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Safety Awareness of Cyclists in the Province of Laguna, Philippines

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Abstract

This study aims to document the cyclists' safety awareness in the province of Laguna, Philippines in terms of cycling safety gears, bike maintenance, cyclist hand signals, and road signage. The descriptive research design was utilized using a self-made survey questionnaire distributed conveniently to 126 cyclist-respondents within the province. The data was interpreted and analyzed using basic, item analysis, and Pearson correlation. The survey found that cyclists are most aware of the majority of the indicators, but are more aware of some of the indicators used for cyclist safety gear, bike maintenance, and road signage. Likewise, it becomes easy for the cyclists to ask the cyclists hand signals, except the two items. It was observed that the civil status, medical health condition, cycling per hour, bike availability, cycling objectives and cycling related accidents of the cyclist - respondents have significant relationship to the cycling safety awareness.

Keywords: *Bike Maintenance, Cyclist, Cyclists Hand Signals, Cyclist Safety Gears, Cyclists Safety Awareness, Road Signage*

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1. Introduction

When the Philippines was in the grip of a pandemic caused by the severe acute respiratory illness coronavirus 2 (SARS-CoV-2), there was an increase in bike users (Lacsa, 2022). The National Economic and Development Authority (NEDA) said that bicycle imports increased 112 percent to 2.1 million units in 2020. During the height of the shutdown of almost all sectors in 2020, as public transportation was suspended for months, Filipinos resorted to cycling. Even if quarantine regulations were relaxed, public transportation vehicles had to lower their carrying capacity to maintain social distancing (Simeon, 2021).

As bicycle users increase, accidents related to bicycles also increase. Based on the World Health Organization (2021), the road traffic collision claims the lives of approximately 1.3 million people each year. Pedestrians, cyclists, and motorcyclists account for more than half of all road traffic fatalities. According to the World Health Organization (WHO) Global Status Report on Road Safety 2018, the number of yearly road traffic deaths has surpassed 1.35 million. Road traffic injuries are currently the main cause of death among those aged 5 to 29. Pedestrians, cyclists, and motorcyclists, particularly those in underdeveloped countries, bear a disproportionate share of the burden (WHO, 2018). Based on the records of the Metropolitan Manila Development Authority (MMDA) in 2019, the bike related accidents in the Philippines were 1,759 and it doubled in 2020 with 3,016.

Grecia (2021) mentioned two possible reasons behind the surge in the number of accidents. One is that the Metro Manila Accident Reporting and Analysis System (MMARAS) now records the number of accidents involving e-bikes and lumps it in with the tally for bicycles and pedicabs. Another is that throughout the pandemic, more people have resorted to using alternative transport solutions such as bicycles, especially during the first few months of quarantine when the availability of public transport was even more limited. Likewise, Baclig (2021) attributes the rising number of bicycle road accidents to the "*severe lack of safe mobility infrastructure*" in the Philippines. With the increased number of cyclist-related accidents, assessing the safety awareness of the cyclists is really a need when it comes to cyclist safety gears, bike maintenance, cyclist hand signals and road signage.

This study may give significant contributions to the following: the cyclists community will be an eye opener to always prioritize safety in riding a bike; the results of this study will give the newbie cyclists some ideas about the safety awareness that they must consider before riding a bike or before buying a bike; and the readers may find significant

ideas about the safety awareness of the cyclists in the province of Laguna, Philippines. Likewise, it will be of help to lessen the cyclist- related crashes in the Philippines.

The general objective of this study was to document the awareness of the cyclists in the Province of Laguna, Philippines in terms of cyclists' safety gears, bike maintenance, road signages and cyclists' hand signals. It also tested the significant relationship between the profile variables and cyclists' safety awareness variables. It proves the following hypothesis:

H_0: There is no significant relationship between the profile variables and the cyclists' safety awareness variables.

2. Review of Related Literature

2.1. Cycling Situations and Safety Awareness

Traffic has been so heavy and congested in the Philippines due to multiple commuters and vehicles crowding the roads daily. The government has been planning to introduce biking to the country to lessen private vehicles on the road and promote a healthy lifestyle for everyone. This stayed as a plan until the pandemic occurred and affected the transportation system in the country where public vehicles are forced to stop operating and people are encouraged to stay at home so riding their private cars is also reduced in numbers. People who are in need to go out and run errands, go to work, and buy various essentials resorted to riding bicycles because of the lessened mobility and to promote wellness (Buchel et al., 2021). Bike lanes are given more attention and importance, and people of all ages are seen riding bicycles each day (Lacsa, 2021). Twenty percent of the population has bicycles (Bosshard, 2022), which outnumbered the number of people that own and ride four-wheel vehicles with a 4:1 ratio as of 2022. Forty-eight percent of them are cycling to get to work, shop, and leisure, which positively affects the traffic situation in the country due to the reduced number of large vehicles crowding the roads every day. In a provincial setting, the bicycle is commonly used for short distance-destinations because it is more convenient and cheap for those who do not want to spend more time and effort riding vehicles but in a faster way (Camena & Castro, 2019). Since the demand rose, the bicycle importation rate increased to 112% to meet the country's needs, which resulted in higher bicycle accidents as the number of cyclists also increased. The number rose from 1,759 in 2019 to 2,606 in 2021 where this was the first time since 2009 that the number of bicycles reported cases went more than 2,000. Likewise, an accident happened in Cabuyao, Laguna when a bicyclist hit an

electric post, it is a very popular place and route to go bicycling because of its steep road and great view. This implies that even using the safest way to avoid close contact with other people and the most convenient way of mobility, accidents could happen anytime, especially due to its rapid usage increase (Terrado, 2021).

In a recent study conducted by Castells-Graells et al. (2019), some work on bike safety has focused on environmental and demographic factors related to cycling safety, e.g., age, gender, daylight conditions and use of helmets. Findings include insights on the limited protection provided by helmets and the necessity that a child is developmentally ready for cycling. Dunlop (2009) mentioned that awareness of the surroundings and learning to ride properly are important safety tools for any cyclist. New or novice riders should be aware of these safety tips: protect their head by wearing a bicycle helmet; and check to see if they are riding a bike that fits them. Additionally, examine their handlebars and wheels to verify that they are secure, and test their brakes to make sure they are able to stop right away. Regularly maintain these functions of their bike, especially if they have not used it all winter.

Similarly, Dunlap (2008) warned cyclists to be aware of the following road rules: complete a pre-ride check of their bike whenever they take to the road. Make sure that their bike's tire pressure, seat height, wheel rotation, gear shifting, and handlebars are all in good working order. Wear a nice cycling helmet to protect their head, and gloves to avoid blisters. Wear luminous clothing and bright colors if they are cycling after dark; a white front light and red rear flasher will make them more visible to oncoming vehicles. Orda (2018) mentioned that bike safety is not only about the decisions of the cyclist during a ride but also about the cyclist's decisions before hitting the road. The key is to equip themselves with essential safety gear – and a comfortable, sturdy helmet does not even cover half it.

Aside from awareness of the cycling safety gears, bike maintenance and road signals, the cyclists should be familiar with the basic hand signals that they can use while cycling. According to Belmonte (2018), being visible and predictable are key to riding safely as they share the road with other modes of transport. While drivers are able to use brake and signal lights to warn other road users of their next move, their simple bicycles come with an obvious limitation. Informing their fellow cyclists and drivers around their next move is a smart way to maintain the harmony they desire. As mentioned by Belmonte (2018), the hand signals that can be used in the Philippines or abroad are: turning left; turning right; slow down; stop; gravel; pothole; move to the left; move to the right; and go ahead.

2.2. Causes of Cyclists Accidents

Road accidents could occur at any time and by any means possible and cyclists are not an exception. According to Ruiz et al. (2012), male cyclists are more prone to road collisions than female, drugs and alcohol intoxication before cycling is also an element for accidents, and bicyclists are more probable colliding in low-powered and light-weight motorcycles than those private four-wheeled cars. Moreover, other causes of bicycle accidents are when they are distracted on the road. It can mean using their phone while riding, looking at their mobile maps on which route they should take or answering phone calls, over speeding especially in routes that do not have bike lanes, and transferring from one lane to another which could lead to them being hit by another vehicle and since bicycle riding is now being used not for leisure but also as a mode of daily mobility from work, exhaustion from a whole day of working or studying could lead to serious accidents (Nolan, 2019). However, in the study of Heesch et al. (2011), they discussed that the severity of the former accidents can also be a component of frequent bicycle crashes. When a bicycle crash only resulted in minor injuries, it is not reported to the proper authorities especially those single bicycle accidents which means that they can treat their wounds alone so they also do not have hospital records for the incident. If there are no common recorded incidents and causes of the same, the situation will not be given a solution to prevent and lessen accidents. Cyclists' characteristics and behavior could also put them at road risk where those who ride for less than five (5) years are more prone to crashes. The environmental situation can deter cyclists from performing and/ or biking well, especially when they are unfamiliar with the place and there are no proper bike lanes for them. In connection with this, cyclists' behavior is in need to be improved as well for them to be able to manage the critical and emergency situation on the road.

2.3. Cyclist Safety Gears

In bicycle riding, one's behavior towards road etiquette is not enough to keep them from accidents and accumulating injuries, so wearing proper gear on the road is a necessary step. In a bicycling handbook, wearing a well-fitted helmet is vital to prevent any serious head and/ or face injuries, putting reflective tapes on the cyclists' clothing and bicycles could help other motorists to see them at night and white lighting in front could help them see better, bringing tool kits in case of emergencies and repairs is vital especially when cycling or kilometers far, bringing identification cards, documents, and cellphone to easily identify

them and call someone related to them is needed in times of accidents, and wearing shatter-resistance eyeglasses and gloves could help lessen the damaging impact of an accident (*Safety Equipment - Bicycle Alliance of Minnesota*, n.d.). Furthermore, Phang et al. (2019) discussed that as cycling is important for mental health, it is as important as the physical safety of the cyclists. They discussed that once a helmet has been in a concussion or in an accident, has a dent or a crack it should not be used again for its quality to protect the user has been lessened. Nonetheless, invest in a high-quality and fitted helmet when riding a bicycle. Safety coincides with comfortableness so the seat must properly support the sitting posture because when a cyclist is uncomfortable in his sitting position his biking skills and surrounding awareness will be reduced and he will be conscious at all times. The width of the same should be fitted to the cyclist riding it, it should not be too soft for it could also cause irritation, and the angle should be properly aligned depending on how the cyclist wants it to be in his own comfortable reference. Having a bell or horns is a vital element not only on large vehicles but also on bicycles so that other cyclists and larger vehicles can be alerted if there is an upcoming bicycle on their way, this is more necessary so that trucks and other heavy equipment vehicles could notice cyclists even if it is on their blind spots. Cycling attire is another important piece of gear when riding a bicycle, make sure that the cyclists are wearing cycling attire that fits them well to promote flexibility and comfortableness of movement, especially the wearing of padded shorts. Wear shoes that do not have ties but clip-ins. To know more about the things that a cyclist should prepare and what would best fit them, consulting a physiotherapist is the best way to get a professional opinion about it.

2.4. Bike Maintenance

Whether a bicycle is often or seldom used, a regular visit to a mechanic should be done before every ride. It must be looked up to for problems in order to prevent more serious risks to the rider and other motorists as well. Always check if the wheels have enough air inflation to keep a safe ride even in long and difficult terrains. The brakes are a vital part of the bicycle for even minor damage to it could cause lives, its tightness and smoothness should be balanced. The chains should be properly lubricated and clean of rust for easy shifting of gears and smooth bike driving even on steep and narrow roads. Along with these, the bolts must be properly screwed for a bicycle to be made and connected with multiple of the same, it would not function well if the nuts and bolts are incomplete and could cause serious damage (*REI Co-op*, n.d.). Many people resorted to riding bicycles for their daily

work and attending errands in the view that it would cost them less than using motor vehicles every day and also it could help lessen air pollution with all the smoke emitted from cars. Maintenance costs differ from various factors like the kind of terrain it passes through often and what kind of bike the cyclist rides on. A high-quality mountain bike that is used and originally built for rough and unfamiliar terrains with quality pieces could cost a person from 28, 350 PHP to 45, 360 PHP annually than normal and regular bikes and/ or mountain bikes that cost the owner from 5,670 PHP to 17,010 PHP annually with regular and mediocre pieces. It depends on how often or seldom the owner brings his bicycle to a mechanic for a check-up and follow-ups (Claudiu, n.d.).

2.5 Cyclist Hand Signals

Hand signals are most commonly used by drivers that are using open vehicles like motorcycles especially bicycles because they are not equipped with light signals, unlike cars that can warn other drivers of what is ahead of them or where they are going. Hand signals are vital signs that help not only the cyclists but also other drivers on the road also because while riding, the surroundings can be noisy due to multiple vehicles and shouting cannot be of help to other riders and it is used to warn other cyclists of the risks ahead so the others can slow down. When the rider in front wants others to slow down, stretch the palms downward while slowly moving their hands up and down. When there is an imminent danger or hazard simply stretch their arms above the head with an open hand. When turning in a specific turn stretch out an arm that sides with the turn that is about to take place with the palm straight out to the side. If giving a warning regarding holes on the road to the others at the back, simply point to the hole upon passing by it or move to it in a circular motion for a clearer indication of a hole. Waving on the road can mean that there is gravel or ice that can cause slipping or tumbling. When a rider does not know proper hand signals on the road, shouting or telling his companions loudly and clearly what is about to happen can already help in preventing accidents and it shows care and respect to the other riders (*Essential Guide to Road Cycling Hand Signals and Calls - Road Cycling UK*, n.d.). Using proper hand signals lessens the traffic and saves people's lives altogether. Given in data from 2015 where approximately 100,000 cyclists died and suffered minor to major injuries ranging up to 467,000 due to road faults and drivers' misunderstanding signage on the road for improper use of them. Accidents could occur anytime and there was no way to stop it but the damage they created could be lessened. Drivers and bicyclists should pay more attention to road

unevenness and hand signals given by other riders on the road. Learning to wait and give way and being on the road takes more than a person who knows how to operate a vehicle or balance a bicycle but they should have road etiquette and knowledge during critical situations (*Bike Law*, 2021).

2.6. Road Signage

Bicyclists tend to explore more of what is there near them given that they do not need to pay for expensive gasoline or petrol for their road-tripping. This often resulted in bikers getting lost or having a hard time going to their planned destination or even returning to their homes. A bicycle way-finding system is a system of signage and marking along the roads may it be on highways or streets to help the cyclists keep track of how long their travel would be and where they should keep their places, giving them an easier way to go biking, alternative routes to pleasing destinations, and to have an update on where are they currently. This is to also give them their own route away from large vehicles that would hit them or collide with them (*National Association of City Transportation Officials*, 2011). In order for the drivers and cyclists to easily understand the road and route they are taking, multiple signs and symbols are used as warnings and information to keep the drivers aware of the road. These signs and symbols are to tell the drivers and riders messages as signs of communication on the road. Being familiar with the colors, shapes, drawings, and letters in the sign could be of great help to the riders to keep them on track and lessen the growing number of road accidents involving bicyclists every day. Signs with a color red background commonly imply road regulations. Yellow signs refer to a warning, green background could majority mean road guide, blue is for services where emergency numbers and hotlines are commonly placed, orange means the road is under construction or excavation, brown means recreation, green is for school zones, and pink for incident management. Road destinations are commonly in yellow background signs with pointing arrows with it and reflectorized stickers so that cyclists and other drivers could easily see and distinguish them when on road (*FHWA MUTCD*, n.d.).

3. Methodology

3.1. Research Design

The descriptive research design was used employing a self-made survey questionnaire to determine the profile of the cyclist-respondents and their safety awareness in terms of

cycling safety gears, bike maintenance, road signage, and cyclist hand signals. The design suits the study objectives as it describes the phenomenon as is.

3.2. Respondents and Sampling Technique

The respondents of this study were the cyclists in the province of Laguna, Philippines. The convenience sampling technique was used in distributing the survey questionnaire via Google forms. There were 126 cyclists who responded to the survey.

The demographics of the respondents show that the majority are between the ages of 21 and 30 (μ=3.40 and σ=1.272), the youngest are between the ages of 11 and 20, and the oldest are between the ages of 71 and above. The 92.86% of respondents are male (μ=1.07 and σ=0.258), 64.29% are single (μ=1.42 and σ=0.696), 72.22% are college graduates (μ=2.94 and σ=0.629), and 88.10% have no medical health condition (μ=1.88 and σ=0.325).

As to their cycling practices, the respondents rode 3.15 days a week on average, with a σ=1.518, and the minimum and maximum days per week are 1 day and 6 days. The average weekly riding time is 7.14 hours with σ=5.674, with a weekly minimum of 1 hour and a weekly maximum of 40 hours. They have 2.11 available bikes with σ=1.820, of which are mountain bike (53.17%) and road bike (37.30%). They learned to ride a bike on their own or through self-teaching (88.89%) with σ=0.615. The majority of them ride their bike for 2.52 cycling objectives with σ=0.918; they include fitness (55.56%) and leisure (22.22%). They ride a bike for 1- 2 years at a rate of 33 or 26.19%, with a mean of 3.69 and σ=2.028. It implies that these bikers are considered as pandemic bikers. According to the findings of Fuller et al. (2021), pandemic restrictions increased overall cycling by 63%. With an average of 1.92 and σ=0.258, 7.14% of cyclists attended a riding seminar. Sixty-six (66) or 52.38% out of the 126 cyclist-respondents have experienced cyclists related accidents.

3.3. Research Instrument

The self-made survey questionnaire was validated by the three (3) cyclists who were research-oriented. The researchers incorporated all suggestions and recommendations of the validators before the conduct of the pilot test. The survey questionnaire was composed of two parts: part I was about the profile of the respondents in terms of: age, sex, civil status, highest educational attainment, bike availability, cycling riding frequency per week, cycling riding frequency per hour a week, cycling objectives, years of cycling, cycling education and cyclists related accident, and part II was about the safety awareness of the cyclist –

respondents in the Philippines, with regard to cycling safety gears, bike maintenance, road signage, and cyclist hand signals.

On the second part of the questionnaire, to document the cyclists' safety gears awareness, the respondents were asked based on the seven (7) items, such as: "*helmet*"; "*water bottle*"; "*lights & reflector*"; "*gloves*"; "*shades*"; "*tool kit*"; and "*road identification/identification card*", and answered based on a 5-point Likert scale: *Most Aware, More Aware, Aware, Less Aware,* and *Not Aware*. Further, to document the cyclist safety awareness in terms of bike maintenance, the respondents were asked based on the five (5) items, such as: "*check the air pressure in the bike tires*", "*lubricate the bike chain*", "*greasing the bearings of the bike*", "*check the torque of the screws*", and "*check the brakes*", and answered based on a 5-point Likert scale: *Most Aware, More Aware, Aware, Less Aware,* and *Not Aware*. Furthermore, to document the cyclist safety awareness in terms of road signage, the respondents were asked based on the seventeen (17) items, such as: "*no right turn*", "*no left turn*", "*give way*", "*stop and give way*", "*no cycling*", "*roundabout*", "*hump*", "*one way traffic*", "*merge*", "*no parking*", "*road work*", "*uneven road*", "*two-way traffic*", "*turn right ahead*", "*turn left ahead*", "*slippery road*", and "*falling rocks*" and answered based on a 5-point Likert scale: *Most Aware, More Aware, Aware, Less Aware,* and *Not Aware*. Moreover, to document the cyclist safety awareness in terms of cyclists' hand signals, the researchers used seven (7) multiple choice items (**See Appendix A:** using a picture of cyclists' hand signals), such as "*left turn*", "*right turn*", "*stop*", "*slow down*", "*give way*", "*road hazard potholes*", and "*road hazard*".

Pilot test was conducted to evaluate the internal consistency and reliability of the questionnaire. Thirty (30) respondents participated in the pilot test. Bujang et al. (2018) suggest a general flat rule to 'use at least 30 subjects or greater to estimate a parameter'. Reliability test was conducted to validate the appropriateness of the questionnaire in measuring the parameters of the study. According to Bujang et al. (2018), an alpha greater than or equal to 0.70 is sufficient to determine that the tool is reliable and valid. As a result, since the test scale alpha was .920, the tool used in this study was highly acceptable.

3.4. Data Collection and Analysis

An online survey was conducted using Google forms to: (1) collect data on the cyclists' age, sex, civil status, highest educational attainment, medical health condition, cycling riding frequency per week, cycling riding frequency per hour a week, bike

availability, cycling education, cycling objectives, years of cycling, attended cycling seminar/training; and cyclists related accident; and (2) cyclists' awareness of cycling safety gears, bike maintenance, cycling hand signals, and road safety. The link to the Google forms was distributed via messenger and the Facebook pages of cycling groups in Laguna, Philippines. The data collection period lasted three (3) months, from December 2021 to February 2022. The data was then extracted in Google Forms using MS Excel and then the basic statistical methods like frequency, percentage, standard deviation, and mean were utilized to evaluate and analyze the profile of the cyclists. Similarly, the mean and standard deviation were utilized to assess safety awareness in terms of cyclist safety gear, bike maintenance and road signage. However, the item analysis was employed to assess safety awareness in terms of cycling hand signals. The Pearson *r* Correlation was employed to test the study's hypothesis.

4. Results and Discussion

Table 1
Cyclist's Safety Gears Awareness

As a cyclist, before I ride a bike I do have/wear	Mean	SD	Verbal Interpretation
1. Helmet	4.8	0.601	Most Aware
2. Water bottle	4.7	0.727	Most Aware
3. Lights & reflector	4.3	0.941	Most Aware
4. Gloves	3.8	1.200	More Aware
5. Shades	4.4	0.951	Most Aware
6. Tool kit	4.5	0.938	Most Aware
7. Road Identification / Identification Card	4.1	1.118	More Aware
Overall Mean and Standard Deviation	**4.4**	**0.669**	**Most Aware**

Legend: *Most Aware (MA) = 5.00 – 4.21*; *More Aware (MA) = 4.20 – 3.41*; *Aware (A) = 3.40 – 2.61*; *Less Aware (LA) = 2.60 – 1.81*; *Not Aware (NA) = 1.80 – 1.00*; *SD = Standard Deviation*

Table 1 shows the cyclist's safety gear awareness. The survey findings revealed that the respondents are found to be the *most aware* of the cycling safety gears such as *helmet* (μ=4.8 and σ=0.601), *water bottle* (μ=4.7 and σ=0.727), *lights & reflector* (μ=4.3 and σ=0.941), *shades* (μ=4.4 and σ=0.951), and *tool kit* (μ=4.5 and σ=0.938). It implies that these cyclist safety gears must be worn by the cyclists before riding a bike. However, it reveals that gloves (μ=3.8 and σ=1.200) and road identification/identification card (μ=4.1 and σ=1.118), with a verbal interpretation of *more aware*. In general, the cyclist – respondents are most

aware of the cyclist safety gears (μ=4.4 and σ=0.669). Odra (2018) supported that cyclists always wear their sunglasses; bring water to keep themselves hydrated and bike tools just in case the cyclist encounters flats and other technical concerns. Most importantly, do not forget to bring bananas and water for nourishment (Odra, 2018).

Table 2

Cyclist's Safety Awareness in terms of Bike Maintenance

As a cyclist, I am aware of bike maintenance….	Mean	SD	Verbal Interpretation
1. Check the air pressure in the bike tires	4.6	0.720	Most Aware
2. Lubricate the bike chain	4.4	0.878	Most Aware
3. Greasing the bearings of the bike	4.2	1.016	More Aware
4. Check the torque of the screws	4.1	1.068	More Aware
5. Check the brakes	4.7	0.701	Most Aware
Overall Mean and Standard Deviation	**4.4**	**0.717**	**Most Aware**

Legend: *Most Aware (MA) = 5.00 – 4.21* *More Aware (MA) = 4.20 – 3.41*
Aware (A) = 3.40 – 2.61 *Less Aware (LA) = 2.60 – 1.81*
Not Aware (NA) = 1.80 – 1.00 *SD = Standard Deviation*

Table 2 shows the cyclist's safety awareness in terms of bike maintenance. The survey findings revealed that *check the air pressure in the bike tires* (μ=4.6 and σ=0.720), *lubricate the bike chain* (μ=4.4 and σ=0.878), and *check the brakes* (μ=4.7 and σ=0.701), with a verbal interpretation of *most aware*. It implies that cyclists are most aware that checking the air pressure of the bike tires, lubricating the bike chain, and checking the brakes of the bike must be done first before riding a bike.

However, cyclist-respondents are *more aware* that *greasing the bearings of the bike* (μ=4.2 and σ=1.016) and *checking the torque of the screws* (μ=4.2 and σ=1.016) must be done before riding a bike. It implies that the cyclist – respondents are more aware that greasing the bearings of the bike and checking the torque of the screws must be done first before riding a bike.

Table 3 shows the cyclist's safety awareness in terms of cyclist hand signals. This part is composed of seven (7) multiple choices (*questions are made in a form of pictures, see Appendix B*) asked to 126 respondents of this study. It shows that 70 out of 126 respondents are correct with the "*road hazard potholes*" (56%) and 72 out of 126 respondents are correct with the "*road hazard*" (57%), and a verbal interpretation of *average*. It implies that road

hazard potholes and road hazard are average questions. Further, the cyclists must know how to recognize the hand signals of their co-cyclists, especially road hazard and road hazard potholes as it can be a cause of cyclist accidents. Ameen (2021) affirmed that various hazards on the roads, poor road conditions are the main reasons of bicyclist deaths and injuries in accidents and crashes, but one of the main reasons is the misunderstanding that occurs between the cyclists and motorists.

Table 3

Cyclist's Safety Awareness in terms of Hand Signals

As a cyclist, I am aware of the cyclist hand signals	Item Difficulty Index	Interpretation
1. Left turn	98%	Easy
2. Right turn	94%	Easy
3. Stop	98%	Easy
4. Slow down	91%	Easy
5. Give way	94%	Easy
6. Road hazard potholes	56%	Average
7. Road hazard	57%	Average
Average Item Difficulty Index	**84%**	**Easy**

Legend:	*Percentage Range*	*Difficulty Index*	*Interpretation*
	76% - 100%	*0.76 – 1.00*	*Easy*
	26% - 75%	*0.25 – 75.00*	*Average*
	0% - 25%	*0% - 25%*	*Difficult*

However, items 1, 2, 3, 4 and 5, "*left turn*", "*right turn*", "*stop*", "*slow down*" and "*give way*" obtained 98%, 94%, 98%, 91%, and 94% correct answers, respectively, with a verbal interpretation of *easy* questions. It implies that the hand signals such as *left turn, right turn, stop, slow down,* and *give way* are easy questions. Further, with this awareness of the cyclists on how to identify the hand signals of their co-cyclists, they will not be involved in a cyclist-related accident. Ameen (2021) inferred that the bike hand signal actually reduces the risk of being hit by a car. No matter what direction they are going in, like turning left, right turn, or slowing down, these hand signals will definitely make their life easier. No matter how they use the turn signal, it will come in handy and make not just theirs but also others' lives easier.

In general, 84% out of 126 respondents said that items 1 to 5, "*left turn*", "*right turn*", "*stop*", "*slow down*", and "*give way*" are easy questions. On the other hand, items 6 and 7, "*road hazard potholes*", and "*road hazard*", are average questions.

Table 4

Cyclist's Safety Awareness in terms of Road Signage

As a cyclist, I am aware of the road signage	Mean	SD	Verbal Interpretation
1. No right turn	4.7	0.706	Most Aware
2. No left turn	4.72	0.688	Most Aware
3. Give way	4.4	1.026	Most Aware
4. Stop and Give Way	4.67	0.767	Most Aware
5. No cycling	4.45	1.148	Most Aware
6. Roundabout	4.37	1.046	Most Aware
7. Hump	4.62	0.817	Most Aware
8. One way traffic	4.6	0.830	Most Aware
9. Merge	4.54	0.834	Most Aware
10. No parking	4.73	0.697	Most Aware
11. Road work	4.72	0.699	Most Aware
12. Uneven road	4.52	0.863	Most Aware
13. Two-way traffic	4.6	0.829	Most Aware
14. Turn right ahead	4.66	0.770	Most Aware
15. Turn left ahead	4.67	0.768	Most Aware
16. Slippery road	4.67	0.745	Most Aware
17. Falling rocks	4.67	0.756	Most Aware
Overall Mean and Standard Deviation	**4.61**	**0.690**	**Most Aware**

Legend: *Most Aware (MA) = 5.00 – 4.21* *More Aware (MA) = 4.20 – 3.41*
Aware (A) = 3.40 – 2.61 *Less Aware (LA) = 2.60 – 1.81*
Not Aware (NA) = 1.80 – 1.00 *SD = Standard Deviation*

Table 4 shows the cyclist's safety awareness in terms of road signage. The study revealed that the 126 cyclist-respondents are *most aware* of the cyclists' safety awareness in terms of road signage overall (μ=4.61 and σ=0.690). It implies that the cyclist – respondents are most aware of the 17 indicators used in this study to measure the cyclist awareness of road signage. As confirmed by the results of the study conducted by Choocharukul and Sriroongvikrai (2017), the respondents could only comprehend road signs to some extent and tourists often misunderstood local road signs.

Table 5

Test of Significant Relationship between the Profile Variables and the Cyclists' Safety Awareness Variables

Variables	Cyclists Safety Gears	Bike Maintenance	Hand Signal	Road Signage
1. Age	-.092	-.018	-.101	.051
	.304	.840	.260	.571
2. Sex	-.115	-.104	-.001	-.173
	.199	.248	.995	.053
3. Civil Status	-.142	-.065	**-.213***	-.074
	.112	.469	**.017**	.411
4. Highest Educational Attainment	-.060	.011	.025	.113
	.502	.904	.783	.209
5. Medical Health Condition	.104	.124	**.208***	.121
	.246	.167	**.020**	.176
6. Cycling Per Day	.146	-.028	-.167	-.095
	.104	.755	.061	.289
7. Cycling Per Hour	**.203***	.070	-.054	.139
	.023	.438	.545	.120
8. Bike Availability	**-.294****	**-.266****	-.095	-.119
	.001	**.003**	.290	.185
9. Learn to Ride a Bike	-.139	-.152	-.033	-.125
	.122	.089	.716	.162
10. Cycling Objectives	**-.227***	-.154	.143	-.129
	.010	.086	.111	.150
11. Year of Cycling	-.076	.004	-.048	.027
	.397	.968	.594	.763
12. Attended Cycling Seminar	.115	.104	.110	.027
	.199	.248	.218	.763
13. Cycling Related Accident	-.035	-.020	.021	**.176***
	.693	.825	.815	**.048**

***. Correlation is significant at the 0.01 level (2-tailed)*

**. Correlation is significant at the 0.05 level (2-tailed)*

Table 5 shows the results of Pearson Correlation Coefficient to test the significant relationship between the profile variables and the cyclists' safety awareness variables. The civil status has a significant relationship to the cyclist's hand signal awareness with a Pearson Correlation value of -.213* and a p-value of .017. It implies that the cyclists' civil status is

closely linked to their awareness of hand signals. Because the majority of the respondents are single or married, they are more aware of cyclists' hand signals, which helps them avoid being involved in cyclist-related accidents. As affirmed by Wilborn (2021), learning three basic hand signals can protect them from danger and help to prevent bike crashes.

It can also be observed that the cyclists' medical health condition has a significant relationship to the cyclists' hand signal awareness with a Pearson Correlation value of .208* and a p-value of .020. It implies that the cyclists with no medical conditions are more aware of the cyclists' hand signals than the cyclists with medical health conditions. Further, the cyclists cycling hour per week has a significant relationship to the cyclists' safety gears awareness with a Pearson correlation value of .203* and a p-value of .023. The longer the cycling hour per week of the cyclists, the higher the cyclist's safety gear is aware. Furthermore, it can also be observed that the cyclists' bike availability has a significant relationship to the cyclists' safety gears and cyclists' bike maintenance with Pearson Correlation value of -.294** and -.266**, and p-values of .001 and .003, respectively. Cyclists with two or more bike availability are more aware of the cyclists' safety gears and cyclists bike maintenance.

Likewise, it can be observed that the cyclists cycling objectives has a significant relationship to the cyclists' safety gears awareness with a Pearson Correlation value of -.227* and a p-value of .010. Cyclists who ride their bikes for fitness and leisure are more aware of cyclist safety gear than the cyclists with objectives of riding a bike for work and competition.

The cyclists' related accident has a significant relationship to the cyclists' hand signal awareness with a Pearson Correlation value of .176* and a p-value of .048. Cyclists who have experienced cycling related accidents are more aware of the cyclists' hand signal awareness. Cyclists do not have the luxury of flipping a switch to signal a turn or to let others know they are slowing down. Instead, they must use hand signals to alert others on the road about their plans. Not only to alert cyclists about their actions, but also to use them in an emergency if their own signals and lights have failed (Howie & Wagman, 2016).

However, it can also be observed that the age, sex, highest educational attainment, cycling hour per day, learn to ride a bike, year of cycling and attended cycling seminar have

no significant relationship to the cyclists' safety gears, bike maintenance, hand signals and road signage.

5. Conclusion

This study found that cyclists are most aware of the cyclist safety gears; however, they are more aware of gloves and road identification/identification cards. Likewise, they are most aware of the cyclist's safety but they are most aware in checking the torque of the screws. Further, they are able to recognize the cyclist hand signals, except the road hazard and road hazard potholes, and are most aware of the road signage. The civil status and medical health condition have a significant relationship with the cyclists' hand signal awareness of the respondents. Likewise, the cycling hour per week, bike availability and cycling objectives have a significant relationship with the cyclists' safety gear awareness of the respondents. Furthermore, it can also be observed that the cycling objectives have a significant relationship with the cyclists' bike maintenance awareness of the respondents and the cycling related accidents of the cyclists have a significant relationship with the road signage awareness of the respondents. These findings imply enhancing the awareness of the cyclists with regard to cyclist safety gears, cyclists hand signals and bike maintenance. As the study is limited to safety awareness, further studies can be conducted on the relationship between safety awareness and occurrence of accidents.

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Appendix A

Descriptive Statistics of the Profile of Respondents

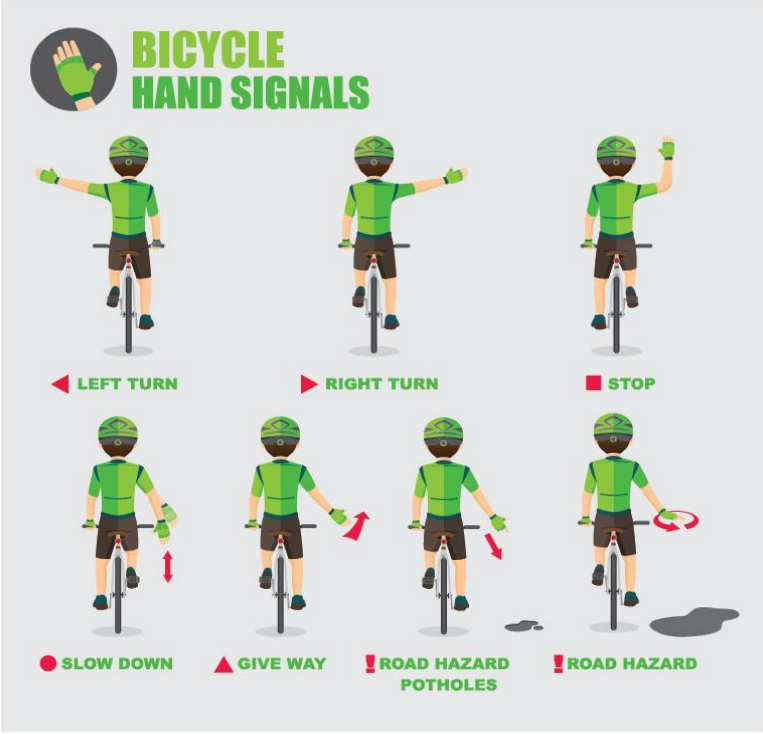
Profiles		SD	Mean	Min	Max	f *(N=126)*	%	Rank
Age	10 years old and below	1.272	3.40	2	8	0	0.00	7
	11-20 years old					35	27.78	2
	21-30 years old					39	30.95	1
	31-40 years old					25	19.84	3
	41-50 years old					19	15.08	4
	51-60 years old					6	4.76	5
	61-70 years old					1	0.79	6.5
	71 years old and above					1	0.79	6.5
Sex	Male	0.258	1.07	1	2	117	92.86	1
	Female					9	7.14	2
Civil Status	Single	0.696	1.42	1	5	81	64.29	1
	Married					42	33.33	2
	Annulled					0	0.00	5
	Solo/Single Parent					1	0.79	4
	Widow/Widower					2	1.59	3
Highest Educational Attainment	Elementary Graduate	0.629	2.94	2	5	0	0.00	5
	High School / Senior High School Graduate					24	19.05	2
	College Graduate					91	72.22	1
	Masters Graduate					6	4.76	3
	Doctor Graduate					5	3.97	4
Medical Health Condition	Yes	0.325	1.88	1	2	15	11.90	2
	No					111	88.10	1
Cycling Riding Per Week	Everyday	1.518	3.15	1	6	19	15.08	3
	Twice					25	19.84	2
	Thrice					40	31.75	1
	Four					16	12.70	4
	Five					12	9.52	6
	Six					14	11.11	5
Cycling Riding Hours per Week	NA	5.674	7.14	1	40	NA	NA	NA
Bike Availability	Road bike	1.820	2.11	1	9	47	37.30	2
	Mountain bike					67	53.17	1
	Cyclocross bike					1	0.79	6.5
	Gravel bike					4	3.17	5
	Fixie					1	0.79	6.5
	BMX					0	0	0
	Fat bike					0	0	0
	Ordinary bike					0	0	0
	Others					6	4.76	4
Cycling Education	Self-Taught	0.615	1.19	1	4	112	88.89	1
	Coached					8	6.35	2
	Attended					2	1.59	4
	Seminar/Training					4	3.17	3

	Other							
Cycling Objectives	Bike for work	0.918	2.52	1	4	9	7.14	4
	Bike for fitness					70	55.56	1
	Bike for competition					19	15.08	3
	Bike for leisure					28	22.22	2
Years of Cycling	1 year below	2.028	3.69	1	7	14	11.11	5
	1-2 years					33	26.19	1
	3-4- years					20	15.87	4
	5-6 years					23	18.25	3
	7-8 years					7	5.56	6
	9-10 years					4	3.17	7
	11 years above					25	19.84	2
Cycling Seminar / Training	Yes	0.258	1.92	1	2	9	7.14	2
	No					117	92.86	1
Cycling Related Accident	Yes	0.501	1.48	1	2	66	52.38	1
	No					60	47.62	2

Note: NA = Not Applicable

Appendix B

Cyclists Hand Signals



Source: https://bicyclensw.org.au/bicycle-hand-signals-3/