POTENTIAL BARRIERS AND CHALLENGES FOR CYCLING AMONG DAILY COMMUTERS IN COLOMBO DISTRICT: A WAY FORWARD FOR THE TRANSPORT SYSTEM IN SRI LANKA

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Abstract

Active transport encompasses human-powered modes of travel, such as walking, cycling, skating, and manual wheelchairs. It offers several advantages for users, society, and a country's economy. Notably, it is a low-cost, health-improving mode of transportation that aids in reducing traffic congestion and environmental pollution. However, in Sri Lanka, active transportation hasn't been widely recognized as a primary mode for daily commuters. This study focuses on identifying potential barriers and challenges, specifically within the Colombo district. The research is limited to cycling due to data availability. Employing a quantitative approach, this cross-sectional study distributed a questionnaire among daily commuters traveling within Colombo for work, education, and other purposes. The questionnaire was distributed both physically and via online platforms, using convenience sampling with a sample size of 389. The data collected concerning respondents' perceptions of potential barriers and challenges were analyzed using the IBM SPSS statistical tool. The study identified four potential barriers: infrastructure, safety, environmental concerns, and public perception about cycling. Additionally, three challenges were recognized: costs associated with cycles, air pollution, and educational aspects. Moreover, the research revealed negative correlations between the usage of active transportation in Sri Lanka and the aforementioned barriers and challenges. The study concludes by proposing recommendations to promote active transportation, particularly cycling, in Sri Lanka in the future.

Keywords: Active transportation, cycling, potential barriers, potential challenges.

1. Introduction

Active transportation, encompassing walking, cycling, and various non-motorized modes such as rickshaws, skateboards, and wheelchairs, serves both transportation and recreational purposes. (VTPI, 2010; gTKP, 2010). Diverse modes cater to different needs and communities, contributing to more efficient and equitable transportation networks. Within this system, walking and cycling stand out as the primary active transportation choices, with walking being an ancient mode of travel while cycling emerged roughly two centuries ago. Walking, the oldest form, is as old as the species, while cycling, the second, is only about 200 years old.

In most of the many large cities in South American and European regions, including Amsterdam, Santiago, Bolgoto and Copenhagen, cycling is known as one of the most popular ways to get to activities related to work. (Heywood, 2020).

A viable solution for developing clean urban transportation frequently includes promoting active transport for relatively short distances up to 7kms which includes a majority of trips in urban cities, active transport is a very attractive mode of transportation.

Researchers have observed a clear decline in active transportation from the end of the 20th century in most countries such as the USA, UK, European countries, etc. In the USA according to the National Transportation survey data which provides longitude data has shown that walking has fallen from approximately 9.3% in 1969 to only 8.6% of all recorded trips in 2001, although changes in survey methods suggest the earlier figure may be artificially low (Florida Department of Transportation and Center for Urban Transportation Research, 2006:4).

Especially in Sri Lanka cycling is not identified as a mode of transportation for commuters. Most of the middle-class families own their vehicles so they can move from one place to another easily with the availability of fuel in the country. Sri Lanka's transportation system depends heavily on automobiles. This indicates that access to other modes of transportation is generally limited and that land use patterns and transportation infrastructure primarily promote automobiles. Traffic congestion has become a huge problem in Sri Lanka. Mainly highly populated cities like Colombo, Kandy, and Gampaha are suffering from traffic congestion. In Colombo and other major cities, traffic congestion occurs during certain times of the day which are called speak periods or rush hours. The balance between the demand and the supply of road space is identified as the main two clear parameters which impact the creation of traffic congestion. (Amal , 2004).

1.1 Problem statement

Sri Lanka as a country used cycling as a mode of transportation for a very long time to fulfill their day-to-day life activities. Many benefits can be achieved by using cycling But with the development of motorization and urbanization, daily commuters have almost stopped using cycling, especially in urban areas. There could be some reasons for that.

As per Damunupola A.K.A (2021) challenges for cycling in Sri Lanka are categorized under 3 categories   Safety and Security, Infrastructure facilities, and Product and   Process-related issues. Fernando, D. (2022) has stated that the barriers are included poor city planning in urban areas and excessive regulations in the country, as well as many   people who are going to work, mostly   living away from their offices, so they could not   able to use active transportation to travel to their offices and they should have   an easy mode of transportation to report to work and also to   fulfil their other personal needs.

It indicates that there's an issue for Cycling. Those issues can be either barriers or challenges which   limit commuters from choosing Cycling as their mode of transport.

1.2 Research Questions

Primary research question,

What are the barriers   to cycling among daily commuters in Sri Lanka?

Secondary Question

What are the challenges for cycling among daily commuters in Sri Lanka?

What is the relationship of barriers and challenges with the usage of cycling in Sri Lanka?

1.3 Research Objectives

Primary Objectives

Identify the barriers   to cycling among daily commuters in Sri Lanka.

Secondary Objectives

Identify the challenges for cycling among daily commuters in Sri Lanka.

Identify the relationship of barriers and challenges with the usage of cycling.

This study is conducted in the scope of overviewing the real challenges that limit active transportation specially cycling from establishing   as a transportation mode in Sri Lanka. Other than that, this study overviews the infrastructure, social, cultural   , transport network and policy barriers towards active transportation in Sri   Lanka as a developing country. This study provides

a lot of accurate data and information for daily commuters, sellers and the government about issues in the current transport network in Sri Lanka to adapt to cycling.

1.4 Limitations of the Study

The study is only based in the Colombo District and the study area is limited to certain areas in Colombo District in order to carry out the study. The chosen geographical area to conduct the study is one of the main corridors to enter the Colombo Metropolitan area, the Galle Road corridor.

Due to the unavailability of enough resources, the study mainly focused on Cycling which is one of the two main modes of Active Transportation. Respondents who choose to conduct the study are people about 15 years old as they normally travel on their own, but it is better if the research also can focus on minors. Also, the research was mainly based on primary data where data was gathered by distributing a questionnaire among the 398 number sample population.

2. Literature Review

A trip involves moving from one place to another using various modes of transportation (Damsara, 2021). The selection of transportation methods plays a crucial role in transport planning. In the latter half of the 20th century and the early 21st century, there was a clear emphasis on prioritizing motorized transportation, particularly cars and two-wheelers, in both developed and developing countries.

R.A.M. Maduwanthi (2016) notes that 37.6% of the modal share in the Colombo metropolitan area is held by private vehicles, including cars, motorbikes, three-wheelers, and other modes. However, only 9.5% of the modal share consists of active transportation modes like walking and cycling.

Active transportation, particularly biking and walking, offers numerous advantages for individuals and communities. It leads to improved physical well-being due to increased physical activity (Rabel, 2011). Furthermore, there are various economic benefits associated with automobile use, such as reduced operating costs (fuel expenses), decreased roadway congestion, cost savings in parking, and improved road safety through fewer accidents resulting from reduced vehicle traffic (Gordon,2018).

2.1 Difference between barriers and Challenges

External variables are barriers because they slow down progress or keep someone from accomplishing their objectives. They can be physical

impediments, financial constraints, social or cultural standards, or legal or regulatory limitations. The person or organization affected by a barrier regards it as external and out of their control. (Baker., LeTendre, (2005)).

Contrarily, obstacles encountered when pursuing a goal are referred to as challenges since, they may be   overcome through work, innovation, or problem-solving. Problems are frequently seen as requiring initiative or action from the person or organization facing those (Ellis et al., (2018).

2.2 Barriers and Challenges for Cycling

Infrastructure Barriers:

Transportation options are shaped by urban design and planning, influenced by place-shaping land use practices and policies (Heath &G.W 2006). These practices and regulations modify the look and feel of places, impacting people's perceptions. Urban planning affects housing density, compactness, street interconnectivity, and the mix of land uses (Badland et al.,2008). Poor urban design can raise safety concerns, acting as a deterrent to using active transportation (Foster et al.,2014). The absence of bike lanes forces cyclists to share the road with cars, increasing safety risks (Tin et al., 2010). Research found that 88% of participants stated that bike lanes would significantly increase their likelihood of cycling.

Public Perception as a Barrier:

A person's need for acceptance from family and social groups increases with the size of their social network. The decision to use a bicycle for transportation may rely on these groups' perceptions. The belief that cycling is common and socially accepted is linked to increased bicycle use (Heinen et al.,2010). Research shows the importance of subjective norms in the decision to commute by bicycle (Bruijn et al, 2009; de Geus, 2008). Individuals are more likely to cycle if their coworkers do, and financial incentives provided by employers can also encourage bicycle use (Dill, 2007; Geus et al., 2008).

Environmental Factors as a Barrier:

Vehicle traffic causing delays, inconvenience, and limiting access to active modes is known as the "Barrier Effect" or "severance." This effect is linked to automobile traffic, while severance focuses on the impacts of new or wider highways. The design of roadways tends to facilitate car movement, impeding pedestrians who want to cross the street. This environment reduces pedestrian numbers, discouraging walking and promoting reliance on motorized transport (Levinson, 2021).

Safety as a barrier

The degree to which people value safety when using various types of transportation is known as safety priority (Moen & Rundmo, 2004). The decision to emphasize safety must be made concerning factors like the safest route, the use of safety gear, and cautious cycling conduct. The person must also think that their actions will lower the risk to which they are exposed. There hasn't been much research on bikers' risk tolerance and emphasis on safety. (Simsekoglu et al., 2015). Further, the individual has to believe that their behaviour will reduce the risk to which they are exposed. The number of studies on risk tolerance and safety priority among cyclists is to date limited (Simsekogl et al., 2015).

Air Pollution as a Challenge
In both high-income and low-income countries, exposure to motor vehicle traffic is a significant source of air pollution. Particulate matter, carbon monoxide, and nitrogen oxide are among the pollutants to which residents living 300 meters from busy roadways are more exposed. Because the transport industry is responsible for 25% of the world's carbon dioxide emissions, the majority of which come from road transportation, it also indirectly affects health through climate change pathways. The prevalence of asthma and wheezing, asthma exacerbations, paired lung function, cardiovascular mortality and morbidity, all-cause mortality, hospital admissions, and restricted physical activity are just a few of the health effects linked to exposure to air pollution, according to several meta-analyses and reviews. Lack of preventative measures and declining ambient air quality pose severe obstacles to the development of safe and healthy lifestyles (Chen. et al, 2019).

Education Aspect as a Challenge
The development of active transportation behaviours also involves education and training on a larger scale. As part of their regular schooling, Danish and German children receive in-depth instruction in safe and efficient cycling techniques. This includes both classroom and "on the road" lessons, first on a cycling training track specifically for kids and then on regular cycling facilities all over the city (Pucher et al. 2010). Training drivers to recognize and avoid endangering cyclists on the road is another crucial component of cycling safety. Even if they violate traffic laws, drivers in the Netherlands, Denmark, and Germany are nonetheless held liable for collisions with children and elderly bikers   (Pucher & Buehler, 2008).

Health Problems as a Challenge
Sedentary behavior, and too much sitting, as distinct from too little physical activity—have emerged as a new concern for chronic disease prevention and are associated with increased risk of type 2 diabetes, cardiovascular disease, and all-cause mortality. Working adults in urban areas sit for approximately 10 hours or more per day, which increases health risks   , Prolonged periods of sitting

include time spent in cars and can be associated with increased cardiovascular disease risk and poorer mental health which act as a challenge which limits people from choosing cycling (Corti et al., (2016).

 Costs related to cycles as a Challenge
Affordability (Initial costs, repairing costs), Age, Ability, Support for mechanics and availability are some challenges for cycling which limit people from choosing cycles in Lagos. These challenges are identified through a survey done for the commuters in Lagos (Mogaji, 2022).

For those who choose to cycle, affordability is an issue that becomes important to them. Many commuters shared their concerns about the cost of buying a good bicycle and repairing the costs of bicycles that can be used for commuting. Also, there is an issue with the prices of safety gear to protect themselves when cycling. People always look for cycles which are durable to ride to work and they do not come in cheap prices. Even though most commuters show their interest but are not aware of their financial commitments to purchase a bike (Mogaji. 2022).

2.3 Theoretical Background

The share of nonmotorized trips by utilizing data from various sources at a more detailed spatial level. They examined correlations between socioeconomic, environmental, and infrastructural factors and the proportion of nonmotorized commuting at the census block group level. Key socioeconomic factors affecting travel demand were identified as age (specifically the percentage of the population under 25 years old), student population (percentage of students in grades above fifth grade), and income (median household income). Environmental factors included travel time (mean population travel time) and neighbourhood land use patterns, encompassing population density, employment density, and neighbourhood diversity (Meiwu & Mei, 2007).

The case study of a Regional trail and Transit corridor at Uttah (Garcia &Khan, 2008), it is discusses the relationship between the usage of active transportation with a regional bike and pedestrian trail and the perception of safety. Based on community surveys results have found residents see barriers to active transportation as feeling unsafe, hard to access on foot or bike, hard to follow or insufficient wayfinding, limited parking, and availability of bathrooms, water fountains, and trash cans. The improvements that they have suggested are improvements for accessibility. landscape improvements and safety improvements like the availability of lighting in trails.

The methodology revealed that pedestrian streets with green spaces and better access, creating a quieter and less polluted environment, were preferred and encouraged walking habits more than traditional factors like distance and time.

To promote healthier communities, street design and pedestrian paths were found crucial. Surprisingly, safety was not a high priority, indicating that factors like traffic volume or parking availability did not significantly impact the choice of these pedestrian-friendly routes for business or school travel   (Lopez et al., 2021).

According to the model, all four factors are described as   follows   Lopez. et al.,2020):

- Attractiveness: green areas, public transport facilities, pedestrian-friendly streets, furniture, public spaces, amenities, and tourist attractions
- Comfort: shade, noise, building heights, trees, and street width
- Safety: fence, traffic intensity, vehicle parking, and traffic management
- Accessibility: slope, obstacles, pavement width, and intersection distance

These factors can be identified as the factors that influence people to choose a route to use cycles. So, roads that   deviate from those can be recognized as barriers.

Hypothesis Developed

To develop the hypothesis, variables described in the conceptual framework in the 3rd chapter are used   to review the literature and theoretical background. Only the positive hypotheses are considered in this study.

- Potential barriers impact the cycling among daily commuters – H_1
- Potential Challenges impact cycling among daily commuters – H_2

3. Methodology

Independent Variables   **Dependent Variable**

Potential Barriers
-Infrastructure barriers (BI)
-Safety barriers (BS)
-Environment factors (BE)

Challenges
- Costs related to cycles (CC)
- Air Pollution (CP)
- Health problems(CH)
- Educational aspects (CE)

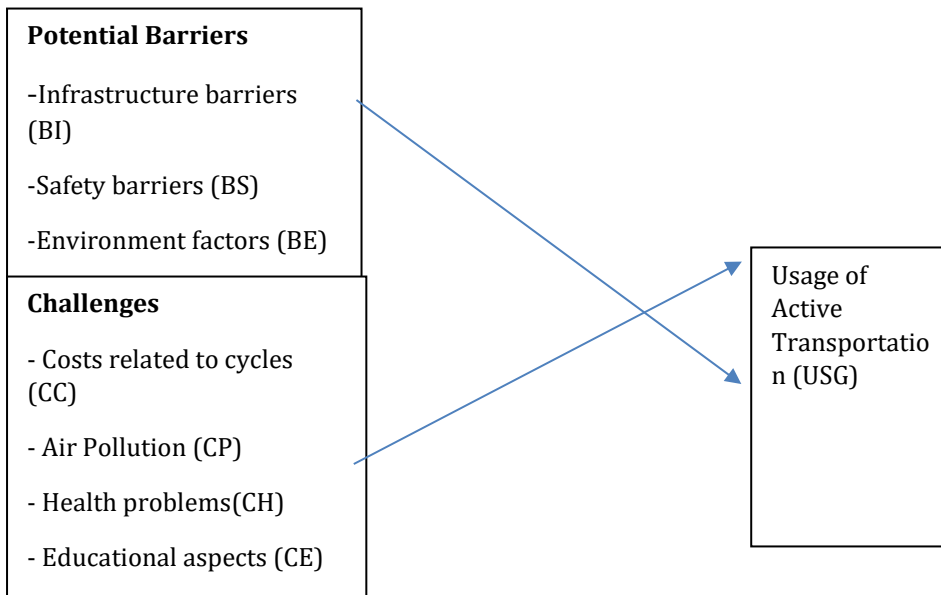| Usage of Active Transportation (USG) |
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Figure 1: Conceptual Framework

The developed conceptual framework is based on a review of the literature. Independent variables are chosen from previously developed models, case studies, and literature by other comparable studies conducted by various authors over the years.

The developed conceptual framework is based on a review of the literature. Independent variables are chosen from previously developed models, case studies, and literature by other comparable studies conducted by various authors over the years. Infrastructure barriers are the barriers in the current transport network regarding the infrastructure which limit cycling in urban areas. It is measured under three categories and uses a mix, Presence of cycling lanes, and limited parking.

Safety barriers are the perceptions of safety among daily commuters. The 3 selected safety barriers in this study are Feeling unsafe, insufficient way finding, and Traffic Safety. Traffic safety in the sense is the accidents that can be faced by cyclists due to the high amount of traffic.

Environment Barriers are measured by Travel distance and Congestion-based delay. Travel distance is the distance that a commuter should travel from their residences to their final destination (offices, universities, and others). Congestion-based delays are the delays faced by commuters in peak hours due to high traffic volume.

Public Perception indicates the perceptions of individuals and society regarding cycling. There is a thing in a society where only low-income people are the ones who ride cycles and people who do white-collar jobs try to use their vehicles to maintain their statuses .

There are four Potential Challenges.

With the current economic situation, the prices of cycles have risen and the cost of repairing is high now. Also when people cycle on main roads they have to use safety gear and they also cost high. So, it can be a challenge for commuters to choose cycling.

Air Pollution also acts as a challenge for cycling, especially cyclists who are exposed to the environment. There are 3 indicators for measuring Air Pollution. They are Polluted misted air, diseases related to air pollution and Fumes by motorized vehicles.

Educational aspects are in the sense the knowledge about cycling at its safety among people in the society. School curriculums, Training for people about practices and benefits and educating vehicle drivers about the safety of cyclists are indicators of it.

Health Problems also act as a main challenge for cycling as discussed in the literature review. Age and poor Health conditions like obesity and cardiovascular diseases are used to measure this challenge.

The Dependent variable is also measured by using three indicators.

● Frequency of using cycling

● Likelihood of using cycling in future

● Recommending cycling to the people they know

As the study area to conduct the study to find out barriers and challenges for active transportation in Sri Lanka, the Galle Road corridor was selected (Appendix 1). In Galle road, the area from Moratuwa to Colombo Fort has been selected for further studies as the trial route to conduct the above-mentioned study. When selecting the study area, the land use pattern was considered. The targeted population of this study is the daily commuters who travel daily to fulfil their work, education, and recreational purposes in the Colombo district.

In this study, the confidence level is 95% and, a margin error is 5%. the sample size has been chosen using convenient sampling. The population who travel daily to Colombo by using the Gall

e road corridor is unknown. These data were collected using convenient sampling. It is a non-probability sampling method where units are selected for inclusion in the sample because they are the easiest for the researcher to access. This can be due to geographical proximity, availability at a given time, or willingness to participate in the research. To collect data a questionnaire has been among the population throughout the study period. The questionnaire consists of 3 categories.

Respondents were selected randomly, on the basis that each passenger knows about active transportation . Data were collected from 389 respondents. This research is conducted with a quantitative approach and it's a cross-sectional research. This study employs a deductive method of inquiry, one of the most commonly associated methods when doing scientific research where it involves hypotheses and theories and then testing them through emphatically observations and data analysis.

Barriers and Challenges for the usage of active transportation are evaluated by using the SPSS statistics package. Descriptive statistics are then applied to analyze answers to the questions on the identified barriers and challenges (mean, median, standard deviation, and frequency). To do the analyses, the variables relating to the identified barriers will be recorded in 5 categories. After those inferential statistics is used to do further analysis.

4. Results and Discussion

4.1 Results

Table 1: Validity

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.851
Bartlett's Test of Sphericity	Approx. Chi-Square	1117.142
	Df	36
	Sig.	.000

Source: Research Data

The KMO (Kaiser-Meyer-Olkin) test is a measure of sampling adequacy used in factor analysis to determine if the data set is valid and suitable for factor analysis. Bartlett's test of sphericity, on the other hand, is a test of whether the correlation matrix between variables is significantly different from an identity matrix. The KMO test outputs a value between 0 and 1. Values closer to 1 indicate that the data set is highly valid for factor analysis, in the table KMOL value is close to 1, It is 0.851, It shows the data is highly valid and suitable for the factor analysis.

The significance value of the table which is also known as P value of Barlett's test is came as 0.000. From the results, it can be identified that the above value is lesser than the const and significance value of 0.05. It can be indicated that the validity and suitability of the responses collected to a study has being addressed through the study.

Table 2: Reliability

Variable	Cronbatch's Alpha		N items
Infrastructure Barriers	0.639		3
Safety Barriers	0.676		3
Environmental barriers	0.598		3
Public Perception	0.621		3
Costs related to cycles	0.632		3
Air Pollution	0.765		3
Health Problems	0.741		3
Educational aspects	0.721		3
Usage of Active Transportation	0.748		3

Source: Research Data

When analyzing Cronbach's alpha values, Air Pollution, Health Problems , Educational aspects and Usage of Active Transportation (Dependent variable) have values more than 0.7. it has higher internal consistency and in high acceptance level. Values for Infrastructure barriers, Safety barriers, Public

perceptions and Costs are over 0.6, so those are also at an acceptable level. The Environmental barriers have a value of 0.598, even though it is less than 0.6, it is closer to that value. So it can be interpreted that this value can be accepted.

Since all the variables have values very close to 0.7, each of these eight (8) elements has an adequate value in terms of internal consistency, accuracy, and reliability.

Table 3: Correlation Analysis

		Usage of Active Transportation
Infrastructure Barriers	Pearson Correlation	-.395**
	Sig. (2-tailed)	0.000
	N	389
Safety Barriers	Pearson Correlation	-.448**
	Sig. (2-tailed)	0.000
	N	385
Environmental barriers	Pearson Correlation	-.301**
	Sig. (2-tailed)	0.000
	N	387
Public Perception	Pearson Correlation	.330**
	Sig. (2-tailed)	0.000
	N	389
Costs related to cycles	Pearson Correlation	-.426**
	Sig. (2-tailed)	0.000
	N	389
Air Pollution	Pearson Correlation	-.441**
	Sig. (2-tailed)	0.000

	N	389
Educational aspects	Pearson Correlation	-.408**
	Sig. (2-tailed)	0.000
	N	389
Health problems	Pearson Correlation	-0.006
	Sig. (2-tailed)	0.902
	N	389
**. Correlation is significant at the 0.01 level (2-tailed).		

Source: Research Data

The table displays the correlations between independent variables and the dependent variable "Usage of Active Transportation" in Sri Lanka.   Except Public Perception, all independent variables exhibit negative correlations with the dependent variable, indicating a decrease in active transportation usage. The strongest factor reducing active transportation is Safety barriers (-0.448), while Public Perception shows a slight positive relationship. However, the impact of Public Perception on increasing active transportation usage is uncertain. Health Problems are found to be insignificant and cannot be considered an independent variable affecting active transportation usage   .

Table 4- Coefficient Table

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.755	0.249		3.032	0.003
	Infrastructure barriers	-0.185	0.048	-0.196	3.843	0
	Safety barriers	-0.242	0.051	0.235	-4.703	0

		-0.006	0.049	-0.006	-0.13	0.009
	Environment barriers					
	Costs related to cycles	-0.077	0.059	-0.077	-1.312	0.019
	Air Pollution	-0.262	0.061	0.238	-4.307	0
	Educational aspects	-0.171	0.057	0.164	-2.989	0.003
a Dependent Variable: Usage of Active Transportation						

Source: Research Data

All the probabilities of the above discussed six independent variables are highly significant with negative beta values. This shows that those independent variables influence negatively the usage of Active Transportation which means they reduce the usage of Active Transportation. Only one independent variable has positive Beta value (Public Perception independent variable does not influence individually but can be influenced jointly.

Concerning the regression analysis and coefficient value, the study developed a function with their respective beta values. The function is illustrated as follows,

Usage of Cycling = 0.755 + (-0.185) Infrastructure barriers + (-0.242) Safety barriers + (-0.006) Environmental Barriers + (0.008) Public Perception + (-0.077) Costs related to cycles + (-0. 2620)Air Pollution + (-0.171) Educational Aspects +ε

In the   above-mentioned equation, the Beta values of each independent variable shows the one-unit change of the independent variables will have an impact on the dependent variable, the Usage of Active Transportation.

Table 6: One Sample   T-Test (Testing Hypothesis)

One-Sample Test						
	Test Value = 0					
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Infrastructure Barriers	100.88	388	0	3.90488	3.8288	3.981
Safety barriers	92.909	388	0	3.81662	3.7359	3.8974
Environment barriers	118.547	388	0	4.04861	3.9815	4.1158
Public Perception	109.577	388	0	3.46392	3.4018	3.5261
Costs related to cycles	96.897	388	0	3.73265	3.6569	3.8084
Air Pollution	93.588	388	0	3.65467	3.5779	3.7314
Educational Aspects	112.719	388	0	3.99572	3.926	4.0654
Health Problems	101.54	388	0	3.77806	3.7049	3.8512
Usage of Active Transportation	63.211	388	0	2.98029	2.8876	3.073

Source: Research Data

From the above sample test table, it can be shown that all significance values of independent variables are equal to 0.00. It means that they are less than the chosen level of significance 0.05. It indicates that the null hypothesis related to the independent variables can be   rejected and also can be concluded that the sample mean is significantly different from the hypothesized population mean.

From the above interpretations following null   hypotheses can be rejected.

- Potential barriers do not impact the usage of Active Transportation – H1,0
- Potential Challenges Factors do not impact the usage of Active Transportation – H3,0

4.2 Discussion
Although many researchers have concluded that barriers to transportation, few studies have investigated this relationship about cycling. And there are some

studies which have shown either challenges or barriers to cycling. The results of this study showed both the potential barriers and challenges for cycling in the Sri Lankan context. As expected, the study has found relationships with potential barriers and challenges with cycling. Some studies have shown that A person's need for acceptance from family and social groups grows with their network size. The decision to cycle as transportation can be influenced by these groups' views. (Xing et al., 2010). Subjective norms play a significant role in the decision to commute by bike. Coworkers' cycling behaviour and employer-provided financial incentives also impact bike usage. (Dill & Voros, 2007). Even in this study, it has been identified that the Income level of the people also impacts to the active transportation as a barrier , specially people with higher income levels who tend to use their private vehicles. Perception of colleagues towards using cycling and Personal statuses which people are likely to maintain also affect the usage of active transportation.

Infrastructure barriers impact cycling in 3 different ways according to the study. Land Use mix in Colombo City especially the enough space in the city, Housing density, compactness, street interconnectivity, and the degree of land use mix are all influences to do active transportation (Badland et al.,2008). Present of cycle lanes on the road and Limited Parking for cycles in the Colombo metropolitan area affect to choice of cycling. Due to the lack of bike lanes on the roadways, cyclists must share the same area with cars, and the absence of separation increases the risk to their safety. In a research conducted by Tin et al. (2010), 88% of participants stated that the presence of bike lanes would significantly increase their likelihood of cycling.

As the Environment barriers, distance from households to Colombo city and delays caused by high traffic conditions impact cycling. Based on a survey of Austin, Texas citizens, residents frequently drive to stores nearby since crowded roads make it hard to take a walk there. (Susan et al., 2001).

According to Mogaji, 2022), commuters in Lagos worry about the costs related to cycles and costs related to of buying a good new bicycle and repairing costs of bicycles that can be used for commuting. Also, there is an issue with the prices of safety gear to protect themselves when cycling. By conducting the study, it has been identified that this also affects to the Sri Lanka more than other challenges as this is a 3rd world country and the economic changes are so high. With the current economy of the country all of these prices are getting higher, so it directly affects people who have to spend more just for cycles from their income.

There are so many down loops in educating people about the usage of cycling in the current system in Sri Lanka. There aren't any programs for educating people about cycling practices and benefits , Also, in the school curriculum there isn't any extensive training about safe and effective cycle techniques. In

Danish school, syllabuses are included with lessons in class as well as training on roads. They first put   kids cycling training   tracks specifically made for children and then on regular cycling facilities all over the city (Pucher et al. 2010). Drivers should be educated about the safety of pedestrian users   and cyclists. Because of these things, educational aspects also   affect the usage of active transportation. Even if they violate traffic laws, drivers in   Germany, the Netherlands and Denmark are nonetheless held liable for accidents with children and adult bikers. (Pucher & Buehler., 2008).

When talking about Air Pollution, misted and unclear polluted air, diseases which can   be caused by exposure to air pollution and exhaust fumes by motorized vehicles make people think   of using cycling as when using a cycle, commuters are always exposed to those things. When air quality declined, bicyclists were inclined to keep cycling if they felt more comfortable and safer. Fewer individuals commute by bicycle, Policies aimed at encouraging a pleasant atmosphere for riding should be paired with the substantial investments made to improve bicycle infrastructure, as they are likely to be replaced by. (Zhao et al.,2018)

Chen. et al. (2016) show that Chinese adults throughout the past twenty years, have been associated with an ongoing decrease in physical activity and a rise in poor diet, both of which boost the risk of developing these illnesses. Even though some studies have shown health problems as a challenge to active transportation, this study has shown that it doesn't directly imply the Sri Lankan context.

5. Conclusion

Three out of the four potential barriers, excluding public perception, display a negative correlation with the usage of cycling in Sri Lanka, indicating that these variables diminish the utilization of cycling. Similarly, all three identified potential challenges show inverse relationships with cycling, suggesting a reduction in usage.

Future research would benefit from exploring other forms of active transportation, not solely focusing on cycling. This study was based in a segment of the Colombo district, and it would be advantageous for future research to encompass other districts in Sri Lanka, providing a comprehensive national context. It would be beneficial for these studies to concentrate on understanding the impact of potential barriers and challenges in active transportation, along with studies highlighting the benefits associated with it.

The study presents recommendations to promote cycling in Sri Lanka, as well as suggestions for conducting future research in this field. Geographical limitations and some demographic constraints were identified as limitations of this study.

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