Final Report
Research Grant 2018

ATRANS
ASIAN TRANSPORTATION RESEARCH SOCIETY

Understanding Cyclists' Perceptions on Riding Intentions and Behaviors: A Key Success of Cycling Promotion

Waiphot Kulachai
Chinda Klabklay
Patipol Homyamyen

Understanding Cyclists' Perceptions on Riding Intentions and Behaviors: A Key Success of Cycling Promotion

ASIAN TRANSPORTATION RESEARCH SOCIETY

902/1 9th Floor, Glas Haus Building, Soi Sukhumvit 25 (Daeng Prasert),
Sukhumvit Road, Klongtoey-Nua, Wattana, Bangkok 10110, Thailand
Tel. (66) 02-661-6248 FAX (66) 02-661-6249
http://www.atransociety.com

List of Members

• Project Leader •

Asst. Prof. Pol.Lt.Col. Waiphot Kulachai, Ph.D.
Burapha University

• Project Members •

Pol.Col.Chinda Klabklay
Royal Thai Police

Patipol Homyamyen
Rajamangala University of Technology Suvarnabhumi

• Advisors

Tuenjai Fukuda, Ph.D.
Nihon University

Chamroon Tangpaisalkit
Asian Transportation Research Society (ATRANS)

Asst. Prof. Surames Piriyawat, Ph.D.
Burapha University

Table of Contents

Lists of Figures

Page

List of Tables

Page

List of Abbreviations and Acronyms

AWARE	**Awareness**
BMA	**Bangkok Metropolitan Administration**
BMTA	**Bangkok Mass Transit Authority**
CBEHA1	**Going to see a doctor**
CBEHA2	**Shopping**
CBEHA3	**Socialization**
CBEHA4	**Sports and exercise**
CBEHA5	**Work/university**
INFRA	**Infrastructure**
IOC	**Item-objective Congruence**
LIFES	**Lifestyle**
OTP	**Office of Transport and Traffic Policy and Planning**
PRESTO	**Promoting Cycling for Everyone as a Daily Transport Mode**
SAFCOM	**Safety and comfort**
SELFE	**Self-efficacy**
SNORM	**Subjective norm**
TPB	**Theory of Planned Behavior**
WEATH	**Weather**
WHO	**World Health Organization**

CHAPTER I INTRODUCTION

1.1 Introduction

In Thailand, people mostly depend on private transportation rather than the poor public transportation. The Department of Land Transport (2017) reported that the number of vehicles registered according to the Vehicle Act B.E. 2522 has increased by 45.28% during the last ten years. In 2008, there were only 25.51 million units including cars, pick-up, and motorcycles. However, the number had increased to be 37.06 million units by the end of 2017. The number of public transport users, on the other hand, had been decreasing during 2012-2016 (The Department of Land Transport, 2017). The users of the Bangkok Mass Transit Authority (BMTA) had fallen by 10.66% from 355.13 million in 2012 to 317.28 million in 2016. According to the customers of The Transport Company Limited had decreased by 27.89% from 10.11 million in 2012 to 7.29 million in 2016. Similarly, the number of people using train had decreased by 26.84% during the same period. These statistics indicate that many people have shifted from public bus and train to other modes of transportation. For instance, some of them have shifted to underground since the number of underground's passengers had increased by 28.10% during 2012-2016. The others may change their travel behavior by using private cars.

Increasing of private car usage can lead to many problems, such as, climate change, air pollution, peak oil, energy supply, road safety, and noise pollution (Insall, 2013). Phala and Bejrananda (2016) also mentioned that increasing of private car can cause traffic congestion and air pollution in a city. A report by the World Health Organization (2000) claimed that the impact of transportation on health and pollution are increasingly recognized. The air pollution could lead to respiratory and cardiovascular diseases. The transportation also causes mental health and wellbeing of people. Lead generated from vehicle result in cognition development among young children. Severe road traffic accidents also cause posttraumatic stress. The traffic can cause aggression, nervousness, reduced social life, and constraint on child development (WHO, 2000).

Cycling is another alternative mode of transportation for people to access to their desired destinations since it has some benefits. For example, it is an easy and accessible way to support physical activity (Insall, 2013). According to the study of Phala and Bejrananda (2016), people use bicycle because their destinations are not so far, and it is beneficial for their health. The WHO (2000) indicated that walking

and cycling could benefit people health in many aspects. For instances, a 50% reduction of heart disease; a 50% reduction of adult diabetes; a 50% reduction in the risk of becoming obese; a 30% reduction in the risk of developing hypertension; a 10/8-mmHg decline in blood pressure in people with hypertension (a similar effect to drugs); reduced osteoporosis; relief of symptoms of depression and anxiety; and prevention of falls in the elderly. However, there are some obstructions for many people not to use bicycle; weather, improper bicycle network, traffic congestion, safety, and time consuming (Phala & Bejrananda, 2016). The WHO (2000) also mentioned the most drawback of cycling and walking which is accident associated with cars.

Even cycling provides great benefits not only for physical health but also for the environment, the number of cyclists still very small. According to Denmark and the Netherlands, the numbers of trips made by cycling were about 18% and 27% respectively. However, there was only 1-4% in the Mediterranean countries. In Thailand, there is no clear comprehensive about the trips made by cyclists. However, the OTP (2014) reported that 30% of commuters used bicycles in Bangkok. This number is higher than the trips reported during 1990-1997 accounting for 18% of trips (ASEAN German Technical Cooperation, 2016).

The Thai Health Promotion Foundation (2015) reported that the number of cyclists in Thailand have been increased drastically to more than 100%. This resulted from health campaigns focusing on young people. The collaboration between the Thai Health Promotion Foundation and the Thai Cycling Club to promote cycling in the country is one of the major factors leading to the widespread use of bicycle. These two organizations encouraged the cabinet to support their idea. The cabinet then agreed with the proposal and the prime minister ordered related public organizations to bring the policy of cycling promotion for implementation. The Ministry of Tourism and Sports initially provided the budget for 43 provinces to build bicycle lane and to provide more budget for the rest 34 provinces. For Bangkok Metropolitan Administration (BMA), some bicycle lanes were built under the "minor road route" and "canal route." The Ministry of Tourism and Sports continuously placed importance on cycling tourism. This resulted in the increased number of tourists travelling by using bicycle. It was estimated that the number of cyclists will be increased to 320,000 people in 2015. Yet, the number had increased more than the expectation accounting for 400,000 people. Furthermore, the Ministry of Tourism and Sports expected that the number of foreign tourists from Asia and AEC will be increased by 30%. This could boost the tourism revenue around 1,400 million Baht for the country (Thairath, 2016). "Bike for Mom" scheme is the most

important event resulting in an increase of a great number of cyclists. This event was organized throughout the country and more than 136,000 people joined the event (Thairath, 2015).

Bangsaen is a city located in Chonburi and by the well-known Bangsaen beach. In 2015, the numbers of tourists visiting Bangsaen were around 1.89 million. Approximaely 94.40% were domestic tourists and only 4.60% were foreign visitors (Sanensuk City Municipality, 2015a). This city is under the jurisdiction of Sanensuk City Municipality covering 20.26 square kilometers. Two routes of bicycle lanes, Longhard Bangsaen, and Leab Chaihard Bangsaen road, have been provided to facilitate cyclists (Sanensuk City Municipality, 2015b). This city organized several cycling events including "Tour of Bangsaen" which attracted more than 4,000 cyclists (Channel3, 2017). To promote tourism in this area, cycling is an alternative for tourists to enjoy nice beach and pleasant atmosphere.

As mentioned that promotion of cycling is important for Thailand to reduce air pollution and energy supply. Prior to making policy on this matter, understanding the cyclists' perception is required. Previous studies indicated various factors influencing the cycling behaviors. Certain studies found convenience as an influential motivator (Betz et al., 1993; Stinson & Bhat, 2004; Dill & Voros, 2007; Wardman et al., 2007; Pucher & Buehler, 2008a; Pucher & Buehler, 2008b; Akar & Clifton, 2009; Koorey et al., 2009; Fernández-Heredia, Monzón, & Jara-Díaz, 2014; Barberan, Silva, & Monzon, 2017). However, some studies indicated that convenience is a deterrent factor (Antonakos, 1994; Hopkinson & Wardman, 1996; Stinson & Bhat, 2003; Stinson & Bhat, 2004; Gatersleben & Appleton, 2007; Dill & Voros, 2007).

Certain studies found safety issue could be either motivator factor (Antonakos, 1994; Stinson & Bhat, 2003; Stinson & Bhat, 2004; Hunt & Abraham, 2007; Gatersleben & Appleton, 2007; Dill & Voros, 2007; Parkin et al., 2008; Pucher & Buehler, 2008a; Pucher & Buehler, 2008b; Akar & Clifton, 2009; Kingham et al., 2011; Winsters et al., 2011; Andrade & Kagaya, 2013) or deterrent factor (Stinson & Bhat, 2003; Stinson & Bhat, 2004; Gatersleben & Appleton, 2007; Hunt & Abraham, 2007; Dill & Voros, 2007; Pucher & Buehler, 2008b; Akar & Clifton, 2009: Barberan, Silva, & Monzon, 2017). Andrade and Kagaya (2013) found that lifestyle characteristics are directly related to the propensity to cycle since cyclists believe that cycling is suitable for their lifestyles (Barberan, Silva, & Monzon, 2017). Awareness about the environment and the society is also important. Some people decide to use bicycle since they would like to do something good for society and

nature (McCarthy, 2011). Subjective norm or approval from friends, family members, and colleagues is an influential factor. Social dis approval could lead to decrease the likelihood to ward cycling (Barberan, Silva, & Monzon, 2017). Self-efficacy was considered as deterrent factor according to Barberan, Silva, and Monzon (2017). They indicated that perceiving personal limitations to ride results in the likelihood of not using bicycle. Several previous studies also found positive relationship between self-efficacy and intention to use bicycle (Lois, Moriano, & Rondinella, 2015). Bad weather could be a barrier for people not to use bicycle (Mayes et al., 1996; Nankervis, 1999; Nagendra & Khare, 2003; Dill & Voros, 2007; Van Bekkum, 2011). The study conducted by Freitas and Maciel (2017) also confirmed that riding in adverse weather is the major limitation deterring people to use bicycle. Byrnes, Miller, and Williams (1999) added that adverse weather is more challenge for women than men since they are more concerned on their hair and make-up. Finally, infrastructure of the cycle ways is another important factor attracting people to use bicycle (Dill & Carr, 2003; Stinson & Bhat, 2004; Gatersleben & Appleton, 2007; Dill & Voros, 2007; Handy, Xing, & Buehler, 2010; Pucher, Dill, & Handy, 2010). However, the gradient of the cycle ways is the deterrent factor according to certain studies (Hunt & Abraham, 2007; Gatersleben & Appleton, 2007; Dill & Voros, 2007).

According to the review of some literature, the authors are interested in examining factors influencing cycling behaviors among people in Bangsaen, Chonburi. Suggestions and recommendations for policy makers will also be discussed in this study.

1.2 Research Questions

1. What is the prevalence of cycling among people in Bangsaen?
2. What factors influencing cycling behaviors among people in Bangsaen?
3. What are appropriate suggestions and recommendations for policy makers?

1.3 Research Objectives

The objectives of this study are as followings:

1. To examine the prevalence of cycling among people in Bangsaen.
2. To examine factors influencing cycling behaviors of people in Bangsaen.
3. To provide suggestions and recommendations for policy makers.

1.4 Operational Terminology

Safety and comfort refers to an individual perception on riding bicycle if it is with high risk of accident or polluted air. This term is also involved an individual' feeling of comfort such as sweaty and stress while riding. A nuisance to pedestrian is also included in this terminology.

Lifestyle is defined as a way or thing that an individual or a group of people usually do. Cycling-related lifestyle in this study focuses mainly on enjoyment and relaxation of riding bicycle. This means that an individual decides to cycle since he enjoys riding. In addition, riding bicycle can provide him more relaxation.

Awareness refers to knowledge that something exists, or understanding of a situation or subject at the present time based on information or experience. This includes understanding that cycling would pollute the environment less, and cycling is good for getting physical exercise.

Subjective norm is the judgment that people make about what an individual should do and his motivation to agree with them, usually parents, friends, co-workers, and classmates. The decision to perform cycling of an individual is influenced by the opinion of these groups.

Self-efficacy refers to self-efficacy in cycling means an individual perception on his capability to perform riding bicycle. This is associated with the capabilities of the individual to going up hills, to perform maneuvers, to fix the bicycle, to ride through traffic, and to plan the route of cycling.

Weather refers to the climate in Bangsaen perceived by the respondents whether it is good for cycling. The weather in this study includes hot, rainy, and cold climate that may affect the decision to use or not use bicycle.

Infrastructure refers to the perception of the respondents toward cycling facilities provided by a local municipality. This includes provision of bicycle lanes, cycling facilities, well-designed bicycle lanes, and the standards and safety of bicycle lanes.

Cycling behaviors refers to a decision of an individual to use or not use bicycle for a specific purposes such as going to see a doctor, shopping, socialization, sports and exercise, and going for work or study.

CHAPTER 2 LITERATURE REVIEW

2.1 Theory of Planned Behavior (TPB)

Ajzen (1991) claimed that the theory of planned behavior (TPB) is an extension of the theory of reasoned action initiated by Ajzen and Fishbein in 1980. This theory stated that one's behavior is influenced by his/her intention. The most likely the stronger intention, the more likely the behavior he/she will perform.

The theory also explained that the perceived behavioral control can be used directly to predict the behavioral intentional and behavioral achievement. The perceived behavioral control has similar meaning with self-efficacy of Bandura (1982). He defined the term as "is concerned with judgments of how well one can execute courses of action required to deal with prospective situations." Hence, it can be concluded that people's behavior is strongly influenced by their confidence in their ability to perform such behaviors.

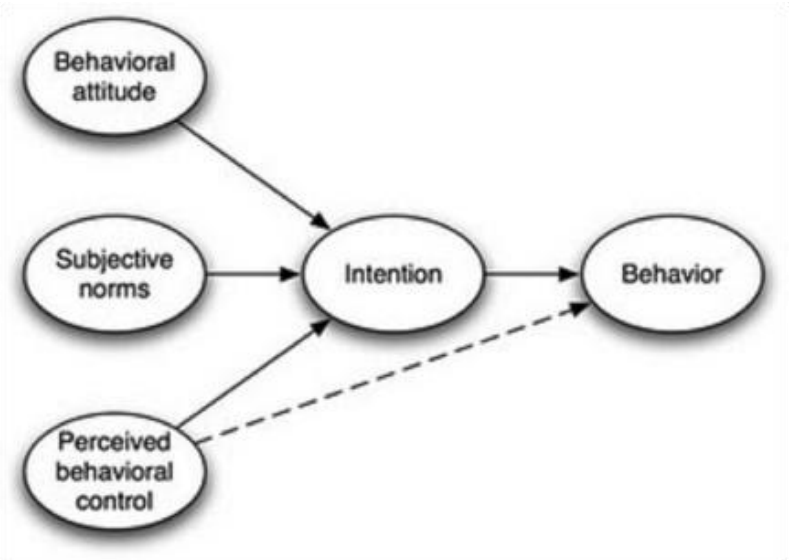

Figure 1 Structure diagram of TPB

Source: Ajzen (1991)

The theory of planned behavior also explained three antecedents of intention which are attitudes toward behaviors, subjective norm, and perceived behavioral control. The attitude toward behavior means the degree to which an individual has a favorable or unfavorable evaluation or appraisal of the behavior in question. Subjective norm which is a social factor can be defined as a perceived social pressure for an individual to perform or not to perform the behavior. The perceived behavioral control refers to the perceived ease or difficulty of performing the

behavior and it is assumed to reflect past experience of an individual. Hence, the stronger the attitude toward behavior, subjective norm, and perceived behavioral control, the stronger intention an individual will perform a behavior. For ease understanding, the structural diagram of this theory is depicted in Figure 1.

2.2 Safety and Comfort and Cycling Behaviors

Certain studies found safety issue could be a motivator factor (Antonakos, 1994; Stinson & Bhat, 2003; Stinson & Bhat, 2004; Hunt & Abraham, 2007; Gatersleben & Appleton, 2007; Dill & Voros, 2007; Parkin et al., 2008; Pucher & Buehler, 2008a; Pucher & Buehler, 2008b; Akar & Clifton, 2009; Kingham et al., 2011; Winsters et al., 2011; Andrade & Kagaya, 2013). Safety education was among the safety motivator attracting one to use or not use bicycle (Antonakos, 1994; Stinson & Bhat, 2004; Gatersleben & Appleton, 2007; Pucher & Buehler, 2008a; Pucher & Buehler, 2008b; Akar & Clifton, 2009). Some studies found low traffic volume as another safety perspective resulting in motivation to use bicycle (Antonakos, 1994; Stinson & Bhat, 2003; Dill & Voros, 2007; Parkin et al., 2008; Winsters et al., 2011). In addition, Akar and Clifton (2009) considered the presence of safety cameras as a motivation factor of using bicycle since people will perceive more safety if the cameras are installed along the cycle ways. Low traffic speed makes people to feel safe while cycling. This is supported by certain studies (Antonakos, 1994; Dill & Voros, 2007). The studies in the USA (Akar & Clifton, 2009) and Canada (Winsters et al., 2011) suggested that better lighting is also a safety issue perceived by cyclists. Higher population density makes people to feel unsafe while cycling. This is supported by the finding of the research conducted in Canada (Hunt & Abraham, 2007). Good land-use mix plays an important role in motivating people to use bicycle as suggested by some previous studies (Stinson & Bhat, 2004; Hunt & Abraham, 2007; Dill & Voros, 2007; Pucher & Buehler, 2008b; Akar & Clifton, 2009). According to the study conducted by Stinson and Bhat (2004), shorter commuting distances are important for cyclists' safety.

However, some studies focus on safety as a deterrent factor (Stinson & Bhat, 2003; Stinson & Bhat, 2004; Gatersleben & Appleton, 2007; Hunt & Abraham, 2007; Dill & Voros, 2007; Pucher & Buehler, 2008b; Akar & Clifton, 2009: Barberan, Silva, & Monzon, 2017). The studies conducted in some countries in Europe (Pucher & Buehler, 2008b) and the USA (Stinson & Bhat, 2004; Akar & Clifton, 2009) stated that dangerous traffic condition is the deterrent factor of using bicycle. Stinson and Bhat (2004) also found that lack of daylight deters people to cycling as well as the percentage of heavy traffic (Stinson & Bhat, 2003; Gatersleben & Appleton, 2007).

Street with auto parking and number of difficult intersections are also deterrent factors toward cycling (Stinson & Bhat, 2003).

Comfort or convenience also plays important role motivating people to use bicycle. The convenience includes secure parking at work (Stinson & Bhat, 2004; Dill & Voros, 2007; Wardman et al., 2007; Pucher & Buehler, 2008a; Pucher & Buehler, 2008b; Koorey et al., 2009), availability of rental bikes (Pucher & Buehler, 2008b), detailed hardcopy maps (Pucher & Buehler, 2008a; Pucher & Buehler, 2008b; Akar & Clifton, 2009), presence of shower and locker at workplace (Stinson & Bhat, 2004; Dill & Voros, 2007; Wardman et al., 2007; Koorey et al., 2009), providing internet route (Pucher & Buehler, 2008a; Pucher & Buehler, 2008b), and promotional program and financial incentives (Wardman et al., 2007; Pucher & Buehler, 2008a; Pucher & Buehler, 2008b). Hence, the first hypothesis was proposed as follow;

H1: Safety and comfort has a positive influence on cycling behaviors.

2.3 Lifestyle and Cycling Behaviors

Uth (1996) explained that there is not clear definition of lifestyle and the concept, today, is still not well-defined. However, she mentioned that this term was introduced by Max Weber and Alfred Adler in 1956. According to Weber (1956), the style of life was considered as one of the three determinants of social development strata, and the other two are hereditary charisma and the appropriation of political or hierocratic authority. His statement about the lifestyle was closely related with the type of occupation. Adler (1956) stated that every individual has his own lifestyle that might be similar to the life styles of other individuals in some extent but never be the same. Lifestyle can be developed through the endogenous styled creative power of the individual during the first years of childhood. He also claimed that heredity and the environment are not the determinants of an individual lifestyle. Recently, lifestyle can be defined as “the way in which a person lives” according to Oxford Dictionary (2018). Cambridge Dictionary defined lifestyle as “someone's way of living; the things that a person or particular group of people usually do.” Hence, it is generally defined as a way or thing that an individual or a group of people usually do.

In transportation field, lifestyle could be a close relationship between individuals’ lifestyle and their decisions to travel by various modes of transportation. Andrade and Kagaya (2013) found that lifestyle characteristics are directly related to the propensity to cycle since cyclists believe that cycling is suitable for their lifestyles (Barberan, Silva, & Monzon, 2017). Hence, the second hypothesis was proposed as follow;

H2: Lifestyle has a positive influence on cycling behaviors.

2.4 Awareness and Cycling Behaviors

Awareness refers to knowledge that something exists, or understanding of a situation or subject at the present time based on information or experience (University of Cambridge, 2018). This includes understanding that cycling would pollute the environment less, and cycling is good for getting physical exercise. Awareness about the environment and the society is also important since some people decide to use bicycle with the reason that they would like to do something good for society and nature (McCarthy, 2011). Previous studies provided the findings that support relationship between awareness and cycling behaviors. For example, a study conducted in Denmark indicated that cycling to work has a significant effect on health. This research also found that a person who cycles to work has a 28% lower mortality rate. The study by Phala and Bejrananda (2016) also reported that cycling is good for cyclists' health. Bronfman et al. (2015) conducted a research in Chile and found that respondents had high level of environmental behavior since they prefer to walk or use bicycle for the short distance. Hence, the third hypothesis was proposed as follow;

***H3*: Awareness has a positive influence on cycling behaviors.**

2.5 Subjective norm and Cycling Behaviors

Subjective norm is the judgment that people make about what an individual should do and his motivation to agree with them, usually parents, friends, co-workers, and classmates. Hence, the decision to perform cycling of an individual is influenced by the opinion of these groups. Subjective norm or approval from friends, family members, and colleagues is an influential factor for an individual to perform cycling. Some studies found that subjective norm is important factor leading to the use of bicycle for commuting (Bruijn et al, 2009; de Geus, 2008). A study conducted by Dill and Voros (2007) found that an individual will change his mode of travel to bicycle if his colleagues use bicycle for commuting. This finding supports the results of some studies (Titze et al., 2008; de Geus et al, 2008) which found that an individual whose friends and relatives use bicycles or encourage him to use bicycle will change his behavior by adopting bicycle as alternative mode of transportation. On the other hand, social disapproval could lead to decrease the likelihood toward cycling (Barberan, Silva, & Monzon, 2017). Hence, the fourth hypothesis was proposed as follow;

***H4*: Subjective norm has a positive influence on cycling behaviors.**

2.6 Self-efficacy and Cycling Behaviors

Bandura (1977) defined self-efficacy as the confidence in oneself and one's capability to perform a behavior. It is also considered as an important factor resulting in behavioral change. The efficacy expectation is originated from four important sources; personal accomplishments, vicarious experience, persuasion, and physiological states. Armitage and Conner (2001) claimed that self-efficacy could account for 7% of intention prediction. Gist (1992) noted that self-efficacy can be created by gradual acquisition of complex cognitive, social, and physical skills by the experience. This term is not associated with an individual's skills but it is concerned with the individuals' perceptions of what he can do with his skills. According to Gist and Mitchell (1992), self-efficacy has three major elements. First, it is an individual perception of his capability to perform a specific task. Second, self-efficacy is a dynamic element since it changes over time. Finally, mobilization of efficacy beliefs affects an individual's performance. From this point of views, it could be implied that self-efficacy in cycling means an individual perception on his capability to perform riding bicycle. When one beliefs that he can ride and control the bicycle so he may intend to use the bicycle. In transportation field, self-efficacy was considered as deterrent factor according to Barberan, Silva, and Monzon (2017). They indicated that perceiving personal limitations to ride results in the likelihood of not using bicycle. However, several previous studies found positive relationship between self-efficacy and intention to use bicycle (Lois, Moriano, & Rondinella, 2015). Hence, the fifth hypothesis was proposed as follow;

***H5*: Self-efficacy has a positive influence on cycling behaviors.**

2.7 Weather and Cycling Behaviors

Thailand is located in the tropical area. The country is under the influence of monsoon winds depending on seasonal characters. For example, the southwest monsoon starting in May causes abundant rain across the country. In winter, the northern monsoon plays an important role leading to cold weather in the northern part of the country but there is still a great amount of rainfall in the southern part. In summer, the weather becomes warmer and hotter especially in April. A study conducted in Khon Kaen by Phala and Bejrananda (2016) reported that cycling is not popular among Thai people living in Khon Kaen since the weather is not appropriate for using bicycle. They also added that too hot and rainy weather are the most important determinants deterring them from using bicycle. A study conducted by Rachatapiti and Jiamphao (2017) also found hot weather as a deterrent factor of bicycle use. They recommended that to promote cycling in a university, cover way should be installed to protect sunlight and rain for cyclists. Previous studies in other countries (Mayes et al., 1996; Nankervis, 1999; Nagendra

& Khare, 2003; Dill & Voros, 2007; Van Bekkum, 2011) also found that bad weather could be a barrier for people not to use bicycle. The study conducted by Freitas and Maciel (2017) also confirmed that riding in adverse weather is the major limitation deterring people to use bicycle. Byrnes, Miller, and Williams (1999) added that adverse weather is more challenge for women than men since they are more concerned on their hair and make-up. It could be implied that good weather might attract people to use bicycle. Hence, the sixth hypothesis was proposed as follow;

H6: Good weather has a positive influence on cycling behaviors.

2.8 Infrastructure and Cycling Behaviors

To a large extent, many cities in the world have become unfit with cycling. Hence, integrated infrastructure for cycling is needed (PRESTO, 2010). To provide such infrastructure, two opposed planning philosophies have developed. The first one is the network/segregation approach which cycling infrastructure is considered as an additional network. The cycling infrastructure should be separated, dedicated, and technically designed for safety purpose. The latter one is the holistic or mixing approach. This approach is based on the assumption that road users in the existing road network should slow down their speeds for safety reason. In addition, the road space should be shared by cyclists.

PRESTO (2010) suggested that certain criterion should be considered to assess the cycling infrastructure ; safe, direct, cohesive, attractive, and comfortable. Safety is a fundamental requirement for cyclists since they cause no significant danger to other road users. Three major measurements (reducing traffic intensity, separating cyclists in space and time, and minimizing dangerous encounter) should be applied for the cylists' safety. Direct refers to the route of cycling should be direct and the travel time should be minimized for cylists. The directness can be influenced by various factors such as detours, number of stops at crossings, traffic light regulation, slopes, and so on. Cohesion refers to the extent to which cyclists can go from any origin to any destination without interruption. It also means good connection to other public transport mode, good provision of cycling facilities, and easy to access public places and amenities. Attractiveness refers to well-integration between the cycling infrastructure and surroundings. This includes design, image and landscape qualities. Comfort involves creating an enjoyable, smooth and relaxed cycling experience. Henc, the cycling infrastructure should be designed using good material.

Andrade and Kagaya (2013) conducted a research entitled "Cyclists' behaviour: identification of factors on commuting by bicycle" in Hokkaido, Japan. They found

that the existence of bicycle paths in the way to campus affects bicycle choice. Their research findings supported some previous studies (Dill & Carr, 2003; Stinson & Bhat, 2004; Gatersleben & Appleton, 2007; Dill & Voros, 2007; Handy, Xing, & Buehler, 2010; Pucher, Dill, & Handy, 2010). However, the gradient of the cycle ways is the deterrent factor according to certain studies (Hunt & Abraham, 2007; Gatersleben & Appleton, 2007; Dill & Voros, 2007) which found positive relationship between cycling infrastructure and cycling use. Hence, the seventh hypothesis was proposed as follow;

***H7*: Infrastructure has a positive influence on cycling behaviors.**

In conclusion, there are various factors influencing the cycling behaviors such as lifestyle, safety and comfort, awareness, subjective norm, self-efficacy, weather, and infrastructure. Hence, the conceptual framework of this research is proposed as illustrated in Figure 2.

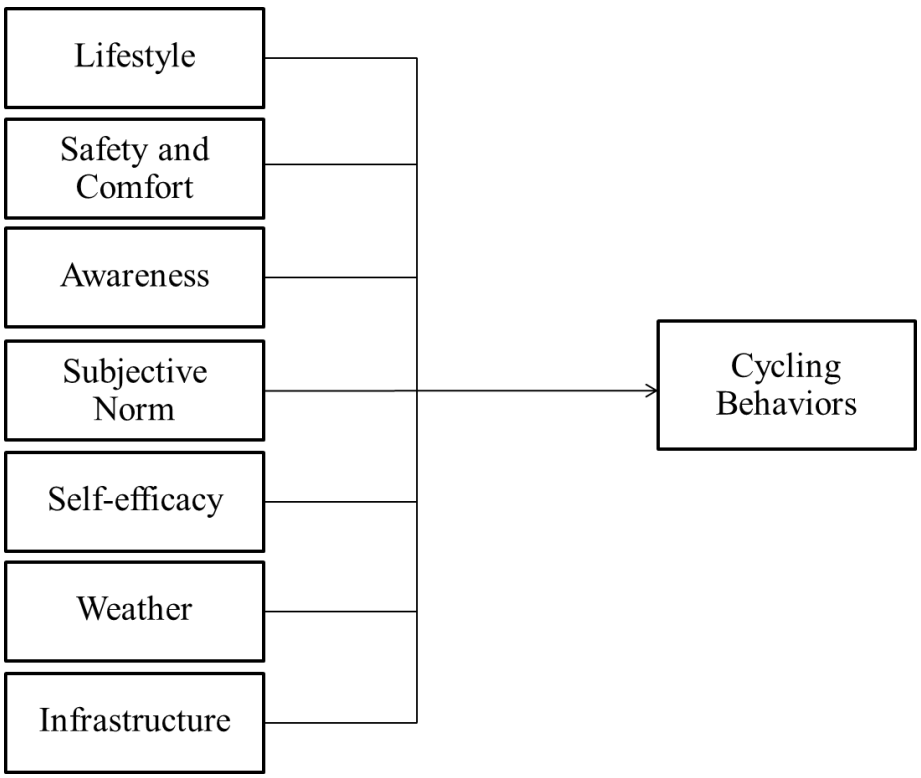

Figure 2 Conceptual framework

CHAPTER 3 METHODOLOGY

3.1 Population

The population of this study is the people living in Bangsaen, Chonburi with the age cohort of 20 years and older. As of March 2018, the total population of this group was 35,655.

3.2 Sample

The samples of this study are the people living in Bangsaen, Chonburi derived from Yamane's formula as follow:

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

Where

N = Population size

n = Sample size

e = Level of precision

When this formula is applied, we get the equation as follow;

$$n = \frac{35,655}{1 + 35,655\ (.05)^2}$$

$$= \frac{35,655}{90.1375}$$

$$= 395.56$$

Hence, the appropriate minimum sample size of this study is 396.

3.3 Sampling

Simple random sampling was applied in this study. By using the random number generator technique, the researcher draws a sample from the population without replacement. The authors randomly selected 1,000 samples living in Bangsaen. Then, send them the questionnaires so they can voluntarily fill in the given questionnaires.

3.4 Measures

Questionnaire was employed to collect primary data from the samples. The measures of this questionnaire were as followings;

1) Demographic data. The demographic data includes gender, age, educational level, marital status, occupation, income, household size, modes of travel, bicycle

ownership, motorcycle ownership, car ownership, bicycle usage, reasons to use bicycle, and reasons not to use bicycle.

2) Lifestyle. The lifestyle consists of two items which are "I (would) enjoy the ride" and "I (would) relax during the trip." This measurement revealed score showing an alpha reliability of .77. The score indicated an acceptable reliability of the measurement.

3) Safety and comfort. This measurement consists of five items. The sample questions are "I (would be)/am sweaty when I arrived at my destination," "I (would be)/am a nuisance to pedestrians," and I (would be)/am stressed when I arrive(d) at my destination." It revealed the score showing an alpha reliability of .80. The score indicated a good reliability of the measurement.

4) Awareness. This measurement consists of two items which are "I (would) pollute the environment less," and "I (would) get some physical exercise." It revealed the score showing an alpha reliability of .86. The score indicated a good reliability of the measurement.

5) Subjective norm. This measurement consists of two items which are "Considering your (possible) commuting trip by bicycle to the place of work or study, to what extent (would) the flowing group of people approve? (my family, my friends, and my co-workers/classmates)." It revealed the score showing an alpha reliability of .92. The score indicated an excellent reliability of the measurement.

6) Self-efficacy. This measurement consists of five items. The respondents were asked to indicate how far they (would) consider themselves capable of performing the following tasks; "Going up hills or changes in level on the bicycle;" "Safely performing maneuvers on the bicycle;" and "Fixing a puncture on a bicycle wheel." It revealed the score showing an alpha reliability of .83. The score indicated a good reliability of the measurement.

7) Weather. This measurement consists of five items. The sample questions are "The weather in my town is not too hot for cycling," "The weather in my town is wonderful for cycling," and "The weather in my town is not too rainy for cycling." It revealed the score showing an alpha reliability of .96. The score indicated an excellent reliability of the measurement.

8) Infrastructure. This measurement consists of five items. The sample questions are "There is enough and suitable bicycle lane in this city," "There are some facilities provided for cyclists," "The bicycle lane in this city is well-designed." It revealed the score showing an alpha reliability of .89. The score indicated a good reliability of the measurement.

9) Cycling behaviors. The respondents were asked to indicate will they consider themselves riding bicycle for the following activities in the next 2-5 years; going to see the doctor, shopping, socialization, for sports & exercise, and for work/University.

3.4.1 Validity

Each item will be assessed by transportation experts giving the item rating of 1 for clearly measuring, -1 for clearly not measuring, and 0 for unclear measuring. Finally, the index of item – objective congruence (IOC) will be calculated using the formula developed by Rovinelli and Hambleton (as cited in Kotchapong, 2008) for each item of the questionnaire. According to Rovinelli and Hambleton (as cited in Kotchapong, 2008), IOC value I_{ik} for *i*-th item on *k*-th objective is an average of rating for each combination of each item and objective, and IOC is defined as follows:

$$I_{ik} = \frac{1}{N}\sum_{j=1}^{N} S_{ijk}, i = 1,\ldots,M, k = 1,\ldots,K,$$

where S_{ijk} = the rating of (-1, 0, 1) of *i*-th item as measure of *k*-th objective by *j*-th specialist

M = total number of items

N = the number of specialists

K = the number of objectives

Prasitrattasin (2007) suggested that the IOC index higher than .50 is determined as valid. Hence, any item with IOC index lower than .50 will be deleted or the statements will be revised in accordance with the recommendations of the experts. According to the review by five experts, all the IOC indexes are greater than .50. Some statements are revised in accordance with suggestions made by the experts.

3.4.2 Reliability

After all items of the questionnaire are validated, the questionnaires will be revised and then sent approximately 30 samples as a pilot survey. Then, the reliability of each measurement, measure of internal consistency, will be examined employing Cronbach's alpha coefficient (Cronbach, 1951). For this research, the Cronbach's Alpha coefficient for *k*-th object is defined as follows:

$$\alpha_k = \frac{M_k}{1 - M_k}\left(1 - \frac{\sum_{i=1}^{M_k}\sigma^2(Y_i)}{\sigma_k^2}\right),$$

where M_k = the number of items in *k*-th objective

$\sigma^2(Y_i)$ = variance of rating of *i*-th item on *k*-th object

σ^2_k = variance of total composite (ratings) in *k*-th object

George and Marry (as cited in Gliem & Gliem, 2003) suggested that the Cronbach's alpha coefficient >.90 – Exccellent, >.80 – Good, >.70 – Acceptable, >.60 – Questionable, >.50 - Poor, and <.50 – Unacceptable. According to the pilot test, the reliabilities of each measure are as illustrated in Table 1.

Table 1 Measurements' reliability

Variable	No. of items	Cronbach's Alpha
Lifestyle	2	.77
Convenience and safety	5	.80
Awareness	2	.86
Subjective norm	3	.92
Self-efficacy	5	.83
Weather	4	.96
Infrastructure	5	.89

3.5 Analysis

The primary data will be collected using questionnaires as a research tool. Well-trained research assistants are assigned to collect data. Then, descriptive statistics such as frequency, percentage, mean, median, and standard deviation (SD) will be applied in data analysis. For hypothesis testing, forward stepwise logistic regression analysis will be applied. This technique is more flexible compared to multiple regression analysis (MRA) which requires normal distribution of the predictors, linear relationship between the predictors and dependent variable (DV) or equal variance within each group. Hence, the predictors for this technique can be any mix of continuous, discrete, and dichotomous variables. Since it requires no normal distribution for predictors, this technique cannot produce negative predicted probabilities (Tabachnick & Fidell, 2014).

CHAPTER 4 RESEARCH PLAN

4.1 Project Schedule

This project is a 1-year project. The timeframe of this research is scheduled as illustrated in Table 2.

Table 2 Timeframe

Activities	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Review of literature												
Inception report submission												
Questionnaire Validation												
Progress report												
Data collection												
Data analysis												
Interim report presentation & submission												
Roundtable discussion & workshop												
Final report presentation & comments												
Final report preparation & submission												

4.2 Project Oversight

The project oversight component of this research has been designed to track and provide guidance, comments, and recommendations at key stages of the project from different perspectives.

1. Project advisors – three advisors are assigned to provide independent assessment and review of major outputs. Then, they responsible for giving comments and recommendations on technical excellence and relevance.

2. Consultative forum – to ensure the relevance and completeness of the findings, this forum or roundtable discussion will be held in order to gain comments and recommendations from various perspectives.

4.3 Project Expenditure

The total budget of the project is 350,000 (Three hundred and fifty thousand Baht) and the expenditure of this project is illustrated in Table 2.

Table 3 Project expenditure

No.	Description	Cost/Unit	Unit	Amount (Baht)
1	Project leader	3,000	12	36,000
2	Research assistants	5,000	12	60,000
3	Expenses for project meeting (3 project members x 12)	1,000	36	36,000
4	Data collection	60,000	1	80,000
5	Transportation & Petrol	3,000	20	60,000
6	Office and computer supply	3,000	1	3,000
7	Secretariat's participation portion	10,000	1	10,000
8	Advisor	10,000	2	30,000
9	Data coding & analysis	20,000	1	25,000
9	Publishing proportion of the report book	10,000	1	10,000
	Total			350,000

CHAPTER 5 RESULTS

5.1 Respondents

The majority of 400 respondents were female accounting for 74.25%. The average age of the respondents was 31 years old. More than half of them were university graduates and undergraduates (57.00%). About 78.00% of the samples were single. The majority of them were students and other occupations (62.75%). The income of most respondents was less than 10,000 Baht a month (56.50%). The average number of family members was 4 people as illustrated in Table 4.

Table 4 Demographic information

Description	Frequency	Percentage (%)
Gender		
Male	103	25.75
Female	297	75.25
Education		
Secondary school or lower	71	17.75
High school / Vocational college	19	4.75
High Vocational College	22	5.50
University (including undergrads)	228	57.00
Marital Status		
Single	312	78.00
Married	65	16.25
Divorced	10	2.50
Separated	5	1.25
Others	8	2.00
Occupation		
Government officer	14	3.50
Public enterprise employee	4	1.00
Employee	53	13.25
Business	41	10.25
Farmer/laborer	37	9.25
Student	251	62.75

Table 4 (Con't)

Description	Frequency	Percentage (%)
Income		
Less than 10,000 Baht/Month	226	56.50
10,001-15,000 Baht/Month	110	27.50
15,001-20,000 Baht/Month	27	6.75
20,001-25,000 Baht/Month	14	3.50
25,001-30,000 Baht/Month	13	3.25
More than 30,000 Baht/Month	10	2.50

5.2 Modes of Travel

According to the modes of travel the respondents used in their daily lives as illustrated in Table 5, motorcycle was the most popular one (60.25%) followed by car (37.25%), bicycle (21.25%), and Songthaew (20.00%) in that order.

Table 5 Modes of travel (n=400)

Modes of travel	Frequency	Percentage (%)
Van		
No	335	83.75
Yes	65	16.25
Sonthaew		
No	320	80.00
Yes	80	20.00
Bus		
No	353	88.25
Yes	47	11.75
Taxi/Motorcycle taxi		
No	321	80.25
Yes	79	19.75
Car		
No	251	62.75
Yes	149	37.25
Motorcycle		
No	159	39.75
Yes	241	60.25
Bicycle		
No	315	78.75
Yes	85	21.25

5.3 Ownership of Vehicle

The percentage of bicycle, motorcycle, and car ownership of the respondents were 54.75%, 68.00%, and 59.75% respectively as shown in Table 6. The data indicates that motorcycle is the most popular vehicle used by the respondents in the study area.

Table 6 Ownership of vehicle (n=400)

Ownership	Frequency	Percentage (%)
Bicycle ownership		
No	181	45.25
Yes	219	54.75
Motorcycle ownership		
No	128	32.00
Yes	272	68.00
Car ownership		
No	239	59.75
Yes	161	40.25

5.4 Bicycle usage

About 83.50% of the respondents reported that they know how to ride bicycle properly. Interestingly, only 18.50% of the respondents reported that they use bicycle in their daily lives.

Table 7 Bicycle usage

Description	Frequency	Percentage (%)
Know how to ride bicycle properly		
Yes	334	83.50
No	66	16.50
Use bicycle in daily life		
Yes	74	18.50
No	326	81.50

Among 74 respondents who reported using bicycle in their daily lives, the majority of them (58.11%) reported that they take 10-30 minutes per trip with the travel distance of 1-5 kilometers per trip (58.11%). About 27.03% of them used the bicycle for the distance less than 1 kilometer (27.03%) as illustrated in Table 8.

Table 8 Travel time and distance of using bicycle (n=74)

Description	Frequency	Percentage (%)
Travel time/trip		
Less than 10 minutes	19	25.68
10-30 minutes	43	58.11
Over 30 minutes	12	16.22
Distance/trip		
Less than 1 KM	20	27.03
1-5 KMs	43	58.11
6-10 KMs	7	9.46
Over 10 KMs	4	5.41

5.5 Reasons to Use Bicycle

When asking about the reasons to use bicycle, more than 64% of them reported that they used bicycle for exercise and recreation. The following reasons include comfort (59.46%), economy (51.35%), environmental friendly (40.54%), and faster (32.43%). Fun, fresh air, freedom, safety, no other alternatives, smart/spiffy, social value, and saving medical expenses are among the reasons to use bicycle.

Table 9 Reasons to use bicycle (n=74)

Reasons to use bicycle	Frequency	Percentage (%)
Exercise and recreation	48	64.86
Comfort	44	59.46
Economy	38	51.35
Environmental friendly	30	40.54
Faster	24	32.43
Fun	22	29.73
Fresh air	15	20.27
Freedom	15	20.27
Safety	14	18.91
No other alternatives	8	10.51
Smart/spiffy	3	4.05
Social value	3	4.05
Saving medical expenses	2	2.70

5.6 Reasons not to Use Bicycle

Table 10 shows the reasons of not using bicycle among non-cyclists. The distance of the destination is the most important reason deterring them from using bicycle (57.06%). The other most important reasons include slow/waste of time (46.32%), too hot/humid (43.56%), dangerous (39.88%), and no enough bike lane (38.65%) in that order. Tiresome, getting soak, fear of having dark skin, fear of smoke/dust, shame, and not smart/spiffy are also the deterred factors.

Table 10 Reasons not to use bicycle (n = 326)

Description	Frequency	Percentage (%)
Far destination	186	57.06
Slow/Waste of time	151	46.32
Too hot/Humid	142	43.56
Dangerous	130	39.88
No enough bike lane	126	38.65
Tired	97	29.75
Getting soak	88	26.99
Fear of having dark skin	87	26.69
Fear of smoke/dust	64	19.63
Shame	5	1.53
Not smart/spiffy	4	1.23

5.7 Variable Attributes

Table 11 indicates the mean and standard deviation of each variable. Awareness has the highest level of mean (Mean = 4.59, SD = .7049) indicating the respondents have a very high level of awareness. They believe that cycling would pollute the environment less, helping them to have exercise and save some money.

Table 11 Mean and standard deviation of variables (n=400)

Variables	Mean	SD	Description
1. Lifestyle	3.61	.8979	High
2. Safety and comfort	2.99	.7848	Moderate
3. Awareness	4.59	.7049	Very high
4. Subjective norm	3.17	.9285	Moderate
5. Self-efficacy	2.94	.8622	Moderate
6. Weather	3.69	.8744	High
7. Infrastructure	2.60	.9316	Low

According to Table 11, weather has the second highest mean (Mean = 3.69, SD = .8744) indicating a good weather; not too hot, not too rainy, not too cold, and wonderful. Lifestyle has the third largest mean (Mean = 3.61, SD = .8979) indicating people view cycling as a lifestyle. For instances, it could make them enjoying, relaxing, and having good impression. However, infrastructure has the lowest mean (Mean = 2.60, SD = .9316) indicating poor infrastructure provided. There would be no enough bike lane, poor facilities, not-well designed bike lane, and not safety. Subjective norm (Mean = 3.17, SD = .9285), safety and comfort (Mean = 2.99, SD = .7848), and self-efficacy (Mean = 2.94, SD = .8622) have moderate level of mean.

5.8 Multicollinearity Testing

This study employed logistic regression to analyze the data. It requires there to be little or no multicollinearity among the independent variables. This means that the independent variables should not be too highly correlated with each other. Hence, we used correlation statistics to test the multicollinearity among the independent variables. According to the general rule of thumb, if the correlation > 0.8 then severe multicollinearity may be present (Mayers, 1990). The results of correlation analysis are as shown in Table 12.

Table 12 Pearson's product moment coefficient

Variables	LIFES	SAFCOM	AWARE	SNORM	SELFE	WEATH	INFRA
LIFES	-						
SAFCOM	-.173**	-					
AWARE	.190**	-.025	-				
SNORM	.254**	-.042	.097	-			
SELFE	.404**	-.100*	-.045	.232**	-		
WEATH	-.191**	.281**	.083	-.100*	-.069	-	
INFRA	.066	.073	-.023	.158**	.197*	-.098	-

**Correlation is significant at the .01 level (2-tailed)

*Correlation is significant at the .05 level (2-tailed)

According to Table 12, there is no coefficient that greater than .80. This indicates no multicollinearity among the independent variables. Hence, the data is suitable to be analyzed by logistic regression.

5.9 Hypothesis Testing

Forward stepwise logistic regression was employed to test the hypotheses in this study. The results of hypothesis testing are as followings;

5.9.1 Factors Affecting the Use of Bicycle for Going to See a Doctor

Table 13 shows the omnibus tests of model coefficient. The full model which considered all the two independent variables together was statistically significant, $\chi 2 = 13.131$, df = 2, N = 400, p = .001.This implies that the odds for the respondent who indicated that he would like to use bicycle for going to see a doctor were related to the two independent variables; awareness (AWARE), and self-efficacy (SELFE). In addition, Table 14 shows the classification table indicating that the model correctly classified approximately 88% of the cases.

Table 13 Omnibus tests of model coefficients (CBEHA1)

		Chi-square	df	Sig.
Step 1	Step	7.339	1	.007
	Block	7.339	1	.007
	Model	7.339	1	.007
Step 2	Step	5.792	1	.016
	Block	13.131	2	.001
	Model	13.131	2	.001

Table 14 Classification table (CBEHA1)

Observed			Predicted		
			CBEHA1		Percentage Correct
			NO	YES	
Step 1	CBEHA1	NO	351	0	100.0
		YES	49	0	.0
	Overall Percentage				87.8
Step 2	CBEHA1	NO	351	0	100.0
		YES	48	1	2.0
	Overall Percentage				88.0

a. The cut value is .500

The "pseudo" R estimates indicate that the model explained between 3.2% (Cox & Snell R Squared) and 6.2% (Nagelkerke R Squared) of the variance in using bicycle for going to see a doctor (CBEHA1) as illustrated in Table 15.

Table 15 Model summary (CBEHA1)

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	290.163[a]	.018	.035
2	284.371[a]	.032	.062

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table 16 presents a summary of the raw score binary logistic regression coefficients, Wald statistics, odds ratios [(Exp (B)] along with a 95% confidence interval (CI). Wald statistics indicate that all the variables significantly predict using bicycle for going to see a doctor (CBEHA1). The strongest predictor of CBEHA1 was self-efficacy (SELFE). This predictor (SELFE) recorded an odds ratio of 1.624. Hence, the odds of using bicycle compared to not using bicycle increase by a factor of 1.624 for a unit increase. In other words, the odds of using bicycle for going to see a doctor increase by 62.4% for each unit increase in SELFE.

Awareness (AWARE)'s effect is smaller than SELFE, and in the opposite direction. It recorded an odds ratio of .636 indicating that the odds of using bicycle for going to see a doctor decrease by 36.4% for each unit increase in AWARE. However, lifestyle (LIFES), safety and comfort (SAFCOM), subjective norm (SNORM), weather (WEATH), and infrastructure (INFRA) had no effect on the using of bicycle for going to see a doctor (CBEHA1).

Table 16 Variables in the equation (CBEHA1)

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	SELFE	.481	.179	7.214	1	.007	1.618
	Constant	-3.447	.594	33.708	1	.000	.032
Step 2[b]	AWARE	-.453	.181	6.261	1	.012	.636
	SELFE	.485	.185	6.896	1	.009	1.624
	Constant	-1.424	.990	2.066	1	.151	.241

a. Variable(s) entered on step 1: SELFE.

b. Variable(s) entered on step 2: AWARE.

The Variables in the Equation output shows us that the regression equation is;

CBEHA1 = -1.424 + .485SELFE - .453AWARE

5.9.2 Factors Affecting the Use of Bicycle for Shopping

Table 17 shows the omnibus tests of model coefficient. The full model which considered all the four independent variables together was statistically significant, $\chi 2 = 44.271$, df = 4, N = 400, $p < .001$.This implies that the odds for the respondent who indicated that he would like to use bicycle for shopping (CBEHA2) were related to the four independent variable; lifestyle (LIFES), awareness (AWARE), subjective norm (SNORM), and weather (WEATH). In addition, Table 18 shows the classification table indicating that the model correctly classified approximately 71.3% of the cases.

Table 17 Omnibus tests of model coefficients (CBEHA2)

		Chi-square	df	Sig.
Step 1	Step	25.454	1	.000
	Block	25.454	1	.000
	Model	25.454	1	.000
Step 2	Step	9.423	1	.002
	Block	34.877	2	.000
	Model	34.877	2	.000
Step 3	Step	5.162	1	.023
	Block	40.040	3	.000
	Model	40.040	3	.000
Step 4	Step	4.231	1	.040
	Block	44.271	4	.000
	Model	44.271	4	.000

Table 18 Classification table (CBEHA2)

Observed			Predicted		
			CBEHA2		Percentage Correct
			NO	YES	
Step 1	CBEHA2	NO	20	104	16.1
		YES	8	268	97.1
	Overall Percentage				72.0
Step 2	CBEHA2	NO	25	99	20.2
		YES	10	266	96.4
	Overall Percentage				72.8
Step 3	CBEHA2	NO	25	99	20.2
		YES	17	259	93.8
	Overall Percentage				71.0
Step 4	CBEHA2	NO	28	96	22.6
		YES	19	257	93.1
	Overall Percentage				71.3

a. The cut value is .500

The "pseudo" R estimates indicate that the model explained between 10.5% (Cox & Snell R Squared) and 14.8% (Nagelkerke R Squared) of the variance in using bicycle for shopping (CBEHA2) as illustrated in Table 19.

Table 19 Model summary (CBEHA2)

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	469.827[a]	.062	.087
2	460.403[a]	.084	.118
3	455.241[a]	.095	.134
4	451.010[a]	.105	.148

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Table 20 presents a summary of the raw score binary logistic regression coefficients, Wald statistics, odds ratios [(Exp (B)] along with a 95% confidence interval (CI). Wald statistics indicate that all the variables significantly predict using bicycle for shopping (CBEHA2). The strongest predictor of CBEHA2 was subjective norm (SNORM). This predictor (SNORM) recorded an odds ratio of 1.664. Hence, the odds of using bicycle compared to not using bicycle increase by a factor of 1.624 for a unit increase. In other words, the odds of using bicycle for shopping increase by 66.4% for each unit increase in SNORM.

The second most important factor affecting CBEHA2 was awareness (AWARE). It recorded an odds ratio of 1.393. Hence, the odds of using bicycle compared to not using bicycle increase by a factor of 1.393 for a unit increase. In other words, the odds of using bicycle for shopping increase by 39.3% for each unit increase in AWARE.

The third most important factor affecting CBEHA2 was lifestyle (LIFES). It recorded an odds ratio of 1.340. Hence, the odds of using bicycle compared to not using bicycle increase by a factor of 1.340 for a unit increase. In other words, the odds of using bicycle for shopping increase by 34.0% for each unit increase in LIFES.

Weather (WEATH)'s effect is the smallest one, and in the opposite direction. It recorded an odds ratio of .709 indicating that the odds of using bicycle for shopping decrease by 29.1% for each unit increase in WEATH. However, safety and comfort (SAFCOM), self-efficacy (SELFE), and infrastructure (INFRA) had no effect on the using of bicycle for shopping (CBEHA2).

Table 20 Variables in the equation (CBEHA2)

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	SNORM	.607	.125	23.466	1	.000	1.835
	Constant	-1.071	.393	7.436	1	.006	.343
Step 2[b]	LIFES	.389	.129	9.138	1	.003	1.475
	SNORM	.532	.130	16.697	1	.000	1.702
	Constant	-2.216	.558	15.757	1	.000	.109
Step 3[c]	LIFES	.343	.130	6.921	1	.009	1.409
	SNORM	.520	.131	15.793	1	.000	1.681
	WEATH	-.311	.139	4.987	1	.026	.733
	Constant	-.853	.819	1.083	1	.298	.426
Step 4[d]	LIFES	.293	.133	4.854	1	.028	1.340
	AWARE	.332	.161	4.264	1	.039	1.393
	SNORM	.509	.131	15.020	1	.000	1.664
	WEATH	-.344	.140	5.981	1	.014	.709
	Constant	-2.032	1.001	4.126	1	.042	.131

a. Variable(s) entered on step 1: SNORM.

b. Variable(s) entered on step 2: LIFES.

c. Variable(s) entered on step 3: WEATH.

d. Variable(s) entered on step 4: AWARE.

The Variables in the Equation output shows us that the regression equation is;

$$CBEHA2 = -2.032 + .509SNORM + .332AWARE + .293LIFES - .344WEATH$$

5.9.3 Factors Affecting the Use of Bicycle for Socialization

Table 21 shows the omnibus tests of model coefficient. The full model which considered all the four independent variables together was statistically significant, $\chi 2 = 66.964$, df = 4, N = 400, $p < .001$.This implies that the odds for the respondent who indicated that he would like to use bicycle for socialization (CBEHA3) were related to the four independent variables; awareness (AWARE), subjective norm (SNORM), weather (WEATH), and infrastructure (INFRA). In addition, Table 22 shows the classification table indicating that the model correctly classified approximately 81.0% of the cases.

Table 21 Omnibus tests of model coefficients (CBEHA3)

		Chi-square	df	Sig.
Step 1	Step	28.879	1	.000
	Block	28.879	1	.000
	Model	28.879	1	.000
Step 2	Step	18.773	1	.000
	Block	47.652	2	.000
	Model	47.652	2	.000
Step 3	Step	12.906	1	.000
	Block	60.559	3	.000
	Model	60.559	3	.000
Step 4	Step	6.406	1	.011
	Block	66.964	4	.000
	Model	66.964	4	.000

Table 22 Classification table (CBEHA3)

	Observed		Predicted		
			CBEHA3		Percentage
			NO	YES	Correct
Step 1	CBEHA3	NO	315	0	100.0
		YES	85	0	.0
	Overall Percentage				78.8
Step 2	CBEHA3	NO	310	5	98.4
		YES	70	15	17.6
	Overall Percentage				81.3
Step 3	CBEHA3	NO	306	9	97.1
		YES	70	15	17.6
	Overall Percentage				80.3
Step 4	CBEHA3	NO	304	11	96.5
		YES	65	20	23.5
	Overall Percentage				81.0

a. The cut value is .500

The "pseudo" R estimates indicate that the model explained between 15.4% (Cox & Snell R Squared) and 23.9% (Nagelkerke R Squared) of the variance in using bicycle for socialization (CBEHA3) as illustrated in Table 23.

Table 23 Model summary (CBEHA3)

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	384.921[a]	.070	.108
2	366.148[a]	.112	.174
3	353.242[a]	.140	.218
4	346.836[a]	.154	.239

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table 24 presents a summary of the raw score binary logistic regression coefficients, Wald statistics, odds ratios [(Exp (B)] along with a 95% confidence interval (CI). Wald statistics indicate that all the variables significantly predict using bicycle for socialization (CBEHA3). The strongest predictor of CBEHA3 was subjective norm (SNORM). This predictor (SNORM) recorded an odds ratio of 2.098. Hence, the odds of using bicycle compared to not using bicycle increase by a factor of 2.098 for a unit increase. In other words, the odds of using bicycle for socialization increase by 109.8% for each unit increase in SNORM.

The second most important factor affecting CBEHA3 was infrastructure (INFRA). It recorded an odds ratio of 1.681. Hence, the odds of using bicycle compared to not using bicycle increase by a factor of 1.681 for a unit increase. In other words, the odds of using bicycle for socialization increase by 68.1% for each unit increase in INFRA.

The third most important factor affecting CBEHA3 was Weather (WEATH). It recorded an odds ratio of .556 indicating that the use of bicycle for socialization decrease by 44.4% for each unit increase in WEATH.

Awareness (AWARE)'s effect is the smallest one, and in the opposite direction. It recorded an odds ratio of .633 indicating that the odds of using bicycle for socialization decrease by 36.7% for each unit increase in AWARE. However, lifestyle (LIFES), safety and comfort (SAFCOM), and self-efficacy (SELFE) had no effect on the using of bicycle for socialization (CBEHA3).

Table 24 Variables in the equation (CBEHA3)

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	SNORM	.773	.154	25.200	1	.000	2.167
	Constant	-3.900	.555	49.441	1	.000	.020
Step 2[b]	SNORM	.774	.160	23.409	1	.000	2.169
	WEATH	-.638	.151	17.921	1	.000	.528
	Constant	-1.637	.742	4.869	1	.027	.195
Step 3[c]	SNORM	.688	.162	18.051	1	.000	1.989
	WEATH	-.613	.153	16.003	1	.000	.542
	INFRA	.523	.150	12.162	1	.000	1.687
	Constant	-2.875	.836	11.818	1	.001	.056
Step 4[d]	AWARE	-.457	.179	6.519	1	.011	.633
	SNORM	.741	.167	19.665	1	.000	2.098
	WEATH	-.587	.156	14.130	1	.000	.556
	INFRA	.519	.152	11.691	1	.001	1.681
	Constant	-1.056	1.095	.930	1	.335	.348

a. Variable(s) entered on step 1: SNORM.

b. Variable(s) entered on step 2: WEATH.

c. Variable(s) entered on step 3: INFRA.

d. Variable(s) entered on step 4: AWARE

The Variables in the Equation output shows us that the regression equation is;

$$CBEHA3 = -1.056 + .741SNORM + .519INFRA - .587WEATH - .457AWARE$$

5.9.4 Factors Affecting the Use of Bicycle for Sports and Exercise

Table 25 shows the omnibus tests of model coefficient. The full model which considered all the two independent variables together was statistically significant, $\chi 2 = 42.405$, df = 4, N = 400, $p < .001$.This implies that the odds for the respondent who indicated that he would like to use bicycle for sports and exercise (CBEHA4) were related to the two independent variables; lifestyle (LIFES), and subjective norm (SNORM). In addition, Table 26 shows the classification table indicating that the model correctly classified approximately 88.3% of the cases.

Table 25 Omnibus tests of model coefficients (CBEHA4)

		Chi-square	df	Sig.
Step 1	Step	36.041	1	.000
	Block	36.041	1	.000
	Model	36.041	1	.000
Step 2	Step	6.364	1	.012
	Block	42.405	2	.000
	Model	42.405	2	.000

Table 26 Classification table (CBEHA4)

	Observed		Predicted		
			CBEHA4		Percentage Correct
			NO	YES	
Step 1	CBEHA4	NO	5	47	9.6
		YES	4	344	98.9
	Overall Percentage				87.3
Step 2	CBEHA4	NO	10	42	19.2
		YES	5	343	98.6
	Overall Percentage				88.3

a. The cut value is .500

The "pseudo" R estimates indicate that the model explained between 10.1% (Cox & Snell R Squared) and 18.7% (Nagelkerke R Squared) of the variance in using bicycle for sports and exercise (CBEHA4) as illustrated in Table 27.

Table 27 Model summary (CBEHA4)

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	273.069[a]	.086	.160
2	266.705[a]	.101	.187

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table 28 presents a summary of the raw score binary logistic regression coefficients, Wald statistics, odds ratios [(Exp (B)] along with a 95% confidence interval (CI). Wald statistics indicate that all the variables significantly predict using bicycle for sports and exercise (CBEHA4). The strongest predictor of CBEHA4 was lifestyle (LIFES). This predictor (LIFES) recorded an odds ratio of 2.332. Hence, the odds of using bicycle compared to not using bicycle increase by a factor of 2.332

for a unit increase. In other words, the odds of using bicycle for sports and exercise increase by 133.2% for each unit increase in LIFES.

The second factor affecting CBEHA4 was subjective norm (SNORM). It recorded an odds ratio of 1.681. Hence, the odds of using bicycle compared to not using bicycle increase by a factor of 1.577 for a unit increase. In other words, the odds of using bicycle for sports and exercise increase by 57.7% for each unit increase in SNORM. However, safety and comfort (SAFCOM), awareness (AWARE), self-efficacy (SELFE), weather (WEATH), and infrastructure (INFRA) had no effect on CBEHA4.

Table 28 Variables in the equation (CBEHA4)

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	LIFES	.979	.172	32.405	1	.000	2.663
	Constant	-1.362	.556	6.005	1	.014	.256
Step 2[b]	LIFES	.847	.176	23.196	1	.000	2.332
	SNORM	.456	.181	6.327	1	.012	1.577
	Constant	-2.284	.679	11.330	1	.001	.102

a. Variable(s) entered on step 1: LIFES.

b. Variable(s) entered on step 2: SNORM.

The Variables in the Equation output shows us that the regression equation is;

$$CBEHA4 = -2.284 + .847LIFES + .456SNORM$$

5.9.5 Factors Affecting the Use of Bicycle for Work/University

Table 29 shows the omnibus tests of model coefficient. The full model which considered all the three independent variables together was statistically significant, $\chi 2 = 44.910$, df = 4, N = 400, $p < .001$.This implies that the odds for the respondent who indicated that he would like to use bicycle for work/university (CBEHA5) were related to the three independent variables; lifestyle (LIFES), subjective norm (SNORM), and weather (WEATH). In addition, Table 30 shows the classification table indicating that the model correctly classified approximately 73.5% of the cases.

Table 29 Omnibus tests of model coefficients (CBEHA5)

		Chi-square	df	Sig.
Step 1	Step	26.394	1	.000
	Block	26.394	1	.000
	Model	26.394	1	.000
Step 2	Step	10.180	1	.001
	Block	36.574	2	.000
	Model	36.574	2	.000
Step 3	Step	8.336	1	.004
	Block	44.910	3	.000
	Model	44.910	3	.000

Table 30 Classification table (CBEHA5)

	Observed		Predicted		
			CBEHA5		Percentage Correct
			NO	YES	
Step 1	CBEHA5	NO	286	0	100.0
		YES	114	0	.0
	Overall Percentage				71.5
Step 2	CBEHA5	NO	275	11	96.2
		YES	100	14	12.3
	Overall Percentage				72.3
Step 3	CBEHA5	NO	271	15	94.8
		YES	91	23	20.2
	Overall Percentage				73.5

a. The cut value is .500

The "pseudo" R estimates indicate that the model explained between 10.6% (Cox & Snell R Squared) and 15.2% (Nagelkerke R Squared) of the variance in using bicycle for work/university (CBEHA5) as illustrated in Table 31.

Table 31 Model summary (CBEHA5)

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	451.697[a]	.064	.092
2	441.517[b]	.087	.125
3	433.181[b]	.106	.152

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

b. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table 32 presents a summary of the raw score binary logistic regression coefficients, Wald statistics, odds ratios [(Exp (B)] along with a 95% confidence interval (CI). Wald statistics indicate that all the variables significantly predict using bicycle for work/university (CBEHA5). The strongest predictor of CBEHA5 was lifestyle (LIFES). This predictor (LIFES) recorded an odds ratio of 1.768. Hence, the odds of using bicycle compared to not using bicycle increase by a factor of 1.768 for a unit increase. In other words, the odds of using bicycle for work/university increase by 76.8% for each unit increase in LIFES.

The second most important factor affecting CBEHA5 was subjective norm (SNORM). It recorded an odds ratio of 1.508. Hence, the odds of using bicycle compared to not using bicycle increase by a factor of 1.508 for a unit increase. In other words, the odds of using bicycle for work/university increase by 50.8% for each unit increase in SNORM.

The third factor affecting CBEHA5 was weather (WEATH). It recorded an odds ratio of .680 indicating that the use of bicycle for work/university decrease by 32.0% for each unit increase in WEATH. However, safety and comfort (SAFCOM), awareness (AWARE), self-efficacy (SELFE), and infrastructure (INFRA) had no effect on CBEHA5.

Table 32 Variables in the equation (CBEHA5)

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	LIFES	.700	.146	23.007	1	.000	2.013
	Constant	-3.529	.571	38.181	1	.000	.029
Step 2[b]	LIFES	.631	.152	17.278	1	.000	1.880
	SNORM	.415	.134	9.661	1	.002	1.515
	Constant	-4.633	.702	43.557	1	.000	.010
Step 3[c]	LIFES	.570	.155	13.611	1	.000	1.768
	SNORM	.411	.136	9.190	1	.002	1.508
	WEATH	-.386	.135	8.184	1	.004	.680
	Constant	-2.995	.889	11.361	1	.001	.050

a. Variable(s) entered on step 1: LIFES.

b. Variable(s) entered on step 2: SNORM.

c. Variable(s) entered on step 3: WEATH.

The Variables in the Equation output shows us that the regression equation is;

$$CBEHA5 = -2.995 + .570LIFES + .411SNORM - .386WEATH$$

According to the forward stepwise logistic regression analysis, the hypothesis testing is summarized as shown in Table 33.

Table 33 Hypothesis testing results

Hypothesis	Description	Results
H1	1.1 Safety and comfort has a positive influence on the use of bicycle for going to see a doctor	Not supported
	1.2 Safety and comfort has a positive influence on the use of bicycle for shopping	Not supported
	1.3 Safety and comfort has a positive influence on the use of bicycle for socialization	Not supported
	1.4 Safety and comfort has a positive influence on the use of bicycle for sports and exercise	Not supported
	1.5 Safety and comfort has a positive influence the use of bicycle for work/university	Not supported
H2	2.1 Lifestyle has a positive influence on the use of bicycle for going to see a doctor	Not supported
	2.2 Lifestyle has a positive influence on the use of bicycle for shopping	Supported
	2.3 Lifestyle has a positive influence on the use of bicycle for socialization	Not supported
	2.4 Lifestyle has a positive influence on the use of bicycle for sports and exercise	Supported
	2.5 Lifestyle has a positive influence the use of bicycle for work/university	Supported
H3	3.1 Awareness has a positive influence on the use of bicycle for going to see a doctor	Supported
	3.2 Awareness has a positive influence on the use of bicycle for shopping	Supported
	3.3 Awareness has a positive influence on the use of bicycle for socialization	Supported
	3.4 Awareness has a positive influence on the use of bicycle for sports and exercise	Not supported
	3.5 Awareness has a positive influence the use of bicycle for work/university	Not supported
H4	4.1 Subjective norm has a positive influence on the use of bicycle for going to see a doctor	Not supported
	4.2 Subjective norm has a positive influence on the use of bicycle for shopping	Supported
	4.3 Subjective norm has a positive influence on the use of bicycle for socialization	Supported

Table 33 (Con't)

Hypothesis	Description	Results
	4.4 Subjective norm has a positive influence on the use of bicycle for sports and exercise	Supported
	4.5 Subjective norm has a positive influence the use of bicycle for work/university	Supported
H5	5.1 Self-efficacy has a positive influence on the use of bicycle for going to see a doctor	Supported
	5.2 Self-efficacy has a positive influence on the use of bicycle for shopping	Not supported
	5.3 Self-efficacy has a positive influence on the use of bicycle for socialization	Not supported
	5.4 Self-efficacy has a positive influence on the use of bicycle for sports and exercise	Not supported
	5.5 Self-efficacy has a positive influence the use of bicycle for work/university	Not supported
H6	6.1 Weather has a positive influence on the use of bicycle for going to see a doctor	Not supported
	6.2 Weather has a positive influence on the use of bicycle for shopping	Supported
	6.3 Weather has a positive influence on the use of bicycle for socialization	Supported
	6.4 Weather has a positive influence on the use of bicycle for sports and exercise	Not supported
	6.5 Weather has a positive influence the use of bicycle for work/university	Supported
H7	7.1 Infrastructure has a positive influence on the use of bicycle for going to see a doctor	Not supported
	7.2 Infrastructure has a positive influence on the use of bicycle for shopping	Not supported
	7.3 Infrastructure has a positive influence on the use of bicycle for socialization	Supported
	7.4 Infrastructure has a positive influence on the use of bicycle for sports and exercise	Not supported
	7.5 Infrastructure has a positive influence the use of bicycle for work/university	Not supported

CHAPTER 6 CONCLUSION AND DISCUSSION

6.1 Conclusion

This study is a quantitative research using questionnaire as a research tool. The main objectives of this study are to (1) examine the prevalence of cycling among people in Bangsaen (2) examine factors influencing cycling behaviors of people in Bangsaen and (3) provide suggestions and recommendations for policy makers. The samples of the study were 400 people living in Bangsaen, Chonburi. The majority of the respondents were female. The average age of the respondents was 31 years old. More than half of them were university graduates and undergraduates. Most of the samples were single. The majority of them were students. The average income of the respondents was less than 10,000 Baht a month. The average number of family members was 4 people.

They reported that motorcycle was the most popular modes of travel they used in their daily lives followed by car, bicycle, and Songthaew (Pick-up taxi) in that order. Motorcycle ownership was ranked the top followed by car and bicycle ownership respectively. Most of the respondents reported that they know how to ride bicycle properly. However, less than 20% of them used bicycle in their daily lives. The respondents using bicycle in their daily lives reported that they used bicycle for a short distance that took about 10-30 minutes.

Most of the respondents using bicycle reported that they used bicycle for exercise and recreation. Comfort, economy, environmental friendly, and fast mode of travel, fun, fresh air, freedom, safety, no other alternatives, smart/spiffy, social value, and saving medical expenses are among the reasons to use bicycle in that order. For people who were not willing to use bicycle due to many reasons; long distance of the destination, slow/waste of time, too hot/humid, dangerous, and no enough bike lanes respectively. Tiresome, getting soak, fear of having dark skin, fear of smoke/dust, shame, and not smart/spiffy are also the deterred factors.

This study employed logistic regression to analyze the data. Prior to the data analysis, we employed correlation statistics to test the multicollinearity among the independent variables (IV). Fortunately, we found no multicollinearity problem among the IV so the logistic regression analysis could be conducted. The main findings are as followings;

(1) Safety and comfort had no impact on all types of cycling behaviors namely going to see a doctor, shopping, socialization, sports and exercise, and for work/university.

(2) Lifestyle had a positive influence on three types of cycling behaviors; for shopping, sports and exercise, and going for work/university. However, it did not affect the use of bicycle for going to see a doctor, and for socialization.

(3) Awareness had a negative influence on using bicycle for going to see a doctor, and for socialization. It also had a positive influence on the use of bicycle for shopping. Yet, it had no influence on the use of bicycle for sports and exercise, and for work/university.

(4) Subjective norm had a positive influence on the use of bicycle for shopping, for socialization, for sports and exercise, and for work/university. However, it had no influence on the use of bicycle for going to see a doctor.

(5) Self-efficacy had a positive influence on the use of bicycle for going to see a doctor. However, it did not affect the rest cycling behaviors.

(6) Weather had a negative influence on the use of bicycle for shopping, socialization, and work/university. However, it had no influence on the use of bicycle for going to see a doctor, and for sports and exercise.

(7) Infrastructure had a positive impact on the use of bicycle for socialization. However, it had no influence on the rest of cycling behaviors.

6.2 Discussion

The results of this study indicate that safety and comfort is not an influential factor affecting cycling behaviors. It did not motivate people to use bicycle for going to see a doctor, for shopping, for socialization, for sports and exercise, and for work/university. The results are not consistent with previous studies which found safety issue as a motivator factor (Antonakos, 1994; Stinson & Bhat, 2003; Stinson & Bhat, 2004; Hunt & Abraham, 2007; Gatersleben & Appleton, 2007; Dill & Voros, 2007; Parkin et al., 2008; Pucher & Buehler, 2008a; Pucher & Buehler, 2008b; Akar & Clifton, 2009; Kingham et al., 2011; Winsters et al., 2011; Andrade & Kagaya, 2013). The findings are also inconsistent with some studies indicating that safety issue is a deterrent factor for using bicycle (Stinson & Bhat, 2003; Stinson & Bhat, 2004; Gatersleben & Appleton, 2007; Hunt & Abraham, 2007; Dill & Voros, 2007; Pucher & Buehler, 2008b; Akar & Clifton, 2009: Barberan, Silva, & Monzon, 2017). It could be implied that Thais are not willing to use bicycle whether it is safe or not. Also, they might be not aware of the environment and economical issue. Many of them are becoming materialists who seek car ownership in order to show or lift up their social status. Hence, safety and comfort is not an influential factor that affects cycling behaviors. Provision of training and education on safety issue would attract

them them to use bicycle (Antonakos, 1994; Stinson & Bhat, 2004; Gatersleben & Appleton, 2007; Pucher & Buehler, 2008a; Pucher & Buehler, 2008b; Akar & Clifton, 2009).

Lifestyle had a positive influence on the use of bicycle for shopping, sports and exercise, and going for work/university. This findings are consistent with the study conducted by Andrade and Kagaya (2013) who found that lifestyle characteristics are directly related to the propensity to cycle. Clearly, many young generation people in Thailand are attracted to cycle after the well-known « Bike for Mom » project was launched. This project has attracted them to use bicycle mainly for sports and recreation. However, some people are attracted to use bicycle for shopping and for work or for going to a university. However, they will not cycle for socialization activity since they don't want to loose their faces while attending socialization activities. In Thailand, showing wealth is generally found in such kind of activity. Instead of using bicycle, Thais will drive a car to get to the venue where the activity is taken place since they would like to show their social status and wealth. In addition, using bicycle to go to see a doctor is not good for patients' health. They might need some assistance to get to the hospital so other modes of travel would be more suitable rather than cycling.

Awareness plays an important role for cycling behaviors. It had a positive influence on the use of bicycle for shopping. When people are aware of the environment and the society, they will do something good for society and nature (McCarthy, 2011). Awareness of health issue attracts people to use bicycle (Phala & Bejrananda, 2016) since it could decrease the mortality rate by 28%. Some people are aware of the environment so they are happy to use bicycle for their daily lives. This is consistent with the study of Bronfman et al. (2015) who found that respondents having high level of environmental behavior prefer to walk or use bicycle for the short distance. In contrast, awareness has a negative impact on the use of bicycle for going to see a doctor, and for socialization. This finding is inconsistent with previous studies. People may aware that riding bicycle is not safe so they don't want to use it for going to see a doctor. In addition, even Thais are aware of safety and the environmental issues, they would not use bicycle for socialization since using bicycle could not show their wealth and social status. This kind of social norm has been rooted in this society for a long period of time and deterred people to use bicycle. This study also found no relationship between awareness and the use of bicycle for sports and exercise as well as for work/university. This could be implied that the environment and safety concern are not the the main factors

attracting them to use bicycle. Furthermore, some people may worry that riding a bicycle may cause him to suffer from toxic air.

Subjective norm refers to the judgment that people make about what an individual should do and his motivation to agree with them, usually parents, friends, co-workers, and classmates. It had a positive relationship with the use of bicycle for shopping, for socialization, for sports and exercise, and for work/university. This finding is consistent with previous studies (Dill & Voros, 2007; Bruijn et al, 2009; de Geus, 2008 ; Titze et al., 2008;). However, subjective norm was not associated with the use of bicycle for going to see a doctor which is not consistent with previous studies. Older people are more likely to have illness problems than other age groups. In addition, those with illness problems with high life experiences may not need advice from those around them.

Self-efficacy had a positive influence on the use of bicycle to go to see a doctor. This finding is consistent with the study conducted by Lois, Moriano, and Rondinella (2015) who found a positive relationship between self-efficacy and an intention to use bicycle. However, they did not study in terms of the relationship between self-efficacy and bicycle usage behavior in each activity. Yet, we found no relationship between self-efficacy and the use of bicycle for shopping, for socialization, for sports and exercise, and for work/university. Even if people have self-efficacy on riding, they may not use a bicycle because the use of bicycles may be prone to air pollution, and humidity. Most importantly, feeling shy of using bicycle may be another reason since people are worried about the others who may look at them as the poors.

Weather had a negative impact on the use of bicycle for shopping, for socialization, and for work/university. This could be indicated that people the use of bicycle depends on the weather situation. This findings are consistent with previous studies (Phala & Bejrananda, 2016; Rachatapiti & Jiamphao, 2017). Bad weather could be a barrier for people not to use bicycle (Mayes et al., 1996; Nankervis, 1999; Nagendra & Khare, 2003; Dill & Voros, 2007; Van Bekkum, 2011). However, the weather had no influence on the use of bicycle for going to see a doctor, and for sports and exercise. People who are illness may sometimes require a bicycle since there is no other alternative modes of travel to get to a hospital. As for those who play sports, there may enjoy cycling under unusual weather conditions because it is challenging and exciting.

Infrastructure plays an important role on the use of bicycle for socialization. This supports certain studies (Hunt & Abraham, 2007; Gatersleben & Appleton, 2007; Dill & Voros, 2007) which found positive relationship between cycling infrastructure and cycling use. However, the infrastructure did not influence the use of bicycle for going to see a doctor, for shopping, for sports and exercise, and for work/university. To promote the use of bicycle, separated lane, safety, direct route, cohesive, attractive, and comfortable facilities should be provided.

6.3 Recommendation

There are different factors affecting the use of bicycle of each group. Hence, to have a success cycling promotion, the government and local government should set up a policy that meet each target' needs. Campaigns and providing benefits of cycling should be disseminated to the people since subjective norm is a very important factor. The most important reason for people to use bicycle is for recreation. Hence, the municipality should provide facilities to meet their needs. For instances, provision of bike path or trail separated from the roadway, bike lane, and signed bike route. Finally, to promote cycling, safety, weather, and bike infrastructure should be taken into consideration. Planting trees along the bike lane would be very beneficial for attracting people to use bicycle.

REFERENCES

Adler, A. (1956). The Individual Psychology of Alfred Adler. New York: Basic Books, Inc.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision processes, 50(*2), 179-211.

Akar, G., & Clifton, K. J. (2009). Influence of individual perceptions and bicycle infrastructure on decision to bike. *Transportation Research Record, 2140*, 165-172.

Andersen, L.B. et al. (2000). All-cause mortality associated with physical activity during leisure time, work, sports, and cycling to work. *Archives of Internal Medicine, 160*(12), 1621.

Andrade, K., & Kagaya, S. (2013). Cyclists' behaviour: Identification of factors on commuting by bicycle. DOI: 10.18830/issn.1679-0944.n9.2013.12292

Antonakos, C. L. (1994). Environmental and travel preferences of cyclists. *Transportation Research Record, 1438*, 25-33.

Armitage, C.J. & Conner, M. (2001). Efficacy of the theory of planned behavior: A meta-analytic review. *British Journal of Social Psychology, 40*, 471-499.

ASEAN German Technical Cooperation. (2016). Cycling as a mobility option for ASEAN megacities: Developments in Bangkok and Metro Manila. Jakarta: The ASEAN Secretariat.

Bandura, A. (1977). Self efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist, 37*(2), 122-147.

Barberan, A., Silva, J.A., & Monzon, A. (2017). Factors influencing bicycle use: A binary choice model with panel data. *Transportation Research Procedia, 27*(2017), 253–260.

Betz, J., Dustrude, J., & Walker, J. (1993). Intelligent bicycle routing United States. *Transportation Research Record, 1405*, 21-27.

Bruijn, G., Kremers, S., Singh, A., Putte, B., & Mechelen, W. (2009). Adult active transportation - adding habit strength to the theory of planned behavior. *American Journal of Preventive Medicine, 36*(3), 189–194.

Byrnes, J.P., Miller, D.C., & Schafer, W.D. (1999). Gender differences in risk taking: A meta-analysis. *Psychological Bulletin, 125*(3), 367-383.

Channel3. (2017). Over 4,000 cyclists joined the "Tour of Bangsaen." Retrieved on the 29th of April 2018 from http://news.ch3thailand.com/sport/35843

Cronbach, L.J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16(*3), 297-334.

de Geus, B., Bourdeaudhuij, C., & Meeusen, R. (2008). Psychosocial and environmental factors associated with cycling for transport among a working population. *Health Education Research, 23*(4), 697–708.

Department of Land Transport. (2017). Registered vehicle statistics. Retrieved on the 26th of January 2018 from http://www.news.mot.go.th/motc/portal/graph/np/index3.asp

Department of Land Transport. (2017). Freight and passengers statistics. Retrieved on the 26th of January 2018 from http://www.news.mot.go.th/motc/portal/graph/np/index.asp

Dill, J., & Carr, T. (2003). Bicycle commuting and facilities in major U.S. cities: If you build them, commuters will use them. *Transportation Research Record, 1828*, 116-123.

Dill, J., & Voros, K. (2007). Factors affecting bicycling demand: Initial survey findings from the Portland, Oregon, region. *Transportation Research Record, 2031*, 9-17.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2013). G*Power Version 3.1.2 [computer software]. Uiversität Kiel, Germany. Retrieved on the 29th of April 2018 from http://www.psycho.uni-duesseldorf.de/abteilungen/aap/gpower3/download-and-register

Fernández-Heredia, A., Monzón, A., & Jara-Díaz, S. (2014). Understanding cyclists' perceptions, keys for a successful bicycle promotion. *Transportation Research Part A, 63*(2014), 1–11.

Freitas, A.L.P., & Maciel, A.B.L. (2017). Assessing cyclists' perceptions, motivations and behaviors: An exploratory study in Brazil. *Procedia Engineering, 198*(2017), 26 – 33.

Gatersleben, B., & Appleton, K. M. (2007). Contemplating cycling to work: Attitudes and perceptions in different stages of change. *Transportation Research Part A: Policy and Practice, 41*(4), 302-312.

Gist, M.E., & Mitchell, T.R. (1992). Self-Efficacy: A theorelical analysis of its delerminants and malleabilily. *Academy of Management Review, 17*, 183-212.

Gliem, J.A., & Gliem, R.R. (2003, October 8-10). Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales. Paper presented at the Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education, The Ohio State University, Columbus, OH. Retrieved June 8, 2012, from https://scholarworks.iupui.edu/bitstream/handle/1805/344/Gliem+&+Gliem.pdf?sequence=1

Handy, S.L., Xing, Y., & Buehler, T.J. (2010). Factors associated with bicycle ownership and use: A study of six small U.S. cities. *Transportation,37*(2010), 967–985.

Hopkinson, P., & Wardman, M. (1996). Evaluating the demand for new cycle facilities. *Transport Policy, 3*(4), 241-249.

Hunt, J. D., & Abraham, J. E. (2007). Influences on bicycle use. *Transportation, 34*(4), 453-470.

Insall, P. (2013). Active travel: Transport policy and practice for health. British Nutrition *Foundation Nutrition Bulletin, 38*, 61–69.

Kingham, S., Taylor, K., & Koorey, G. (2011). Assessment of the type of cycling infrastructure required to attract new cyclists. New Zealand Transport Agency research report, 449.

Koorey, G., Kingham, S., & Taylor, K. (2009). Attracting the next 10% of cyclists with the right infrastructure. Paper presented at the 7th New Zealand Cycling Conference 2009.

Kotchapong, T. (2008). The effect of social entrepreneur characteristics, principles of good governance and fair trade principles on social enterprise performance of the Thaicraft fair trade producer groups. (Unpublished master thesis). University of the Thai Chamber of Commerce, Bangkok.

Lois, D., Moriano, J.A., & Rondinella, G. (2015). Cycle commuting intention: A model based on theory of planned behaviour and social identity. *Transportation Research Part F, 32*(2015), 101–113.

Mayes, M., Halliday, M., & Hatch, O. (1996). A Qualitative Assessment of Attitudes to Cycling in the UK. Paper presented at the Transport Policy and its Implementation. Proceedings of Seminar B held at the 24th European Transport Forum, Brunel University, England 2 – 6 September 1996, Vol. P402.

Mayers, R.H. (1990). Classical and modern regression with applications. PWS10: Kent Publishing Company.

McCarthy, D. (2011). I'm a normal person': An examination of how utilitarian cyclists in Charleston South Carolina use an insider/outsider framework to make sense of risks. *Urban Studies, 48*(7), 1439 - 1455.

Nagendra, S.M.S., & Khare, M. (2003). Artificial neural network based line source models for vehicular exhaust emission predictions of an urban roadway. *Transportation Research Part D, 9*(2004), 199-208.

Nankervis, M., 1999. The effect of weather and climate on bicycle commuting. *Transportation Research Part A: Policy Practice, 33*, 417–431.

Parkin, J., Wardman, M., & Page, M. (2008). Estimation of the determinants of bicycle mode share for the journey to work using census data. *Transportation, 35*, 93-109.

Phala, J., & Bejrananda, M. (2016). An investigation of cycling behavior for bike use policy in Khon Kaen city. *Academic Journal: Faculty of Architecture, Khon Kaen University, 15*(2), 103-116). [in Thai]

Prasitrattasin, S. (2007). Social science research methodology (14th ed.). Bangkok, Samlada. [In Thai]

Promoting Cycling for Everyone as a Daily Transport Mode (PRESTO). (2010). PRESTO cycling policy guide: Cycling infrastructure. Retrieved on the 25th of September 2018 from https://ec.europa.eu/energy/intelligent/projects/sites/iee-projects/files/projects/documents/presto_policy_guide_cycling_infrastructure_en.pdf

Pucher, J., & Buehler, R. (2008a). Cycling for everyone: Lessons from Europe, *Transportation Research Record, 2074*, 58-65.

Pucher, J., & Buehler, R. (2008b). Making cycling irresistible: Lessons from the Netherlands, Denmark and Germany. *Transport Reviews, 28*(4), 495-528.

Pucher, J., Dill, J., & Handy, S. (2010). Infrastructure, programs, and policies to increase bicycling: An international review. *Preventive Medicine, 50*, 106-125.

Rachatapiti, C. & Jiamphao, W. (2017). A study of a guideline to promote the use of bicycles to protect the environments in Naresuan University. Proceedings of the 17th Graduate Studies in Northern Rajabhat Universities National Conference, 21 July 2017, Phitsanulok.

Sanensuk City Municipality. (2015a). Tourist statistics 2013-2015. Retrieved on the 19th of September 2018 from https://saensukcity.go.th/images/doc/stat-tourism-2556-2558.pdf

Sanensuk City Municipality. (2015b). Strategic plan 2015-2019. Retrieved on the 19th of September 2018 from https://saensukcity.go.th/images/doc/Strategic-Plan-2558-2562.pdf

Stinson, M. A., & Bhat, C. R. (2003). Commuter bicyclist route choice: Analysis using a stated preference survey. *Transportation Research Record, 1828*, 107-115.

Stinson, M. A., & Bhat, C. R. (2004). Frequency of bicycle commuting: Internet-based survey analysis. T*ransportation Research Record, 1878*, 122-130.

Tabachnick, B.G., & Fidell, L.S. (2014). Using multivariate statistics. Great Britain: Clays.

The Thai Health Promotion Foundation. (2015). The number of cyclists increased by 100%. Retrieved on the 20th of September 2018 from http://www.thaihealth.or.th/Content/29147

Thairath. (2015). Bike for mom broke the world record. Retrieved on the 20th of September 2018 from https://www.thairath.co.th/content/518730

Thairath. (2016). The Tourism Authority of Thailand and Nan proposed new bicycle routes in Thailand hidden gems cities. Retrieved on the 20th September 2018 from https://www.thairath.co.th/content/733825

Titze, S., Stronegger, W., Janschitz, S., & Oja, P. (2008). Association of built-environment, social-environment and personal factors with bicycling as a mode

of transportation among Austrian city dwellers. *Preventive Medicine, 47*, 252–259.

University of Cambridge. (2018). Cambridge dictionary. Retrieved on the 20th of September 2018 from https://dictionary.cambridge.org/dictionary/english/awareness

Uth, T.C. (1996). Definitions of fife style and its application to travel behavior. Denmark: Trafikdage på AUC.

Van Bekkum, J. E. (2011). Understanding and encouraging cycle commuting in workplace setting: A psychological perspective. Unpublished doctoral thesis, the University of Edinburgh.

Wardman, M., Tight, M., & Page, M. (2007). Factors influencing the propensity to cycle to work. *Transportation Research Part A: Policy and Practice, 41*(4), 339-350.

Weber, M. (1958). Essays in Sociology. New York: Oxford University Press.

Winters, M., & Teschke, K. (2010). Route preferences among adults in the near market for bicycling: Findings of the cycling in cities study. *American Journal of Health Promotion, 25*(1), 40-47.

Winters, M., Davidson, G., Kao, D., & Teschke, K. (2011). Motivators and deterrents of bicycling: comparing influences on decisions to ride. *Transportation, 38*, 153-168.

World Health Organization. (2000). Transport, environment and health. Australia: World Health Organization.

Yamane, T. (1967). Statistics: An introductory analysis (2nd Ed.). New York: Harper and Row.

Inception Report

Research Grant 2018

ATRANS