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Identification Of Factors Affect People's Desire To Ride Bicycles In The City Of Banjarbaru

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ABSTRACT
Bicycles are a symbol of sustainable transportation. At this time cycling began to be used as a means of transportation, this study aims to determine the factors that influence people's desire to cycle in Banjarbaru City. Based on references from several previous studies, 7 independent variables (x) were obtained, namely humans (x1), environment (x2), security (x3), comfort (x4), accessibility (x5), facilities (x6), and distance. (x7), and the dependent variable (Y) is the desire to cycle (Y1) and infrastructure (Y2). To get the variables that affect the desire to cycle, multiple linear regression data analysis was performed using the IBM SPSS 25 software. After identification, the regression equation model was obtained for Y1 = 1.378 + 0.554 X4_4 + 0.550 X6_3 + 0.537 X1_5 + 0.423 X4_2 + 0.234 X5_3 + (-0.268) X1_4 + (-0.314) X2_6 with a value of (R2) 0.744. For the regression equation model Y2 = 1.945 + 0.689 X6_3 + (-0.676) X6_4 with a value of (R2) 0.256. Then, it was analyzed again using binary logistic regression using the orthogonal SPSS design scenario. So that the utility equation is obtained U = 1.049 + 0.5165 X1 - 0.1451 X2 - 0.132 X3 – 0.569 X4 – 0.5832 X5 – 0.532 X6 – 0.208 X7 – 0.242 X8.
Key words: *Sustainable transportation, bicycles, cycling desire factors*

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I. INTRODUCTION

At this time, cycling activities are very popular among the people of Banjarbaru City, especially during the COVID-19 pandemic. The use of bicycles itself has many positive impacts for its users. From an environmental perspective, cycling reduces air pollution, reduces congestion due to the use of motorized vehicles, and decreases demand for motor fuel (BBM). In terms of health, it helps control and reduce weight, burn calories and body fat, increase metabolism and immunity. Cycling itself is an element of sustainable transportation. The sustainable transportation model has been widely applied in developed countries, therefore it is hoped that in Indonesia, especially the city of Banjarbaru, it is also expected to be implemented. Based on the sample population taken at random, it is expected to know the factors that influence the desire to cycle Banjarbaru people, as well as evaluate the needs of bicycle users.

II. REFERENCE LITERATURE

According to the Organization for Economic Co-operation and Development (OECD) 1994, sustainable transportation is transportation that does not have an impact that endangers public health or ecosystems and can meet mobility needs consistently by paying attention to renewable resources. Cycling is considered an element of sustainable transportation. Bicycles are non-motorized transport (NMT). This study took a random sample of the population, then sampled using a Likert scale 1-5 to measure attitudes and opinions as well as perceptions Sugiono, 2007.

There are 2 regression analyzes carried out in this study, namely multiple linear regression analysis with the retrieval method using a Likert scale and binomial logistic regression analysis, namely a scale of 1 = No, 2 = Yes.

III. RESEARCH METHODOLOGY

Data Processing

In this research case study, a sample of 100 people was taken for multiple linear regression analysis and 113 samples for logistic regression analysis. Sampling was taken randomly, knowing some of the characteristics of the respondents including gender, education, occupation, vehicle ownership, bicycle ownership, and frequency of bicycle use.

Data Analysis

The data analysis process is as follows:

1. Data analysis was carried out using multiple regression and logistic analysis;
2. The sample population is the people of Banjarbaru City, to get an estimate of the number of samples it is necessary to use the slovin formula:

$$n = \frac{N}{N\,(d)^2 + 1}$$

n = Sample sizes
N = Population
d = Prescision(0,1)

So, obtained for this research sample required 100 samples;

1. Identification of research variables and indicators is carried out. The data collection technique is simple random sampling;
2. After data collection, multiple regression analysis was performed. After obtaining the regression model, it was continued by making an orthogonal design of the existing variables;
3. Then, the analysis continued with data collection using an orthogonal design questionnaire. Then, the data obtained were analyzed using logistic regression;
4. From the results of the logistic regression, the utility value of the variable is obtained, then continued by testing the probability with the formula:

$$P = \frac{\exp(Utility)}{1 + \exp(Utility)}$$

5. The analysis is then continued with the sensitivity test of the model to determine the effect of one variable affecting other variables.

IV. ANALYSIS RESULTS

From the analysis of the model obtained from the SPSS program using the stepwise method and multiple linear regression, the regression equation model is Y1 = 1,378 + 0,554 X4_4 + 0,550 X6_3 + 0,537 X1_5 + 0,423 X4_2 + 0,234 X5_3 + (-0,268) X1_4 + (-0.314) X2_6 with a value of (R2) 0.744. For the regression equation model Y2 = 1.945 + 0.689 X6_3 + (-0.676) X6_4 with a value of (R2) 0.256. To see the effect of the independent variable on the dependent variable, several tests were carried out.

Table. 1 Multicolinearity Test

Variable	Tolerance > 0,10	VIF < 10	Result
Y1 – X	0,177	7,902	Correlated
Y2 - X	0,180	7,827	Correlated

Table. 2 Autocorelation Test

Variable	Durbin-Watson	dL	dU	4-dU	Result
Y1 – X	1,688	1,571	1,78	2,22	Received
Y2 - X	1,74	1,55	,803	2,197	Received

Table. 3 HeteroscedasticityTest for Y1

Variable	Sig. > 0,05	Result
X1	,226	✓
X2	,410	✓
X3	,887	✓
X4	,824	✓
X5	,953	✓
X6	,943	✓
X7	,963	✓

Table.4HeteroscedasticityTest for Y2

Variable	Sig. > 0,05	Result
X1	,308	✓
X2	,597	✓
X3	,351	✓
X4	,528	✓
X5	,246	✓
X6	,175	✓
X7	,449	✓

Table. 5T-*test*

The formula to find the value of t table:
T table = (a/2 ; n-k-1)
=(0,50/2 ; 100-7-1)
=0,25 ; 92
T table = 1,989 (*Based on the percentage point distribution T df=1-100*).
The results of the interpretation of the t-test output for Y1 and y2 using the SPSS IBM 25.

Variable	T Count	> T Table	Hypothesis	Sig.	< 0,05	Hypothesis
Y1-X1	2,684	1,989	Received	,009	0,05	Received
Y1-X2	0,769	1,989	Rejected	,444	0,05	Rejected
Y1-X3	2,530	1,989	Received	,013	0,05	Received
Y1-X4	3,445	1,989	Received	,001	0,05	Received
Y1-X5	3,438	1,989	Received	,001	0,05	Received
Y1-X6	2,231	1,989	Received	,028	0,05	Received
Y1-X7	3,574	1,989	Received	,001	0,05	Received
Y2-X1	3,165	1,989	Received	,002	0,05	Received
Y2-X2	1,806	1,989	Rejected	,074	0,05	Rejected
Y2-X3	3,927	1,989	Received	,000	0,05	Received
Y2-X4	4,735	1,989	Received	,000	0,05	Received
Y2-X5	3,503	1,989	Received	,001	0,05	Received
Y2-X6	2,550	1,989	Received	,012	0,05	Received
Y2-X7	1,277	1,989	Rejected	,205	0,05	Rejected

Table. 6 F-*test*

Variable	F Count	> F Table	Hypothesis	Sig.	< 0,05	Hypothesis
Y1-X1	7,206	2,11	Received	,009	0,05	Received
Y1-X2	,592	2,11	Rejected	,444	0,05	Rejected
Y1-X3	6,399	2,11	Received	,013	0,05	Received
Y1-X4	11,865	2,11	Received	,001	0,05	Received
Y1-X5	11,817	2,11	Received	,001	0,05	Received
Y1-X6	4,976	2,11	Received	,028	0,05	Received
Y1-X7	12,772	2,11	Received	,001	0,05	Received
Y2-X1	10,015	2,11	Received	,002	0,05	Received
Y2-X2	3,261	2,11	Received	,047	0,05	Received
Y2-X3	15,419	2,11	Received	,000	0,05	Received
Y2-X4	22,420	2,11	Received	,000	0,05	Received
Y2-X5	12,273	2,11	Received	,001	0,05	Received
Y2-X6	6,504	2,11	Received	,012	0,05	Received
Y2-X7	1,630	2,11	Rejected	,205	0,05	Rejected

Table.7Analysis of determination (Rsquare)

Variable	R Square	%	Variable	R Square	%
Y1-X1	,068	6,8	Y2-X1	,093	9,3
Y1-X2	,006	0,6	Y2-X2	,032	3,2
Y1-X3	,061	6,1	Y2-X3	,136	13,6
Y1-X4	,115	11,5	Y2-X4	,186	18,6
Y1-X5	,108	10,8	Y2-X5	,111	11,1
Y1-X6	,108	10,8	Y2-X6	,062	6,2
Y1-X7	,048	4,8	Y2-X7	,016	1,6

Table. 8Multiple linear regression analysis

Meanwhile, the regression equation in this analysis is:

Y = a + b1x1 + b2x2 + … + bnXn

Interpretation of the results of regression analysis using the SPSS program for Variable Y1 against X.

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	T	Sig.
X1_4	-0,268	0,094	-0,286	-2,846	0,006
X1_5	0,537	0,101	0,691	5,310	0,000
X2_6	-0,314	0,117	-0,327	-2,681	0,010
X4_2	0,423	0,187	0,372	2,266	0,027
X4_4	0,544	0,246	0,477	2,208	0,031
X5_3	0,234	0,108	0,278	2,163	0,035
X6_3	0,550	0,239	0,576	2,304	0,025

Interpretation of the results of regression analysis using the SPSS program for Variable Y2 against X.

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	T	Sig.
X6_3	0,689	0,241	0,595	2,857	0,005
X6_4	-0,676	0,251	-0,535	-2,692	0,009

So, we get several independent variables that affect the dependent variable as follows:

VARIABLE ITEMS		DESCRIPTION	KOEFISIEN
Y1 (Constant)		The desire to cycle for daily activities	1,378
	X1_4	There are not many places I want to go by bicycle	-0,268
	X1_5	I want to ride a bicycle during the day	0,537
	X2_6	I want to cycle if the route/road is smooth (no potholes)	-0,314
	X4_2	I want to ride a bicycle if the condition of the bicycle is comfortable to ride	0,423
	X4_4	I want to ride a bicycle if it is free from verbal distractions	0,554
	X5_3	Cycling saves travel time	0,234
	X6_3	Safe and comfortable public bathrooms are available	0,550
Y2 (Constant)		Influence of infrastructure on Cycling desire	1,945
	X6_3	Safe and comfortable public bathrooms are available	0,689
	X6_4	There are special bicycle signs/boards available	-0,676

Then, the equation model is made as follows:

Variable	Equation	R Square	Sig.
Y1 (Desire)	$= 1{,}378 + 0{,}554(X4 - 4) + 0{,}550(X6 - 3) + 0{,}537(X1 - 5) + 0{,}423(X4 - 2) + 0{,}234(X5 - 3) + (-0{,}268)(X1 - 4) + (-0{,}314)(X2 - 6)$	0,744 =74,4%	0,000
Y2 (Infrastructure)	$= 1{,}945 + 0{,}689(X6 - 3) + (-0{,}676)(X6 - 4)$	0,256 =25,6%	0,009

From the Equation above, it can be seen that the variables that affect the desire to cycle are:

1. Verbal disturbance (Cat Calling)
2. Public bathroom facilities
3. The purpose of cycling
4. Bike trails
5. Rest area
6. Cycling distance
7. Bicycle storage
8. Cycling time

Table. 9Orthogonal Design

No.	Card Plans							
	Time (X1)	Distance(X2)	Destination (X3)	Bike Lane (X4)	Storage facilities/ Bicycle parking (X5)	Rest Area Facilities (X6)	Bathroom Amenities (X7)	Verbal disturbance (X8)
1	Night	>5km	Sports/Recreation	Isn't	Is	Isn't	Isn't	Isn't
2	Night	>5km	All Activities	Is	Isn't	Isn't	Is	Isn't
3	Night	<5km	Sports/Recreation	Is	Isn't	Is	Is	Isn't
4	Day	>5km	Sports/Recreation	Is	Is	Is	Is	Is
5	Day	<5km	Sports/Recreation	Is	Isn't	Isn't	Isn't	Is
6	Night	<5km	All Activities	Is	Is	Isn't	Isn't	Is
7	Day	>5km	All Activities	Isn't	Isn't	Isn't	Is	Is
8	Night	>5km	Sports/Recreation	Isn't	Isn't	Is	Isn't	Is
9	Night	<5km	All Activities	Isn't	Is	Is	Is	Is
10	Day	<5km	All Activities	Isn't	Isn't	Is	Isn't	Isn't
11	Day	>5km	All Activities	Is	Is	Is	Isn't	Isn't
12	Day	<5km	Sports/Recreation	Isn't	Is	Isn't	Is	Isn't

The orthogonal design table is created using the SPSS tool by using existing variables. The orthogonal design is a special experimental design which is a factorial design. Orthogonal means the effect of each factor is mathematically estimated independently of the effects of other factors. In this study, the data taken is data on the desire for cycling of the Banjarbaru community, which if given such a scenario, the respondent chooses yes or no. Because there are 2 choices, namely yes and no, the analysis used is binomial/binary logistic regression. The following is the output of the orthogonal SPSS design:

Table. 10The results of respondents answers for orthogonal designs

No.	X1	X2	X3	X4	X5	X6	X7	X8	Y1	Y2	Total
1	2	2	1	1	2	1	1	1	26	87	113
2	2	2	2	2	1	1	2	1	41	72	113
3	2	1	1	2	1	2	2	1	67	46	113
4	1	2	1	2	2	2	2	2	73	40	113
5	1	1	1	2	1	1	1	2	57	56	113
6	2	1	2	2	2	1	1	2	41	72	113
7	1	2	2	1	1	1	2	2	57	56	113
8	2	2	1	1	1	2	1	2	32	81	113
9	2	1	2	1	2	2	2	2	35	78	113
10	1	1	2	1	1	2	1	1	68	44	113
11	1	2	2	2	2	2	1	1	43	70	113
12	1	1	1	1	2	1	2	1	20	93	113
										5607951	1355

Table. 11*Hosmer and Lemeshow Test*

Step	Chi Square	df	Sig.
1	.000	7	1.000

Table. 12*Omnibus test*

		Chi-Square	df	Sig.
Step 1	Step	16.301	8	0.038
	Block	16.301	8	0.038
	Model	16.301	8	0.038

Table. 13Parcial*test*

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B) Lower	Upper
Step 1	Constant	1.049	0,494	4,5128	10,038		2,8565		
	X1	0,5165	0,1151	20,1175	10,038		1,67611,3375		2,100
	X2	0,1451	0,115	1,59047	10,038		1,15610,92271,4486		
	X3	-0,132	0,1159	1,2982	10,038		0,8760,69821,0997		
	X4	-0,569	0,11579	24,1505	10,038		0,5660,45110,7102		
	X5	0,5832	0,1158	25,365	10,038		1,7921,42792,2482		
	X6	-0,5318	0,11587	21,0658	10,038		0,58750,46810,7373		
	X7	-0,2084	0,11516	3,2764	10,038		0,81180,64781,0174		
	X8	-0,2424	0,1157	4,3869	10,038		0,78460,62530,9845		

a. Variable(s) entered on step 1: X1, X2, X3, X4, X5, X6, X7, X8.

Logistics Regression Modeling

Regression modeling was carried out with the help of IBM SPSS 25 software. In order to obtain the following regression equation.

$U = (a + bx1 + bx2 + bx3 + \cdots + bxn)$

Wherever,

U =Utility
a =Constanta
b =Coeffisien
x = Variable independent

U = 1,049 + 0,5165X_1 + 0,1451X_2 – 0,132X_3 – 0,569X_4 +0,5832X_5 – 0,532X_6 –0,208X_7 –0,242X_8

Based on the respondents' assessment, the following results were obtained:

Percentage				
NO.	Scenario	Yes	No	Total
1	Scenario 1	87	26	113
2	Scenario 2	72	41	113
3	Scenario 3	46	67	113
4	Scenario 4	40	73	113
5	Scenario 5	56	57	113
6	Scenario 6	72	41	113
7	Scenario 7	56	57	113
8	Scenario 8	81	32	113
9	Scenario 9	78	35	113
10	Scenario 10	44	68	113
11	Scenario 11	70	43	113
12	Scenario 12	93	20	113

So, the calculation of utility with Equation is obtained:

U = 1,049 + 0,5165X_1 + 0,1451X_2 – 0,132X_3 – 0,569X_4 +0,5832X_5– 0,532X_6 – 0,208X_7 – 0,242X_8

List of utility values for each Scenario, as follows:

Intercept	1,049599								
Coefficient	0,5165	0,145105	-0,1320	-0,569	-0,5832	-0,531	-0,208	-0,2424	
No.	*X1*	*X2*	*X3*	*X4*	*X5*	*X6*	*X7*	*X8*	*U1*
1	2	2	1	1	2	1	1	1	1,8553
2	2	2	2	2	1	1	2	1	0,3626
3	2	1	1	2	1	2	2	1	-0,1822
4	1	2	1	2	2	2	2	2	-0,2128
5	1	1	1	2	1	1	1	2	-0,2009
6	2	1	2	2	2	1	1	2	0,7667
7	1	2	2	1	1	1	2	2	0,1726
8	2	2	1	1	1	2	1	2	0,4979
9	2	1	2	1	2	2	2	2	0,5954
10	1	1	2	1	1	2	1	1	-0,0532
11	1	2	2	2	2	2	1	1	0,1059
12	1	1	1	1	2	1	2	1	0,9853

After obtaining the utility value, then we can count the probability value. With Equation as follows:

$$P = \frac{\exp(Utility)}{1+\exp(Utility)}$$

Table. 14 Probabilityfor P1 and P2

Intercept	1,0496										
Coefficient	0,5165	0,145	-0,13	-0,57	0,58	- 0,53	- 0,21	- 0,24			
No.	*X1*	*X2*	*X3*	*X4*	*X5*	*X6*	*X7*	*X8*	*U1*	*P1*	*P2*
1	2	2	1	1	2	1	1	1	1,8554	0,865	0,135
2	2	2	2	2	1	1	2	1	0,3626	0,59	0,41

3	2	1	1	2	1	2	2	1	-0,182	0,455	0,545
4	1	2	1	2	2	2	2	2	-0,213	0,447	0,553
5	1	1	1	2	1	1	1	2	-0,201	0,45	0,55
6	2	1	2	2	2	1	1	2	0,7667	0,683	0,317
7	1	2	2	1	1	1	2	2	0,1727	0,543	0,457
8	2	2	1	1	1	2	1	2	0,4979	0,622	0,378
9	2	1	2	1	2	2	2	2	0,5955	0,645	0,355
10	1	1	2	1	1	2	1	1	-0,053	0,487	0,513
11	1	2	2	2	2	2	1	1	0,106	0,526	0,474
12	1	1	1	1	2	1	2	1	0,9853	0,728	0,272

In column P1 there is a probability of choosing yes. In scenario 1, a probability of 0.865 is obtained, meaning that scenario 1 has a chance to occur with a percentage of 86.5% which also applies to the next scenario.

Table. 15Model Sensitivity

a. Sensitivity of probability of wanting to cycle with utility included Trip time (Day with short distance < 5km)

No.	X1	X2	X3	X4	X5	X6	X7	X8	U	P1	P2
1	Day	Near (<5km)	Sports/ Recreation	Is	Isn't	Isn't	Isn't	Is	-0.20094	45.0%	55.0%
2	Day	Near (<5km)	Sports/ Recreation	Isn't	Is	Isn't	Is	Isn't	0.985321	72.8%	27.2%
3	Day	Near (<5km)	All Activities	Isn't	Isn't	Is	Isn't	Isn't	-0.05328	48.7%	51.3%

By attention to the time of day trips (X1) with a travel distance of Near > 5km (X2) in the desire to use a bicycle, it can be explained that the probability of respondents wanting to use a bicycle on a day with a short distance for Sports/Recreation is 72.8%.

b. Sensitivity of probability of wanting to cycle with utility including Travel time (Day with distance Far > 5km)

No.	X1	X2	X3	X4	X5	X6	X7	X8	U	P1	P2
1	Day	Far (>5km)	All Activities	Is	Is	Is	Isn't	Isn't	0.105989	52.6%	47.4%
2	Day	Far (>5km)	Sports/ Recreation	Is	Is	Is	Is	Is	-0.21289	44.7%	55.3%
3	Day	Far (>5km)	All Activities	Isn't	Isn't	Isn't	Is	Is	0.1727	54.3%	45.7%

By paying attention to the travel time at night (X1) with a travel distance of Far >5km (X2) in the desire to use a bicycle, it can be explained that the probability of respondents wanting to use a bicycle at night with a distance of >5km for sports/recreation is 86.5%.

c. Sensitivity of the probability of wanting to cycle with the utility including Travel time (Night with distance Far > 5km)

No.	X1	X2	X3	X4	X5	X6	X7	X8	U	P1	P2
1	Night	Far (>5km)	Sports/ Recreation	Isn't	Is	Isn't	Isn't	Isn't	1.8553	86.5%	13.5%
2	Night	Far (>5km)	AllActivities	Is	Isn't	Isn't	Is	Isn't	0.3626	59.0%	41.0%
3	Night	Far (>5km)	Sports/ Recreation	Isn't	Isn't	Is	Isn't	Is	0.4979	62.2%	37.8%

By attention to the Night travel time (X1) with a travel distance of Far >5km (X2) in the desire to use a bicycle, it can be explained that the probability of respondents wanting to use a bicycle at night with a distance of >5km for sports/recreation is 86.5%

d. Sensitivity of probability of wanting to cycle with utility including Travel time (Night with Near distance < 5km)

No.	X1	X2	X3	X4	X5	X6	X7	X8	U	P1	P2
1	Night	Near (<5km)	AllActivities	Isn't	Is	Is	Is	Is	0.5954	64.5%	35.5%
2	Night	Near (<5km)	Sports/ Recreation	Is	Isn't	Is	Is	Isn't	-0.1822	45.5%	54.5%
3	Night	Near (<5km)	AllActivities	Is	Is	Isn't	Isn't	Is	0.7667	68.3%	31.7%

By paying attention to the pIs Night travel time (X1) with a travel distance of Near <5km (X2) in the desire to use a bicycle, it can be explained that the probability of respondents wanting to use a bicycle at night with a distance of <5km for All activities is 68.3%.

V. CONCLUSION

Based on the research conducted, the following conclusions are obtained:

1. Characteristics that affect the desire to cycle if there are not many places to go, it is obtained from the results of regression analysis with a coefficient value of 0.268. Ispun the factors that have a big influence on the desire to ride a bicycle. Variables are comfort, facilities, people, and accessibility. The comfort factor is a factor that influences the desire to cycle with the largest coefficient value of 0.554.
2. Based on the research, the condition of the city of Banjarbaru is quite suitable for bicycle users, it can be seen from the number of bicycle users and the number of bicycle ownership of the respondents.
3. The handling solution is further improved both in terms of facilities, such as better roads/routes, available green open spaces, rest areas, bathrooms. In terms of security, it may be further improved, such as installing CCTV in vulnerable areas, dividing the bicycle lane and the main road, handling cat calling, and so on.

VI. SUGGESTION

In connection with these conclusions, the suggestions that can be put forward in this study are as follows:

1. In terms of security, to increase the desire for cycling, it is better to install CCTV at vulnerable points so that bicycle users feel safe. In terms of facilities, such as bicycle lanes, there must be improvement, as well as the need to integrate the use of bicycles with public facilities.
2. The need for a policy on the use of bicycles.
3. For further research, it is recommended to take questionnaire data directly or interview so that the data obtained is more reliable/reliable.
4. This research can be the basis for further research.

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