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ANALYSIS OF ACCIDENTS OF PEDESTRIANS IN LANES WITHOUT TRAFFIC LIGHTS IN THE FEDERAL DISTRICT

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Abstract: This study aims to investigate whether the conditions of the crossing environment interfere with the behavior of pedestrians or use the road without traffic lights. For this, in the first stage of work, there was a search for traffic accidents on unsignalized roads through annual information bulletins published by the Federal District Traffic Department (DETRAN-DF). With this, it was possible to identify these places and find out the conditions of the two crossing environments. In the second stage, the questionnaire was applied to students from level to FD, being divided into four blocks: (I) Individual profile; (II) and (III) Behavior of the respondent in relation to the crossing of roads without traffic lights; (IV) Two respondents weighed up factors that make the riding environment more comfortable and safe. At the end of the research, as the main conclusion, it was seen that the well-preserved pedestrian belts stimulated the pedestrian to reach out or reach before crossing, known as a hazard or sign of life.

Keywords: Pedestrians. Lanes not signalized. Outrages. behavior. crossing environments.

INTRODUCTION

Between the years 1995 and 1996, Brasília presented two of the most violent transits in Brazil. The number of accidents per year represents, respectively, 49.8% and 47.3% of the total number of fatal accidents in the entire Federal District. Numbers that reveal a serious situation in which there was a pedestrian-vehicle relationship, in Brasília/DF, a city planned for the fast and easy circulation of cars, with long and long lanes, which favored or abused speed and made it difficult to cross pedestrian streets. (LÉ-SÉNECHAL-MACHADO; TODOROV, 2008, p.196).

According to Lé Sénéchal-Machado and Todorov (2008), in August 1996, the Brazilian newspaper Correio headed or called Campanha for Peace in Traffic, responsible for the mobilization of Brazilian society against violence in traffic, since the movement It has continuity with the University of Brasília (UnB), through the Permanent Forum for Peace in Traffic. Inspired by the Correio Brasiliense, in October 1996, or the Government of the Federal District (GDF) expanded the Traffic Safety Program for the Peace and Traffic Program. In January 1997, with the union between representative members of the government and society, it was presented for the purpose of "Pedestrian Education for Traffic" in the forum. The objective was to make the pedestrian lane be respected in Brasília. After the proposal was approved, as of April 1, 1997, must be started to obey the "law of the lane". From here on, the police begin to fine motorists who do not respect the preference of pedestrians in the lane. In addition, the Traffic Department of the Federal District (DETRAN-DF) contributed with the painting of new lanes, so that we were in inappropriate locations, plates such as "Passagem de Pedestre" were installed and, in September 1997, were turned off launched an educational campaign "Dê Sign of Life", which recommended that pedestrians must make a sign with their arms before crossing.

However, even with this historical fact, it is still common to find pedestrian gangs presenting precarious signs in the Federal District (DF), causing irregularities mainly on the part of two bikers and motorcyclists, who do not stop for pedestrians, even as a sign of crossing, also called a sign of life, or that demonstrates that, due to the preference for the continuity given to the traffic of motorized vehicles and the lack of adequate infrastructure for the displacement of pedestrians, both of them are responsible for two transport planners, are factors that contribute to the generation of conflicts between vehicles and pedestrians in urban

areas, and we are responsible for accidents, most of the time, of medium to high severity, including fatalities. (CARVALHO, 2006, p.12).

The urban environment influences the behavior of pedestrian travel. On this influence, Rozestraten (1988) assesses the transit as being made up of 3 systems that interact with each other: Either the first would be or home, or the second would be via and the third or vehicle. Günter (2003) added more than one element, which would be the environment, made up of society, the social norms and laws. In context, Environmental Psychology is responsible for explaining the relationship between behavior, human experience, and the physical environment.

Among the research related to behavioral models applied to pedestrians, Margon (2016) developed a method to identify the pedestrian profile of a locality from the analysis of their behavior while a street without traffic lights, taking into account individual consideration and behavioral factors. For this, the questionnaire was elaborated in which the participant must indicate their behavior of crossing on a road without traffic lights, considering for this purpose the assertiveness in starting to cross the road, the speed of the walk and the attention to the flow of vehicles during the crossing. This questionnaire was applied in the city of Brasília and was advocated by the Theory of Planned Behavior, which says that human behavior goes through 3 types of considerations: Behavioral Beliefs, Normative Beliefs and Control Beliefs.

Taking into account all this trajectory of awareness and respect for pedestrian traffic in the Federal District, or the resulting work from this research, the general objective is to investigate whether the conditions of the crossing environment influence the behavior of pedestrians or use traffic without traffic lights.

How many specific objectives, one has:

- Locate traffic accident points in unsignalized roads in DF based on the statistics of two accident reports from DETRAN-DF.
- Assess the conservation of painting and local signs, classifying the crossing environments as good, regular or bad.
- Identify, through the application of a questionnaire, behavioral alterations in the pedestrian journey related to the change in the state of conservation of the lanes. For this, use the data validated in the previous stage for the setting of the questionnaire.

This way, by proposing to investigate the conditions of road maintenance and signals interfering with pedestrian behavior when crossing, this study will be of great value to direct traffic planning strategies, accident control and educational campaigns for traffic in the Federal District.

MATERIALS AND METHODS

This study presents two different stages: Firstly, it deals with the analysis of the state of conservation of the non-traffic lights where pedestrian accidents occurred in the Federal District in the years of 2018 and 2019, according to the informative bulletins of accidents from DETRAN -DF By lane well conserved, we understand the research as that with clearly visible sign plates and with a painting in good condition. Not total, were validated 4 lanes, being these classified in good, regular or ruined states of conservation. Lane in best state and lane in worst state will serve as the setting for the questionnaire of the second stage. The second stage, in turn, consists of a survey of the opinion of university students from the Federal District about the crossing of the space, using for this purpose the Method of Identification of the

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Pedestrian Profile (MIPP), or which "seeks to collect given behavior indicators pedestrians during the crossing and the identification of the variables that influence this behavior, considering the way in which the pedestrian gear is used during the crossing." (MARGON, 2016, p.82).

ANALYZE THE CONDITIONS OF THE PARCELS

With the directions made available in the informative information on road traffic accidents at non-traffic light highways in 2018 and 2019 from DETRAN-DF (Table 1), the location of the highways was verified by Google Earth. It must be noted that the data from 2018 and 2019 are the only ones available on the DETRAN-DF site when this research was completed. From the images of Google Earth, which were aged for two years, there was an assessment of the state of conservation of the lanes according to the check list presented in Table 2. A lane in the best and the best state of conservation was chosen to serves from setting to the questionnaire of the second stage.

QUIZZ

The applied questionnaire was addressed to higher level students from DF, in view of the ease of disclosure to this public. The form, not Google Forms and disclosed through social networks, has the purpose of identifying the profile of the pedestrian, according to the changes in the behavior of the pedestrian in the face of changes in the state of conservation of the goods, based on two concepts of conformity of established non-MIPP crossing. According to Rouphail (1984 apud MARGON, 2016, p. 84), crossing compliance "represents the suitability for the use of pedestrian structures, and can be analyzed on two parameters: Spatial Conformity and Temporal Conformity".

For the MIPP, these Rouphail crossing compliance concepts are treated with some adaptations for non-signalized routes, in addition to having the introduction of one more parameter: Conformity with the Transit System.

Based on the work of Margon (2016), the types of travel conformity can be understood in the following way:

- Spatial conformity: The pedestrian sign (face or "sign of life") with the intention of interrupting or flowing to thus initiate the crossing.
- Temporal compliance: The pedestrian signals to interrupt or flow and maintain a constant speed in the crossing, similar to his walking speed in daily displacements.
- Conformity with the traffic system: When the crossing is carried out by an attempt to flow two vehicles, at a constant speed and with a previous interruption or traffic.

Based on the type of conformity, pedestrians are classified as insecure, hesitant, assertive attentive and assertive distracted, as exemplified in figure 1.

The first block of the questionnaire tried to identify the individual characteristics of two research participants (sex, age, city of residence, schooling and transportation habits). The second and third blocks were related to the conformity of the crossing in the lane without traffic lights. We are looking for two blocks to reproduce a scenario in which the respondent must imagine going through a lane in two situations: First, an image of a lane was made available, validated as in poor conservation conditions. In the second, an image of a lane validated as under good conservation conditions was made available. The answers for these blocks will indicate the behavior of the respondent

Adresses	
2018	**2019**
DF 290 – SM, KM 31.5 NEAR MOTEL ROTA 69, PEDESTRIAN TRACK	DF 001 (EPCT) – LS, KM 27 ALTURA DA PIZZARIA DOMINGOS, PEDESTRIAN LANE
CITY AND HOTEL BRASIL, 21 FOOT TRACK - Brasilia	1st Av. – SOUTH, QS 108, NEXT. TO THE ''RESTAURANTE GARÇOM''

Table 1 - Location of occurrences of pedestrian collisions on unsignalized roads in the Federal District (2018 and 2019).

Font: Elaborated by authors.

PEDESTRIANS CHECK LIST

Location		Date	
Latitude		Longitude	
Answer Technical			

ROAD CHARACTERISTICS / TRAFFIC OPERATION

	number of tracks		
	Simple		
	Pair		
TRACK	floor	Type	
		Conservation state	
	Central Site		
traffic direction	Single		
	Double		
	type of signaling	Conservation	Visibility
Signaling	Vertical		
	Horizontal		
	Speed Limit		
Speed	reducers	Radar	
		Speed bump	
	with bay		
Bus Stops	no stall		
	date of accident		
	accident vehicle		
	accident time		
Comments	age of victims		
	Were there any improvements to the crosswalk after the accident?		

Table 2 - Check List for evaluation of the conditions of the goods.
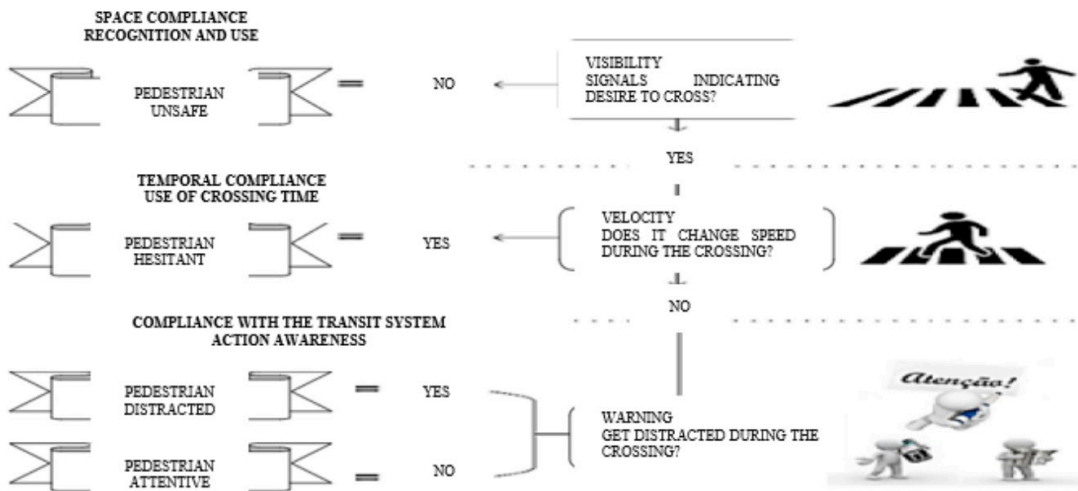
Font: Elaborated by authors.

Figure 1 - Classification of two pedestrians according to the conformity of crossing.

Source: Margon (2016).

for: i) the beginning of the journey (spatial conformity); ii) time of crossing (temporary conformity); iii) attention to the flow of vehicles in the crossing (in accordance with the transit system). At that moment, it was informed without questioning which lane was well preserved and which was poorly preserved. The respondent must have this critical view. The last block was about considerations that the respondent must do about the importance of some factors to make the ideal crossing environment, or it seems more comfortable and safe for the pedestrian. Here we will enter issues such as signage, painting, illumination etc.

The questions related to the conformity of the crossing of blocks 2 and 3 are presented in figure 2.

The indication of the profile of the pedestrian was found by raising-there are only the answers to the questions about conformity of the crossing. To classify the profile of the pedestrian, the answers of the questionnaire were transformed into numerical data, assigning 0 for yes and 1 for none. Thus, each pedestrian profile would have a specific code, as shown in Table 3.

The questionnaire was opened on 03/19/2021 and dated on 04/04/2021. The final number of respondents was equal to 433, being that the necessary sample was estimated at 384.

RESULTS AND DISCUSSION
LANES EVALUATION WITHOUT TRAFFIC LIGHTS

This stage of the investigation consisted in assessing the state of conservation of some roads where pedestrian attacks occurred in the years of 2018 and 2019, according to the DETRAN-DF bulletins on pedestrian attacks on roads without traffic lights. Specifically, they were endorsed lanes in the DF-290 road in Santa Maria, in Via S2 do Setor Hoteleiro

Sul, in the DF-001 (EPCT) road in Lago Sul and in the 1st avenue south of the city of Samambaia.

In these locations, using images from Google Earth, which were aged for two years, information on the pavement, or direction of traffic, signs, speed of two cars and the presence of bus stops were collected. These information forms are organized in tables, not the standard found in Table 2. After analysis, the forms in the best and in the best state of conservation were chosen for the setting of the questionnaire, respectively, Santa Maria and ''Setor Hoteleiro Sul '' (SHS).

Figure 3 is an image of the pedestrian lane located on the DF-290 highway in the city of Santa Maria, chosen as the lane in the best state of conservation. It is known that this segment is duplicated, with 3 one-way lanes on the image track, a central canteiro and a visually flexible pavement in a general state of poor conservation. The maximum speed allowed in this section is 60 km/h, counting on the help of a fixed radar a few meters before the safety line. It was also not verified spine in the vicinity of the lane.

Figure 4 is an image of the pedestrian zone located on via S2 in the South Hotel Sector, chosen as the one in the best state of conservation. It is known that this segment is simple with 4 lanes, being 2 for each direction, absence of separator between flows and visually flexible pavement in good general state of conservation. The maximum speed allowed in this stretch is 60 km/h and there is no speed reduction mechanism in the vicinity, such as fixed or spine radar. Generally speaking, this lane was classified as being in a good state of conservation.

QUESTIONNAIRE ANSWERS
Individual Characteristics

The first set of questions from the questionnaire consisted of a survey of

01. To start the crossing, you position yourself in front of the crosswalk and.__*

○ makes a signal with his hand, indicating to drivers that he wants to cross.

○ wait for a crossing opportunity to arise where there are no vehicles close to crossing the lane.

02. When crossing, you walk...*

○ faster than your normal walking speed

○ At your normal walking speed

○ Slower than your normal walking speed

03. While making the crossing, you...*

○ Pay attention to the movement of vehicles until the crossing is completed

○ Continue doing what you were doing before starting the crossing (listening to music, checking messages or talking on your cell phone)

○ Stares at the end of the crosswalk

Figure 2 - Questions of the questionnaire related to conformity of crossing

Fonte: Elaborated by authors.

Crossing Compliance	Signal? (questions 1 and 4)	Does it change speed? (questions 2 and 5)	Attentive to vehicles? (questions 3 and 6)		
Space	1	-	-		UNSAFE
Temporal	0	0	-		HESITANT
	0	1	0	=	ATTENTIVE
Traffic	0	1	1		DISTRACTED

Table 3 - Codes for classification of the pedestrian profile in questions 1 to 6 of the questionnaire.

Font: Adapted from Margon (2016).

Figure 3 - Highway crosswalk DF-290

Source: Google Earth

Figure 4: Lane de pedestrians da Via S2

Source: Google Earth

the individual characteristics of the two respondents. These informations help to familiarize the reader with the characteristics of the sample before the presentation of two results on compliance of crossing.

Of the 433 people who responded to the questionnaire, according to figure 5, 55.9% were female and 44.1% were male. At age group, we concentrated in the intervals 18-20 years (30.7%) and 21-25 years (47.1%). Being that, 96.07% shows two components in the Federal District and 3.93% in the environment.

As the research was widely disclosed for undergraduate students, according to figure 6, these constituted the majority of the respondents, about 70.2%. How many years of transport, the majority uses a car daily (53.6%).

CROSSING COMPLIANCE
Spatial conformity

Spatial conformity is related to recognition of the use of the pedestrian lane. Therefore, it is or pedestrian face or "sign of life", or even is in spatial conformity.

To analyze the data collected through the behavioral choices of the issues on how the pedestrian starts the journey when the lane is in a very poor state of conservation (situation 1) and when it is in a good state of conservation (situation 2), obtain the following date:

- Situation 1 "bad lane"

- Face a sign with a hand, indicating to the motorcyclists what you want to cross (74.83%).

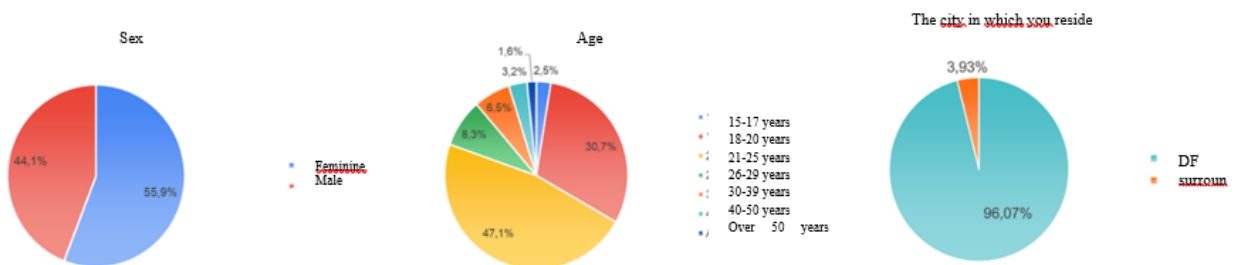- Expectations to arise a crossing opportunity in which there are no vehicles close to crossing to Lane (25.17%).

Figure 5 - Individual Characteristics.
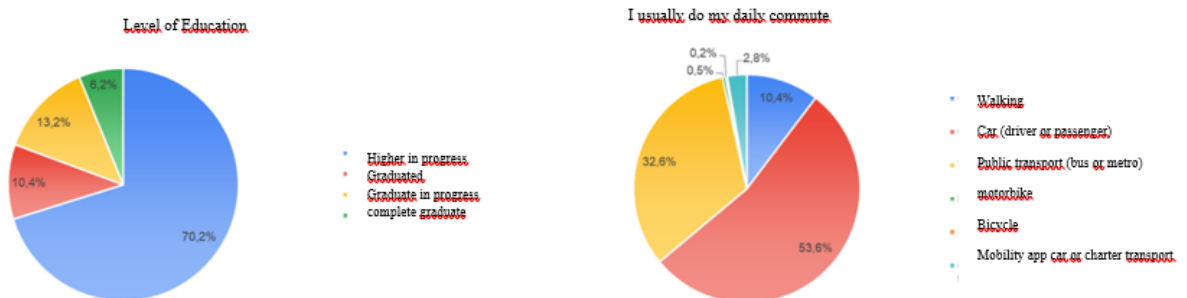
Source: Elaborated by authors.

Figure 6 - Characteristic.

Fonte: Elaborated by authors.

- Situation 2 "good lane"

- Face a sign with a hand, indicating to the motorcyclists what you want to cross (91.69%).

- Expectations to arise a crossing opportunity in which there are no vehicles close to crossing to Lane (8.31%).

In both cases, in most cases two pedestrians or "sign of life", indicating the drivers' years of desire to cross face. As stated by Margon (2016, p.130), "the implementation of the policy for the use of clothing in Brasília inserted this custom on pedestrians in the city, which continues to be transferred to the children and to the new residents of the premises ".

Two pedestrians who reported waiting for a "gap" in situation 1, 75.23% went on to make a life sign in situation 2. With this, it can be inferred that visible sign plates and pedestrian strips with paintings in this state influence or individual to do or "sign of life".

Temporary conformity

According to time, it investigates the variation of the walking speed when the pedestrian crosses on the job.

To analyze the data collected through the behavioral choices of the issues on the variation of speed during the crossing when the lane is in a very bad state of conservation (situation 1) and when it is in a good state of conservation, we obtain the following date:

- Situation 1 "bad lane"

- Faster than his normal walking speed (85.22%).

- At their normal walking speed (13.86%).

- More wander than his normal walking speed (0.92%).

- Situation 2 "good lane"

- Faster than his normal walking speed (75.52%).

- At their normal walking speed (27.02%).

- More wander than his normal walking speed (0.46%).

Here it is possible to perceive that both in situation 1 and in situation 2, show pedestrians traverse at a higher speed than normal walking speed. The variation in speed can indirectly indicate discomfort or insecurity in sharing the road with vehicles at the time of the crossing, reducing the time of non-local permanence, using a time less than or necessary for the crossing to occur. (MARGON, 2016, p.134).

Of the group of people who in situation 1 walked at a speed higher than their normal walking speed, 18.43% went on to walk at their usual speed in situation 2.

On this matter, the informed city knows that when crossing the road on the lines delimited for this purpose, or even the priority of the passage, as guaranteed by the Brazilian Traffic Code of 1997. From the results above, it can be deduced that the lines will be conserved help to awaken this awareness of pedestrians' rights.

Compliance with the transit system

Conformity as a traffic system is related to the pedestrian's level of awareness about his or her role as an agent of the traffic system. I searched here for the focus of the attention of the pedestrian to the crossing.

To analyze the data collected through the behavioral choices of the issues on the focus of the pedestrian during the crossing when the lane is in a very poor state of conservation (situation 1) and when it is in a good state of conservation (situation 2), obtain the following dices:

- Situation 1 - "bad lane"

- Be attentive to the movement of two vehicles at the end of the crossing (93.76%).

- Continue doing or what was doing before starting to cross - listening to music, checking messages or saying no cell phone - (0.69%).

- Fix or look at the end of the pedestrian lane (5.54%).

- Situation 2 - "good lane"

- Be attentive to the movement of two vehicles at the end of the crossing (87.76%).

- Continue doing or what was doing before starting to cross - listening to music, checking messages or saying no cell phone - (3.46%).

It is clear, when comparing the two scenarios, that at the attention of the pedestrian to the flow of two vehicles reduced from situation 1 to 2, this is, two pedestrians who remained attentive to the flow of vehicles in situation 1, 8.37% present some form of distraction in relation to the traffic in situation 2, be looking or smelling for the end of the crossing or keeping a cell phone, for example. With this, it can be inferred that the better the signaling and state of lanes, more or pedestrian paintings tend to "relax" their attention to the vehicles, to understand, possibly, that because it is a well-signaled place, it is about A safe environment of crossing, so that the drivers can see better the lane due to its good state of conservation.

Identification of the pedestrian profile

In situation 1, where or pedestrian must imagine a road crossing in poor conservation conditions, or hesitant profile is predominant (63.51%), followed by two profiles, insecure (25.17%), attentive (10.85%) and distracted (0.46%). The hesitant profile, for its part, is represented by that pedestrian who signals before crossing, but speeds up or slows down to walk or cross the road. In situation 2, this fate is repeated. In this case, 65.82% two pedestrians with a hesitant profile, 21.71% attentive, 8.31% insecure and 4.16% distracted.

Two pedestrians who were insecure in situation 1, that is, they did not signal to interrupt or flow of vehicles, in situation 2, with better conditions of signaling and painting, 47.71% became hesitant, doing, therefore, or "sign of life" This behavioral change demonstrates that in the presence of marked lanes and preserved paintings, it increases the chances of the pedestrian eating with the hands, indicating his desire to cross.

More than once, it confirms the findings made by Margon (2016), who states that making it visible that the driver is on the way is essential to encourage the pedestrian to signal, warning that he intends to cross it. Likewise, the implication of public policy is clear: It is essential that the driver of the vehicle has adequate visibility from the pedestrian belt!

The predominance of the hesitant profile can be justified by the Brazilian culture of respect for lane, initiated with the Campaign for Respect for Lane and reinforced with the initiative of DETRAN-DF, which instituted the "sign of life" in 1997. Curiously, this profile is characterized by people who walk at a speed higher than their normal walking speed. This can indicate a possible custom of the Brazilian motorist of not waiting for a complete pedestrian crossing, which is when it reaches the street or central canteiro, or to act by activating or accelerating, intimidating or pedestrian. These are all factors that can explain the variation in pedestrian speed. However, an observational study would be necessary to investigate the behavior of the pedestrian x driver.

By way of comparison, in the characterization of the two pedestrian profiles of UnB given by Margon (2016), there is also a predominance of the hesitant profile (Figure 7).
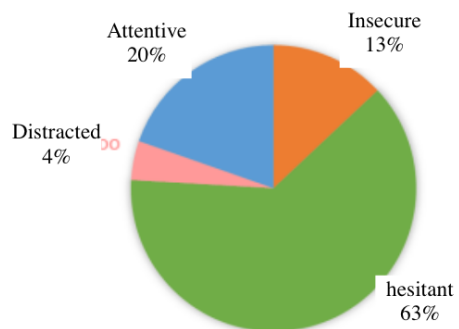

Figure 7 - Profile two pedestrians da UnB.

Source: Margon (2016).

Interesting fact to be commented on in relation to the profile of the pedestrian x form of daily displacement. It was possible to notice that the hesitant profile was predominant for the majority of two types of transportation habits, this, or the fact of walking or not regularly, did not seem to exert great influence on the pedestrian profile. The statistics are as follows:

- Situation 1

-Public transport (bus or subway): predominant hesitant profile (59.57%).

-Walking: predominantly hesitant profile (64.44%).

-Car (ride or driver): predominant hesitant profile (64.66%).

-Moto: Predominantly hesitant profile (100%).

-Bicycle: predominant attentive profile (100%).

-Freighted transport or mobility application car: predominant hesitant profile (83.33%).

- Situation 2

-Public transport (bus or subway): predominant hesitant profile (62.41%).

-Walking: predominantly hesitant profile (73.33%).

-Car (ride or driver): Predominantly hesitant profile (65.52%).

-Moto: Predominantly hesitant profile (100%).

-Bicycle: predominant attentive profile (100%).

-Freighted transport or mobility application car: predominant hesitant profile (83.33%).

Preferences about the touring environment

The last block of the questionnaire deals with some factors of the environment of the crossing in which the respondents pondered on a scale of importance. Such factors were:

- Pedestrian lane painting in good state of conservation;

- Absence of visual obstacles that prejudice the visibility of two pedestrians in relation to the vehicles;
- Signage plates;
- Presence of traffic lights at the lane location;
- Lighting close to the lane location in cases of crossing non-night period;
- Existence of speed control devices close to lane.

Two results obtained, I realize that for painting in a good state of conservation, absence of visual obstacles, sign plates and lighting, most of the respondents chose a very important scale. See:

- Pedestrian lane painting in good state of conservation: 63.51% defines it as very important.
- Absence of visual obstacles that prejudice the visibility of pedestrians in relation to vehicles: 53.58% would define it as very important.
- Sign plates: 62.12% define them as very important.
- Lighting close to the lane location in cases of crossing non-night period: 65.82% would define it as very important.

We are, a priori, led to think that crossing the road would only provide comfort and safety to pedestrians if there was a traffic light signal to control the flow of vehicles. The results above prove or oppose. In the case of the scale of importance of the stoplight, most chose or moderate item (39.72%).

This corroborates the history of campaigns of respect for pedestrians in Brasília. The Brazilian city sees the city without traffic lights as a safe space for crossing, since it is in a good state of conservation, as demonstrated in the analysis of the results of this research. Therefore, you do not necessarily need a traffic light for the pedestrian to feel comfortable using this space.

CONCLUSION

In order to investigate whether the conditions of the crossing environment influence the behavior of the pedestrian, this research allowed us to conclude, through the analysis of the responses of the applied questionnaire, that belts are well preserved, stimulating pedestrians to make or sign of life and walk at their normal speed. On the other hand, the more it is preserved, the more pedestrian it tends to relax its attention or flow of vehicles.

It was possible to verify that the predominant profile of the sample showed a tendency to be hesitant, independent of the condition of conservation of the track. This profile is characterized by performing the "sign of life" and increasing or decreasing walking speed as it crosses. With this, it was possible to perceive that the question of the sign of life has been spread in Brasília, and there is also a culture of respect for the band and awareness of the rights and duties of pedestrians, initiated from the Campaign for Peace in Traffic. Furthermore, it was also verified that the user's perception of road traffic lights is not so important, in terms of making the crossing more comfortable and safe for pedestrians, as well as aspects such as the crosswalk paint in good state of conservation, absence of visual obstacles in the crossing environment, vertical signage well visible and local lighting. Therefore, it is evident that public policies must be aimed at increasing the visibility of pedestrian traffic, making it so that the vehicle driver can easily identify these crossing environments, and consequently encouraging the pedestrian to do or sign of life.

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