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Lay Beliefs About the Causes of Traffic Accidents in a Colombian Sample

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Author's Statement

The author declares that he has been involved in the entire scientific process of this research, including conceptualization, methodology, writing, and editing. He also declares that he has no potential conflicts of interest regarding the authorship and publication of this article.

Abstract

Introduction/Objective. Individuals form spontaneous theories to make sense of their everyday experiences when they lack other satisfactory sources of information. The high frequency of traffic accidents is an event that, for the inhabitants of many cities in Colombia and around the world, is part of their daily lives. This study aimed to explore the implicit beliefs held by the general population regarding the causes of traffic accidents. Method. A survey was conducted with 300 residents of Neiva, Colombia, to inquire about the causes of traffic accidents in the city. Quantitative content analysis was performed using text-mining techniques. Results. In addition to the keywords, fourteen causes were

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identified, of which three referred to environmental or vehicle-related factors, and eleven were related to characteristics or actions of the driver, with recklessness being the most significant, mentioned by 45% of the participants. Conclusion. In line with other research, it is demonstrated that adverse events are often attributed to the characteristics of the actor involved. Recklessness prominently features in ordinary people's perception as the primary cause of traffic accidents in Neiva. New research avenues are emerging through text mining and data science tools, which hold promise as alternative or complementary strategies to traditional qualitative techniques for uncovering lay theories and social representations.
Keywords: lay beliefs; traffic accident; text mining.

Introduction

Every year, one million three hundred and fifty thousand people die worldwide due to traffic accidents, with more than half of these fatalities affecting the most vulnerable road users, namely pedestrians, cyclists, and motorcyclists, especially in the age group of 5 to 29 years. This results in healthcare costs exceeding three percent of countries' gross domestic product (World Health Organization [WHO], 2018). In the Americas, death rates from traffic accidents range from 11.8 to 18.3 deaths per one hundred thousand inhabitants for high and low-income countries, respectively (WHO, 2018). Colombia exceeds 14 deaths per one hundred thousand inhabitants, a rate that has remained relatively stable in recent years (National Institute of Forensic Medicine and Forensic Sciences [INMLCF], 2023).

Between 2020 and 2021, the proportion of deaths attributed to a transportation event increased from 24 to 27 out of every hundred deaths from external causes. In the category of non-fatal external injuries, those caused by transportation events went from 10.4% to 14.4% of the total medicolegal assessments (National Institute of Forensic Medicine and Forensic Sciences [INMLCF], 2022, 2023). According to the National Road Safety Agency (Agencia Nacional de Seguridad Vial [ANSV], 2022), there were 145,921 road accidents in the country in 2021, lower than the ten-year average estimated at 176,496 cases. Nevertheless, this figure still represents an average of 400 events per day. According to the same source, nearly 80% of these road accidents occurred in twenty municipalities, thirteen of which are departmental capital cities, including Santa Marta, San José del Guaviare, Tunja, Neiva, and Yopal, which have experienced the highest increase in fatalities (ANSV, 2022). These data suggest that collisions, rollovers, or pedestrian accidents are relatively common occurrences in residents' daily lives in all regions of the country.

Around road safety, a multidisciplinary field has developed, which has made significant progress in understanding the variables associated with road accidents. One of these variables is the human factor, which could account for between 64% and 93% of accidents, either as a definitive, probable, or possible cause (Treat et al., 1979; Vogel & Bester, 2005; Flórez Valero et al., 2018). This significant responsibility led to the emergence of the field of traffic

psychology in the 1990s, which is interested in studying the relationship between psychological processes and the behavior of road users in their various roles (Rothengatter, 1997; Ledesma et al., 2011). Among the phenomena studied are driver cognition and personality, leading to various descriptive, evaluative, and prescriptive approaches (Rothengatter, 1998; Sagberg et al., 2015).

While traffic psychology, in particular, and the science of road safety, in general, produce systematic and valuable knowledge, ordinary people also develop theories to explain what happens in their environment. These explanations should not be ignored because they are where the phenomenon originates and where interventions ultimately reach. According to Kelly (1992), there is a need to bridge the gap between formal scientific theories and the theories provided by common sense to have a more complete view of the world. These explanations are known as lay theories, implicit theories, lay beliefs, or naive theories and arise from a process in which individuals attempt to explain their reality, the behavior of others, and the nature of such behavior while seeking epistemic congruence (Levy et al., 2006).

Since the mid-20th century, it has been proposed that how people explain what happens around them serves to understand reality and even fill gaps that scientific knowledge has not satisfied (Heider, 1958), thus providing a certain sense of knowledge and control over the environment, feelings of personal efficacy, social belonging, and self-presentation (Furnham, 1988; Levy et al., 2006). Their relationship with the Theory of Social Representations is so close that they can occasionally be confused in terminological terms (Rodríguez Pérez & González Méndez, 1995), and it is accepted that the beliefs individuals form about their environment are a product of social interaction (Rateau et al., 2012). Additionally, their approach enriches and complements scientific knowledge, contributing to understanding the possible origins of many constructs that eventually result in recognized explanatory theories of the universe based on evidence (Dweck, 2017).

Studies on the causes of road accidents based on the explanations provided by individuals have been conducted over the decades. For example, Moyano-Diaz (1997) conducted a study in Chile where 216 individuals were surveyed using a questionnaire that included open-ended questions about the causes of accidents. The coding of responses identifies approximately 30 causes, which were then grouped into five categories. The most common causes were recklessness, imprudence, and alcohol consumption, each mentioned by 53% of the sample. These causes were later grouped into four categories, with the main ones being related to the driver and the environment.

In West Africa, Kouabenan (1998) developed a scale to identify fatalism tendencies and measure a risk-taking index when driving a vehicle among 556 individuals from different backgrounds, religious practices, and professions. He also included open-ended questions to identify lay definitions of accidents through content analysis. His main finding was the

significant influence of cultural practices on risk perception and explanations for accidents, such as reckless driving, after performing a ritual believed to protect them from harm.

Following an analysis of 205 traffic accidents reported by the French National Gendarmerie, Bordel et al. (2007) discovered that attributing causal factors in accidents is strongly associated with the role played in the event, distinguishing between the driver, the passenger, or the witness. They found evidence of an actor/observer bias, where drivers attributed accidents to external causes like road conditions. In contrast, observers tended to provide explanations based on internal factors such as the driver's ability.

More recently, Useche and Llamazares (2022) conducted research in Spain involving 2,499 pedestrians, of which 262 were involved in traffic accidents in the last five years. In addition to structural equation modeling using a battery of tests, they collected descriptions of the accidents, which were subjected to content analysis and categorization to identify causal attributions. 45% of the pedestrians self-attributed the cause of their accident, and nine out of ten considered it to be due to an unintentional error. On the other hand, 23% attributed the cause of the accident to someone else, of which six out of ten believed there had been a deliberate violation of the rules.

Efforts to understand and explain what others do constitute a significant part of the theories about how the world operates that people create based on their intuition and experiences. The severity of the consequences influences explanatory interpretations of adverse events such as natural disasters or traffic accidents, whether there were only material damages, injuries, or fatalities. Spectators may resort to explanations ranging from a simple twist of fate to blaming one of the victims. In this regard, researcher Elaine Walster demonstrated more than half a century ago that there is a tendency to find someone to blame for a disaster, even when evidence shows no human responsibility. Furthermore, if the event's severity is high, the need to find someone to blame is more remarkable than if the event's consequences were mild, which can be attributed to luck or fate (Walster, 1966). This suggests that attributional style varies according to the severity of the consequences but also due to factors present in the scenario (DeJoy, 1990), available information about the event, or the degree of identification of the observer with the presumed responsible party (Shaver, 1970; Palat & Delhomme, 2018). The literature review did not reveal any similar studies within the Colombian context that approached the perception and construction of common sense theories among this population regarding the issue of road traffic accidents.

The previous research clarifies the importance of the explanations provided by individuals involved in accidents and the significant influence of the socio-cultural context in constructing these theories. Furthermore, it demonstrates that tapping into their beliefs enhances our understanding of the phenomenon of road accidents. Therefore, it is advisable to investigate the theories that ordinary people construct, regardless of their level of involvement in traffic accidents, regarding the causes of those accidents they may witness in their daily lives in

a setting like Colombia. This aims to gather the perspective of ordinary individuals and identify the spontaneously attributed causes, reducing the bias that exposure to a traffic accident-related stimulus may entail.

Methodology

A descriptive study with an exploratory scope was conducted using a survey, following the classification proposed by Montero and León (2007), among residents of Neiva, Colombia.

Participants

A non-probabilistic convenience sampling was conducted, whose size, given the study's exploratory nature, was calculated at a minimum of 272 respondents, assuming a 90% confidence level and a 5% margin of error. Ultimately, the sample consisted of 300 inhabitants of the city of Neiva-Colombia (52.67% identified as female and the remainder as male) ranging from 18 to 72 years old, with an average age of 32.27 years (SD=12.81), a median age of 26, and the most frequent age being 22 years (1st Quartile= 22; 3rd Quartile= 37). Initial contact was made through instant messaging groups and social media invitations.

Data Collection Technique

The data was collected through telephone and face-to-face interviews with those who voluntarily consented to participate. Self-reporting is one of the methodologies Furnham (1988) suggested for lay theories research, chosen considering the research objective, the participant population, and the analytical process to be developed. An ad hoc questionnaire was used, consisting of two closed-ended questions (age and gender) and one open-ended question:
"What do you believe is the cause of traffic accidents in Neiva?"

Analysis Procedure

A quantitative content analysis (Estrada Cortés & Lizárraga, 1998) was conducted using text mining, as Barreto et al. (2011) recommended. Text mining involves using computational linguistics technologies to discover new knowledge in large amounts of unstructured information (Hearst, 1999; Cohen & Hunter, 2008). The text can come from any source, including interview transcripts, a standard procedure in applied research.

The responses were transcribed verbatim into an electronic spreadsheet, from which the necessary exports to the used programs were performed. First, the Orange Data Mining software (Demšar et al., 2013) was used to count and calculate terms' relevance and create word clouds. Secondly, the KH Coder software (Higuchi, 2017) was used to develop co-

occurrence networks and correspondence analyses. Both programs are open-source tools with algorithms and functions for the Spanish language.

With each of the software tools, preprocessing of the corpus (data set) was carried out, which involved transformation (converting all text to lowercase and removing accents), segmentation/tokenization (separating the text according to delimiting characters and defining the most basic units of analysis, which in this case are words), removal of stopwords (words with no semantic contribution), and lemmatization (transforming various terms, but with semantic equivalence, into a common one based on their root or lemma).

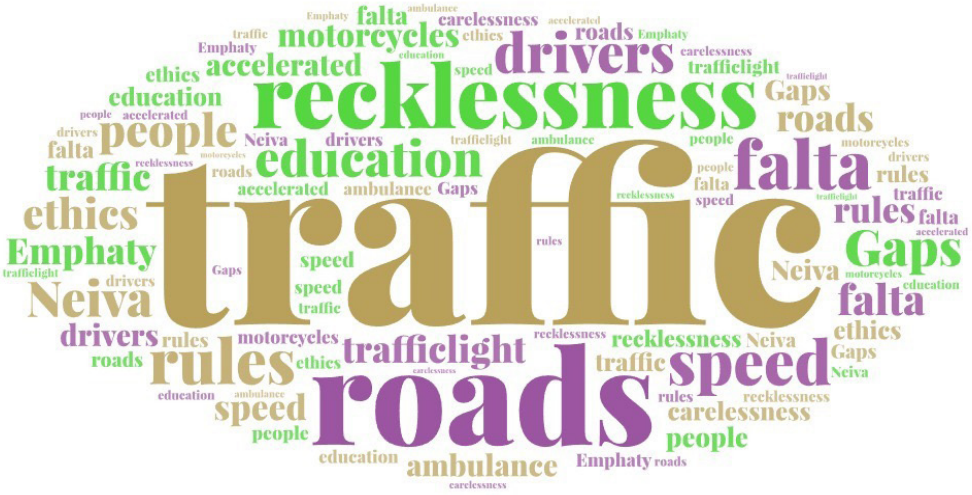
Ethical Implications

The development of this research adhered to the guidelines outlined in Resolution 8430 of 1993, the technical and scientific standard for human research in Colombia, and Law 1090 of 2006, which establishes the deontological and bioethical code for psychology.

Results

The first analysis exercise was conducted using the word cloud visualization technique. In this visualization, the size of each word represents its frequency in the participants' responses. Figure 1 presents the word cloud for the respondents' answers after preprocessing by Orange Data Mining. It shows the 325 different terms extracted by the program. The corpus contains 1,110 tokens, resulting in a lexical density of 29.3% (the number of different terms divided by the total number of terms used in the corpus).

Figure 1. Word cloud of responses to the question: "What do you believe is the cause of traffic accidents in Neiva?"



Source: Own elaboration.

Based on Figure 1, the surveyed individuals more frequently used terms such as "imprudence," "speed," and "roads," especially considering their size and location in the word cloud. Smaller words are located towards the periphery, indicating lower frequency and less presence within the corpus. One way to statistically corroborate the use of these terms is by examining their weight within the corpus. Table 1 presents a list of the twenty most frequently used words, along with their respective weights. It also includes the value for each term according to the inverse document frequency (idf) function, which is a formula used to attenuate the effect of a high frequency of one of the terms, making them more comparable in terms of their relevance within the corpus (Manning et al., 2008). Using both indices provides an idea of the relevance of each word and is sometimes combined in what is known as the tf-idf algorithm.

Table 1. Weights of the twenty most frequent words

#	TERM	WEIGHT	IDF	#	TERM	WEIGHT	IDF
1	Recklessness	.43	.37	11	Education	.06	.17
2	Lack	.23	.34	12	People	.06	.16
3	Roads	.21	.33	13	Bad	.06	.16
4	Traffic	.14	.29	14	City	.05	.16
5	Speed	.10	.23	15	Culture	.05	.16
6	Drivers	.08	.20	16	Signals	.05	.16
7	Excess	.07	.19	17	Motorcycles	.04	.13
8	People	.07	.19	18	Drive (They)	.03	.11
9	Rules	.07	.19	19	To drive	.03	.11
10	Traffic light	.07	.18	20	Neiva	.03	.11

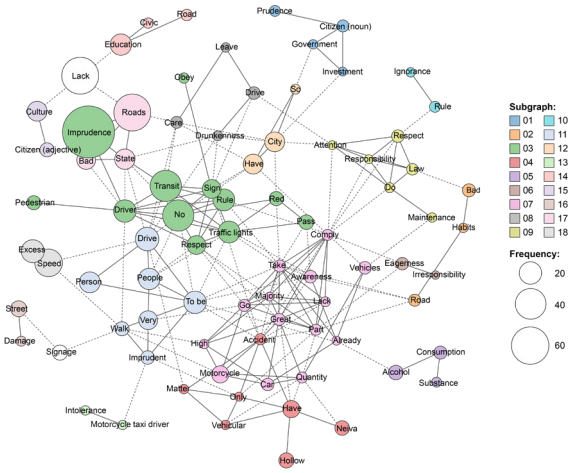
Source: Own elaboration.

Note. The weight corresponds to the relative frequency weighting of the term in the corpus over the number of instances (responses from respondents; N = 300); it can be read in percentage terms if multiplied by 100; idf (from Inverse Document Frequency, in English) results from the logarithm of the number of documents divided by the number of documents containing the term.

Although the word cloud visualization technique is beneficial as an exploratory strategy, more is needed to identify the implicit theories in the respondents' answers since frequent terms like lack or traffic do not provide information that identifies any conceptual trend. For this reason, using the KH Coder program (Higuchi, 2017), a word co-occurrence network was plotted that allows identifying an approach to the natural language used by respondents; that is, expressions that are used together (n-grams) and that allow a greater semantic understanding. Figure 2 shows how people express themselves when asked about the causes of traffic accidents in Neiva. It is possible to identify some of the most used phrases that are shown as part of clusters classified here by colors, called subgraphs, and where, as in the word clouds, the size of the bubble corresponds with the frequency of use of the term, which quickly highlights recklessness among all others, but also bigrams and trigrams like street-

damage (lemmatization made the adjective damaged be converted to the corresponding verb, something that often happens when not having more sensitive algorithms for the Spanish language), excess-speed, poor-condition-roads, or lack-traffic-education.

Figure 2. Word Co-occurrence Network



Source: Own elaboration.
Note. Nodes = 83; Edges = 208; Density = .06

Other denser subgraphs require more effort to identify combinations of terms with semantic value. However, among others, one can mention a need for civic culture, consumption of substances and alcohol, irresponsibility on the road, and government investment [poor]. Also, the term prudence, which, when checked in its context, is part of the phrase, does not have prudence, which would be an alternative way to refer to recklessness.

From this representation, it is possible to postulate the predominant attributions that participants formulate, but there are still isolated terms that could provide valuable information. Therefore, a better purification and structuring of the data is achieved through a coding exercise based on co-occurrences. The result is shown in Table 2, including some examples extracted from the characteristic responses for each category.

Table 2. Weights of the categories

#	CATEGORY	WEIGHT	EXAMPLE
1	Recklessness	.45	*Recklessness*
2	Road condition	.26	*Poor condition of the city's roads*
3	Disrespect for the rules	.18	*Traffic lights and signs are not respected*
4	Speeding	.12	*Always wanting to go at high speeds*

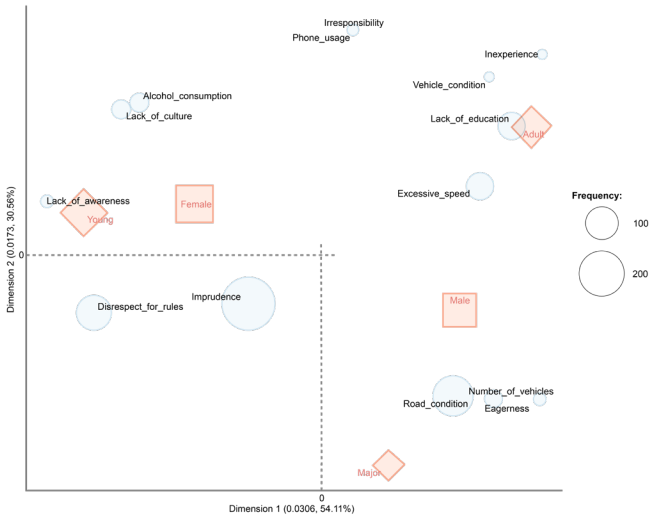
5	Lack of education	.11	*Lack of education of the citizens of Neiva*
6	Lack of culture	.05	*The lack of culture of the citizens*
7	Alcohol and substance use	.05	*Mixing gasoline with alcohol*
8	Hurry	.04	*People are always in a hurry, it's the big excuse*
9	Number of vehicles	.02	*The large number of cars and motorcycles that travel through the city*
10	Lack of awareness	.02	*The large number of cars and motorcycles that travel through the city*
11	Irresponsibility	.02	*The irresponsibility of people on the road*
12	Inexperience	.01	*Regardless of whether one has driving experience or not*
13	Vehicle condition	.01	*Lack of vehicle maintenance*
14	Phone use	.01	*Using the phone while driving*

Source: Own elaboration.
Note. Weights based on the total number of instances (N = 300)

According to the participating sample, the coding process yielded 14 categories that constitute the causal attributions of traffic accidents in the city of Neiva. Of these, recklessness (cited by 45% of respondents) is the most relevant, with a notably higher weight than the second in frequency (poor condition of the roads) and the subsequent ones: disrespect for rules and signs, speeding, and lack of education. Three of the 14 causes refer to factors other than humans as causes of accidents: road conditions, number of vehicles, and vehicle condition, where the first presents a high relevance compared to the others (.26, .02, and .01, respectively). Of the eleven causes attributed to characteristics or actions of the driver, four are related to violations (disrespect for rules, speeding, alcohol consumption, and phone use), and the rest are generic causes, not referring to a specific action but to driving characteristics (lack of education, lack of culture, recklessness, etc.).

To identify the role of gender and age in the proposed theories, correspondences of the codes integrating these variables were analyzed, which is presented in Figure 3. Age was divided into the groups Young (18-25 years), Adult (26-40 years), and Older (> 40 years). These analyses consist of perceptual maps based on the distances between elements. These distances are given by the frequency of use of terms together and the number of documents (instances) in which this occurs. Introducing variables like those included here allows for identifying the lexical profiles of each group or how much the patterns resemble between groups.

Figure 3. Correspondence analysis of codes by age and gender groups



Source: Own elaboration.

It is observed that about 85% of the variance is explained with the two dimensions plotted. Due to its proximity to the origin (coordinates 0,0), the category of recklessness should be understood as not being a representative cause of any particular subgroup. However, instead, it is frequently formulated across all subgroups. The causes of recklessness and disrespect of the rules are close to each other and, in turn, closer to young women. Something similar could be said about older men with the causes of road conditions, number of vehicles, and hurry. However, these distances need to be longer to become distinctive theories of a group. Through the chi-square test to the cross table between genders and the five categories with a weight greater than 10%, it was found X^2 (4, N = 334) = 3.58, p = .47. For age groups, the analysis through chi-square yielded X^2 (8, N = 334) = 14.37, p = .07, demonstrating that, statistically, age groups also do not differ in terms of the beliefs they formulate.

Discussion

Based on statistics (ANSV, 2022; INMLCF, 2023), for the inhabitants of a city like Neiva, there is a high probability of witnessing, either live or through the media, road accidents without being directly involved, and that becomes part of their daily experience. The experiences shared by an entire community promote intuitive explanations for these phenomena, gradually becoming more common and gaining strength as they are socialized to the point of resisting evidence that confronts their truthfulness (Levy et al., 2006); as they require no effort for being spontaneous and unconscious, they generate a sensation of evidence leading to their approval and adoption among the members of that community (Rodríguez Pérez & González Méndez, 1995). In such cases, the responses provided by respondents are valid as explanatory hypotheses for each of them. Given the demonstrated stability of lay beliefs, they will probably continue to be supported for a long time (Haslam, 2017).

Viewed together, the fourteen identified causes are consistent with statistics on road safety since they include attributions to the road condition, vehicle conditions, and the human factor, though different weights, which would be too much to expect. While various reports maintain that environmental and vehicle factors are responsible for less than 10% (Vogel & Bester, 2005), for 26% of respondents, the cause of accidents is the poor condition of the roads, and to much lesser degrees the conditions of the vehicle and the number of vehicles circulating.

More remarkable similarities were found in the study by Moyano-Diaz (1997), especially in the attributions presented, although 29 causes were coded in that study, and in this one, 14. Observing the word co-occurrence network in Figure 2 and the word cloud in Figure 1, it is possible to identify the presence of virtually all the causes, except that in the current research, the coding criteria were different, which is evidenced, for example, in that in the Chilean study, the cause irresponsibility and recklessness were assigned a different code than the cause of driver's irresponsibility and recklessness. From the post-classification carried out by Moyano-Diaz, with little effort, it is possible to equate it with the one done here between the causes attributed to the driver and those related to the environment or external factors, allowing us to conclude that the Chilean and Colombian samples have similar belief profiles. However, several of the specific causes may differ in frequency, which could be explained as the effect of daily experience in their respective environments, cultural elements that influence beliefs, and even the handling of the event by the media (Havârneanu, 2012), as well as methodological aspects of each investigation.

The asymmetry between causes attributable to the driver and the environment present both in the Chilean study, and this one is in line with the research by Bordel et al. (2007), where an actor/observer bias was demonstrated depending on whether one is placed as a driver or as a witness in the accident. As Palat and Delhomme (2018) discovered, the attributional profile changes dramatically from actor to spectator either because of a difference in information and perspective or as a mechanism to maintain a positive self-image, known as defensive attribution (Shaver, 1970).

Looking for a culprit is part of the spontaneous causal attributions necessary to experience the sensation that we understand our world (Weiner, 1985). If that culprit is identifiable, we hope that in the future, they will act correctly or be removed, which will distance us from the risk of suffering something similar (Walster, 1966). The study by Useche and Llamazares (2022) showed that self-attributed causes were related to less grievous behaviors, while causes attributed to others focused on intentional faults, assigning them a more significant responsibility. For this research, respondents assumed the role of spectators in their exposition, which allows understanding that the causes attributed chiefly refer to the driver and, therefore, are focused on violations more than errors. In turn, this creates the challenge of delving deeper into the research on attributional profiles by controlling for sociodemographic variables related to driving experience and road accidents. A more detailed understanding of personal constructs surrounding traffic accidents will be achieved by doing so.

The differences in the attributional profile between observer and actor had already been expressed since the works of Heider (1958). Later, Ross coined the term fundamental attribution error, which is the tendency to explain what happens around us by overemphasizing the characteristics of the person involved and underestimating situational factors; this tendency is differential when assuming the role of observer or actor (Ross, 2018). The fundamental attribution error develops the idea that when faced with a negative situation, others suffer, and spectators tend to attribute it to personal conditions such as their ability or intelligence. In contrast, in their negative situations, responsibility is usually attributed to luck or external circumstances. In the causes uncovered here, the presence of this phenomenon is notable, which suggests that, for the respondents, the variables that lead to a traffic accident are given by the personal conditions of the driver, if the driver is someone else; that is, a propensity to see accidents as the responsibility of others. Additionally, behind these theories exists the central belief that everyone gets what they deserve, that is, they brought it upon themselves. This tendency is known as the just-world hypothesis (Lerner & Miller, 1978), through which even victim blaming is reached.

Practical Implications

The practical implications of this study are especially relevant to the actions developed by institutions responsible for preventing road accidents. It is necessary to understand that a campaign that does not take into account psychological and social processes, such as the spontaneous causal attributions of potential recipients in this case, will be doomed to ineffectiveness, as mere technical or scientific knowledge is insufficient, especially if the goal is to design programs with high ecological validity, context-based.

On the other hand, text mining is a valuable strategy for conducting quantitative content analysis, as understood by Leung and Chung (2019). While it does not aim to replace qualitative analyses in terms of depth, it is a great help as an exploration instance and identification of first-order inductive categories and a plausible technique when intending to process responses to open-ended questions (Álvarez Esteban, 2003). It also demonstrates its usefulness in analyzing texts from other sources, such as social networks, one of the most dynamic and rich information repositories available today, or in multiple databases (Mariñelarena-Dondena et al., 2017).

Limitations

The study's main limitation is related to the non-representativeness of the sample, given that the call for participation and subsequent collection of information was based on the voluntary participation of people who were part of groups related to the author and his team. Future research should consider variables such as the driving history and accident history of the respondent to allow for more segmented analyses. However, as this is the first study of its kind in the region, it can be taken as a starting point to correct errors and develop robust research lines in the field of implicit theories and road safety.

References

Agencia Nacional de Seguridad Vial. (2022). *Anuario nacional de siniestralidad vial Colombia 2021*. https://ansv.gov.co/sites/default/files/2022-07/Anuario_Nacional__2021_Vfinal.pdf

Álvarez Esteban, R. (2003). Las preguntas de respuesta abierta y cerrada en los cuestionarios. análisis estadístico de la información. *Metodología de Encuestas*, *5*(1), 45–54. http://casus.usal.es/pkp/index.php/MdE/article/view/932

Barreto, I., Velandia-Morales, A., & Rincón-Vásquez, J. C. (2011). Estrategias metodológicas para el análisis de datos textuales: aplicaciones en psicología del consumidor. S*uma Psicológica, 18*(2), 7–15. https://dialnet.unirioja.es/servlet/articulo?codigo=3970960

Bordel, S., Guingouain, G., Somat, A., Terrade, F., Aubouin, A.-V., Querrat, D., & Botrel, K. (2007). Naive Explanations of Road Accidents: Self-Serving Bias and Defensive Attribution. P*sihologia Resurselor Umane, 5*(2), 36–47. https://doi.org/10.24837/pru.v5i2.326

Cohen, K. B., & Hunter, L. (2008). Getting Started in Text Mining. PLOS *Computational Biology, 4*(1), e20. https://doi.org/10.1371/JOURNAL.PCBI.0040020

DeJoy, D. M. (1990). Spontaneous attributional thinking following near-miss and loss-producing traffic accidents. *Journal of Safety Research, 21*(3), 115–124. https://doi.org/10.1016/0022-4375(90)90019-8

Demšar, J., Erjavec, A., Hočevar, T., Milutinovič, M., Možina, M., Toplak, M., Umek, L., Zbontar, J., & Zupan, B. (2013). Orange: Data Mining Toolbox in Python. *Journal of Machine Learning Research, 14*, 2349–2353. https://www.jmlr.org/papers/volume14/demsar13a/demsar13a.pdf

Dweck, C. (2017). Foreword. En C. M. Zedelius, B. C. N. Müller, & J. W. Schooler (Eds.), *The Science of Lay Theories* (pp. v–vii). Springer International Publishing. https://doi.org/10.1007/978-3-319-57306-9

Estrada Cortés, J., & Lizárraga, A. (1998). El análisis de contenido. En E. De la Garza Toledo & M. E. Arce (Eds.), *Hacia una metodología de la reconstrucción. Fundamentos, crítica y alternativas a la metodología y técnicas de investigación social* (pp. 109–122). UNAM. Dirección general de proyectos académicos.

Flórez Valero, C. F., Patiño Puerta, C., Rodríguez, J. M., Ariza, L. K., & González, R. A. (2018). Análisis multicausal de 'accidentes' de tránsito en dos ciudades de Colombia. *Archivos de Medicina (Manizales), 18*(1), 69–85. https://doi.org/10.30554/ARCHMED.18.1.2477.2018

Furnham, A. (1988). *Lay theories. Everyday understanding of problems in the social sciences* (1a ed.). Pergamon Press.

Haslam, N. (2017). *The Origins of Lay Theories*: The Case of Essentialist Beliefs. En The Science of Lay Theories (pp. 3–16). Springer International Publishing. https://doi.org/10.1007/978-3-319-57306-9_1

Havârneanu, G. M. (2012). The perceived causes of severe traffic accidents: A psychosocial approach. *Procedia - Social and Behavioral Sciences, 33*, 428–432. https://doi.org/10.1016/J.SBSPRO.2012.01.157

Hearst, M. A. (1999). Untangling text data mining. *Proceedings of the 37th annual meeting of the association for computational linguistics on computational linguistics: association for computational linguistics*, 3–10. https://aclanthology.org/P99-1001.pdf

Heider, F. (1958). *The psychology of interpersonal relations*. John Wiley & sons.

Higuchi, K. (2017). *KH Coder 3* (3). http://khcoder.net/en/

Instituto Nacional de Medicina Legal y Ciencias Forenses. (2022). *Forensis 2020. Datos para la vida*. https://www.medicinalegal.gov.co/documents/20143/787115/Forensis_2020.pdf

Instituto Nacional de Medicina Legal y Ciencias Forenses. (2023). *Forensis 2021. Datos para la vida*. https://www.medicinalegal.gov.co/documents/20143/878249/Forensis_2021.pdf

Kelley, H. H. (1992). Common-Sense Psychology and Scientific Psychology. *Annual Review of Psychology, 43*(1), 1–24. https://doi.org/10.1146/ANNUREV.PS.43.020192.000245

Kouabenan, D. R. (1998). Beliefs and the Perception of Risks and Accidents. *Risk Analysis, 18*(3), 243–252. https://doi.org/10.1111/j.1539-6924.1998.tb01291.x

Ledesma, R. D., Poó, F. M., & Montes, S. A. (2011). Psicología del Tránsito: Logros y desafíos de la investigación. *Psiencia, 3*(2), 106–116. https://doi.org/10.5872/psiencia/3.2.72

Lerner, M. J., & Miller, D. T. (1978). Just world research and the attribution process: Looking back and ahead. *Psychological Bulletin, 85*(5), 1030–1051. https://doi.org/10.1037/0033-2909.85.5.1030

Leung, D. Y., & Chung, B. P. (2019). Content analysis: Using critical realism to extend its utility. En P. Liamputtong (Ed.), *Handbook of Research Methods in Health Social Sciences* (pp. 827–842). Springer. https://doi.org/10.1007/978-981-10-5251-4

Levy, S. R., Chiu, C. Y., & Hong, Y. Y. (2006). Lay Theories and Intergroup Relations. *Group Processes & Intergroup Relations, 9*(1), 5–24. https://doi.org/10.1177/1368430206059855

Manning, C. D., Raghavan, P., & Schütze, H. (2008). *An introduction to information retrieval*. Cambridge University Press.

Mariñelarena-Dondena, L., Errecalde, M. L., & Castro Solano, A. (2017). Extracción de conocimiento con técnicas de minería de textos aplicadas a la psicología. *Revista Argentina de Ciencias del Comportamiento, 9*(2), 65–76. http://www.scielo.org.ar/scielo.php?script=sci_arttext&pid=S1852-42062017000200006&lng=es&nrm=iso&tlng=es

Montero, I., & León, O. G. (2007). A guide for naming research studies in Psychology. *International Journal of Clinical and Health Psychology, 7*(3), 847–862. https://web.archive.org/web/20180508202326id_/http://aepc.es/ijchp/GNEIP07_es.pdf

Moyano-Díaz, E. (1997). Evaluation of Traffic Violation Behaviors and the Causal Attribution of Accidents in Chile. *Environment and Behavior, 29*(2), 264–282. https://doi.org/10.1177/001391659702900206

Palat, B., & Delhomme, P. (2018). Causal attribution in explanations of near-crash events behind the wheel, and its relationship to comparative judgments. *Journal of Safety Research, 65*, 133–139. https://doi.org/10.1016/J.JSR.2018.02.009

Rateau, P., Moliner, P., Guillemi, C., & Abric, J.-C. (2012). Social representation theory. En P. A. M. Van Lange, A. W. Kruglanski, & T. Higgins (Eds.), *Handbook of theories of social psychology* (Vol. 2, pp. 477–497). SAGE.

Rodríguez Pérez, A., & González Méndez, R. (1995). Cinco hipótesis sobre las teorías implícitas. *Revista de Psicología General y Aplicada, 48*(3), 221–229. https://dialnet.unirioja.es/descarga/articulo/2161352.pdf

Ross, L. (2018). From the Fundamental Attribution Error to the Truly Fundamental Attribution Error and Beyond: My Research Journey. *Perspectives on Psychological Science, 13*(6), 750–769. https://doi.org/10.1177/1745691618769855

Rothengatter, J. A. (1997). Psychological Aspects of Road User Behaviour. *Applied Psychology, 46*(3), 223–234. https://doi.org/10.1111/J.1464-0597.1997.TB01227.X

Rothengatter, J. A. (1998). An overview of traffic psychology: do research and measures match? En G. B. Grayson (Ed.), *Behavioral research in road safety VIII* (pp. 214–220). Transport Reasearch Laboratory.

Sagberg, F., Selpi, Bianchi Piccinini, G. F., & Engström, J. (2015). A Review of Research on Driving Styles and Road Safety. *Human factors, 57*(7), 1248–1275. https://doi.org/10.1177/0018720815591313

Shaver, K. G. (1970). Defensive attribution: Effects of severity and relevance on the responsibility assigned for an accident. *Journal of Personality and Social Psychology, 14*(2), 101–113. https://doi.org/10.1037/H0028777

Treat, J. R., Tumbas, N. S., McDonald, S. T., Shinar, D., Hume, R. D., Mayer, R. E., Stansifer, R. L., & Castellan, N. J. (1979). *Tri-level study of the causes of traffic accidents: final report. Executive summary*. https://deepblue.lib.umich.edu/handle/2027.42/64993

Useche, S. A., & Llamazares, F. J. (2022). The guilty, the unlucky, or the unaware? Assessing self-reported behavioral contributors and attributions on pedestrian crashes through structural equation modeling and mixed methods. *Journal of Safety Research, 82*, 329–341. https://doi.org/10.1016/j.jsr.2022.06.009

Vogel, L., & Bester, C. J. (2005). A relationship between accident types and causes. *Proceedings of the 24th Southern African Transport Conference,* 233–241. https://repository.up.ac.za/bitstream/handle/2263/6327/025.pdf

Walster, E. (1966). Assignment of responsibility for an accident. *Journal of Personality and Social Psychology, 3*(1), 73–79. https://doi.org/10.1037/H0022733

Weiner, B. (1985). "Spontaneous" Causal Thinking. *Psychological Bulletin, 97*(1), 74–84. https://doi.org/10.1037/0033-2909.97.1.74

World Health Organization. (2018). *Global status report on road safety 2018*. https://www.who.int/publications/i/item/9789241565684