Analysis of Factors Associated with Pedestrians' Crossing Behavior along MacArthur Highway, San Matias, Santo Tomas, Pampanga

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Abstract*—As the population continues to grow, a significant number of individuals rely on pedestrian crossings in their daily lives. However, people exhibit different behaviors when using such facilities, which can lead to traffic congestion and conflicts with other road users. Pedestrian behavior is a complex issue influenced by various factors, including pedestrians themselves, as well as traffic, road, and environmental characteristics. This study aims to explore the subjective factors underlying pedestrian crossing behavior at an unsignalized intersection along MacArthur Highway, San Matias, Santo Tomas, Pampanga. Through a review and collation of various studies, potential factors were identified and grouped into five main categories: pedestrians' attitudes, positive behaviors, negative behaviors, perceptions, and preferences. A survey questionnaire was utilized to gather data from 390 respondents, selected through convenience sampling. The questionnaire consisted of questions to be rated using Likert Scale responses. Correlation analysis revealed direct associations between pedestrians' positive and negative behaviors, as well as their preferences, with their crossing behavior. This finding emphasizes the importance of pedestrian behavior and preferences in determining safe crossing practices. Promoting safety awareness and responsible behavior among pedestrians can prove effective in improving pedestrian safety. Based on the results, recommendations are provided for both the local government and pedestrians. These recommendations include maintaining marked crosswalks, installing additional pedestrian crosswalks, implementing barricades and signage, ensuring adherence to traffic laws, and encouraging the proper utilization of pedestrian facilities.

Indexed Terms*—Pedestrian Behavior, Likert Scale, Marked Crosswalks, Traffic Laws, Pedestrian Facilities.

I. THE PROBLEM AND REVIEW OF RELATED LITERATURE AND STUDIES

1.1 Introduction

Pedestrians are a crucial component of transportation, and they have the right to the highest level of protection and comfort on the streets. Assessing the pedestrian level of service (PLOS) is essential for organizing and improving pedestrian traffic and ensuring the safety of road users. PLOS evaluates the extent to which road facilities meet pedestrians' expectations in terms of safety, comfort, and continuity. The results of PLOS assessments are often presented on a scale ranging from A to F. "A" represents "free flow" or "high satisfaction," while the letter "F" represents "no movement," "worse," or "very unsatisfied" [1].

There are numerous existing studies that examine pedestrian behavior and its influencing factors, including demographics, traffic conditions, road environment, and other visible characteristics [2]-[10]. However, limited research has focused on understanding pedestrians' perceptions, preferences, habits, and subjective aspects that could be integrated into improving pedestrian crossing facilities, thereby increasing their usage and safety. This study analyzes factors based on previous research and literature that

may significantly impact pedestrians' behavior when crossing the road. While some studies have already explored the relationship between subjective factors like attitudes, perceptions, preferences, and crossing behavior in other countries, this research aims to bring the study into the context of Pampanga, Philippines. Furthermore, if significant determinants are identified, the findings of this study can serve as a foundation for creating a more pedestrian-friendly environment in the local area and potentially in the country as a whole.

1.2 Review of Related Literature

1.2.1 Pedestrian Level of Service (PLOS)

The pedestrian level of service (PLOS) is a crucial performance indicator for evaluating the current conditions of pedestrian crossing facilities [11]. Assessing the quality of roads and other traffic infrastructures is essential for improving the service of existing facilities and developing new ones [12]. Crosswalks are critical locations where pedestrians interact closely with vehicular traffic, which can lead to conflicts or accidents. Pedestrians may cross the road at both signalized and non-signalized crossings, and some may even choose to cross directly at undesignated locations [12]. The exploration of pedestrian level of service (PLOS) encompasses various factors and is more complex compared to assessing motor vehicle level of service [13]. Two common approaches for analyzing PLOS are capacity-based models and highway characteristic-based models [14].

1.2.2 Pedestrians' Crossing Behavior

Pedestrians have an impact on traffic at both signalized and unsignalized intersections. As a result, knowing their behavioral characteristics is critical that may result in a better design of crossing facilities for them. Pedestrian behavior is a complex issue that involves a number of factors, from pedestrians as well as traffic, road, and environmental characteristics. Their safety is dependent, among other factors, on how they cross the roadway [15]. When pedestrians choose to cross the road using an unmarked crossing, they put themselves and other road users at risk and increase the probability of a collision when compared to a marked and/or signalized crossing [16]. Estimating pedestrians' behavior has proven to be challenging since they can walk in a number of directions, be obstructed by a variety of objects, and be distracted while using electronic devices. Furthermore, their decisions might be influenced by a variety of variables [17]. Previous studies have also looked at the underlying variables that affect pedestrian behavior when crossing the street.

Pedestrians Being Abstracted: These factors include the distractions being experienced by pedestrians while crossing the road. These qualities may have a favorable and unfavorable impact on pedestrians. Numerous research demonstrates how this relates to their crossing behavior. A study conducted by [18] wherein observers monitored the crossing behaviors of 1102 pedestrians. Almost one-third of all pedestrians (29.8%) engaged in a distracting activity while crossing. Listening to music (11.2%), text messaging (7.3%), and using a mobile phone (6.2%) were among the distractions. In addition, among the 21,760 pedestrians observed, nearly one-third crossing on a green signal and nearly half crossing on a red signal wearing headphones, talking on a mobile phone, and/or using an electronic device [19]. Other distractions include behaviors such as looking in a handbag, reading a newspaper, tending to a young kid, and so on, that may otherwise distract the pedestrian from focusing on the task of safely crossing the street [20].

Gap Acceptance: A lot of characteristics need to be factored in to clarify the underlying factors behind pedestrians' crossing behavior. One of these factors is the vehicular gap. According to a study by [6], pedestrians were less likely to cross the street when faced with higher vehicle speeds and exhibited slower crossing initiation, even for a given distance gap. Conversely, in higher-speed situations, pedestrians were more likely to commence quickly and cross for a certain period of time, indicating that vehicle speed influences their crossing behavior. These findings suggest that pedestrians should consider visual looming, which depends on vehicle speed and distance, to determine whether it is safe to cross the street or not. Additionally, [7] found that if a pedestrian encounters a larger vehicular gap after reaching the curb or median, the waiting time has less influence on the pedestrian's speed change behavior. This implies that when there are greater vehicular gaps, people tend to walk at a normal speed.

Pedestrian Crossing Facility Location: Another factor influencing pedestrians' crossing behavior is the location of the crossing facility itself. Besides distracting factors and the vehicular gap, the specific location of the crossing facility plays a role in determining pedestrians' crossing speed. A study by [8] revealed that pedestrian crossing speeds vary depending on the type of crossing location. This was observed after comparing pedestrian crossing speeds at various crossing locations. Furthermore, according to the findings of a study conducted by [9], pedestrians take into account the costs and dangers involved before deciding how to cross the street. Despite the availability of pedestrian bridges and signalized crossroads in certain locations, if there is no detour required and the origin or destination is directly accessible, people still prefer to cross the road directly.

1.3 Background of the Study

Despite the ease of access to various crossing infrastructure for pedestrians, individuals exhibit different behaviors when utilizing these facilities, which can lead to traffic congestion and accidents. Human factors influencing pedestrian behavior have received less attention in the literature compared to other road users, even though road and traffic factors account for only a small portion of pedestrian walking and crossing behavior in urban areas [21]. Based on records from the Municipal Police Station of Sto. Tomas, Pampanga, a total of 12 accidents involving pedestrians were documented between 2018 and 2022. These incidents underscore the significant safety concerns within the area during this time period. The recorded accidents serve as a reminder of the importance of road safety measures and the need for increased awareness among both drivers and pedestrians. Efforts to mitigate such accidents should be prioritized, including implementing stricter traffic regulations, enhancing pedestrian infrastructure, and raising public awareness campaigns to promote responsible and cautious behavior on the roads.

Fig.1 *Map of San Matias (Source: Google Maps)*

The researchers focused on San Matias, one of the barangays of Santo Tomas. Its population was 13,769, according to the 2020 census, which represented 32.14% of the total population of Santo Tomas. In addition, barangay San Matias is located at the coordinates 15.0079, 120.7122 (15° 0' North, 120° 43' East). It is bounded on the north-east by San Fernando, on the south-east by the municipality of San Simon and on the south-west by the town of Minalin. As a result, it is expected that several vehicles, including public utility vehicles (jeepneys, tricycles, and pedicabs) and private cars, would pass by the area, particularly during typical workdays. It is projected to have heavy traffic during peak hours, when students and workers must drive home. The MacArthur Highway also served as a route for heavy trucks carrying building supplies.

The researchers directed their attention to an unsignalized intersection along MacArthur Highway, a location known for its high pedestrian presence. Despite the availability of pedestrian crossings such as crosswalks and footbridges, some individuals choose not to utilize them due to their inconvenient placement. Instead, they prefer to cross the road directly or use unsignalized crosswalks for their convenience. Furthermore, the study site is situated in close proximity to four educational institutions, resulting in a significant volume of students crossing the road on a daily basis.

1.4 Objectives of the Study

1.4.1 General Objective

This study aims to determine the factors associated with pedestrians' crossing behavior in a non-

signalized intersection along MacArthur Highway, San Matias, Santo Tomas, Pampanga

1.4.2 Specific Objectives

Specifically, this study aims:

- To assess the current pedestrian level of service (PLOS) of crosswalks in a selected non-signalized intersection,
- To identify pedestrians' attitudes, behaviors, perceptions and preferences towards the available crossing facilities,
- To determine if the factors have significant influence to their crossing behavior, and
- To give recommendations to improve pedestrian safety and encourage them to utilize crosswalks.

1.5 Statement of the Problem

The study sought to answer the following questions:

1. What is the pedestrian level of service (PLOS) of crosswalks in the selected non-signalized intersection along MacArthur Highway, San Matias, Santo Tomas, Pampanga?
2. How may the pedestrians be described in terms of their;

2.1 Attitudes
2.2 Positive Behaviors
2.3 Negative Behaviors
2.4 Perceptions
2.5 Preferences

3. Do pedestrians' attitudes and behaviors, perceptions and preferences significantly affect their crossing behavior?

1.6 Significance of the Study

The purpose of this research is to add to the existing body of knowledge that may be used to design strategies to improve road user safety. The study's goal is to give an in-depth, accurate, and improved understanding of different factors that influence pedestrian crossing behavior. Furthermore, the following people will profit from this paper:

Pedestrians: This study aims to provide guidance to pedestrians in making informed decisions, particularly when crossing the road. By understanding the factors that influence crossing behavior, pedestrians can prioritize their safety and utilize the available crossing facilities in the study area effectively.

Operators/Drivers: The findings of this study will benefit drivers or operators by increasing their understanding of pedestrian behavior and the utilization of various crossing facilities. By reading this study, they can gain valuable insights on considering pedestrian safety and managing their driving speed, ultimately reducing the number of accidents in the study area.

Traffic Engineers/Experts: This research will assist traffic engineers and experts in generating relevant ideas for implementing plans that improve pedestrian flow and enhance the design of appropriate crossing facilities. The insights gained from this study will contribute to creating a more pedestrian-friendly environment.

Local Government: The study findings will provide local government authorities with reliable information to enhance the implementation of road safety ordinances. This can facilitate easier compliance and, most importantly, contribute to creating more efficient and safe pedestrian access.

Future researchers: The outcomes of this study will serve as a valuable resource for future researchers interested in any aspect related to this topic. It will provide a foundation for further improvements and advancements in the subject matter, serving as a reference material for ongoing research.

1.7 Scope and Limitations

This study aimed to identify significant subjective factors, including attitudes, behavior, perception, and preferences, that influence pedestrians' crossing behavior along MacArthur Highway in San Matias, Santo Tomas, Pampanga. The researchers utilized printed questionnaires and conducted semi-structured interviews to gather data from pedestrians within the intersection and along MacArthur Highway during peak periods, using Convenience Sampling.

One limitation of this study is that it only assessed the pedestrian level of service (PLOS) for crosswalks within the study area, neglecting other pedestrian facilities such as sidewalks and pedestrian bridges. Consequently, the study may not provide a comprehensive understanding of the pedestrian experience in relation to all available facilities.

Another limitation is the exclusion of observable factors like age, gender, and personal information, as these have been extensively studied in previous research. Additionally, the study's scope was limited to the specified location due to financial and time constraints. Therefore, the findings are expected to be specific and applicable primarily to the study area, and variations may occur in different locations or countries where similar research is conducted.

By focusing on subjective factors specific to the study area, this research can offer recommendations for enhancing pedestrian safety and crossing behavior along MacArthur Highway in San Matias, Santo Tomas, Pampanga. It can also serve as a foundation for future studies, potentially leading to more comprehensive research that incorporates both subjective and observable factors.

Moreover, to analyze the data gathered, the researchers used correlational analysis and thematic analysis. Correlation analysis was done to assess the relationship between the variables of the study, specifically in analyzing the independent and dependent variables' associations. Finally, thematic analysis was utilized to locate, compile and provide an understanding of patterns of meaning throughout the data gathered from the semi-structured interview.

1.8 Conceptual Framework

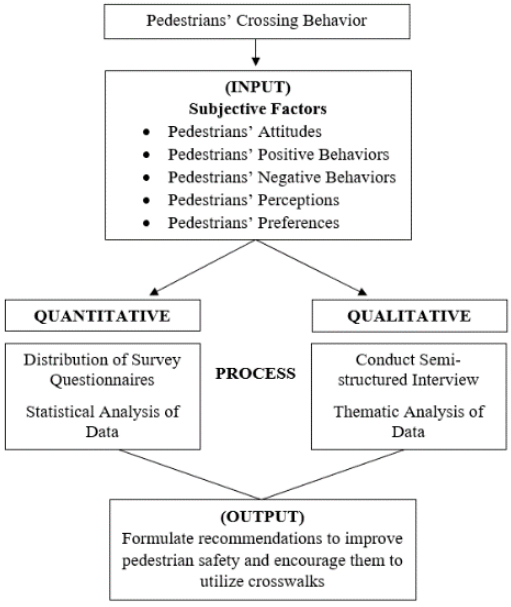

Fig.2 *Conceptual Framework*

The paradigm shows the Input-Process-Output (IPO) format. This study explored the subjective factors namely attitudes, positive and negative behaviors, perceptions and preferences which are expected to have a positive, negative or no relationship with the dependent variable namely pedestrians' crossing behavior. Through face-to-face survey approach and semi-structured interviews, the researchers were able to collect necessary data from the respondents and performed statistical and thematic analysis. Lastly, the output includes the conclusion and recommendations to improve pedestrian safety and encourage them to utilize crosswalks.

II. METHODOLOGY

2.1 Phase 1 – Methodological Framework

2.1.1 Research Design

This study used a mixed-method research design. It was used to allow the researchers to look at various characteristics at once and to determine information about what is happening with the present population. Quantitative research, particularly Descriptive and Correlational research design, was utilized to measure and analyze the numerical data gathered in the study. On the other hand, Qualitative research, specifically the Phenomenological approach, was used to gather information from the people who can provide the richest insight. In order to gather necessary data about the study, the researchers used survey questionnaires and semi-structured interviews. urvey questionnaires were distributed to participants in order to achieve the study's goals, which include assessing subjective variables influencing pedestrian crossing behavior in a non-signalized intersection, particularly along MacArthur Highway, San Matias, Santo Tomas, Pampanga.

2.1.2 Research Locale

The researchers determined the necessary samples for the research using Raosoft sample size calculator resulting in 377 respondents. However, the researchers were able to gather data from a larger sample size of 390 respondents due to the availability of resources. This means that the researchers exceeded the minimum required sample size and may have a greater level of confidence in the accuracy of the findings.

2.1.3 Respondent Sampling

The researchers implemented non-probability sampling specifically Convenience sampling to identify the participants of the study. This sampling technique does not necessarily require a selection of participants based on any set of criteria; instead, researchers can choose individuals at random who are willing to contribute and become a part of the study. In addition, convenience samples are frequently referred to as "accidental samples" since elements may be chosen in the sample merely because they are physically or administratively close to where the researcher is collecting data [22].

2.1.4 Research Instrument

To collect necessary data from the study's respondents, survey questionnaires and semi-structured interviews were utilized. A survey questionnaire is known and widely recognized as one of the most commonly used and effective methods for gathering first-hand data from respondents. For this reason, questionnaires were printed in several copies to collect information from the respondents. Meanwhile, semi-structured interviews were conducted face to face with the consent of the local government unit of barangay San Matias, Santo Tomas, Pampanga.

This questionnaire is divided into sections gauged to know the Pedestrians' mobility, travel motivations, attitude, positive and negative behaviors, and their perceptions and preferences. Under these sections is a list of items formulated to quantitatively assess the participants' experience and knowledge necessary to answer the problems posed at the beginning of the paper. These items are to be rated using Likert scales that measure the extent to which respondents always or never engage in a certain behavior or the extent to which they agree or disagree with a certain statement. Finally, as a foundation for the proposals and solutions, the researchers conducted interviews with various transportation specialists from the industry. The interview is made up of questions concerning pedestrians' crossing behavior observed by traffic experts within the study area. There were additional questions asking for expert opinions and advice regarding ways to improve pedestrian safety. Through this, the researchers were able to provide viable strategies for ensuring a smooth flow and provide a comfortable experience on the road.

2.2 Phase 2 – Data Collection

The research was conducted during the first and second semesters of the academic year of 2022-2023 in San Matias, Santo Tomas, Pampanga, specifically along the MacArthur Highway. The research was conducted in person, with adherence to Covid-19 health protocols set by the local government.

The researchers created a permission letter addressed to the barangay captain to notify them of the planned survey in the area. Prior to conducting the survey, the participants were also asked for their permission. More significantly, the researchers explained the objectives of the research to the participants and guaranteed them that their identities would be kept private in order to protect their privacy. A printed copy of the survey questionnaires was distributed to them, and a semi-structured interview was conducted with traffic experts. With the data gathered from the respondents, it serves as the data for the statistical analysis.

The researchers analyzed all the acquired data from the response of the respondents using descriptive, correlation, and thematic analysis in order to compile information and come up with recommendations. As a result, the researchers were able to know the factors that affect the behavior of pedestrians along MacArthur Highway, San Matias, Santo Tomas, Pampanga.

2.3 Phase 3 – Statistical Treatment and Data Analysis

Provided the nature of the problem, descriptive and inferential statistics were utilized in the study. Descriptive analysis was used to answer research questions one to two. At the same time, inferential statistics, specifically correlation analysis, answered the third research question. Statistical Package for the Social Sciences (SPSS) software was used in conducting the analyses as it is powerful and easier to manipulate.

2.3.1 Descriptive Analysis

Descriptive analysis is a data analysis method that aims to describe, display, or summarize data in a meaningful manner, facilitating the identification of patterns and meeting the conditions of the data. It provides insights into the distribution of the data and identifies similarities between variables, laying the

groundwork for further statistical analyses. This analysis approach was used to describe various aspects such as pedestrian level of service (PLOS) at crosswalks, pedestrians' attitudes, behaviors, perceptions, preferences, as well as their modes of transportation and travel motivations. For example, in addressing the first research question, the PLOS was evaluated using the provided formula. Similarly, subjective factors of pedestrians were summarized by calculating the mean scores derived from the survey questionnaire responses.

The following was used in order to determine the pedestrian level of service (PLOS) of the selected study area:
Pedestrian Unit Flow Rate: It is the number of pedestrians passing a point per unit of time.

The formula used is:

$$V_p = \frac{V_{15}}{15 * W_E}$$

where,
V_p = pedestrian unit flow rate (p/min/m),
V_{15}= peak 15-min flow rate (p/15-min), and
W_E= effective crosswalk width (m)

Level of Service	Flow Rate (p/min/m)	Interpretation
A	≤ 16	Relatively free, can select normal walking speed, and conflicts are unlikely
B	16-23	Select normal walking speed, bypass slow-moving pedestrians, and minimum of restrictions
C	23-33	Restricted flow, minor conflicts occur, and slightly lower mean speed and flow
D	33-49	High probability of conflict, speed is restricted, and difficulty in passing
E	49-75	Speed severely restricted, frequent adjustment of gait, and approaching the capacity limit
F	Variable	Progress made only by shuffling and bunching, extreme restriction of speed, and breakdown of flow

Table.1 *Average Flow LOS Criteria for Walkways and Sidewalks*

Likert Scale: On each item, the Likert scale gauges the degree of response from the area mean. The following tables show the Mean's range and verbal interpretations.

The scale of statistical mean and descriptive equivalent rating are shown in the tables below.

Mean Score	Adjectival Rating
3.26 – 4.00	Everyday
2.51 – 3.25	More than Once a Week
1.76 – 2.50	Less than Once a Week
1.00 – 1.75	Never

Table.2 *Scale and Rating for Mode of Transportation*

Mean Score	Adjectival Rating	Alternative Adjectival Rating
3.26 – 4.00	Strongly Agree	Always
2.51 – 3.25	Agree	Often
1.76 – 2.50	Disagree	Seldom
1.00 – 1.75	Strongly Disagree	Never

Table.3 Scale *and Rating for 4-point Likert Scale*

2.3.2 Correlation Analysis
According to [23], correlation is predictive of the relationship between two variables. Using this, one can discover the nature, direction, and strength of the association between two factors. According to [24], correlation analysis provides a correlation coefficient ranging from +1 to -1. A value close to +1 or -1

indicates a direct or inverse relationship between the two variables, respectively. A value close to 0, on the other hand, indicates that there is no relationship at all. This study used a survey questionnaire that involved items to be rated using Likert Scale. A Likert scale is a type of rating scale that is used to assess opinions, attitudes, or behaviors. Respondents select the option that best expresses their feelings about the statement or question [25]. Given that the research data are expected to be ordinal, Spearman's correlation was applied. According to [26], Spearman's correlation coefficient (rs) assesses the degree and direction of the relationship between two ranked variables. In this study, subjective factors, namely pedestrians' attitudes and behaviors, perceptions, and preferences, are considered to be the independent variables. Meanwhile, pedestrians' crossing behavior was the outcome or dependent variable.

2.3.3 Thematic Analysis

Thematic analysis is a qualitative data analysis technique that focuses on studying patterns of meaning. It involves identifying and analyzing themes within a dataset to understand the underlying meanings. Typically, it is applied to a group of texts, such as interview transcripts [27]. In this study, thematic analysis was utilized to extract patterns from the responses obtained during the semi-structured interviews. The process involved transcribing the audio recordings, carefully reviewing the text, and taking initial notes to gain familiarity with the data. Subsequently, the data was coded, which entails identifying specific text passages, such as phrases or sentences, and assigning "codes" to represent their content. These codes provide a systematic overview of the key points and common themes that emerge across the data, organized according to their meanings. Through this process, the researchers were able to identify patterns within the responses and generate a detailed report of the findings.

III. RESULTS AND DISCUSSION

3.1 Pedestrian Level of Service (PLOS)

The main two pedestrian crosswalks of the study area are situated along MacArthur Highway which has four lanes and one along the Municipal Road with two lanes. The width of the road for both locations are 13.4m and 6.7m respectively provided by Department of Public Works and Highways (DPWH). While the crosswalk width for crosswalk 1 is 2.5 meters and 3 meters for both crosswalks 2 and 3. Table 4 shows the 15-minute pedestrian volume result that has been counted three times within the day.

Time Interval	Crosswalk 1 along MacArthur Highway	Crosswalk 2 along MacArthur Highway	Crosswalk 3 along Municipal Road
6:30 am – 6:45 am	66	111	71
12:00 noon – 12:15 pm	83	39	53
3:45 pm – 4:00 pm	128	44	67

Table.4 *15-minute Pedestrian Volume Count*

3.1.1 *Evaluation of Pedestrian Level of Service (PLOS)*

We know,

$$V_p = \frac{V_{15}}{15 * W_E}$$

where,

V_p = pedestrian unit flow rate (p/min/m),

V_{15}= peak 15-min flow rate (p/15-min), and

W_E= effective crosswalk width (m)

Observed Area	Duration	15-min Pedestrian Flow Rate (p/15-min)	Effective Crosswalk Width (m)	Pedestrian Unit Flow Rate (p/min/m)	Result (refer to table 3)
Crosswalk 1 along MacArthur Highway	6:30 am – 6:45 am	66	2.5	1.76	PLOS A
	12:00 nn – 12:15 pm	83	2.5	2.21	PLOS A
	3:45 pm – 4:00 pm	**128**	**2.5**	**3.41**	PLOS A
Crosswalk 2 along MacArthur Highway	**6:30 am – 6:45 am**	**111**	**3**	**2.47**	PLOS A
	12:00 nn – 12:15 pm	39	3	0.87	PLOS A
	3:45 pm – 4:00 pm	67	3	1.49	PLOS A
Crosswalk 3 along Municipal Road	**6:30 am – 6:45 am**	**71**	**3**	**1.58**	PLOS A
	12:00 nn – 12:15 pm	53	3	1.18	PLOS A
	3:45 pm – 4:00 pm	67	3	1.49	PLOS A

Table.5 *PLOS Results based on Pedestrian Unit Flow Rate*

It has been shown that all the pedestrian levels of service during its peak 15-minute pedestrian volume, 128 for crosswalk 1, 111 for crosswalk 2, and 71 for crosswalk 3, are all rated as PLOS A, which is the

highest level of service. This indicates that the pedestrian experience during this time is of the highest quality. In addition, pedestrians in areas rated as PLOS A typically experience minimal delays, and they can move easily and freely, with enough space to avoid congestion or overcrowding.

3.2 Correlational Analysis

Independent Variables	Correlation Coefficient	Sig. (2-tailed)	Interpretation
Pedestrians' Attitudes	390	.139	Not Significant
Pedestrians' Positive Behavior	390	<.001	Significant
Pedestrians' Negative Behavior	390	.035	Significant
Pedestrians' Perceptions	390	.325	Not Significant
Pedestrians' Preferences	390	.002	Significant

Table.6 *Independent Variables vs. Dependent Variable*

Table 6 shows the correlational analysis between the independent variables and the pedestrians' crossing behavior. It can be observed in the table that pedestrians' positive and negative behaviors and pedestrians' preferences have a significant relationship to their crossing behavior. Since the significance value is less than 0.05, it shows a significant relationship between the variables. On the other hand, pedestrians' attitudes and perceptions do not have a significant relationship with their crossing behavior. The value of the significance level is greater than 0.05, indicating that the relationship between these variables is not significant.

IV. SUMMARY, CONCLUSION AND RECOMMENDATIONS

4.1 Summary of Findings

Following are the findings of the statistical analyses applied to the gathered data:

1. What is the pedestrian level of service (PLOS) of crosswalks in the selected non-signalized intersection along MacArthur Highway, San Matias, Santo Tomas, Pampanga?

All three crosswalks, namely Crosswalk 1, Crosswalk 2, and Crosswalk 3, have received PLOS A ratings for pedestrian level of service during their peak 15-minute pedestrian volume of 128, 111 and 71 respectively, indicating that the pedestrian experience is of the highest quality. This rating implies that pedestrians can move easily and freely, experience minimal delays, and have sufficient space to avoid congestion or overcrowding.

2. How may the pedestrians be described in terms of their:

Attitudes: Pedestrians tend to agree that crossing the road is difficult, especially at unmarked crosswalks where they feel that vehicles are less respectful towards them. They also find crossing at unmarked crosswalks inconvenient and feel unsafe when crossing alone. Furthermore, they believe that crossing at unmarked crosswalks poses a high risk of accidents.

Positive Behaviors: According to the survey results, respondents tend to use crosswalks and exhibit cautious behavior when crossing the road. The mean score for crossing the road using the crosswalk is high, indicating that pedestrians frequently use crosswalks. Pedestrians also use crosswalks when traffic enforcers are present and when the crosswalk is nearby. However, there is a decrease in scores for utilizing crosswalks when the destination is on the other side of the road, suggesting that some pedestrians may not always adhere to safe practices. Nonetheless, the overall average score for cautious behavior when crossing the road is high, indicating that pedestrians tend to be careful when crossing.

Negative Behaviors: Pedestrians tend to engage in unsafe behaviors less frequently. However, crossing outside the designated area when in a hurry is a behavior that respondents often observe. Running while crossing and crossing outside of the designated area due to the influence of others was less prevalent,

indicating that these behaviors are uncommon. Pedestrians generally do not use a mobile phone or become distracted while crossing, indicating that they prioritize safety in these situations. Nonetheless, any of these unsafe behaviors can raise the chance of an accident or injury. Therefore, pedestrians need to prioritize safe practices when crossing the road.

Perceptions: Based on the survey results, most respondents agree with the perception that crossing the road outside the designated area is not safe, increases the chances of an accident, and is not right. Additionally, the perception that crossing at an unmarked crosswalk saves time was also found to be in agreement among the respondents. However, the perception that crossing the road outside the designated area is acceptable because other pedestrians do it was found to be disagreed upon by the respondents. These findings suggest that the majority of the respondents perceive crossing the road outside the designated area as unsafe and unacceptable behavior.

Preferences: Pedestrians who prioritize safety tend to choose designated crosswalks when crossing the road, especially when there are no approaching vehicles and when vehicles give way. In contrast, those who are willing to take risks scored low, indicating that they rarely engage in unsafe behavior. Pedestrians who are willing to take a longer route to cross the road also scored highly, suggesting that they often prioritize safety over convenience. These findings highlight the importance of safe pedestrian behavior and suggest that prioritizing safety can reduce the risk of accidents and injuries.

3. Do pedestrians' attitudes and behaviors, perceptions and preferences significantly affect their crossing behavior?

This study analyzes the behavior of pedestrians when crossing the road and the factors associated with it. The results indicate that pedestrians' attitudes towards drivers' respect and convenience are highly related to their waiting behavior before crossing the road. Convenience is also found to be associated with having experienced or witnessed a close-call accident. Lack of attention to traffic is significantly associated with their frequency of road crossing and close-call accidents while using mobile phones and being in a hurry in crossing is associated with a higher likelihood of experiencing a close-call accident.

The study discovers a significant connection between crosswalk behavior, adherence to laws, traffic enforcer presence, crosswalk location, desired destination, frequency of road crossing, and crosswalk utilization. Their waiting time is also affected by the behavior of looking left and right before crossing the road. Furthermore, their waiting time is highly related to their perception of increased accident risk while crossing beyond the designated area.

Pedestrians' preferences for crossing at specified locations, taking risks to save time, and willingness to take a longer route are significantly associated with their road-crossing frequency. Their preference for crossing at marked crosswalks and when no vehicles are present is associated with increased crosswalk usage and waiting time. Finally, taking risks to save time was significantly associated with witnessing a close-call accident. These findings can provide insights into developing more effective road safety strategies and promoting safer pedestrian behavior.

4.2 Conclusion

The association of pedestrians' crossing behavior with their attitudes, positive and negative behaviors, and their perceptions and preferences were assessed, being the study's main purpose.

Pedestrians' positive and negative behaviors and their preferences were found to be the only significant factors affecting pedestrians crossing behavior. Pedestrians' positive behavior when crossing the road, such as using designated crosswalks, can increase their crosswalk usage for various reasons. Firstly, positive experiences can create habits, and if pedestrians have a good experience while using designated crosswalks, they are more likely to repeat the behavior in the future. Secondly, it can create a sense of safety and control, which can increase pedestrians' confidence in using crosswalks. Lastly, it can create a sense of social norm, where other pedestrians may also be more likely to use crosswalks if they see others doing so. Furthermore, the study found that the majority of pedestrians prioritize safety over convenience. However, despite the majority of pedestrians prioritizing safety, the study also found that there is a

portion of pedestrians who are willing to take risks when crossing the road. This suggests that some pedestrians may be more willing to engage in unsafe behavior, such as crossing the road outside of designated crosswalks or ignoring traffic signals, which could put them at greater risk of injury or accidents. This is because unmarked crosswalks may lack adequate signs, markings, or street lighting, making it harder for vehicles to recognize pedestrians, especially at night or in poor weather. Considering all these, findings suggest that pedestrians may consider various factors when crossing the road. Maintaining an environment that promotes safe crossing behavior, such as providing adequate pedestrian infrastructure, enforcing traffic laws, and promoting positive crossing behavior, is essential for improving safety for pedestrians and all road users.

4.3 Recommendations

- It is highly suggested that the local government should maintain the visibility of the pedestrian lanes in the area, especially if it is frequently used by children that come from school.
- Constructing another pedestrian lane will help people, especially students, to lessen the number of people crossing outside the crossing facilities.
- Install additional barricades and signage.
- It is recommended to add traffic enforcers to guide pedestrians when crossing roads.
- Strong implementation of traffic laws and usage of designated pedestrian facilities.
- Pedestrians can maintain their safety by adhering to traffic regulations in the same way as motorists do. This entails following traffic laws and signs and using authorized crosswalks.
- Future researchers may consider other variables which potentially significantly affect pedestrians' crossing behavior.
- Future researchers may utilize the Peak Hour Factor (PHF) for pedestrians over weak-long period in their studies.

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