



THE RELATIONSHIP BETWEEN IMAGEABILITY QUALITY AND WALKING BEHAVIOR ON A HISTORIC COMMERCIAL STREET: LESSON FROM MALANG, INDONESIA

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Abstract

Walking is crucial for a sustainable and healthy life, but people's interest in walking, especially in Indonesia, still needs to grow. Previous research found that imageability is one of the urban design qualities that play a crucial role in facilitating interest in walking. Unfortunately, the role of imageability in this context has not been studied. Therefore, this research aims to fill the gap and explore the relationship between imageability and walking behavior in Kayutangan Street, Malang, Indonesia, a historic commercial area that has undergone renovation to accommodate pedestrian needs. This research employed a quantitative approach, applying a questionnaire survey method to 103 randomly selected participants on-site. Imageability quality was measured based on ten indicator variables obtained from previous research, including uniqueness, attractiveness, distinctiveness, recognizable quality, memorableness, unforgettable memory, impressiveness, legibility, pleasantness, and image quality, which was confirmed using factor analysis. The relationship between imageability quality and walking behavior was explored using regression analysis. The results show that imageability quality has a significant influence on the frequency of purposive walking ($p < 0.01$) but has no effect on discursive walking ($p > 0.05$). Furthermore, the results show that imageability has no significant impact on walking duration. However, a significant relationship exists between imageability and activity duration in the study area ($p < 0.01$). This research also found that memorableness is one of the imageability indicator variables that influence people's preference and interest in walking ($p < 0.05$).

Keywords: Imageability, Walking Behavior, Historic Street, Indonesia, Urban Design

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INTRODUCTION

Walking benefits individuals and the population in terms of both physical and psychological health (Constantinides et al., 2021; Hamidi & Moazzeni, 2019; Buzzatoni & Minaker, 2023). These physical and psychological aspects strengthen the argument that walking is closely related to health and environmental characteristics. The problem in Indonesia is that walking behavior still needs to improve, ranking among the worst in the world (Althoff et al., 2017; Indonesia Ministry of Health, 2018). Therefore, planning and design to support a walkable environment have always received more attention from year to year.

Although previous studies have identified factors that influence interest in walking, such as the physical attributes of the street, the role of urban design quality, particularly imageability, which is considered the most crucial determinant of urban design quality (Ewing, 2013; William & Stewart, 2024), remains underexplored. Previous studies have rarely discussed how mental images influence people's positive responses, such as attractiveness and uniqueness, in determining their desire to be active in public spaces. Therefore, this research aimed to fill this gap. It involves examining the relationship between imageability quality and walking behavior based on people's perceptions.

LITERATURE REVIEW

Imageability Quality in Urban Design

Imageability is the ability of an area to be easily recognized and remembered. It is characterized by the form of physical elements and their arrangement, which can evoke positive images and feelings. A place with good imageability is easy to recognize (recognizable), different from other places (distinct), and easy to remember (memorable) (Ernawati et al., 2018). Moreover, good imageability gives the area users a deep impression, generates certain feelings, and invites attention (Ewing, 2013). Imageability, facilitated by a well-organized physical environment, enables people to identify existing physical elements easily and group them into clear patterns (Lynch, 1960), thereby creating a pleasant space for activities (Ewing & Clemente, 2013).

Imageability can be measured both objectively and subjectively. Subjective measurements, based on users' perceptions, are essential to urban design (Badawi & Farag, 2018). According to Ewing & Handy (2009), although perceptions are individual, perceptions of a place can be obtained based on the objectivity of the physical environment that is unique to an area. Therefore, imageability in this research was evaluated based on users' perceptions.

Walking Behavior

Walking has been proven to offer many benefits for public health, social life, economic growth, and the environment (Hamidi & Moazzeni, 2019). Previous studies have found that socioeconomic status, including education level and

income, significantly influences physical activity, such as walking, in public areas (Cerin et al., 2009). Other factors influencing walking behavior include density, design diversity, accessibility, and distance to public transportation (Ewing & Cervero, 2010). Therefore, many factors affect walking behavior.

Walking can enhance happiness, cognitive functioning, positive mood, self-esteem, and quality of life (Kelly et al., 2017). These conditions support the argument in the previous discussion that an environment with good imageability influences positive human emotions. Therefore, walking and urban design quality go hand in hand in supporting human life in cities. However, only a few factors explained the relationship between walking behavior and the quality of urban design, specifically imageability. Therefore, it is essential to explore this relationship.

Imageability Quality and Walking Behavior

Figure 1 shows the hypothetical relation between urban design quality and walking behavior.

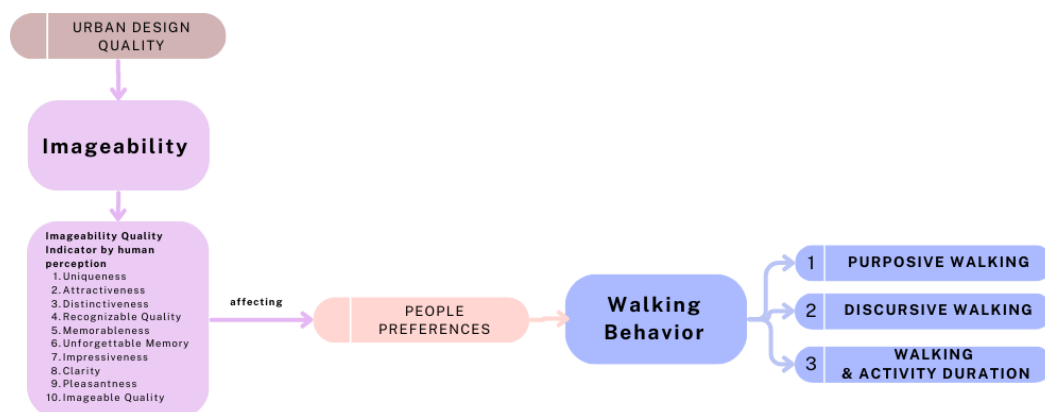


Figure 1: Hypothetical Relationship Model of Urban Design Quality, Imageability, and Walking Behavior

To explore the relationship between urban design quality and walking behavior, it is essential to recognize that urban environments can impact the mental health of people living in them (Lamblin et al., 2017; Buttazzoni & Minaker, 2023). Therefore, planning that focuses on walking activities aims to classify urban design features to develop urban areas that promote an active lifestyle. This design can be referred to as pedestrian and transit-oriented design principles. One of the key design features is imageability, which is related to mental health phenomena (Buttazzoni & Minaker, 2023). This situation can lead to identifying and responding to emotions and spiritual bonds between humans

and various places (Williams & Stewart, 2024). During the process of connecting them, the physical attributes of the area influence the perception of street users, evoking emotional responses (Buttazzoni & Minaker, 2023). In this context, positive responses have been proven to influence users to perceive urban design more favorably, making them feel at home for a longer period of activities (Buttazzoni & Minaker, 2023). These previous findings showed the importance of imageability quality for walking behavior.

RESEARCH METHODOLOGY

This descriptive research employed a quantitative approach, utilizing a survey method, to explore community evaluations of the imageability quality of a historic commercial street and users' walking behavior in the area.

The research was conducted on Kayutangan Street, a historic commercial area frequently visited by locals and tourists in Malang-Indonesia. The area of Kayutangan Street was observed from the intersection of the twin building (Lafayette) to the Sarinah intersection.



Figure 2: The Study Street: Kayutangan Street

Population and Sample

The population in this research consists of all individuals who use Kayutangan Street. Participants were selected randomly. Following the procedure of Hull & Revell (1989) and Ernawati & Moore (2014), the researchers visited Kayutangan Street at various random times generated by www.randomizer.org. Upon each arrival, the first five individuals in view were invited to participate.

Initially, 105 respondents were included, but two were excluded due to incomplete responses in the questionnaire, resulting in 103 questionnaires ready for analysis.

Instrument and Research Variables

The primary instrument used in this research was a self-administered questionnaire to explore the quality of perceptual imageability and walking behavior. The questionnaires were distributed in situ. This requirement aims to assess the image of the Kayutangan historic commercial area in respondents' minds while they were in the location. The researchers accompanied the respondents when they filled out the questionnaires to help them understand the questions as needed. Research variables and their measurement techniques are presented in Table 1.

Table 1: Research Variables

No	Socio-Demographics and Characteristics of Respondents Variables	Measuring Technique
1	Age	Check Box
2	Gender	Check Box
3	Education	Check Box
4	Economic Level	Check Box
5	Occupation	Check Box
6	Origin	Check Box
7	Length of stay	Check Box
8	Frequency of visit	Check Box
9	District of Home address	Check Box
10	Frequency of activities	Check Box
No	Imageability	Measuring Technique
1	Uniqueness	Measurement uses a seven-point Likert Scale: Strongly disagree (1) – strongly agree (7)
2	Attractiveness	
3	Distinctiveness	
4	Recognizable quality	
5	Memorableness	
6	Unforgettable memory	
7	Impressiveness	
8	Clarity/Legibility	
9	Pleasantness	
10	Image quality	

No	Walking Behavior	Measuring Technique
1	Discursive walking	Five-point multiple rating scales: very rarely (1) - very often (5)
2	Purposive walking	Five-point multiple rating scales: very rarely (1) - very often (5)
3	Walking purpose	Check box
4	Walking duration	Five-point multiple rating scales: <30 minutes (1) - >2 hours (5)
5	Activities duration	Five-point multiple rating scales: <30 minutes (1) - >2 hours (5)
6	Walking preferences	Seven-point multiple rating scales: Least prefer (1) – most prefer (7)

Source: developed from Ernawati & Moore (2014), Ewing et al. (2006), Ewing & Clemente (2013), Purciel & Marrone (2006), Ernawati (2020); Constantinides et al., 2021; Hamidi & Moazzeni, 2019)

This study employed factor analysis through principal component analysis to confirm whether the ten imageability indicator variables collectively measured the imageability of Kayutangan Street. The results yielded a single factor comprising ten imageability indicator variables. This result indicates that the ten indicator variables are genuine imageability indicators, explaining 65.2% of the variance in the population.

Data Analysis Techniques

This study employed descriptive statistics to examine the socioeconomic and demographic characteristics of the respondents. Mean score analysis was used to explore the imageability quality of the study area and determine the walking behavior of respondents. Furthermore, this study applied regression analysis to explore the relationship between imageability quality and walking behavior, which included purposive walking, discursive walking, walking duration, and activity duration. In this situation, imageability was treated as the independent variable, and walking behavior was the dependent variable. Additionally, this study also employed regression analysis to examine the influence of imageability quality on people's preferences for walking in the area. In this situation, imageability was treated as the independent variable, and people's preference was the dependent variable.

ANALYSIS AND DISCUSSION

The respondents consisted of 40.8% men and 59.2% women. Visitors to the study area were predominately aged 17-35 (84.4%), showing that the respondents were relatively homogeneous in terms of age and likely had similar abilities to interpret the questionnaires. Most respondents were High School, Bachelor, and Diploma graduates and had middle-class economic incomes. The study site, Kayutangan Street, attracts both visitors and locals, with 64,1% of the respondents being visitors to Malang City and 35,9% residents.

The length of stay of respondents in Malang City is also one of the factors that influenced respondents' assessment of the imageability quality of historic street design in Malang City. A person's period of residency influences their familiarity with the environment in which they live, which, in turn, affects their impression of the city's visual environment. Although respondents varied in their length of stay in Malang, the majority had lived there for one to five years (63,1%) or more than 20 years (24,3%). In these conditions, the respondents were familiar with the city's environment and could easily identify historic places within it. Moreover, most respondents visited the study area at least 2-3 times a week, showing they were well-acquainted with Kayutangan historic street.

Malang City is divided into five districts: Klojen, Lowokwaru, Blimbing, Kedungkandang, and Sukun. Most respondents who participated in this research lived in Lowokwaru District (69.9%) and Klojen District (21.4%), the city centers where the case study site is located. The remaining (8.7%) were evenly spread across other districts, representing the five districts.

People's Evaluation of Imageability Quality of the Historic Street

The factor analysis conducted on the ten indicator variables of imageability found that only one factor accounted for imageability, suggesting that a single, overarching imageability factor can collectively represent all ten variables observed, as presented in Table 2. Therefore, the following regression analysis, which was used to explore the relationship between imageability and walking behavior, utilized factor scores resulting from this factor analysis.

Table 2: Principal Component Analysis of Imageability Quality

Variables	Component
	Factor 1
	Imageability
1. Uniqueness	.872
2. Attractiveness	.835
3. Distinctiveness	.819
4. Recognizable quality	.841
5. Memorableness	.876
6. Unforgettable memory	.721
7. Impressiveness	.767
8. Clarity	.805
9. Pleasantness	.804
10. Image quality	.719
Extraction Method: Principal Component Analysis.	
a. 1 Component extracted	

Table 2 presents the research findings, which corroborate prior research, indicating that the relationship between the indicator variables is a determinant of imageability. These findings suggest that the respondents in the

study area have experienced a place with a pleasant memory atmosphere and can easily distinguish it from other regions. Respondents' perceptions of imageability quality, as shown in Table 4, can be categorized into three categories based on the mean score, as shown in Table 3.

Table 3: Categorization of Mean Score Assessment

Categorization of Mean Score	Interval of Quality
Low quality	$1.00 \leq M < 3.00$
Moderate quality	$3.00 < M < 5.00$
High/Good quality	$5.00 < M \leq 7.00$

Table 4: People's Evaluation of Imageability Quality and Walking Behavior

Variables of Imageability	Descriptive Statistics		Variables of Walking Behavior	Descriptive Statistics	
	Mean	Imageability Quality		Mean	People's Rating
1. Uniqueness	5.76	High/Good	1. Discursive walking	2.40	Low
2. Attractiveness	5.90	High/Good	2. Purposive walking	2.51	Low
3. Distinctiveness	5.78	High/Good	3. Walking duration	1.80	Low
4. Recognizable quality	5.74	High/Good	4. Activities duration	2.53	Low
5. Memorableness	5.75	High/Good	5. Preferences for walking	5.50	High/Good
6. Unforgettable memory	5.30	High/Good			
7. Impressiveness	5.36	High/Good			
8. Clarity	5.46	High/Good			
9. Pleasantness	5.45	High/Good			
10. Image quality	5.50	High/Good			

People's perceptions of the imageability quality of the Kayutangan historic commercial street show that the quality of imageability is high or good across all variables, with attractiveness scoring the highest ($M = 5.90$). This result further supports previous research by Ernawati (2020), which demonstrated that attractiveness is an essential factor in imageability. Despite the interest in walking and engaging in activities in the study area, the research found that respondents' walking behavior in the Kayutangan historic street was rated low ($M < 3$ on a five-point scale). The results in Table 4 correspond with statements from Althoff (2017) and the Indonesian Ministry of Health (2018) regarding the high level of physical inactivity among Indonesians. However, the study showed that people preferred walking and engaging in activities on Kayutangan Historic Street ($M = 5.50$).

The Influence of Imageability Quality on Purposive Walking

A linear regression analysis was conducted to investigate the impact of imageability quality on purposive walking, with imageability serving as the independent variable and purposive walking as the dependent variable.

Table 5: Model Summary of the Influence of Imageability on Purposive Walking

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.281 ^a	.079	.070	.963
a. Dependent Variable: purposive walking b. Predictors: (Constant), Imageability				

Table 6: ANOVA of The Influence of Imageability on Purposive Walking

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	8.012	1	8.012	8.635	.004 ^b
Residual	93.716	101	.928		
Total	101.728	102			
a. Dependent Variable: purposive walking b. Predictors: (Constant), Imageability					

The results indicate that imageability has a significant impact on purposive walking ($p < 0.01$). This research finding aligns with a previous study conducted by Nordh et al. (2017), which revealed that most individuals primarily walk from their residences to public transportation hubs rather than engaging for recreational purposes. Furthermore, a previous study found that imageability affects walking preference and influences walking for specific purposes, especially on commercial streets (Ernawati et al., 2018). Therefore, imageability as a trigger for travel experiences may not significantly affect walking activities, but it shows that walking bridges individuals to engage in recreational activities.

The Influence of Imageability Quality on Discursive Walking

Linear regression analysis was also employed to investigate the impact of imageability quality on discursive walking, with imageability serving as the independent variable and discursive walking as the dependent variable.

Table 7: Model Summary of the Influence of Imageability on Discursive Walking

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.191 ^a	.036	.027	.951
a. Dependent Variable: discursive walking b. Predictors: (Constant), Imageability				

Table 8: ANOVA of The Influence of Imageability on Discursive Walking

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	3.452	1	3.452	3.814	.054 ^b
Residual	91.421	101	.905		

Model	Sum of Squares	df	Mean Square	F	Sig.
Total	94.874	102			
a. Dependent Variable: discursive walking					
b. Predictors: (Constant), Imageability					

The results in Tables 7 and 8 show that imageability does not influence discursive walking ($p > 0.05$). When discussing people's motivation to visit a destination, three contexts of recreational activities, which include leisure, hedonism, and social activities, are considered (Su et al., 2021). Visitors' motivation is shaped by the experience of consuming products and services (Loncaric et al., 2021; Kim, 2017). Therefore, it is unsurprising that imageability affects purposive walking but not discursive walking due to the insufficient level of consumption of visitors' products and services.

The Influence of Imageability on Walking Duration

Regression analysis was used to examine the influence of imageability on walking duration, treating imageability as the independent variable and walking duration as the dependent variable.

Table 9: Model Summary of the Influence of Imageability on Walking Duration

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.104 ^a	.011	.001	.857
a. Dependent Variable: walking duration				
b. Predictors: (Constant), Imageability				

Table 10: ANOVA of The Influence of Imageability on Walking Duration

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	.810	1	.810	1.104	.296 ^b
Residual	74.122	101	.734		
Total	74.932	102			
a. Dependent Variable: walking duration					
b. Predictors: (Constant), Imageability					

The findings suggest that imageability does not significantly affect the walking duration ($p > 0.05$). Despite a small effect of 1.1%, it cannot significantly impact overall interest in walking behavior. Many studies have discussed the motivation of people to stay in recreational destinations to enjoy their beauty (Kim et al., 2015; Mehmetoglu & Normann, 2013; Said & Maryono, 2018), but this does not necessarily mean that they enjoy the place by walking. Previous research has shown that people's experience of reaching a destination affects place satisfaction, indirectly highlighting the need for hedonism, refreshment, and engagement (Loncaric et al., 2021). The more activities, novelties, and uniqueness are obtained, the more exciting and memorable the destination

becomes. Indirectly, the better the imageability of a place, the higher the movement of activities and the desire for new experiences. This situation suggests that imageability may influence the duration of a person's enjoyment of a place, but it does not explicitly state that walking is the primary means of enjoying it; therefore, the walking duration could be shorter.

The Influence of Imageability Quality on Activity Duration

To investigate the impact of imageability quality on activity duration, this study employed linear regression analysis, with imageability serving as the independent variable and activity duration as the dependent variable.

Table 11: Model Summary of the Influence of Imageability on Activity Duration

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.282 ^a	.079	.070	1.038
a. Dependent Variable: activity duration b. Predictors: (Constant), Imageability				

Table 12: ANOVA of The Influence of Imageability on Activity Duration

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.396	1	9.396	8.719	.004 ^b
	Residual	108.837	101	1.078		
	Total	118.233	102			
a. Dependent Variable: activity duration b. Predictors: (Constant), Imageability						

The results, as presented in Table 11 and Table 12, show that imageability significantly influences activity duration ($p < 0.05$). This finding aligns with the previous discussion, which mentioned that good imageability corresponds to a high rate of activity variation. Various dimensions influence people's experiences (Loncaric et al., 2021). Kim (2017) also noted that travel satisfaction is a psychological state that accumulates over time through the consumption of travel experiences. Therefore, it is not surprising that various activities will prolong activity duration. Many studies discuss how attraction affects the duration of people's stays, but this does not specifically refer to walking activities. It could refer to other more interesting, unique, and new activities. Attractiveness can be formed through various activities that make a place attractive, unique, and easily recognizable (Constantinides et al., 2021; Guedoudj et al., 2020).

The Influence of Imageability Quality on People's Preferences for Walking in the Study Area

Table 13 illustrates the impact of the ten imageability indicator variables on individuals' preferences for walking and other activities.

Table 13: ANOVA of The Influence of Imageability on People's Preferences for Walking and Doing Activities

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	77.811	1	77.811	115.682	.000 ^b
Residual	67.936	101	.673		
Total	145.748	102			

a. Dependent Variable: people's preferences for walking and doing activities
b. Predictors: (Constant), Uniqueness, Attractiveness, Distinctiveness, Recognizable Quality, Memorableness, Unforgettable Memory, Impressiveness, Clarity, Pleasantness, Imageable Quality

The results indicate a significant influence of imageability on people's preference for walking and activities in the historic street ($p < 0.01$). However, further analysis shows that among imageability indicators, only the memorableness of Kayutangan Historic Street significantly influences people's preference for walking and activities ($p < 0.05$).

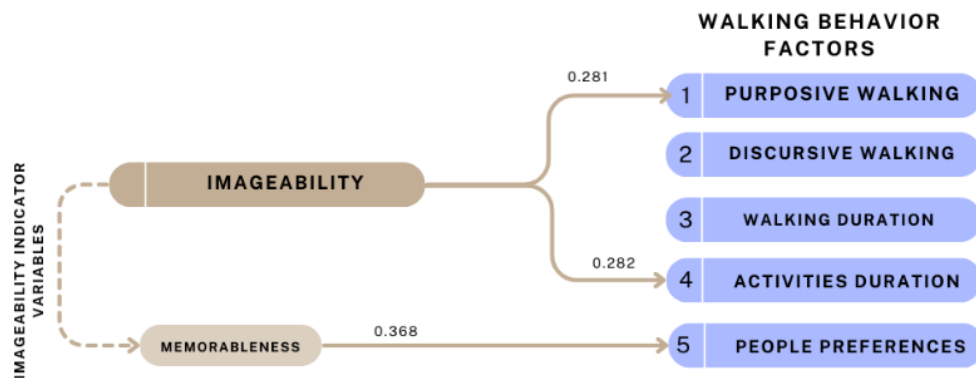


Figure 3: Study Results: The Relationship Between Imageability and Walking Behavior

The level of memorableness impacts individuals' motivation towards activities and purposive walking. Additionally, the case study site, Kayutangan Street, as a historical area, inherently possesses an atmosphere that evokes reminiscences of past experiences for individuals (Silva & Chapagain, 2013). The study results align with the argument that memory is a crucial element of visits to tourist sites, particularly historical areas (Kim, 2017). Meanwhile, memory is present because of the attraction and impression of something special and pleasant experiences that will be discussed again sometime in the future (Zhong et al., 2017). Memory can also be relied upon for unforgettable experiences (Kim, 2017; Sharma & Nayak, 2019; Yu et al., 2019). Therefore, memorableness indirectly affects other dimensions of imageability and significantly influences walking preference.

CONCLUSION

The results indicate that imageability affects purposive walking rather than discursive walking within the study area. Although imageability does not influence walking duration, it does influence activity duration. These findings suggest that although imageability does not significantly affect walking behavior, it does significantly impact the behavior pattern of visitor activities. Walking is not the main effect of design quality, but a place with high imageability accommodates a variety of activities. Moreover, the most significant imageability indicator affecting walking preference is memorableness, as the results show that mental images, in the form of memory, are vital in determining walking preferences. The research supports previous knowledge about the importance of pedestrian and transit-oriented principles in creating a sense of place, which triggers visitors' preference for walking.

However, this study's findings suggest that various urban design variables might reveal more factors influencing people's preference for walking in an urban historic street. Therefore, future studies should consider investigating other variables to reveal a more comprehensive understanding of urban design aspects that can increase the preference for walking, specifically in historic commercial streets, thereby promoting a more pedestrian-friendly environment.

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DISCLOSURE

There is no conflict of interest in this research.

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