Kano Method: Development of Multi-Function Walker Product Attributes

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Abstract
Sensory and motor disorders experienced by a person can reduce the ability to walk. The triggers for these disorders vary, including age factors. Older adults who are at high risk have limitations in their daily activities. Therefore, they must improve their walking ability using rehabilitation aids (walkers). This study aims to design a multi-function walker that can work optimally in older people. The urgency of this study is that the types of walkers on the market are still limited, so they need to be developed into a multifunctional design. The method used in this study is the Kano method. The expected research results are the development of a design for one type of walker with multiple functions, namely functioning as a walking aid (walker) and functioning as a wheelchair, with a comfortable level of seating and can adjust its height.

***Keywords*:** *Sensory Disorders, Motor Disorders, Walking Ability, Walker, Elderly, Kano Method.*

Abstrak
Gangguan sensorik dan motorik yang dialami seseorang dapat menurunkan kemampuan berjalan. Pemicu terjadinya gangguan tersebut bermacam-macam, diantaranya adalah faktor usia. Lansia yang berisiko tinggi memiliki keterbatasan dalam melakukan aktivitas sehari-hari. Oleh karena itu, perlu dilakukan peningkatan kemampuan berjalan dengan menggunakan alat bantu rehabilitasi (walker). Penelitian ini bertujuan untuk merancang alat bantu jalan multifungsi yang dapat bekerja optimal pada lansia. Urgensi penelitian ini adalah jenis walker yang beredar di pasaran masih terbatas sehingga perlu dikembangkan menjadi desain walker multifungsi. Metode yang digunakan dalam penelitian ini adalah metode Kano. Hasil penelitian adalah mengembangkan desain satu jenis walker dengan multi fungsi yaitu berfungsi sebagai alat bantu jalan (walker) dan

berfungsi sebagai kursi roda, dengan tingkat kenyamanan pada dudukannya serta dapat diatur ketinggiannya.

Keywords**:** *Gangguan Sensorik, Gangguan Motorik, Kemampuan Berjalan, Walker, Lansia, Metode Kano.*

1. Introduction

A person's physical condition will certainly decrease with age; this is the cause of reduced body function. (Ariana Mustikasari et al., 2019). Decreased body function will occur naturally, called natural aging. (Modok & Wati, 2019). According to Law Number 13 of 1998, the definition of elderly, or, in other words, elderly, is a person who has reached the age of more than 60 years, where at that age there is a high health risk. In addition, elderly age is usually marked by increasingly weak physical conditions and decreased function of the five senses, thus disrupting motoric conditions and causing increasingly limited mobility. (Hakim, 2020). However, by nature, they still want to do daily activities. Therefore, due to the decreased ability to walk in the elderly, rehabilitation is needed using a walking aid (walker).

Walker is a walking aid made of metal with two handles that function as handrails and consists of four legs as handles. (Idiar & Muhammad Yunus, 2021). Generally, there are three types of walkers on the market: standard walkers, front-wheeled walkers, and four-wheeled walkers. The standard and front-wheel walkers have two of the same functions: a height adjustment system with pins that can be adjusted at a certain distance. These two types of walkers can also be folded when not in use by the walker user, making it easier to store the tool.

However, product design and development activities must be carried out, especially those related to functional aspects (Ibrahim et al., 2020). Product development should consider work principles, the added value of tools or innovation, ergonomics, and consumer comfort (Dharma et al., 2018). However, some products still need to pay attention to ergonomics and practicality. (Mujibulloh & Jakaria, 2022) .

Referring to the research conducted by (Jakaria et al., 2023), who designed walker attributes for the elderly using the Quality Function Deployment (QFD) method by testing 16 attributes, the design results met the dominant attributes. Which include features such as a seat; the product has a simple, comfortable, and foldable shape; The product is comfy to sit and lean on; speed in customer service for repairs; the resulting product is a high-quality product; the resulting product has a positive impression in terms of design and attached accessories, The product has a technical life of approximately ten years. Then Idiar and Muhammad Yunus (2021) In their research, conducted the Development of a Flexible Walker Design for the Elderly with the front support functioning as a fixed foot or wheeled foot, the walker holder arm can be adjusted up and down by 150 mm, a foldable seat, and the walker can be folded. Then, Dwi Djumhariyanto's research developed a walking aid (walker) using the Quality Function Deployment (QFD) method, with the materials used being made of aluminum, the footrests on the frame and handles being made of rubber and plastic, the walker weighing 3 kg, there being a mechanism for adjusting the height of the footrest and the number of folds, there

being a rectangular place to carry items placed at the front. There is a removable seat.(Djumhariyanto, 2016).

The problem-solving approach in this study is to identify walker attributes for the elderly by considering the types of walkers available on the market based on the research results. So that it produces a multi-function walker design that can meet the needs of the elderly using the Kano method. The Kano Model is one of the methods used to identify and categorize attributes in a product or service to satisfy customers. (Martí Bigorra et al., 2019), Explaining that the steps in implementing the Kano model are as follows: (1) identifying customer demand; (2) creating and distributing the Kano model questionnaire; (3) evaluating the results of the questionnaire using the Kano evaluation table; and (4) analyzing the results of the Kano model distribution process. The results of the Kano evaluation are in the form of attributes that have been divided based on categories for designing walker products to meet the needs of the elderly.(Hartono, 2023; Liao et al., 2015; Wulansari & Jakaria, 2022).

Based on this, it is known that the types of walkers available on the market and with the results of the research above, in general, there are dual functions in one walker construction, both as standard walkers and front-wheeled walkers with flexible height adjustment mechanisms and have a foldable seat system. This still has limitations in function, so it is necessary to develop a design for one type of walker with multiple functions, namely functioning as a walking aid (walker) and functioning as a wheelchair, with a level of comfort on the seat and can adjust its height. This study will examine how important the functional, ergonomic, added value, innovation, and consumer comfort aspects are in developing the design attributes of multi-function walker products.

2. Method

2.1 Research Object

The object of this research is *the walker* used by older adults at high risk and with limitations in their daily activities.

2.2 Research Subject

The subjects used in this study were older adults undergoing post-hospital or independent rehabilitation. Respondents consisted of men and women with the specified criteria. The population was 100 people with a 90% confidence level, using the Slovin formula. (Imran, 2017) , so that to determine the number of samples taken is as follows:

$$n = \frac{N}{1+Ne^2} \quad (1)$$

note:
n = Number of Samples
N = Population Size
e = maximum tolerable error limit in the sample, aka significance level

2.3 Types of Research Data

In this study, the data is divided into two types, namely (1) primary data, which is data obtained based on the results of distributing questionnaires to 50 respondents with the criteria

that the respondents are older adults with certain conditions, and (2) secondary data, which is data obtained from scientific article sources related to the design of walker products for elderly users in conditions of care at health clinics or independently.

2.4 Research Procedures

a. Research Preparation Stage

In this stage, research preparation is carried out as follows: (1) Searching for information related to the weaknesses and strengths of walker products on the market that elderly users and research results use, and (2) Compiling a questionnaire that will be distributed to respondents related to the use of walkers for the elderly.

b. Needs Identification Stage with Customer Windows

User needs were identified by distributing questionnaires to 30 respondents regarding walker products for elderly users. Based on the results of the questionnaire, the following consumer needs data were obtained: (1) the need for a walker that is desired and has been fulfilled; (2) the need for a walker that is obtained but not desired; and (3) the need for a walker that is desired and has not been fulfilled.

c. Design Planning Stage

At this stage, the walker design is made based on the needs of the elderly using the Kano method approach. The Kano Model is one of the methods used to identify and categorize attributes in a product or service to satisfy customers (Chen, 2019; Yusuffa & Jakaria, 2023). According to Sari & Purnomo (2017), explaining that the steps in implementing the Kano model are as follows: (1) Identifying customer demand; (2) Creating and distributing the Kano model questionnaire; (3) Evaluating the results of the questionnaire using the Kano evaluation table; and (4) Analyzing The results of the Kano model distribution process. The results of the Kano evaluation are divided into attributes based on the category of fulfilling consumer satisfaction. Therefore, the design of improvements to multi-function walker products is based on the categories needed to satisfy and meet consumer needs.

3. Result and Discussion

3.1 Validity and Reliability Test Results

Validity and reliability tests are conducted to ensure that each question in the Kano model questionnaire is valid and can be trusted or relied upon. Hartanto (2017) Explains that validity tests are used to determine whether the research instrument used in data collection is valid according to the object of study being measured. The reliability test determines whether a research instrument can be trusted or relied upon. Validity and reliability tests in this study were conducted by testing positive/functional questions and negative/dysfunctional questions, each of which had four questions tested on 30 respondents with a significance level of 5%. The results show that all questions asked as a tool for collecting data are valid, and the calculated R-value for positive/functional questions and negative/dysfunctional questions is greater than the R table value (0.279). In addition, the reliability test shows that positive/functional and negative/dysfunctional questions are reliable; Cronbach's alpha value indicates this> R table value with a significance of 5% (0.279).

3.2 Data Processing with the Kano Model

Kano Model is arranged in the form of a questionnaire that is made contradictory so that it can find consumer opinions related to the features created (positive/functional) and consumer opinions if the feature is not created (negative/dysfunctional). The responses to each question are assessed with the following categories: (1) Value 1 for the answer like; (2) Value 2 for the answer should be like that; (3) Value 3 for the neutral answer; (4) Value 4 for the answer do not like, but can still tolerate; and (5) Value 5 for the answer do not like. Kano model attributes are obtained based on customers' voices using a questionnaire distributed to 30 respondents. Based on the questionnaire, the results obtained for the development of dining table products obtained four attributes as follows (Figure 1 and Table 3). Figure 1 explains the results of identification using customer windows, resulting in the data described in Table 1.

Figure 1. Identification of Multi-Function Walkers

Table 1. Identification of attributes based on customer windows

No	Product Development Attributes	Development Aspects	Information
1	Footrest and elbow rest	Functional aspects	Functions to place feet when the user feels tired or changes location make it easier for others to assist.
2	Backrest	Ergonomic Aspects	Added backrest feature, which functions to increase user comfort and safety.
3	Holding hands	Practicality aspect	Added hand grip feature to make it easier for users to use
4	Peer hook and wheel	Comfort aspect	It provides user comfort because it can create flexibility and makes movement easier because it has wheels that can rotate 180.'

In Table 3, the results of the questionnaire data collection will be evaluated using the Kano evaluation table. The table groups each consumer's answer by considering each response to positive/functional and negative/dysfunctional questions. The Kano evaluation table is shown in Figure 1. (Nurjannah & Purnomo, 2018).

Table 2. The Kano Evaluation

	Customer Required	**DYSFUNCTIONAL**				
		Really like	**Like**	**Neutral**	**Do not like**	**Very Dislike**
FUNCTIONAL	Really like	Q	A	A	A	O
	Like	R	I	I	I	M
	Neutral	R	I	I	I	M
	Do not like	R	I	I	I	M
	Very Dislike	R	R	R	R	Q

Information:
M = Must Be
O = One Dimensional
A = Attractive
I = Indifferent
R = Reverse
Q = Questionable

The results of the Kano evaluation table are then calculated for the satisfaction index (SI) and dissatisfaction index (DI) to determine the level of importance of each feature or attribute submitted to consumers. Satisfaction index/Customer Satisfaction (SI/CS) and dissatisfaction index/Customer Dissatisfaction (DI/DS) can be obtained using the following formula.(Maatita & Lawalata, 2017):

1. Satisfaction Level

$$CS = \frac{A+O}{A+O+M+I} \quad (2)$$

2. Dissatisfaction Level

$$CS = \frac{M+O}{(A+O+M+I)x(-1)} \quad (3)$$

Each attribute is made into a Kano model questionnaire consisting of positive/functional and negative/dysfunctional questions. The Kano model evaluation table will evaluate all consumer responses related to the attributes offered (figure 2). Kano model attributes are categorized based on the following formula (Maatita & Lawalata, 2017; Tseng, 2020) :

1. If the total value (A+M+O) is > than the total value (I+R+Q), then the highest value category is selected between A, M, and O.
2. If the total value (A+M+O) < the total value (I+R+Q), then the highest value category is selected between I, R, and Q.

3. If the total value (A+M+O) = the total value (I+R+Q), the highest value category is selected between A, M, O, I, R, and Q.

Next, the calculation of satisfaction index (SI) and dissatisfaction index (DI) is carried out using formulas (2) and (3). After the calculation of SI and DI is carried out, it is depicted in the X and Y graphs to determine the position of the Kano model attributes towards consumer satisfaction. (Figure 3).

Table 3. Results of Calculating the Satisfaction Index (SI) and Dissatisfaction Index (DI)

Attribute	A	O	M	I	R	Q	Total	SI	IN	A+M+O	I+R+O	Category
1	11	7	4	5	0	3	30	0.67	0.41	22	8	A
2	11	7	3	5	1	3	30	0.69	0.38	21	9	A
3	12	9	2	5	0	2	30	0.75	0.39	23	7	A
4	9	9	2	7	1	2	30	0.67	0.41	20	10	A/O

Based on the canoe category table in Table 3, several attributes were obtained that can be developed to improve multi-function walker products with the following provisions (Haryono & Bariyah, 2014) :

1. Attributes that fall into the indifferent category will be ignored because they will not increase consumer satisfaction.
2. Attributes that fall into the must-be category should be a priority because they are basic features that must be present in the dining table product.
3. Attributes with one-dimensional categories must be considered because customer satisfaction is directly proportional to the fulfillment of these attributes.
4. Attributes with attractive categories must be done because this attribute will increase customer satisfaction if fulfilled. However, it will only decrease customer satisfaction if fulfilled.

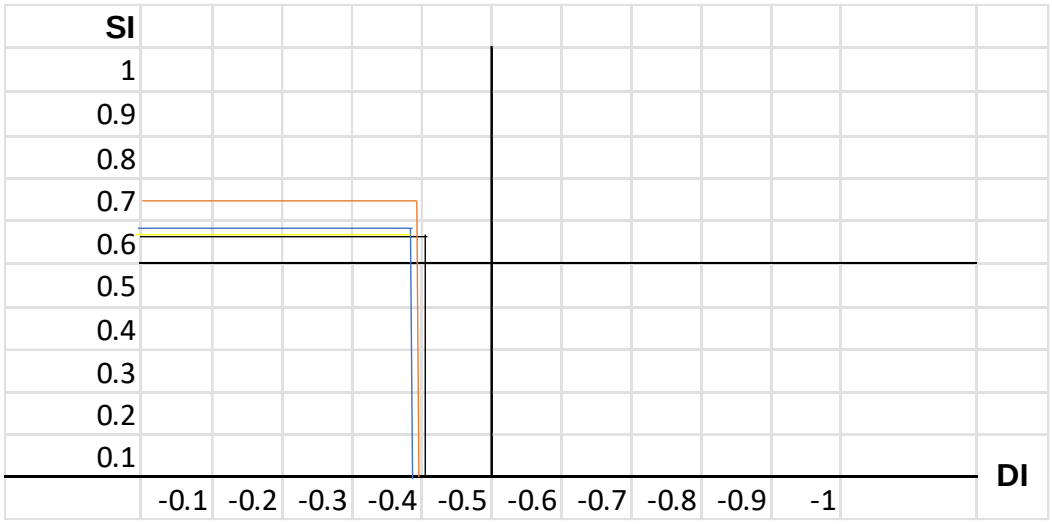

Figure 2. Satisfaction Index (SI) and Dissatisfaction Index (DI) Graph

Based on the calculation of the satisfaction index and dissatisfaction index shown in the graph in Figure 2. The attributes offered to consumers fall into the attractive category, so based on this category, all attributes/features offered to improve the multi-function walker need to be done: (1) Footrest and elbow rest, (2) Backrest, (3) Handrails, (4) Peer hooks and wheels. Thus shown in Figure 3, this results from improvements to walkers on the market by adding attributes to provide comfort and maximize function to increase the use of walkers as a therapy.

Figure 3. Multi-Function Walker Design

4. Conclusion

This study concludes that applying the Kano Method in developing the attributes of the Multi-Function Walker product enables a more optimal design, focusing on ergonomic, safety, and multifunctional features. This meets users' basic expectations and offers significant added value through design innovations that can improve users' quality of life and independence, particularly older people and individuals with limited mobility.

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