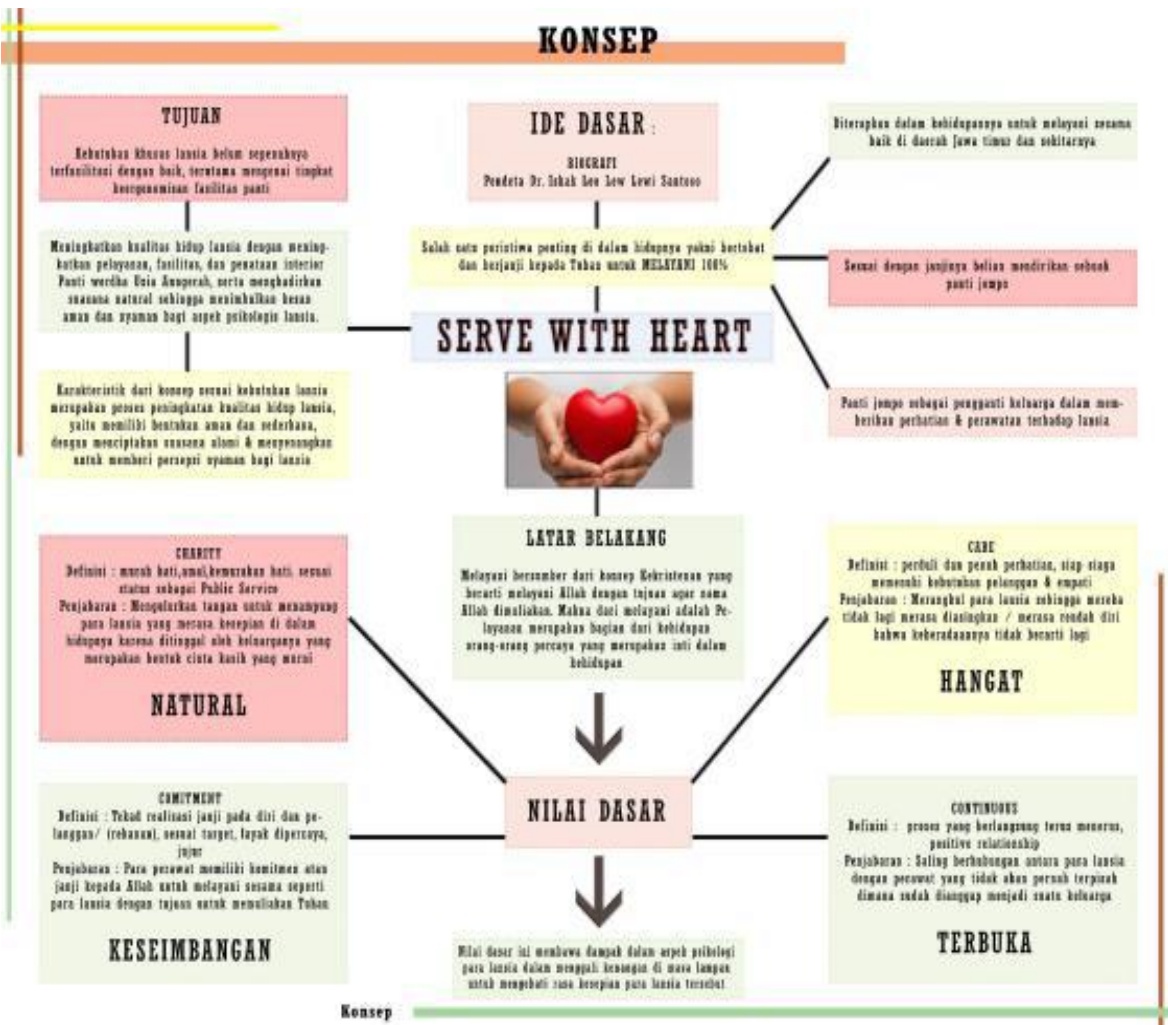
The design approach is in accordance with the design problem, namely how to accommodate the elderly in the bathroom and toilet space in a safe, comfortable and pleasant manner. For this reason, the design approach used is a behavioral approach (Sugianto, 2016). The design and layout of bathrooms and toilets for the elderly is based on the organization of space (space relations). While the organization of space is determined by the sequence of activities carried out by the elderly in nursing homes. One of them is the layout of the bathroom and toilet should be placed close together in the elderly bedroom to make it easier for the elderly to reach the bathroom quickly (N. A. Wijaya et al., 2018). Meanwhile, public bathrooms and toilets are placed between other rooms which aim to make them easier to reach (Fitriani & Hidayat, 2018). In addition, the interior design of the bathroom should consider various aspects such as the selection of materials and the form of facilities that need to be considered (Akçay et al., 2021). Setiadi (2018), said that a house inhabited by the elderly needs an adjustment or redesign of the interior design of the bathroom and toilet, this is because the motor sensor capacity of the elderly has decreased. Considering that the bathroom and toilet are the most dangerous areas, special attention needs to be given to the touch of an ergonomic design.

The application of the criteria for the therapeutic physical environment in the design of spaces for the elderly includes ceiling heights of 2.6 – 2.8 meters to give a familiar impression, furniture like in ordinary households so that it can give the impression of being at home. Besides that, color elements are also chosen with warm shades and the use of materials using natural combinations with natural elements (Gunawan, 2017). According to Sugiharto (2017), a safe environment for the elderly in an environment that provides support in the form of safety for the elderly, one of which is by providing ramps and handrails. Ramps and handrails are used to support the elderly who have a lack of balance.

The concept of "Serve with Heart" has basic values that can have an impact on the psychological aspects of the elderly in exploring memories of the past. The concept of "Serve with Heart" can treat the loneliness of the elderly. These basic values include (N. A. Wijaya et al., 2018):

1. Charity has the understanding of reaching out to accommodate the elderly who feel lonely in life because they have been left by their families, which is a form of pure love that creates a natural attitude.
2. Commitment means the promise of nursing home nurses to serve the elderly.
3. How to have an understanding Caring is attentive and has empathy in serving the elderly so that the elderly does not feel isolated.
4. Continuous means that there is a continuous relationship between nurses and the elderly (positive relationship) so that they are considered as one family.

The basic values in the concept can make interior design more meaningful so as to make the design more sustainable and harmonious. The description of the concept is the chart below:



J. Elderly Accessibility Element

Accessibility is a condition to facilitate movement activities from one place to another safely, comfortably, and at a reasonable speed. Residential spaces for the elderly must fulfill the function of rationality, security, practicality, health and comfort, and flexibility of design principles to improve the quality of life of the elderly and prolong the lives of the elderly as users (Fitriani & Hidayat, 2018). The principle of accessibility in Indonesia according to the regulation of the Minister of Public Works N0.30/PRT/M/2006 is as follows:

1. Safety, namely every building that is public must pay attention to safety for everyone.

2. Convenience, that is, everyone can reach all rooms easily.
3. Usefulness, that is, everyone must be able to use every room in a public building.
4. Independence, that is, everyone must be able to use every room in a public building without the need for help from others.

The essence of this accessibility requirement is as an effort to accommodate all the demands of activities to utilize and access the facilities of spaces in buildings of a general nature. While the form of implementation refers to the anthropometry of the human body such as the facilities needed to support activities, the amount of circulation that is intended for the elderly.

K. Selection of Accessibility Elements for Bathrooms and Toilets

Based on the regulation of the Minister of Public Works N0.30/PRT/M/2006 regarding facility requirements including accessibility elements in buildings, Fitriani (2018):

1. The basic size of the room (width, length, and height) refers to the function of the room as a place for the elderly to clean themselves.
2. Guide Path that guides the elderly to walk by utilizing the texture of the floor.
3. The door is part of the complementary elements forming the space consisting of the door leaf, hinges, and door handles.
4. Toilet is a sanitation facility that is accessible to everyone (elderly, disabled, pregnant women) which is one of the facilities in public buildings.
5. The arrangement of furniture in the layout must provide sufficient space for movement and circulation for the elderly who use canes.

L. Elderly Anthropometry

Anthropometry has an understanding of the study of the average dimensions of the human body to facilitate human movements in carrying out activities (M. A. Wijaya et al., 2016). The body dimensions of the elderly, both men and women, experienced a decrease in height by 5%. This shrinkage is caused by bending of the spine, changes in cartilage, joints into mature bones, and changes in the structure of the skeleton that make up the body, this is a result of the aging process (E. N. Andini et al., 2020). Anthropometric reviews in the elderly are not only limited to static measurements and anatomical changes due to the aging process, but dynamic anthropometric measurements are important. This is because the reduced movement of the elderly will greatly affect the design of the facilities that will be used by the elderly.

M. Lighting System in Bathrooms and Toilets for the Elderly

A good lighting system is absolutely necessary for bathrooms and toilets to create an environment that allows the community to see clearly so that visual activities can be carried out easily and precisely, allowing residents to walk and move easily and safely, does not cause an excessive increase in air temperature in the room, provides lighting with an intensity that remains evenly spread, including not dazzling, and does not cause shadows. A good lighting system used in bathrooms and toilets for the elderly is to use natural lighting and artificial lighting. Natural lighting is used in the morning until noon because natural lighting is very good for health. Sunlight can increase vitamin D in the body and stimulate the hormone serotonin to overcome depression and improve blood circulation.

According to Novianti and Pertiwi (2018), adequate natural lighting in bathrooms and toilets can reduce the risk of mold growth. It needs to be designed by placing ventilation and

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window openings according to their places and the number and size of openings adjusted to the size of the available bathroom and toilet space. At night, adequate artificial lighting is used (Darmayanti and Rucitra, 2016). We recommend that you choose an ambient light lighting system, this system produces lighting with an even light (diffuse). In addition, the interior of the bathroom and toilet for the elderly in addition to using the ambient light system should also use the Mood Light system. The Mood Light system is a lighting system that displays a certain atmosphere in a room. For example, yellow gives the impression of being warm and intimate. While the type of lamp armature selected should choose semi-indirect armature, more than 60% of the lamplight is directed upwards, while at the same time directing 40% of the light downward. In this system, there is practically no shadow problem and glare can be minimized (Mirzah et al., 2017). While the type of lamp that is suitable to be applied to bathrooms and toilets for the elderly is the type of LED lamp.



Light distribution techniques

Source: Philips Methods of light disbursement, 2017

N. Air Conditioning Systems in Bathrooms and Toilets for the Elderly

Air conditioning is very crucial in bathrooms and toilets. Moreover, in Indonesia, most bathrooms and toilets are only not too wide and closed. Regulating ventilation in bathrooms and toilets can be done with the following system (Daryanto, 2013):

1. Ventilation in the form of small windows or small gaps that allow dirty air in the bathroom and toilet to come out and exchange with outside air, this system is suitable for bathrooms that are not too large.
2. Exhaust fans are used in closed bathrooms and toilets that do not have ventilation access. Exhaust fan functions to suck dirty air in the bathroom and toilet to be thrown out.
3. AC is an air conditioning system that is used in bathrooms and toilets that are large and do not have access to ventilation.

O. Characteristics of materials that are suitable for use in bathrooms and toilets for the elderly

Material selection must consider the needs of the elderly for thermal sensitivity, safe to prevent accidents. In addition, the selected material must have a strong structure, not sharp, has a low heat absorption capacity to the body, does not reflect light, and is not slippery. Especially for bathroom floors, materials that have a rough texture and do not reflect light are selected. Bathtubs made of fiberglass have a lower heat permeation value compared to bathtubs made of ceramic materials. In the bathroom, it is necessary to limit the plastic curtain as a barrier with other spaces to avoid splashing water during bathing. For wall finishing materials, doff paint is chosen to reduce excessive light reflection. As for the

furniture materials in the bathrooms and toilets, materials and finishes are selected that are resistant to water and humid air (Zein, 2015).

P. Appropriate colors are applied to the interior of the bathroom and toilet for the elderly

The application of color really supports the impression of comfortable space. The application of colors that are suitable for the interior of the elderly room is contrasting colors such as red, yellow, orange, brown, and others. Besides that, as much as possible avoid cold colors blue and green because, after humans reach old age, they will experience a decrease in eye acuity in recognizing these colors (Zein, 2015). The application of appropriate colors in the interior design of nursing homes that can give the impression of a strong healing environment is the application of contrasting colors. Because contrasting colors according to Wijaya et al (2018) can give a strong and independent impression to the elderly as space users, besides that the elderly can distinguish between functions and types of space. Meanwhile, excessive use of neutral or pastel colors makes it difficult for the elderly to distinguish colors. If there are many openings in the room so that maximum sunlight enters the room, it is best to avoid using excessive cream because the cream is a color that can reflect light. The reflection of the light causes the eyes of the elderly to be dazzled.

Conclusion

To provide a sense of comfort and safety in the design of bathrooms and toilets for the elderly, it is better in the process of design all elements in the interior design of bathrooms and toilets that are related to the comfort and safety of the elderly in carrying out activities. Do activities in the bathroom and toilet space.

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