FOREWORD

This thesis was written for my Master degree in Transportation Sciences with specialization in Traffic Safety at the Hasselt University, Belgium. The subject of this thesis is related to Naturalistic Behavioral observation of road users. This is a very fascinating research topic as it is a blend of technical and social sciences ranging from pure transportation concepts to human behavioral and habitual characteristics.

After thanking Allah Almighty and my family for their endless support, I would like to thank a few people here. I am really grateful to my promotor (Prof.ir Dr. Stijn Daniels), co-promotor (Prof.ir Dr. Tom Brijs) and supervisor (Wouter Van Haperen) for their guidance, reviews and recommendations. Specially Wouter who has been guiding me every step of the way as we worked together on this review of behavioral observation studies without whom this would not have been possible. These people were always present to help me with my research whenever I needed them. Working with these people was a steep learning curve for me as they did not only polish my research skills but also gave me an insight into the dimensions of the real world traffic safety issues.

Malik Sarmad Riaz
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“Academic work needs to follow rules of good practice, but we should not confuse rigor with tediousness or objectivity with lack of personality. Academics are still ‘*human after all’* – to quote Daft Punk. And beyond the barren scientific facts that academics produce, they have a life, an upbringing, a cultural context they inhabit, with opinions and passions (Hassenzahl, 2010).”

Summary

Observation of road user behaviour has been reported since the 1930, but especially during recent years the number of (peer-reviewed) studies and reports is increasing rapidly. Several methodologies have been developed to study road user behaviour, of which behavioural observation studies aim at collecting naturalistic behavioural data. However, an overview of the current extent, range and nature of this type of research is lacking. Therefore, a scoping review was performed in order to identify how road user behavioural observation studies have been conducted, which topics have been covered and which research gaps still exist in literature, focusing on the evaluation of safety through measurements of behaviour. The aim of this report is to a) provide an overview of conducted road user behaviour observation studies, b) assess their usefulness, c) prevent duplicate research efforts, d) identify which indicators have been applied and e) indicate which areas of road user behaviour research needs further examination.

The review team, consisting of two members, carefully created and tested a search protocol to systematically retrieve relevant literature from three major online databases (ScienceDirect, Web of Science and TRID). The search term *"Traffic Behavio*r" AND "Safety OR Observation"* was utilized and yielded more than 21.000 results. After the removal of duplicates and several screening rounds, 583 papers remained. Studies were excluded if they were published in any other language than English, if it only contained stated behaviour (e.g., questionnaires and focus groups) and if the data was collected with the participants' awareness of being part of an experiment (e.g., naturalistic driving and driving simulator research). Based on subsamples of the included papers, a codebook was designed in order to extract relevant information. The publication years ranged from 1939 till 2015 and the majority of the studies were conducted in the USA (38%), Canada (8%) and China (8%). It wat found that 36% of all included studies contained at least one vulnerable road user type (VRU-studies), while at least one other road user type was present in 82% of all studies (driver-studies). For both study categories, the main goal of behavioural observation is to simply observe what happens (> 50%), followed by the evaluation of safety improving treatments (around 30%) and the development of microsimulation models or automated video-analysis software. In total, 26 research topics were identified, of which VRU-studies mainly focused on crossing behaviour, yielding and red-light running, while for driver-studies the area of speeding is most often examined. Furthermore, the review identified 47 indicators used for behavioural observation analyses, of which red light running and yielding are most often used in VRU-studies and speed and headways in driver-studies.

Based on the findings of this review, it was concluded that road user behavioural observation studies are a useful tool to investigate underlying processes of (vulnerable) road users' safety. The main strength of such studies is that naturalistic data is gathered without road users being aware that they are being observed for research purposes. It enables the observation and identification of behavioural and situational processes that contribute to crash occurrence. However, such studies are limited to what happens, since researchers cannot manipulate or control the driving environment. Because the use of video cameras to capture behavioural observations has become the major data collection technique in recent years, the current efforts to improve and further develop automated video-analysis software tools might prove to be a valuable asset in behavioural observation studies and traffic safety evaluation in general.

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RTA -Road Traffic Accident

VRU - Vulnerable Road User

CHAPTER 1: Introduction

1.1. Scope:

Human race since the beginning has recognized the importance of travelling and transport, in the beginning the humans mostly travelled on foot mainly due to adverse weather conditions or in search of food. Nowadays in this modern era an average person travels a lot as it is now not only to get basic necessities of life but also to satisfy the leisure desires. So over the time there has been modernization in the modes of transport where the needs and desires of people travelling has also revolutionized. These factors have all contributed towards an increase in ownership of vehicles in the last century. This rapid increase in transportation has proved to be a major challenge to the mankind. This increased number of vehicles and people travelling on roads has effected not only the environment but also negatively affect the mankind as increased used of modern transport means has increased crash fatalities and injuries. It has been documented that it might not be possible to eliminate all risks associated with modern transport but there is a possibility to reduce the risk of fatal crashes or severe injuries. Road traffic accidents are now a global health crisis, currently the 9^{th} biggest cause of deaths in the world and is predicted to be the 5^{th} highest in 2030. RTAs result in one million fatalities which averages more than 2500 people losing their lives per day.

The Haddon Matrix has been commonly used in road safety injury prevention field, developed by William Haddon, the matrix describes the human, vehicle and environmental factors associated with a fatal crash or severe injury. Treat et al., 1977 describes the contribution of these three factors towards a crash from a crash data, it shows that human factor(error) can result in 95.4% of the road traffic accidents. this error or lack of judgement can result in fatal crashes and injuries, so understanding human behavior while travelling can help reduce the risk of crashes and severity of injuries. This has been discussed by Reason et al., as well where he describes that for an accident to occur, all these safety compromising factors need to happen at the same time for a road accident to occur.

Behavioural observation studies using naturalistic data was one of the first methods used in traffic safety research. There has been a lot of studies conducted on behavior observation of road users. Nearly a century ago, Dodge (1923) argued that studying human factors (behaviour) of road users is important to improve traffic safety. The oldest behavioural observation study found dates back to 1934 (Greenshields et al., 1934), in which the method of taking pictures was presented as a new form of data collection for analysing road user behaviour. During the recent years there have been a lot of research conducted on road user behaviours and it continues to grow over the years. Since then, the use of behavioural observation studies has become common practice for various research aims, including testing the effectiveness of a certain countermeasure or to develop models for microsimulation software. There have been several methods of collecting behaviour of road users which have been discussed in Chapter 3 of this report but Naturalistic behaviour observation has the most validity. This report will focus on the research conducted of road users in a naturalistic setting, where behavioural data was collected. This report is an effort to systematically review the available knowledge on naturalistic behaviour of road users.

A scoping review has been performed in order to identify how road user behaviour observation studies are conducted, the topics which have been covered widely and which research gaps still exist in the literature, focusing on the evaluation of safety through measurements of behaviour. The aim of this effort is to find the nature and range of the available knowledge of behaviour observation of road users while using a systematic approach which can make the whole review process explicit and repeatable in the future and hence increasing the validity of the review process as compared to traditional knowledge synthesis methodologies (narrative review).

1.2. Problem Statement:

Behavioral observation studies of road users have been conducted widely in traffic safety research, a scoping review of this area of research in road traffic safety is not available which can help identify how road user behavioral observation studies have been conducted over the years, which topics have been covered widely and which research gaps still exist in the literature focusing on the safety evaluation through measuring behavior of road users.

The study should aim to aggregate all the information available on behavioral observational studies of road users, the process should be transparent which allows the readers to assess the comprehensiveness and completeness of the whole process and the process can be replicated in the future. The scoping review would be beneficial for the researchers, funders and policy makers of road safety as this can help reduce duplication of effort in research and research gaps still existing in the available knowledge. The strength and weaknesses of the current practices are still unclear. This scoping review will summarize and map all the present literature available of Naturalistic behavior observation where the road users are not aware of being observed (unobtrusive) hence reducing the impact of behavioral adaptation when aware of being observed.

1.3. Research Questions:

The section describes the aim of this research effort. Below are some of the research questions that the report will aim to answer.

a) provide an overview of conducted road user behaviour observation studies

b) assess their usefulness

c) prevent duplicate research efforts

d) identify which indicators have been applied

e) indicate which areas of road user behaviour research needs further examination.

f) Strength and weaknesses of current practices.

1.4 Overview of the Report:

The layout of the report is kept simple and straight-forward. The chapter 1 introduces the topic and classifies the aims and objectives of the research. The Chapter 2 discusses the background literature study related to different knowledge synthesis methodologies and is followed by background study of Behavioral observation of road users in Chapter 3. Chapter 4 describes the key terms and scope of the study. In chapter 5 the methodology of the review is described followed by the codebook (created for extracting data from included studies) and its items in Chapter 6. Chapter 7 covers the analysis and discussion of different parts of the included behavioral observation studies. At the End Chapter 8 and 9 conclude the report with some discussion and conclusions.

CHAPTER 2 Background Study: Reviews

The background study of the master thesis topic carried out can be broadly classified in two parts, background study on knowledge-synthesis methodologies and behavioural observation studies in transportation domain. Different types of reviews that are used by researchers are discussed in this chapter, explaining the scoping review and the process of carrying out a scoping review and followed by the background study on behavior observation research carried out on road users in chapter 3.

2.1. Reviews

Today in the information age, where the number of published studies has increased dramatically in the last decades synthesizing the information has an increasing importance. Review of the literature helps in summarizing the present literature regarding a specific problem. Traditionally reviews have been written in a narrative way with a broad overview of the relevant information. In some cases, a reader might want to gain more knowledge about the topic and want to be assured that the evidence provided by the author in the narrative review is unbiased and comprehensive. An implicit process is used in Narrative reviews for providing evidence regarding the statements being made (Garg et al, 2008) where the reader cannot tell if the evidence provided was based on author's experience and/or how much literature was searched for evidence and why some studies were given more importance than others. The studies selected in a narrative review can mostly be those which reinforce the idea of the author or views on a topic. To deal with this, Scoping reviews are used to compile the information in a more systematic way with an explicit process.

2.1.1. Current Knowledge-Synthesis Methodologies

Currently there are five knowledge-synthesis methodologies available that are used by researchers worldwide to synthesize the literature available on a particular domain. Traditionally it can be a narrative review as discussed above, or it can be evidence mapping, scoping review, systematic review and meta analysis with progressive methodological techniques used respectively. Other than Narrative reviews, all other review methods have a systematic search for evidence while most of these reviews focus on the Qualitative analysis of the literature, meta analysis includes quantitative analysis of the included literature as well. In the next section, Scoping reviews are explained, the differences with a traditional narrative review are described and how a scoping review is carried out.

2.1.2. Scoping Review

Scoping review is a relatively new knowledge-synthesis methodology and many authors who have conducted a scoping review have found it necessary to describe what is meant by a scoping review. (Pham et al. 2014). According to Mays,Roberts and Popay 2001, Scoping reviews have the aim to map the key concepts in a research area, the main sources of research and the type of evidence/indicator that are being used currently in a research area. They can be undertaken as stand-alone projects when the area is complex or where the area of research has noot been reviewed earlier. So scoping reviews are a form of knowledge synthesis where an exploratory research question is aimed at mapping concepts, evidence types and gaps in a research body related to any predefined area or field and the whole search process is systematic with predefined inclusion and exclusion criteria for summarizing existing knowledge. (Colquhoun et al. 2014).

The aim of a scoping review of literature is to summarize, identify and evaluate all the concepts/trends of all available knowledge regarding a certain topic. The findings are collected in a systematic approach and offers academics and practitioners a clear overview of the efforts performed so far. Scoping reviews are based on a pre specified design, which is carefully created and discussed in detail, so it is easily reproducible by other researchers. these literature reviews can help in finding out what is known about a particular topic, and where the information is lacking. The information sources are increasing drastically in the last 2,3 decades. Even in a single area of focus, the numbers of studies are well over thousands before the inclusion or exclusion phase of the review has started. But with a scoping review a clear picture of the research evidence can emerge.Scoping reviews have been used alot in the medical field to find evidence regarding health interventions.They are now not only limited to the medical field and are becoming common in all sciences where data is collected. In the next section , the difference between a traditional narrative review and a scoping review are discussed.

2.1.3. Difference between Scoping Review and Narrative Review

The main difference between a narrative review and systematic review is the transparency of the whole process. A review of the literature helps in summarising findings to identify relevant research opportunities. Most studies use narrative reviews, which use implicit processes to provide evidence (Garg et al., 2008). However, the reader cannot determine if this evidence is based on the author's experience, how much literature was searched for and if certain studies were ignored due to contradicting findings, Studies described in a narrative review are mostly those that reinforce the ideas and research objectives of the study being conducted where an implicit process is used to provide evidence regarding the statements being made (Garg et al., 2008). In order to avoid subjectivity in the process of summarizing literature that is available on a certain topic, other reviewing techniques have been developed such as Scoping reviews, for example, use a systematic approach for retrieving relevant articles. The aim is to map the key concepts in a research area, the type of evidence available and the sources from where studies can be retrieved. Scoping reviews are widely undertaken as independent projects when a research area is complex and there has not been a review of the research area available earlier. (Mays, Roberts, & Popay, 2001; Wilson, Lavis, & Guta, 2012). Guiding future research and reducing duplicate efforts are important objectives of a scoping review (Armstrong et al., 2011; Wee & Banister, 2016). An additional advantage is that such reviews can be used for many applications, even outside the authors' intended purposes (Armstrong et al., 2011). The quality of a scoping review is determined by its clear definition of terms, the systematic retrieval of relevant literature, the transparency and replicability of the data extraction process and the acknowledgement of posed limitations. Some of the differences between these review types are mentioned in Table 1

Table 1 Differences between Narrative & Scoping Review

Features	Narrative Reviews	Scoping Review
Research Question	Broad	Often Broad
Source	Usually not specified and can be biased	Comprehensive search and explicit process
Selection	Usually not specified and can be biased	Criteria based, applied uniformly
Evidence	Few articles	thousands of records searched from databases
Research	Qualitative	Synthesis more qualitative and typically not quantitative
Objective	Provide evidence on statements being made in the study	Used to identify parameters and gaps in a body of literature
Duration of Search Process	Weeks to months	Months to years

2.1.4.Why Use Scoping Reviews

A scoping review is carried out to map key concepts, the type of evidence available , gaps in a research carried on a defined area/field using a systematic process of searching, selecting and summarising available knowledge. It uses a broad question of investigating what has been done in an area of research. the range and nature of the existing knowledge is mapped out in relation to concepts, location (country), sources of information and origin. It can be carried out to identify gaps in research or general gaps in a field of research, make recommendations for future research and avoid duplication of effort. Scoping reviews can also be carried out to determine if a detailed systematic review can be carried out in a particular research domain.

2.1.5.Carrying out a Scoping review

This section describes the guidelines for carrying out a scoping review which is objective, repeatable and evidence based scoping study (Higgins and Green, 2009). Below are the important steps which are required for carrying out a scoping review.

a. Defining and refining search terms
b. Identify appropriate databases and search engines
c. Defining and applying in/exclusion criteria filters.
d. Managing the data and logging the details for an objective and repeatable evidence based scoping study.

The next few paragraphs discuss the above mentioned steps of carrying out the scoping review describing the importance of defining research terms and strategy and documentation of the scoping review process for its validity and replicability.

2.1.5.1. *Search Terms and Search Strategy*

The first step is defining and refining search terms which is basically what are we going to look for when gathering the relevant available literature. The search terms should be defined and refined if needed to have as much relevant studies as possible from the search terms. It depends on the domain and subject the review is going to focus on. The process can be an iterative to have refined search terms for the most relevant results and minimize the risk of missing relevant articles. The search strategy should include the details of the approach to searching.

The search strategy must be comprehensively reported and the detailed search strategy for a minimum of three bibliographic citation databases that have been searched should be in the appendix of the review (Joanna Briggs Institute methodology guidance for scoping reviews). The appropriate databases or types of sources should be identified before starting the review process and it must include the most relevant databases. The individual search strategy for each database should be presented in the scoping review in an appendix. (Joanna Briggs Institute methodology guidance for scoping reviews)

2.1.5.2. *Inclusion/Exclusion Criteria and Documentation of the review*

Inclusion and Exclusion criteria specifies on what basis the studies were considered for inclusion in the scoping review. Effort should be made to make this criterion as unambiguous as possible. The inclusion and exclusion criteria should be documented and it should be in line with the objectives of the scoping review. Managing the details and logging of the details of the whole review helps in a repeatable evidence based review. This documentation of the whole search process is very important for the validity of the review process. The duration of the review should also be documented and if there are any limitations it must be declared, for example “only studies published in English language were considered for inclusion” or “only peer reviewed articles were considered for inclusion”. Details about the results, including number of studies gathered and included should also be documented for the scientific validity of the scoping review.

Using these steps can help find and manage required literature, the specification of the scope of the research is critical, so the included studies can be analyzed feasibly. A good scoping statement can help ensure that the irrelevant material is excluded from the research as there is a time and staffing required for carrying out a review which can be managed using a good scoping statement. The inclusion & exclusion criteria must be formulated before carrying out the review and each step carried out in the review should be logged to ensure the process can be repeated.

2.1.6. Flow of Information

The flow of information/evidence in a scoping review is carried out in four phases described breifly here.

1. Identification

In the identification phase, all the relevant databases are searched to identify the number of sources relevant to the topic.

2. Screening

The second phase is screening the information by excluding the duplicates found in the database or other studies which are excluded from the review like conference proceedings etc.

3. Eligibility

In Eligibility phase, full text articles are accessed to check if they are eligible for the specific research question.

4. Included

The last phase is to mention the included studies for the Scoping review.

2.1.7.Extraction of Data

Once the studies are screened and included in the review according to the inclusion & exclusion criteria, the relevant data is extracted according to the research questions and scope of the review. A form or draft table should be developed to record the information from each study according to the review questions. This form can be refined during the screening process and updated. According to Joanna Briggs Institute methodology guidance for scoping reviews, some of the infromation that the reviewers might chart here are

a. Authors and Reference of the study
b. Publication year
c. Country where the study was conducted or published
d. Study population
e. Study goal
f. Other details according to the question (scoping review)

As reviewers are extracting the relevant information from the studies , it might be possible to include other useful data. So the process of extracting the data can be iterative where the form or draft table is updated continusouly.

2.1.8.Presenting the results

During the early stages of the review, the reviewers should have a plan for the presentation of the findings, as the review process is in the last stages, the reviewers would have a better understanding about the contents of the included studies. As mostly the objective of the review is to map the results, the table and charts may be used to describe the distribution of studies by publication year, countries, research goals, topic and other questions according to the research objectives. With the tables and charts a narrative description of the results should also be included for each research topic/concept. For each result a clear explanation should be provided.

CHAPTER 3 Background Study: Behavioural Observation of Road Users

This chapter focuses on traffic safety and different behavioural observation methods which are used as proxies of traffic safety. The Naturalistic behaviour observation of road users are described towards the end of the chapter and its advantage over other methods of behaviour observation.

3.1. Traffic Safety

The term 'traffic safety', or 'road safety', is well known by specialists and the general public, but a clear definition has never been formulated (Evans, 2004, p7; Elvik et al., 2009, p3). In its most basic form, safety means the absence of unintended harm to living creatures or inanimate objects. However, most studies and reports focusing on road safety consider only fatal and (severe) injury crashes when discussing traffic safety levels (e.g. WHO, 2009; EU, 2015), thereby ignoring crashes in which only minor or no injuries at all occur. These studies use crash data retrieved from police and hospital departments, even though problems regarding this form of data collection have been acknowledged. The most important limitation of crash data regards underreporting or incorrect reporting. A meta-analysis of 49 studies conducted in 13 countries found that generally cyclist are highly under reported while under reporting of car occupants was very low, when hospital data and police reports were compared (Elvik and Mysen 1999). However, the precise underreporting rates remains unclear, since it is very likely that accidents without physical or property damage are not reported to either source. Other issues regarding accident data have been reported before (e.g. de Leur & Sayed, 2003; Laureshyn, 2010; Svensson & Hydén, 2006), including the rare occurrence of crashes and underreporting problems. Furthermore, accident data only provides information on the outcome of an unsafe traffic event, but valuable information regarding situational and behavioural processes leading to crash occurrence is missing. Therefore, research investigating road safety have also focused on the traffic events that precede accidents. The pyramid in Figure 1 sketches which type of traffic events can be distinguished, including their relative proportions. Road user behaviour observation studies can focus on all of these events, however such studies rarely focus on accidents (due to their rare occurrence and unpredictability).

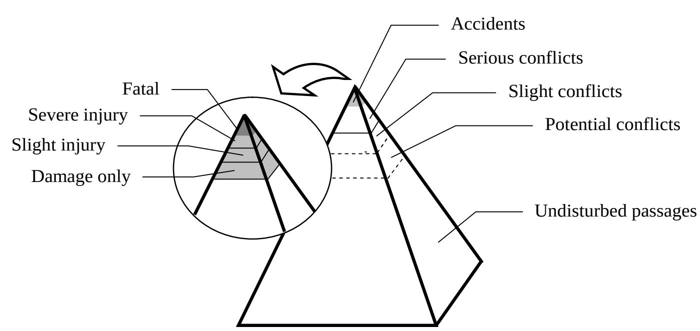


Figure 1 Conceptual Safety Pyramid (Hyden, 1987).

The three factors that can lead to a road traffic accident are human factors, environment and vehicle factors according to the Haddon Matrix. The research conducted by Treat et al., 1977 found out from the crash data that human factors (error or lack of judgement can contribute to 95.4% road traffic accidents as shown in figure 2 below.

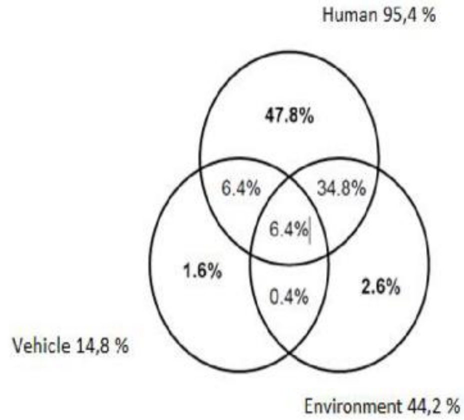


Figure 2 Human, Vehicle and Environment Factors resulting in a RTA (Treat et al., 1997)

According to the Swiss Cheese model, Reason et al. (2006) crashes are caused by a series of safety compromising events and that crashes will only occur if all these events occur at the same time (Figure 2). It is therefore important to identify which safety compromising events can contribute to crash occurrence, in order to develop efficient safety improving measures and programmes. Traditional crash data cannot offer such information.

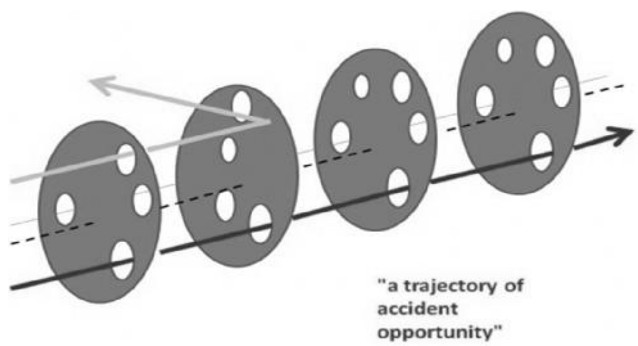


Figure 3 The Swiss Cheese Model of Reason (2002).

Figure retrieved from http://www.skybrary.aero.

In the next section, there is discussion about behaviour observation of road users and different behaviour observation methods which have been used as proxies of traffic safety are discussed.

3.2. Defining Behaviour Observation

Behavior Observation of road users is a part of traffic psychology which is defined as “the discipline of psychology which studies the relationship between psychological processes and behavior of road users” (Talib Rothengater, 1997). Road user behavior can help us understand the behavior of drivers in driver task demand. Error by a road user can lead to a crash and behavior observation of road users will help in reducing the crash risk. Learning road user behaviors would make decision making easier for road safety officials and to make roads much safer and for vehicle manufacturers as well to make vehicles according to the behavior of road users. The purpose of behavior observation in traffic research and methods of behavior observation used in traffic research are discussed briefly in the following pages.

3.3. Methods of Observation and Data Collected

Road user behavior can be observed by using various methods which are discussed briefly below. The road user behavior data can be categorized into five categories.

- Stated behavior data(surveys)
- Available data(crash data , police data, traffic violations etc)
- Data collected from simulations using driving simulators or virtual reality to create a mockup of the real traffic conditions
- Naturalistic driving using instrumented vehicles to collect behavior data.
- Naturalistic Observations where data is collected in the real world.

Multiple methodologies to evaluate traffic safety that do not use traditional crash data have been proposed and applied in scientific literature (Table 2). These approaches might be considered as proxies for traffic safety, since they do not analyse or evaluate crashes itself, but focus on processes and events that precede them. These methodologies can be distinguished in naturalistic data collection (reflecting driving behaviour in the real environment) or controlled data collection (in which researchers have the ability to manipulate and control traffic events).

Table 2 The most common safety evaluation methods used in Scientific literature

Actual (objective) traffic safety	**Proxy for actual (objective) traffic safety**		
Naturalistic data collection		Controlled data collection	
Revealed		Simulated	Stated
Crash data	**Behavioural Observation*** Traffic conflict observation Naturalistic Driving	Driving Simulator Microsimulation	Questionnaires Interviews Focus groups

* The focus of this scoping review.

Controlled data collection techniques can be further divided into stated and simulated research methodologies. Stated research designs investigate attitudes and behaviours based on questioning participants, usually with the use of questionnaires, interviews or focus groups. These methodologies are limited in the sense that collected data is dependent on behaviour that is stated by respondents (e.g. attitudes, opinions and beliefs), rather than behaviour actually shown in a natural setting. The advantage of simulated studies is that different scenarios or new types of infrastructure can be tested, without the need of constructing them first. However, known issues regard behavioural adaptation during driving simulator research and issues regarding validity for both driving simulator research and microsimulation studies (Jenness, 2007; Bedard et al., 2010; Schectman et al., 2009; Y Wang et al 2010). In the next few sections these data collection techniques have been further discussed, where proxies of traffic safety are collected to analyse safety.

3.3.1. Controlled Data Collection

3.3.1.1. *Survey / Stated Behavior*

Surveys in traffic research also known as self report have become very popular in traffic safety research in the last decades with measuring opinion, beliefs, attitudes, emotions and behavior. Surveys or self reports are used for measuring both driver skills and driving style i.e. driver behavior. There has been questions raised on survey methodology to measure driver skills or performance by Bryan E Porter., (2011) as most of the actions taken by the driver during the driving are unconscious (changing gears) and drivers are less aware of their skills with more experience. Driver Behavior Questionnaires are used to observe drivers behavior and a lot of literature is available on different types of DBQs with examples of different countries having a different DBQ. There are also DBQs available for different road users like Motorcycle driver behaviour questionnaire(Reference) Other examples of driver behavior observation using survey methodology is using different scales of behavior observation like Sensation seeking Scale (SSS) or Drivers skill inventory(DSI).Other than Questionnaires, survey methodology can use self report diaries of drivers as well as interviews conducted of a focus group. For the validity of surveys conducted in traffic research, some of the problems faced are that the drivers would like to respond to the questionnaire in such a way that the response makes her/him look good (PaulHus 1984). Other methods of checking the validity is to check the reliability and validity of the data obtained by surveys. Some examples of survey methodology is to measure opinions or attitudes about speeding or driving under the influence of drugs, self reports can also be used for reporting crashes and crash risk. All the aspects of driving can be covered by using this approach but the validity of this methodology is a concern for behavior researchers in traffic research.

3.3.1.2. *Driving Simulator*

Driving Simulators go back as far as pre Second World War which were used for training purposes are were flight simulators, they were used to reduce operational cost (Blana E.1996). They are used in the traffic research with a mock-up of a car, bikes, motorbikes and planes. They range from a low end simulator with a computer screen with a joystick or keyboard to high end simulators with 360 degree field of view with several screens and high end resolutions. Key components of a driving simulator are a modified car, visual system and motion system. The driver is seated in a vehicle cabin which relates to a real cabin and vehicle movements are simulated by motion systems. Compared to real traffic studies observation the driving simulator has some advantages; a specified traffic scenario can be created in a driving simulator to observe the specified behavior. The participants in the research of driving simulators can be confronted with a situation which can occur rarely in reality. Interactions among road users can also be simulated to observe car following behavior or affect of red light cameras on road users for example with the scenario created according to the specified behavior to be observed. Some behaviours cannot be observed in real traffic conditions such as driving under influence of drugs or alcohol which can be observed in a controlled simulator environment. Studies involving near accidents behavior can also be observed in a safe way in driving simulators.

In Driving simulator the question of the validity of the results obtained from driving simulator with the real world remains. The driver might not behave in necessarily the same way he/she behave in real traffic conditions. Another problem faced in driving simulators in the simulator sickness with participants feeling disorientation.

3.3.1.3. *Micro Simulation*

Micro simulation is also used for behavior observation by using micro simulation softwares like VISSIM etc. Modeling is also another way of Behavior observation which are sometimes calibrated, validated or developed using real world data. Sometimes Models and Micro simulation results are validated by results from real traffic.

3.3.2.Naturalistic Data Collection

3.3.2.1. *Crash Data / Available Data*

Crash data is used directly as an indicator of safety at a site; they are mostly used for statistical analysis of crashes from the data collected by police or other agencies. Crash data is also used for interventions effectiveness as a before-after study while it is not that reliable when it comes to crashes of pedestrians and bicyclists as they are underreported (Elvik and Mysen 1999). The data can be used to describe the behavior of the users involved in a crash by checking the police crash data or approaching the users involved in the crash. Depending on the quality of the crash data, different behavior of the road users can be recorded like seat belt use, helmets use, speeding or driving under the influence of drugs or alcohol. Crash data can also help decision makers and law enforcement agencies to enforce such conditions which would increase road safety. For example by using helmet the probability of a fatal head injury by the road user would be reduced by 68.7 %.(Maids, 2004)

3.3.2.2. *Naturalistic Driving*

Naturalistic Driving is a research method for observation of road user behavior where the vehicle of the subject is instrumented to observe driver visual, hand or head maneuvers as well as vehicle maneuvers to observe driver behavior Backer-Grøndahl, A., et al. (2009). The participants in a naturalistic driving study are told to drive normally as they would do in their everyday life. Naturalistic Driving data provides a very detailed data on driver behavior, road characteristics, weather and traffic conditions. The data is collected in normal as well as in near crash conditions. This method of behavior observation can obtain information that cannot be gained by other observation methods like visual observations of driver, handling of the vehicle and what kind of information the driver looks for during driving. Other data that can be gathered by using this method is speeding data as well as route behaviour. Naturalistic Driving Data is used mostly in cars but is now also used in trucks, vans and motorbikes as well as bicycles.One of the first study of Naturalistic driving was conducted in United states where 100 cars were equipped with instruments to observe driver’s behavior also known as “100-car-study” Dingus, T.A., et al. (2006). A lot of data is generated in such studies so a mechanism is formed to only include the relevant data according to the study. In the 100-car study case the research team only wanted to study what happens in the car and on the road before a near crash, so only data relevant to these behaviors is identified. This research also has less validity as the road users are aware of being tracked/observed as the awareness of the sensors on their vehicle might cause behavioural adaptation effects.

3.4. Naturalistic Behavioural Observation

Naturalistic data collection methodologies focus on the observation of behaviour that is shown in the real traffic environment. A distinction can be made between studies in which road users are aware of being observed (naturalistic driving studies) and studies in which unobtrusive observations of road user behaviour are made (behavioural observation and traffic conflict studies). Although the concept of unobtrusive is not clearly defined in behavioural observation studies, it seems generally regarded as the avoidance of informing road users of their participation in the study. When road users know that they are being observed, they may change the behaviour of interest (Porter, 2011). Naturalistic driving studies enable the collection of vast amount of data during individuals’ trips, but the awareness of the sensors on their vehicle might cause behavioural adaptation effects. Therefore, behavioural observation studies, and, as an extension traffic conflict studies can most closely represent natural road user behaviour. The main difference between these two methodologies is that traffic conflict studies try to measure traffic safety in terms of the expected number of (injury) accidents, while road user behavioural observation studies focus on observing what happens, rather than to quantify traffic safety levels.

Porter, 2011 has discussed some of the questions that you can ask before deciding the method of observation in “Handbook of traffic Psychology”. First question to ask is that “what is the purpose of the study" If there is a need to study the occurrence or frequency of a behavior than Naturalistic observation can be used, but to understand the underlying causes other methods can be used. Secondly can the behavior of interest be checked visually, third "what is the population/sample which will be observed" and lastly the cost associated with the research. On site behavior observation can be very industrial/labor-intensive so the scope and time assosciated with the research must be clearly stated.

3.5. Direct vs. Unobtrusive Observation

Direct observation means that the road users will see the researcher or research teams and may alter the desired behavior of interest. Porter., (2011) mentions that the drivers would put on the seat belt once they saw that they are being observed. Unobtrusive observation can be done when the drivers or road users don't know that they are being observed. For this purpose researchers choose places where they are hard to recognize and if video camera is used to observe behavior then it is concealed in such a way so the road users are not aware of being observed. The review will focus on unobtrusive observation where road users are not aware of being observed as anonymity among road users may reveal the actual behaviour. According to social psychology research , people behave differently when they know they are anonymous (not aware of being observed) as compared to situations where they can be identified (James W Jennes 2007). This opinion is also backed by Shinar 1998 as he discusses the negative effects of anonymity of a automobile driver who might engage in aggressive driving and road rage because of feeling anonymous.

3.5.1. Advantages of Unobtrusive Naturalistic Behaviour Observation

As mentioned above in section 3.4 there is no direct environment available in other methods of observation, on site observation can be used to directly analyze the behavior which is being studied without relying on proxies of behavior like self reports and others mentioned in previous sections (Porter, 2011).

On site behavior observation has more validity as it is done in naturalistic environments as compared to Driving Simulators. It's also different from Driving Simulators as drivers are observed in their own car and not aware of being observed which can only be done by observing the road user from outside the vehicle.(Porter, 2011).

CHAPTER 4: Key Terms & Scope of the review

Behavioural observation of road users using naturalistic data was one of the first methods employed by traffic safety researchers, almost a century ago, Dodge (1923) argued that understanding of human factors (behaviour) of road users is important to improving traffic safety. Since then there has been a lot of research carried out on human factors (behaviour) in traffic safety research ranging from simply monitoring the behaviour, testing the effectiveness of a countermeasure to improve traffic safety to validating, calibrating or developing microsimulation models. The amount of published peer-reviewed studies has grown rapidly in the last decades but a scoping (systematic) review is missing which gives an over view of the current state of knowledge in this domain.

4.1. Key Terms

In order to guarantee the transparency and replicability and to clearly communicate the focus of this review, key concepts are defined as follows:

- Road users are all users of the road infrastructure that can move freely and are not constraint to guiding systems (e.g. trains on rails). Transportation modes that are guided are excluded since drivers/riders of those modes have very limited control over their own direction. Aviation and ships are excluded from the review, since they do not make use of the (public) road infrastructure.
- Road user safety is the absence of unintended harm to road users or damage to the vehicle of their mode of transportation. Road user safety in this research is independent of injury severity.
- Road user behavioural observation studies (from here referred to as behavioural observation studies) are studies observing road user behaviour, in which the road users observed are not informed (beforehand) of their participation in the research. These studies focus on how road users pass the observation site in a naturalistic setting and should be related to traffic safety aspects.
- Vulnerable road users (VRUs) are those road users that do not have a protective shell around them (Wegman and Aarts, 2006). These include, among others, pedestrians, cyclists and riders of powered-two-wheelers.
- All road users that do not comply to the definition of vulnerable road users were labelled as drivers in this research. Examples are cars, trucks and busses.

4.2. Scope of the Scoping Review

The amount of documents reporting on research of road user behaviour is extensive. A preliminary search on three major online databases yielded over 21.000 papers, reports and other research documents. In order to guarantee the feasibility of the review, it was therefore important to formulate exclusion criteria. The most important requirements for inclusion are listed below:

- Document type: Only peer-reviewed journal articles were included in this review, thereby discarding research reports, book sections and conference proceedings.
- Publication year: Road user behaviour has already been observed since the 1930s. Although problems regarding the accessibility of papers published before the 1990's arise – those papers are not necessarily digitalized, nor might authors be still

professionally active to be contacted – it is preferable to include those older studies as well, since they provide insight into how the behavioural observation techniques have evolved over time. Furthermore, exclusion of older publications might sketch a distorted perspective on the actual usefulness of behavioural observation studies. Therefore, no restriction on publication year was introduced.

- Publication language: Only articles in English were considered for inclusion, due to the limitation of the knowledge of (certain) foreign languages.
- Involved road users: All the road user's motorists and Vulnerable road users are included in the review. Car drivers, Heavy vehicle drivers (Bus and trucks) are termed as drivers in the report while the vulnerable road users include pedestrians, cyclists and powered two wheels.

The limitations raised by using the above mentioned criteria is discussed in Chapter 8.

Chapter 5: Methodology

This chapter will discuss the methodology used to gather all the literature, the inclusion and exclusion criteria, data management and the flow of information during the screening process. The following sections describe the important elements of the review process.

5.1. Review team

The review process was carried out by two reviewers (Riaz M.S & Haperen W.V). both reviewers carried out all the screening and inclusion process and the extraction of results. It was decided to keep the review team to two members as with more people involved, it is inevitable to have subjectivity issues as each member of the review team may interpret defined criteria differently (Mallet et al., 2012). Therefore, the two members who created and tested the search protocol and designed the first version of the codebook. It was made sure that both reviewers had regular discussions and performed multiple consistency checks during the entire review process.

5.2. Search protocol

Three major online databases were systematically searched for possible relevant journal articles: Web of Science, ScienceDirect and TRID. The authors believed that these three electronic databases are comprehensive enough to yield most relevant references regarding road user behaviour observation studies. After testing several combination of terms in the Web of Science and ScienceDirect databases, a search term was formulated and used in all three databases: Traffic AND (Behavio*r OR Safety). Several additional filters were set for the databases, which can be found in Annex 1. References were retrieved on the late afternoon at December 2nd 2015. Thirteen papers accepted for publication in 2016 were found, but in this review recoded as papers published in 2015. The three databases yielded 21.169, which were all imported into the Endnote referencing software. After the automatic and manual removal of duplicate entries, 12.121 references remained for screening.

5.3. Screening

One of the most important stages during a scoping review is the screening of the references found by the search strategy. During this stage, an assessment of the relevance of the found references is made. It is important that exclusion criteria are defined as clearly and unambiguously as possible, in order to limit the influence of selection bias (the extent to which different individuals in- or exclude references) and to guarantee the replicability of the review process for other researchers. In our review, three rounds of screening were used to identify the relevant references: selection, relevance and eligibility screening.

5.3.1. Selection screening:

The first screening round was used to remove all references that were not peer-reviewed journal articles published in English. Examples include conference proceedings, non-peer-reviewed journal articles, book sections and research reports. After this screening round, 7.007 references remained. Unlike the other steps of the screening process, the selection screening was performed by only one member of the review team.

5.3.2. Relevance screening:

The second round of screening evaluated the relevance of found references. Both members of the research team checked the titles and abstracts in order to determine if the articles regarded the unobtrusive observation of road user behaviour. Three exclusion criteria were formulated: not relating to (road) traffic, no collection of uninformed observed behaviour (e.g. driving simulator, questionnaires, crash data analyses) and being a traffic conflict study only. During this stage, the differences in in- or exclusion between the research members were discussed. In case of doubt, references were kept for eligibility screening. The "inclusion criteria" of the search protocol describes the basis on which studies will be included in the review and it should be clearly defined. The inclusion criteria guidelines also help the reader to understand clearly what is being proposed in the review and also help the reviewers in including or excluding studies for the scoping review. The in/exclusion process is specified below. The review is focusing on Road traffic studies, with a behaviour element, carried out in the Naturalistic setting without the road user aware of being observed (unobtrusive).

5.3.2.1. *Related to Road traffic?*

If the study is not related to traffic like studies in the domain of medical science or other domains of science etc will be excluded with reason: "Not related to traffic". If the study is related to Traffic we check for the next inclusion/exclusion criteria.

5.3.2.2. *Behaviour observation or not*

After confirming that study is related to traffic, the next step is to check if the study has a road user behaviour element. In case of not related to behavior observation the study will be excluded with reason: "Not related to behavior observation". For example studies analysing only crash data, or studies which do not include the behaviour of road user to provide evidence (surveys, self reports). In case of a behavior observation study we check the next exclusion criteria.

5.3.2.3. *Aware of being observed?*

If the study is related to traffic and is a behavior observation study of road users conducted using naturalistic observations, then it is checked for the last inclusion/exclusion criteria which is that "are road users aware of being observed". Only unobtrusive observation studies have been included in the review.

Figure 4 on the next page describes this process of inclusion & exclusion of studies during the relevance screening through a schematic diagram.

Figure 2 Inclusion/Exclusion Criteria of the Review

5.3.3. Eligibility screening:

Almost 700 full papers were examined for data extraction. At the start of this screening round, papers were coded into the codebook by both reviewers, until a satisfactory level of consistency was reached (after around 75 references). Then, the papers were divided based on publication year (even vs odd years). Additionally, a subsample of papers was coded by both review members as well, in order to continue to check for consistency. Whenever a reviewer was not sure about certain aspects of the extracted information or if an article did not seem to be eligible for information extraction, a notation was made and the references was checked by the other review member as well.

5.4. Data Management

For Data management, a spreadsheet software was used to keep track of all the included and excluded articles during screening process. Endnote was used to retrieve all the included studies. (Annex 2)

5.5. Paper retrievals

The automatic text retrieval function in Endnote was used to collect full text articles. Papers that could not be found were searched for manually through google scholar and Research Gate. A list of missing articles was then formulated and effort was made to retrieve these papers. From the

620 references, 37 publications could not be located. The majority of these papers were published before 1985 (56%).

5.6. Flow of Information

The flow of information of the review process has been shown here on the next page with data collected from three databases (Web of Science, ScienceDirect & TRID) and after screening the data, the amount of studies included in the final review according to the scope of the review and inclusion/exclusion criteria are shown in the flow chart (Figure 5) on the next page.

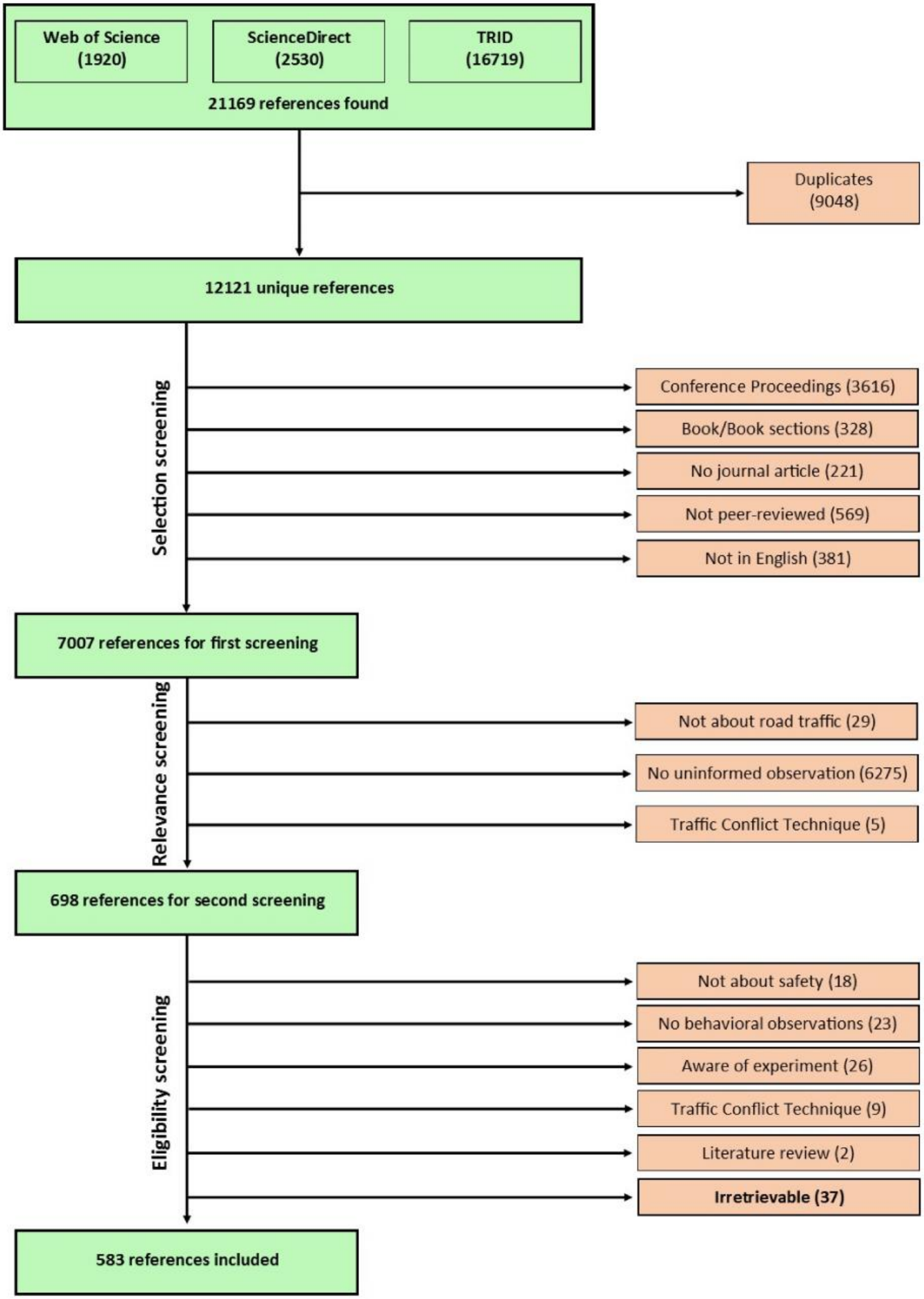


Figure 3 The flow chart of the screening process

Chapter 6: Extraction of Data

Once the available literature is screened and included in the review, the relevant data is extracted according to the research questions and objectives of the review. A codebook (MS Access form) was created to record information from each study. This form was refined during the screening process and during extraction of the data because as the review was being conducted it became apparent to include other useful data. this process of extracting the data was an iterative process where the codebook (form) is updated continuously.
Once the codebook was created. To verify the consistency of recording/coding the information among the two reviewers and verify the completeness of the codebook, around 55 studies were checked by both reviewers to have a version of codebook which can include all types of information according to the research objectives. After the information extraction process, the codebook was revised again in order to include elements that were difficult to categorize based on definitions used in the working version. The following sections describe the elements that were included in the final version.

6.1. General Information

The first section of the codebook contained the most general and basic information regarding the included journal articles. The following information was extracted:

- Unique identifier and the member of the review team who initially coded the article
- Research goal: monitoring, evaluation, model development, software development
- Research focus: traffic safety, mobility or both
- Full reference
- Exclusion (ineligible or irretrievable)

6.2. Research Topic

The second section of the codebook collected information regarding the main topic. In order to structure the data, a categorization for classifying research topics was proposed, based on the examination of the first 55 papers (Table 3). The topics were defined as follows:

- <u>Infrastructural-intersection</u>: *Phase change warning systems* and *dilemma zones* both relate to driver behaviour during the final stages of the green or amber phase. The difference between them was defined as the presence of a certain system that warned approaching drivers for the oncoming phase change. Studies that specifically focused on *red light running* were considered separately. With regard to the topics of *yielding* and *crossing*, the distinction was defined as yielding representing the studies in which the process of negotiation between road users who shall cross first was observed, while crossing studies represented the actual crossing and elements related to it (e.g. waiting position and waiting time). Finally, *shared space* was considered as a infrastructural-intersection topic. Studies investigating this topic focused on situations in which road users have no allocated position, forcing road users to interact and communicate with each other.
- <u>Infrastructural-road section</u>: *Speeding*, *car following* and *merging* are topics that can be allocated to the category of road sections, since they reflect behaviour that is typically shown on stretches of road. Other topics include *overtaking/passing* (defined as one road user overtaking another or two road users passing each other while traveling in the

opposite direction), *lane changes*, *gap acceptance* and *dedicated infrastructure* (observing behaviour regarding the use of annotated road user positions, e.g. bicycle lanes).

- Situational: Research regarding *work-zone* safety, the influence of *weather conditions* and *violations* other than violations directly related to the other defined topics (e.g. red-light running) were allocated to this category. A few studies were also found that focused on *emergency vehicle warning* systems, which alerted drivers that an emergency vehicle was approaching or being approached.
- Personal: The use of safety systems, like *seatbelts*, *child restraints* and *protective clothing* were considered as topics relating to personal characteristics. The topics of *turn indicator* use, *mobile phone* use*,* driver *distraction*, driver *aggression, drunk driving* and *risky driving behaviour* were also allocated to this category.
- Other: Finally, a category was created to capture all studies of which the topic could not be allocated to one of the defined topics. Examples include the effect of road lighting, hand positions on the steering wheel and the effect of speed bumps. In order to keep the list of topics as structured as possible while keeping a sufficient amount of detail, no specific categories for these topics were created.

Table 3 The topic types defined in this review

Category		Topic
Infrastructural	Intersection	Phase Change Warning Systems
		Dilemma Zone
		Red Light Running
		Crossing
		Yielding
		Shared space
	Road section	Speeding
		Car-following
		Merging
		Overtaking / Passing
		Lane change
		Gap acceptance
		Dedicated infrastructure
Situational		Work-zone Safety
		Weather conditions
		Emergency Vehicle Warning
		Other violations
Personal		Seatbelt
		Turn Indicator
		Child restraint
		Protective clothing
		Mobile phone
		Drink driving
		Aggression
		Distraction
		Risky driving behaviour
Other		

In addition to the specification of the research topic, a notion of the type of infrastructure was made as well. A categorization of four types was made:

- Intersections: Included are signalized, priority controlled, priority-from-the-right (road users arriving from the right have the right-of-way) and stop-controlled (stop-signs at all legs) intersections and roundabouts;

- Crossing facilities: pedestrian crossings (not part of an intersection), cyclist crossings (not part of an intersection), channelized right-turn lanes and railroad crossings;
- Road sections: straight roads, curves and work zones;
- Other: shared space, parking lots and other locations (which were specified in an additional variable).

6.3. Methodological information

The third section of the codebook focused on methodological aspects. Several types of information were extracted and structured, including on which road user types the studies focused, whether data was collected on all involved or a pre-selected road user type (e.g. yielding studies focusing on both drivers and pedestrians or only focusing on pedestrians) and if the behavioural observations were combined with other methodologies (e.g. the traffic conflict technique or the driving simulator). Other important information extracted regarded:

- Research design: Four types were distinguished:
    - Single observation: a single site or multiple comparable sites are monitored. No comparison between sites is made.
    - Before-after: At the same site(s), measurements are made before and after the implementation of a safety improving treatment. The effectiveness of the treatment is evaluated.
    - With-without: At the same site(s), measurements are made with the treatment activated and the treatment deactivated (e.g. countdown timers). This type of research design is most often applied when the treatment has been in place for a long time or if the treatment is part of a series of different treatments to be tested at the same location.
    - Cross-sectional: Two or more sites are compared to test the effectiveness of a safety improving treatment. The difference with with-without research designs is that in cross-sectional research comparisons between sites are made.

  For before-after and with-without studies, it was also investigated if a control group was used to address confounding factors such as regression-to-the-mean and natural variability problems. A notion was also made when a semi-controlled design was used, in which instructed road users provoked traffic events of interest.
- Data collection technique: The means of data collection was coded. The following categories were defined: human observers, cameras, vehicles equipped with cameras (observing other road users), detectors, (handheld) speed guns and other sensors.
- Data collection characteristics: Finally, information regarding the collected data itself was extracted. This information focused on the number of testing sites, their geographical location (country), the sample size and the time of day data was collected (peak or off-peak, day or night, week or weekend). Peak hours were determined based on the statement of the authors that volumes of road users of interest were high or not at the selected time of data collection. It should be noted that this section of the codebook solely focused on the characteristics of the data that was actually analysed, because not all studies have analysed all the data that were collected.

6.4. Indicators

A wide variety of indicators was used in the 583 included studies, which relate to different aspects of traffic safety events, situational aspects and road users characteristics. A categorization was applied to structure the 47 identified indicators, closely related to the categorization created for the research topics. It is important to note that this proved to be a difficult task since multiple indicators were difficult to allocate to only one category (e.g. speed and gap acceptance). Only indicators with a connection to traffic safety were included (road user characteristics being an exception). Indicators related to mobility (e.g. start-up lost time, delay time) were ignored. The following categories were defined:

- Infrastructural indicators
- Traffic Safety Aids
- Distractions
- Personal characteristics

6.4.1. Infrastructural indicators

The majority of the identified indicators (n = 30) can be related directly to infrastructural elements (Table 4). The following categorization was applied:

- Intersection-Dilemma Zone: Five indicators were found to describe behaviour during dilemma zone scenarios. The most common ones included the *stop-or-go* decision and *yellow-* and *red-light running*. Two other indicators tried to describe the severity of yellow- or red-light running by recording the *distance-to-stop-line* during the onset of the amber or red phase and to measure the *intersection-entry-time* (the time after the onset of the amber or red phase that a vehicle passes the stopping line).
- Intersection-Yielding: Four indicators were identified that can be used to examine yielding behaviour. The most basic indicator, *yielding*, just indicates if a road user stopped to let the other one pass first. Other indicators include *looking* behaviour, *yielding distance* (describing the distance at which yielding occurs) and the occurrence of *evasive actions* (sudden changes in speed or direction to avoid a collision).
- Intersection-Crossing: Indicators related to the crossing manoeuvre can broadly be distinguished into pre-crossing and during-crossing indicators. The former includes *waiting position, waiting time, gap* acceptance, *gap size* and *stop sign compliance.* Behavioural indicators describing the process of the crossing manoeuvre itself include *crossing time*, *crossing path* and *jaywalking* (road users do not cross at the crossing facility).
- Intersection-Railroad Crossing: A special type of intersection is the railroad crossing. Several studies investigated the extent to which road users respect the traffic rules, focusing on stop sign compliance or adhering to signalling lights.
- Road section: Indicators used to describe behaviour at road sections include measurements that do not necessarily require interaction (*speed*, space and time *headway*, *lateral position* and *lane choice*) and measurements in which two or more road users need to interact with each other (*overtaking*, *overtaking attempts*, *merging*, *merging distance* and *lane changing*).
- Violations: Finally, indicators relating to violations were identified. They included *wrong-way driving* and violations that could not be allocated to the other defined indicators.

6.4.2. Traffic Safety Aids

Seven indicators were identified that relate to the use of traffic safety aids. Three of them are exclusive for vehicles and regard the use of *turn indicators*, *seatbelts* and *child restraints*, while the use of *protective clothing* and *pedestrian push buttons* are only applicable for VRUs. Finally, the use of *(head)lights* was encountered in the literature. An additional category was included, indicating if measurements were used that could not be allocated to one of the previously mentioned indicators.

6.4.3.Distractions

In total, five indicators were identified that relate to (driver) distraction. A sixth indicator was defined to capture measurements that could not be allocated to the five identified indicators. The indicators regarded personal behaviours (*mobile phone use*, *smoking* and *carrying items*) and situational characteristics (the *presence of a passenger* for vehicles and the *group size* of crossing road users).

6.4.4.Road user characteristics

The final category of indicators consists of road user characteristics. It includes *age*, *gender* and *ethnicity*. Some studies also focused on following certain road users over space and time or relating shown behaviour to crash/violation history. For these studies, the *license plate* or vehicle registration number was collected. These indicators are not considered to be behavioural, but important to include into the review since literature has shown that for example men are more willing to take risks than woman (e.g. Buss, 2004; Yagil, 1998).

Table 4 The infrastructural indicators found in the behavioural observation studies

Type (Element)		Indicator	Measurements
Intersection	Dilemma zone	Stop / Go	Stop-or-go
		Yes / No	Yellow light running
		Yes / No	Red light running
		Time	Intersection entry time
		Distance	Distance from stop line
	Yielding	Yes / No	Yielding
		Distance at which is yielded	Yielding distance
		Yes / No	Looking
		Yes / No, type	Evasive action
	Crossing	Location	Waiting position
		Time	Waiting time
		Time	Crossing time
		trajectory	Crossing path
		Yes / No	Jaywalking
		Yes / No	Gap acceptance
		Time	Gap size
		Yes / No, type of stop	Stop-sign compliance
	Railroad crossing	Yes / No, type of stop	Sign compliance
		Yes / No	Light-compliance
Road section		Speed	Speed, acceleration, style
		Headway	Time, Distance
		Lateral position	Distance
		Lance choice	Left / Middle / Right
		Overtaking	Yes / No
		Overtaking Attempts	Number
		Merging	Yes / No
		Merging Distance	Distance at which is merged
		Lane change	Yes / No
Violations		Wrong-way driving	Yes / No
		Other	

Chapter 7: Findings and Analysis

The process of data retrieval showed that the amount of peer-reviewed journal articles relating to road user behavioural observation studies is extensive: 583 relevant and retrievable articles were found. The previous chapter described how information from these articles was extracted and structured. With the use of descriptive analyses, this chapter describes the main findings and observation of the current application of behavioural observation studies published in scientific literature. The following sections describe the descriptive analyses of the information coded in the codebook. The findings are structured as follows: first an overview of road user focus is given, then topics and behavioural indicators are described, afterwards the purpose of behavioural observation studies is explained and finally methodological aspects are discussed.

7.1. Road user focus

7.1.1. Vulnerable Road Users & Drivers

In order to acquire a better view on the applicability of such studies with regard to VRUs' safety, a distinction between studies including at least one VRU road user type (hereafter referred to as VRU-studies) and studies including at least one non-VRU road user type (hereafter referred to as driver-studies) was made. Based on this categorization, 214 of the 583 studies (37%) were labelled as VRU-studies and 477 of the 583 studies (82%) as driver-studies as shown in the figure below.

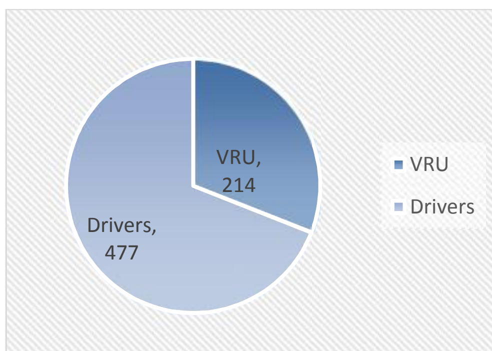


Figure 4 Distribution of VRU & Driver Studies in the review

It is important to note that this categorization does not take into account if behavioural data of these road user types is collected. For example, studies investigating yielding behaviour between car drivers and pedestrians in which data for both road users was collected and studies only focusing on the crossing pedestrian were both labelled as VRU- and driver-studies

Figure 7 provides an overview of the specified road user types' involvement in behavioural observation studies, shown in percentages on the y-axes and in absolute numbers on the data labels. The numbers of the different road user types do not add up to 100%, since studies can include multiple VRU or driver types. The VRU-studies show that the majority of research interest has focused on pedestrians (67%) and, to a lesser extent, cyclists (25%). The area of powered-two-wheelers' behaviour is less addressed: only 33 studies (15%) were found. This might seem surprising, since riders of powered-two-wheelers are highly represented in crash statistics worldwide (WHO, 2009). However, our experience during the selection process indicated that motorcyclists' safety might mainly be addressed by investigating attitudes, using driver behaviour questionnaires (e.g. Ozkan et al., 2011, Elliott et al., 2007). Other road user types included in VRU-studies are staged pedestrians and cyclists, which are used to investigate driver behaviour at certain events of interest (e.g. yielding or lateral overtaking distance). Finally, behaviour of e-bikes has been observed during recent years. 12 studies have been found in the review which included e-bike user behaviour with ten of them conducted in china and one conducted in Singapore and Taiwan.

Car drivers were included in almost all driver-studies. Determining the involvement of heavy vehicles was difficult, since many studies did not formulate clear statements regarding their in- or exclusion. Several articles only reported the inclusion of heavy vehicles by describing them in result tables, a few studies clearly stated whether or not they were included, but many studies made no remark at all. Therefore, it is rather difficult to formulate any meaningful observations regarding heavy vehicles' involvement in behavioural observation studies.

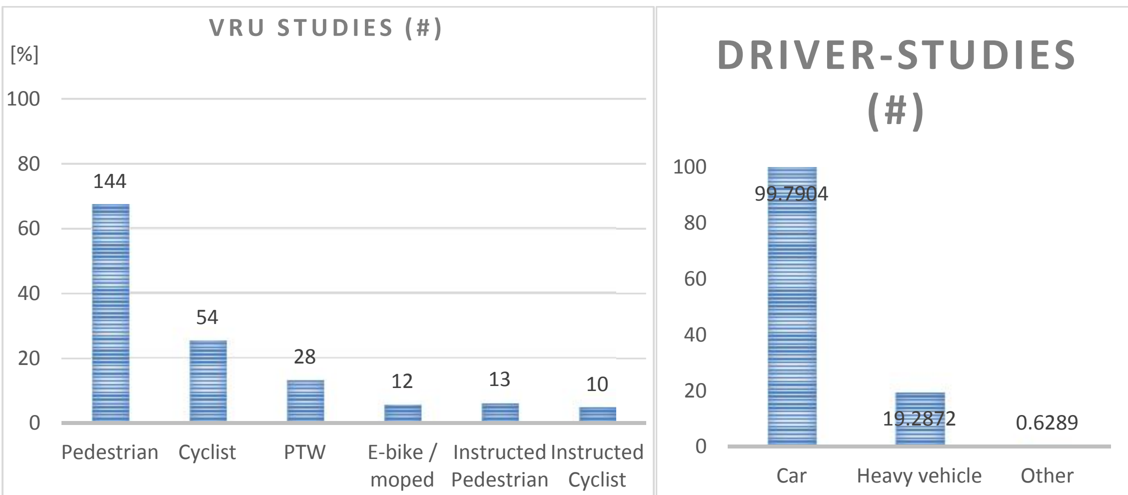
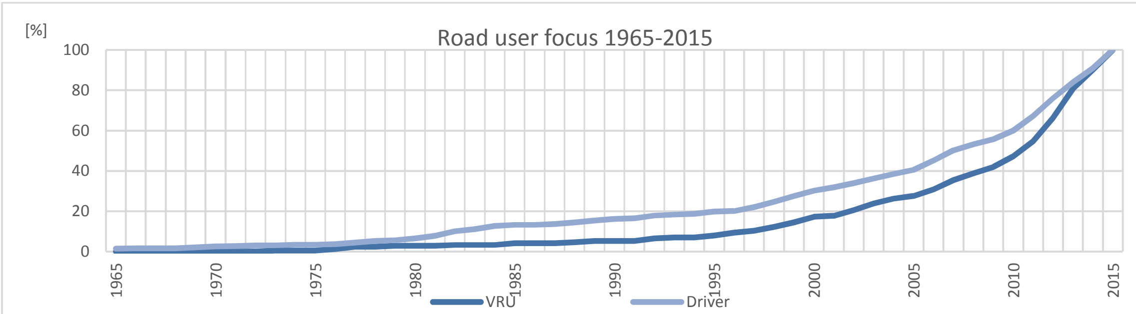


Figure 5 Specified Road user studies (VRU & Driver). On the left, VRU-studies are shown (n=244) and driver-studies are shown on the right (n=477)

The number of published studies on road user behaviour observation studies has been growing rapidly since the first journal article was published in 1939. In order to examine how these publications have evolved over time, the cumulative distributions of both VRU- and driver-studies were plotted (Figure 8, top). The first study including VRUs was found in 1973, while drivers have already been subject of behavioural observation studies since 1939. The cumulative distributions for both VRUs and drivers show an exponential growth. It can be seen that the majority of the studies (>50%) have been carried out within the last five and last ten years for VRU and drivers respectively. When considering the three most examined road user types (Figure 8, bottom), it can be observed that studies involving car drivers and pedestrians have grown exponentially. For cyclists however, the exponential growth seems to have reached it limits: the increasing rate of research efforts declined slightly from 2013.



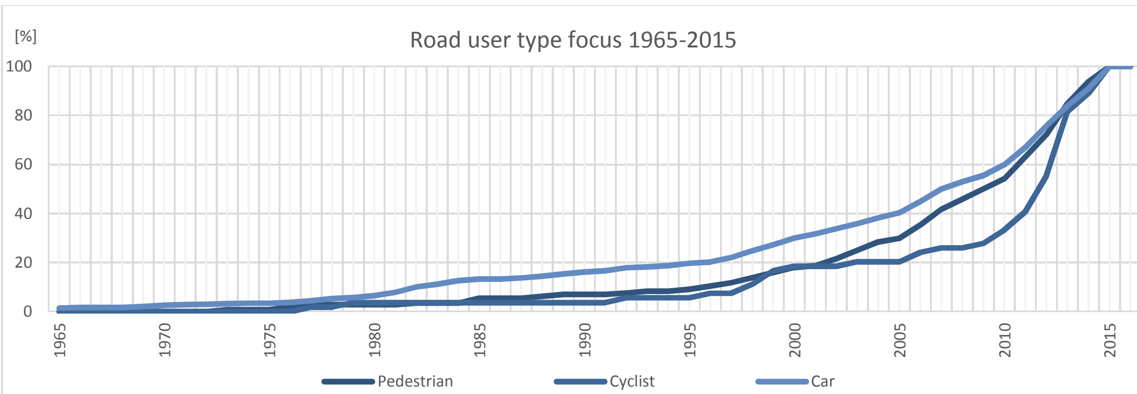


Figure 6 Road User Studies evolution over time

(On the top, the evolution over time of research focusing on VRUs and drivers. On the bottom, the three most common road user types are plotted. Due to low number of studies in early years, the graphs depict the period from 1965 till 2015)

7.1.2.Unique Road User types

Only three studies were found that included road users that could not be allocated to one of the formulated road user types. These studies will be briefly described in this section, in order to gain insight into the content of these studies and why their use has been limited to these few articles only.

- Only one of the 476 Motorist-studies did not include car drivers. This study focused on the behaviour of bus drivers and bus commuters near bus stops in Pakistan (Mirza et al, 1999). This study is unique in the sense that it ignores interaction with car drivers and that it focuses on bus drivers specifically. Risky behaviours of bus drivers like stopping at bus stops and speeding behaviour were observed.
- Behaviour of taxi drivers have been included in the study of Friedrickson, Frank & Freeman (1939). The study observed conforming behaviour of car drivers, chauffeurs and taxi drivers to the traffic regulations when there was no enforcement. The results showed that taxi drivers showed least conformity, Chauffeurs showed more conformity and private car drivers were intermediate.
- Hall & Harkley (1999) studied on the on-road behaviour of 16 ft wide mobile homes and its effect on the oncoming traffic. The authors recommended the pavement width for these

mobile homes to be operational on various roads based on the mobile homes lateral positioning on roads and of the oncoming traffic.

7.1.3. Countries

For all 583 articles it was noted down in which countries data was collected. In total, 51 different countries were identified. The majority of the studies took place in America and Europe. When considering country level, most studies were conducted in the USA (38%), Canada (8%), China (8%), the UK (4%) and Israel (4%). For almost half (n = 24) of the identified countries, only one or two studies were found. A few countries were found that invested more research efforts into VRUs than drivers (Austria, Bosnia-Herzegovina, Denmark, Egypt, India, Malaysia, Poland and Vietnam), but it should be noted that the total amount of behavioural observation studies in these countries is rather limited. A complete overview of the amount of VRU and driver studies can be found in Figure 9.

The table 5 below shows the top five contributing countries on studies regarding these widely observed road users in behavioural research. These top contributing countries based on specified road user types are also shown in figure 10 as pie charts.

Each chart shows the countries with the most studies relating to the defined road user type. One should be careful during interpretation of these figures, since those do not relate to the research efforts per country: the fact that the USA has the highest score for almost all road user types is the result of the USA having conducted most studies. For example, when looking at pedestrians, the USA has actually the lowest share of studies including pedestrians (21% of all studies conducted in the USA) compared to the other four ‘top’ countries (29%, 29%, 42% and 42% for Canada, China, UK and Israel respectively). However, based on this reasoning, there is an important observation regarding the USA’s share in powered-two-wheeler and electric bike research. The pie charts show that for these road user types, most studies have been conducted in Asia and that currently behavioural observation research into e-bikes is limited to China, Singapore and Taiwan only.

Table 5 Top Contributing countries based on specified road user types

	Road User	Top Contributing Countries
Drivers	Car Drivers	USA, Canada, China, Australia, UK
	Truck Drivers	USA, Australia, China, Israel, UK, Canada
Vulnerable Road Users	Pedestrians	USA, Canada, China, UK, Israel
	Cyclists	USA, China, Sweden, Netherlands, Canada
	Powered Two Wheelers	Malaysia, Taiwan, India, New Zealand, China

Due to the limited amount of studies in most countries, sorting road user types based on research efforts per country will not provide a meaningful perspective on the allocation of research efforts. Furthermore, it is important to note that the results of this review regard behavioural observation studies only and that it is possible that other research methodologies might be more applicable to investigate, for example, powered-two-wheelers’ behaviour.

7.1.3.1. *Studies conducted in Multiple Countries*

Several studies (n = 16) were found that used testing sites in multiple countries. Main reasons for such a decision were to enlarge the dataset (e.g. Rudloff et al., 2011) or to compare different driving cultures (e.g. Marczak et al., 2013). From these studies, three quarters included testing locations in two countries, but four studies were found that made comparisons between three countries.

Figure 7 Behaviour observation studies conducted in each country

(The road user focus of the different countries conducted road user behavioural observations, sorted based on number of VRU & Driver studies)

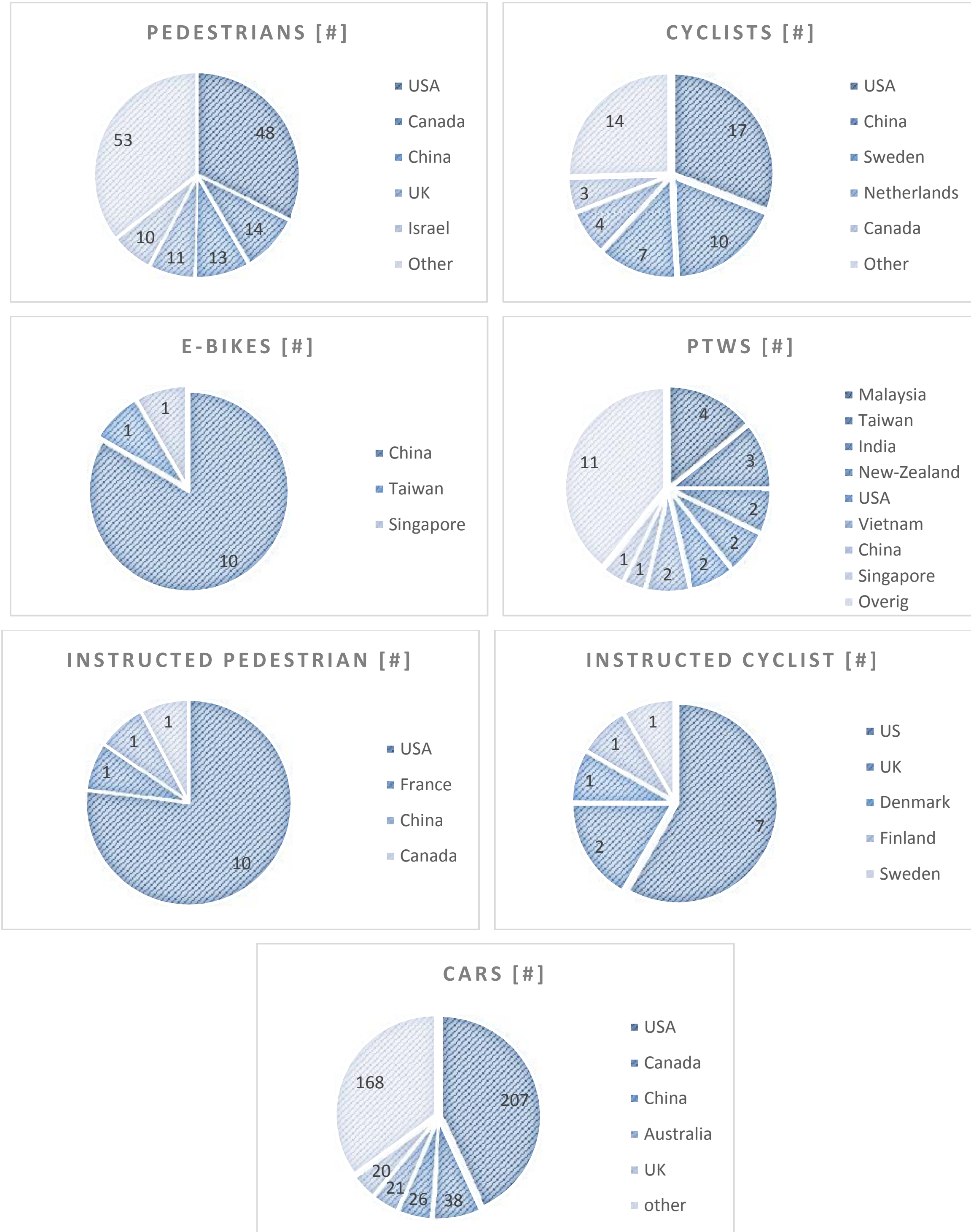


Figure 8 Countries with most research effort for the defined road user types.

7.2. Topics and indicators

This section provides an overview of the topics and indicators that have been applied in the scientific literature. First, the infrastructural elements that were the focus of conducted studies as defined in section 4.2 are discussed. Then, research topics and indicators are briefly described. Finally, topics and corresponding indicators are discussed in more detail.

7.2.1. Infrastructure

Figure 11 shows the use of infrastructural elements in studies observing VRUs' and drivers' behaviour. It can be seen that VRU-studies mainly focus on locations where interaction between road users is required. Mainly signalized intersections (39%) and pedestrian crossings (31%) have been extensively researched. Driver-studies on the other hand mainly focused on road sections (34%), where interaction with other road users is not necessarily required. Furthermore, the infrastructural elements of railroad crossings and stop-controlled intersections mainly relate to driver studies.

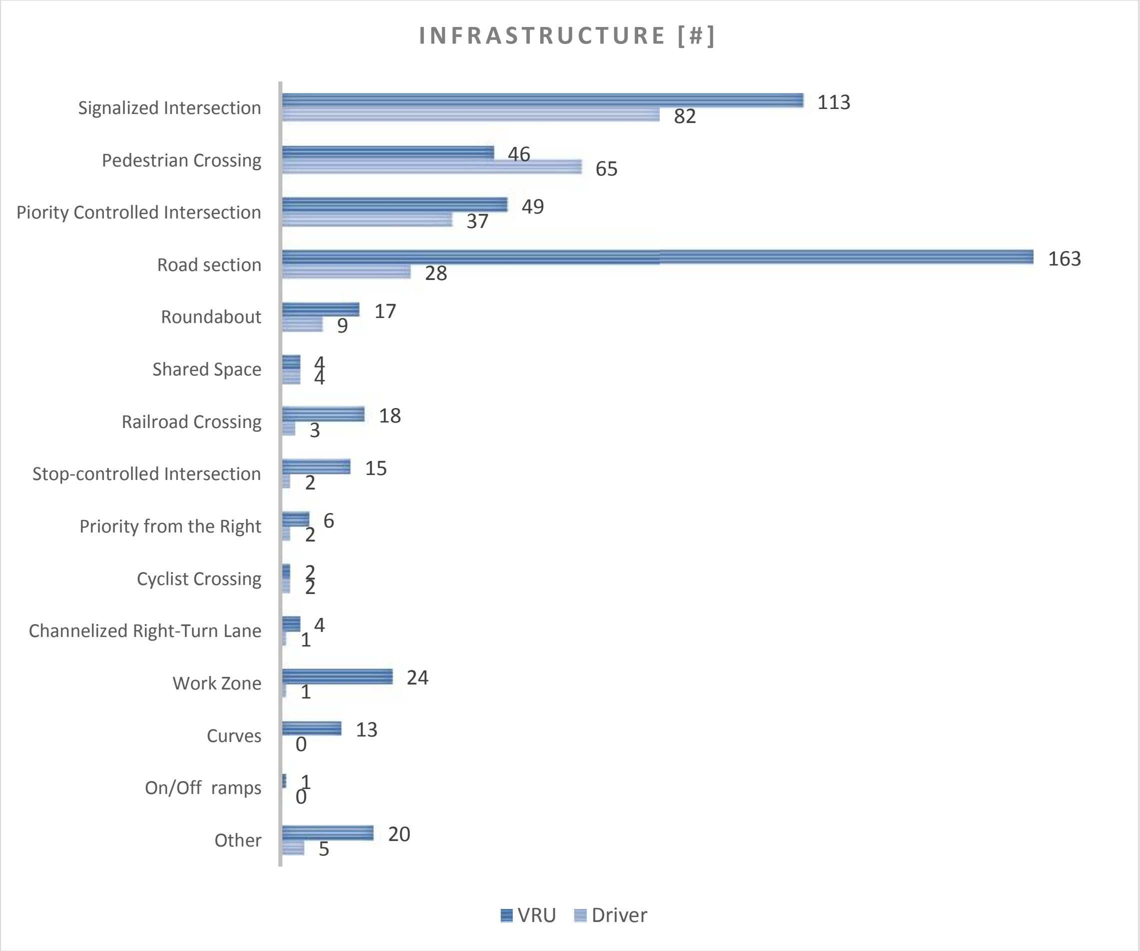


Figure 9 The infrastructural elements of interests, sorted by number of VRU & Driver-studies

7.2.2.Topics

The pie charts in Figure 12 show the distribution of the different topic categories. The most prominent area of research has been 'Intersection', with almost 38% of all driver- and almost 80% of all VRU-studies. For driver studies, the share of 'road sections' is comparable (36%), followed by 'personal' and 'situational' topics. The same order of shares of research topics can be found for VRU-studies. From 34 studies (of which 9 included VRU-studies and 32 driver-studies) the topics could not be allocated to one of the specified categories. Examples include the observation of hand positions on the steering wheel (Fourie, 2011; Walton, 2005), validating driving simulators (Yan, 2008) and cycling on the sidewalk (Okinaka & Shimazaki, 2011).

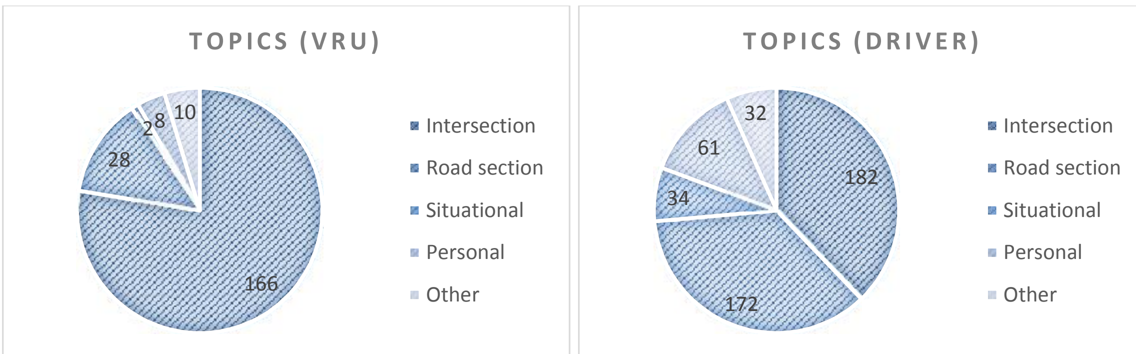


Figure 10 Share of Topic- Categories

A full list of VRU- and driver-studies related to the defined research topics can be found in Figure 13. It shows that the topics of crossing (40%) and yielding (23%) have received most attention in VRU studies. Red light running and overtaking follow, but their share is rather limited (10% and 4% respectively). The other topics are researched quite infrequently, not exceeding more than seven out of 214 studies per topic.

The amount of topics represented by driver studies is slightly higher compared to VRU studies, since topics like seatbelt and child restraint usage can only apply for drivers. This is reflected in the shares of the research topics: the most popular one, speeding, accounts for 'just' 16% of all driver studies, followed by yielding, crossing and seatbelt usage (13%, 13% and 7% respectively). Drivers' behaviour during the dilemma zone is a well-known topic: the combination of Red-Light-Running, Dilemma Zone and Phase Change Warning Systems adds up to 53 studies (11%). Surprisingly, studies regarding violations like mobile phone use and drink driving only formed a very small part of topic focus, while they are recognized as very important road safety problems (e.g. the EU states that yearly around 600 deaths and hospital admissions in the Netherlands are caused by mobile phone use while driving, while 2600 deaths and 330,000 serious injuries occur in the USA because of this distraction (2009)). A possible explanation could be that such studies are only published as research reports or that different methodologies are used to investigate these safety issues. For example, driver behaviour questionnaires are very useful to analyse attitudes, opinions, beliefs, emotions and behavioural and cognitive processes when considering driving under the influence of alcohol (Drew et al, 2010). Only three out of 27 topics had more VRU- than driver-studies (crossing behaviour, red light running and the use of protective clothing), even though the amount of driver studies was more than twice as high (212 versus 476), suggesting that these areas of research are very useful for observing behaviour of VRUs.

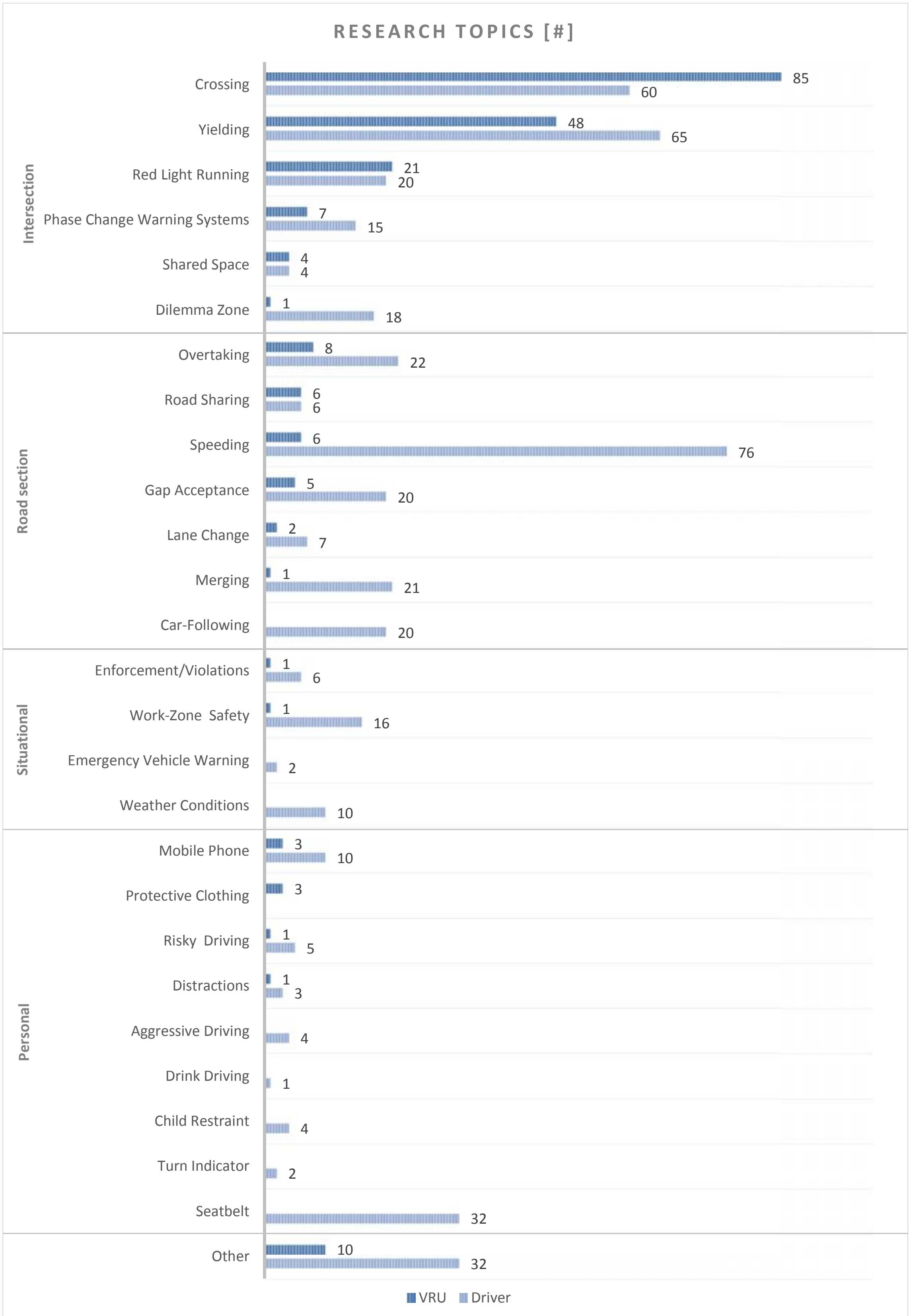


Figure 11 The research topics found in included studies. Data is sorted per category based on the number of references for studies relating to VRU-types.

7.2.3.Indicators

The bar chart in Figure 14 depicts the distribution of indicators. With regard to VRU-studies, it shows that the behavioural indicators belonging to the categories of crossing (87%), road section (48%) and yielding (45%) are most often measured. The observation that indicators relating to road sections are well represented is somewhat contradicting to the observation that mainly intersections have been the topic of research for VRU studies. Possible explanations for this finding might be the classification of 'speed' as an indicator relating to road sections and that for studies involving both VRU's and drivers, the indicators relating to road sections measure the behaviour shown by drivers. For driver-studies, most measured behavioural indicators relate to road sections (79%), followed by crossing (39%), yielding (27%) and dilemma zones (27%). Personal characteristics are also well-reported for both study types: 43% in VRU-studies and 33% for driver-studies.

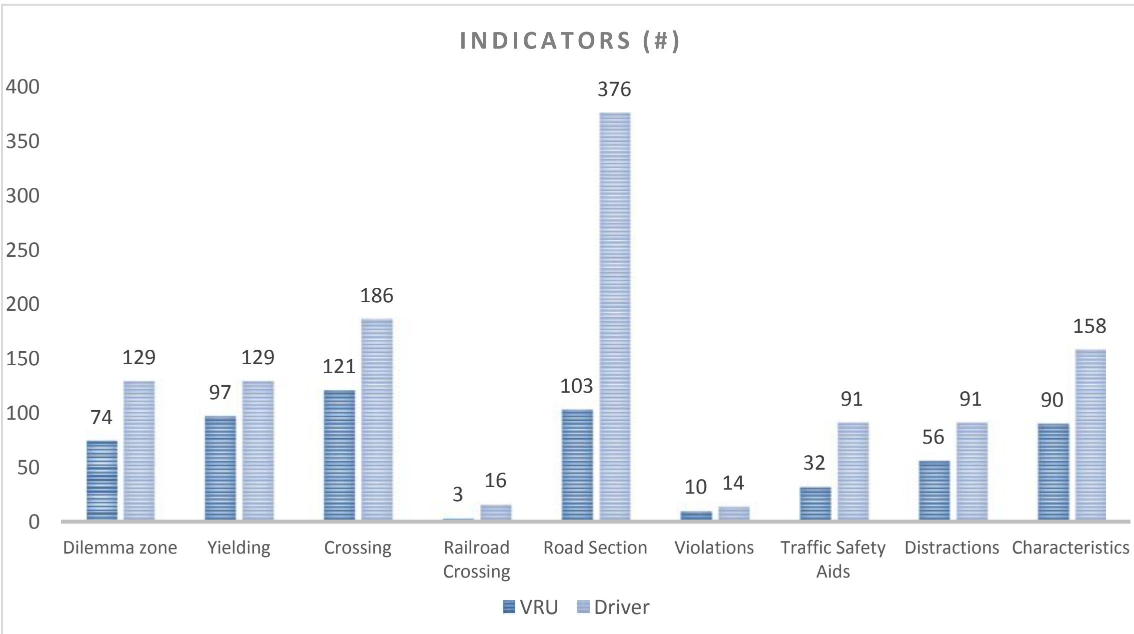


Figure 12 The indicator-categories

A full list of VRU- and driver-studies measuring the defined indicators can be found in Figure 15. It shows that speed is most often measured for both study types: in 44% of the VRU-studies and 59% of the driver-studies speed data was collected. Other popular indicators for VRU studies are red light running (35%), yielding (32%) and looking behaviour (22%). For driver studies, headways (18%), yielding (14%) and gap acceptance (13%) are behavioural indicators measured often. It was further found that twelve out of 43 indicators were more often measured in VRU-studies, most of them belonging to the category of 'crossing' indicators. With regard to personal characteristics, it can be seen that age and gender belong to the top ten of most collected indicators for both study types, although they do not directly relate to aspects of traffic safety. Furthermore, especially VRU-studies considered the influence of group size, defined as the amount of road users present during the behavioural action of interest (19%).

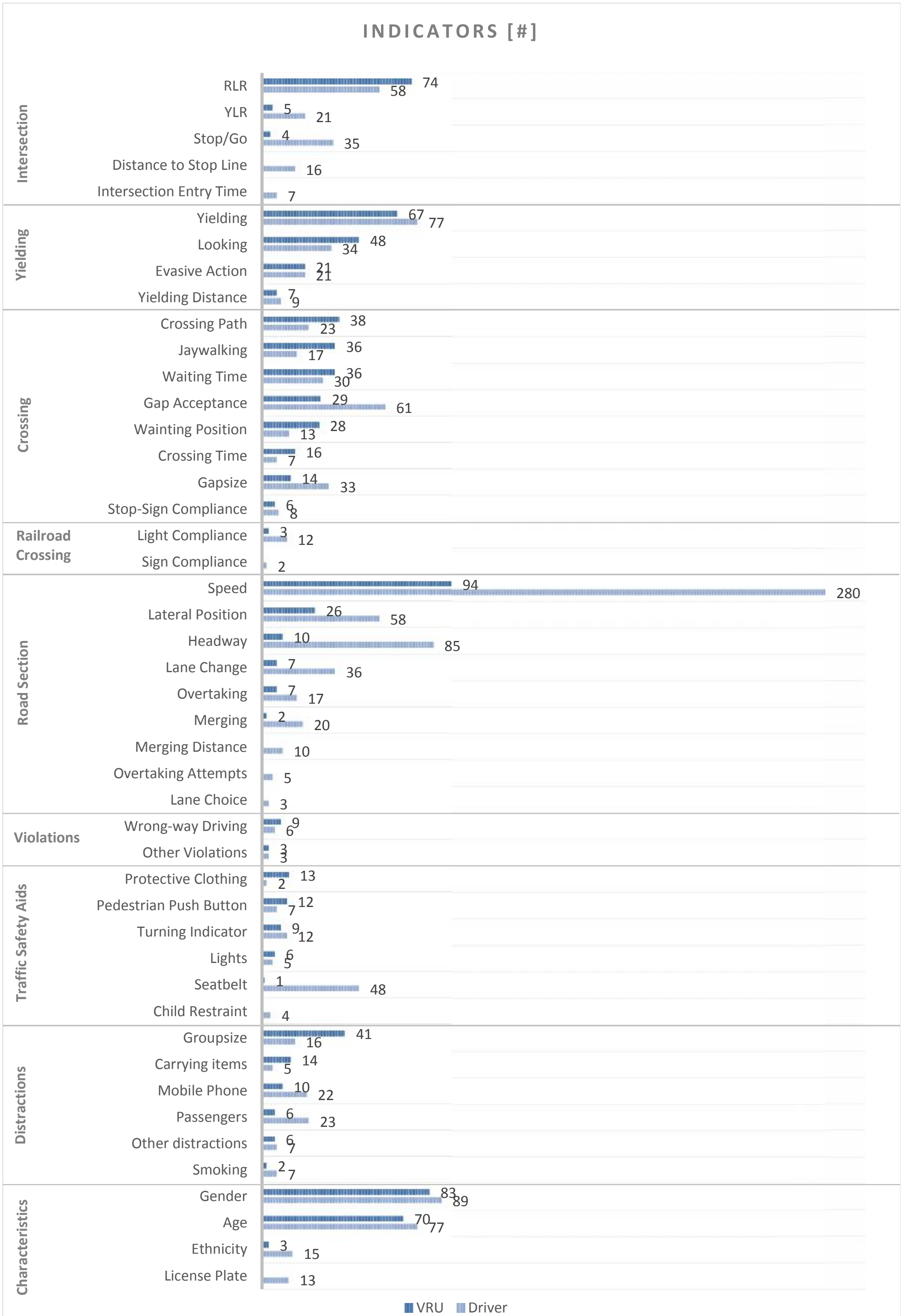


Figure 13 Indicators of the included studies sorted based on VRU & Driver-studies

7.2.4. Topics of interest

This subsection looks closer into the connection between topics and indicators. Unlike the other analyses, findings discussed in this chapter relate to all studies, unless it is explicitly stated that observations are based on the VRU- or driver-study level.

7.2.4.1. *Dilemma Zone*

The most common safety indicators used during dilemma zone situations are the stop-or-go decision and whether road users run the red light or not. A few studies also included the indicator 'yellow light running', which states if the driver passes the stop bar after the onset of the amber light, but before the light has turned to red. The added value of such an indicator on its own is difficult to determine, since the meaning of the amber light is fully dependent on the approaching driver: in general the amber light states that passing is not allowed, unless one cannot stop safely anymore. Consequently, running an amber light might not necessarily be regarded as an unsafe behaviour. Therefore, several studies included the measurement of the distance between the driver and the stop line during the onset of the amber or red phase. A further extension of these indicators, able to interpret some form of severity, is the 'intersection entry time', which describes at what time after the onset of the amber/red phase a road user is (illegally) entering the intersection. Although relevant for safety evaluation, this indicator has only been found seven times. When looking into more detail at the indicator of red and yellow light violations, it can be observed that the majority of the studies had monitoring purposes (66%), while some studies were found that tested the effectiveness of, for example, red light cameras (Polders et al., 2015). Studies specifically focusing on red-light violations have been applied for both VRU- and driver-studies, but the indicator itself has also been used for other topics (e.g. crossing in general).

7.2.4.2. *Yielding*

In total, 67 studies were found that examined yielding behaviour of drivers and VRUs. Most of them were conducted at pedestrian crossing facilities that were not part of an intersection (n = 33) or priority controlled intersections (n = 23). The remaining studies examined the effect of unprotected left- and right-turn signal phasing in which turning drivers need to yield to drivers, cyclists and/or pedestrians going straight, evaluated stop-sign compliance and monitored crossing facilities on roundabouts. The majority of the studies tested the effectiveness of a certain measure to increase drivers' yielding towards cyclists and pedestrians. Examples include advanced yield markings, additional signage and push buttons. Other studies were limited to monitoring purposes only, in which instructed pedestrians or cyclists were used to observe, for example, the effect of race (Goddard et al., 2015), staring (Guegen et al., 2015) and hand gestures (Zhuang, 2014).

Yielding is mainly being evaluated as whether a road user stops to enable another road user to go first. Many times this has been coded as a binary (yes/no) variable, but few studies included the manner of yielding, distinguishing in a hard or soft yield (e.g. Samuel et al., 2013; Schroeder et al., 2013). Another yielding-related indicator, mainly applied in earlier years, is if road users performed evasive actions (e.g. hard breaking or swerving) to avoid a collision (e.g. Van Houten et al., 1985).

7.2.4.3. *Crossing*

Studies focusing on crossing behaviour (n = 126, 22%) have mainly focused on signalized intersections (n = 47), pedestrian crossing facilities (n = 30) and railroad crossings (n = 19). Most of these studies monitored behaviour (n = 69), rather than to test the effectiveness of a safety treatment (n = 36). Both VRUs and drivers have been subject of crossing research. The most applied indicator for VRU-studies is the crossing path, while for driver-studies gap-acceptance is most often considered. Few studies provide more detail on the aspect of gap acceptance by examining the actual size of accepted and rejected gaps. Although railroad crossings form a major safety hazard across the EU (Eurostat, 2016), only 21 studies (3%) examining crossing behaviour were found. Most of these studies only considered drivers and the extent to which they complied to lights and signs. A few studies were found that observed pedestrians (Lobb et al., 2003; Siques, 2002) and cyclists (Cobey et al., 2013).

7.2.4.4. *Road sections*

The most often used indicator in driver-studies is speed, most likely because speeding has been identified as one of the biggest problems in road safety as speeding greatly increases the risk of accident (Elvik, 2004). Speed is most often measured in terms of driving speed in km/h, but several studies used the pace of driving/walking during crossing (e.g. in a hurry, relaxed) as an indicator (e.g. Walmsley & Lewis, 1989; Zeedyk et al.,2002). Research solely focusing on speeding aims at evaluating traffic control devices (e.g. Yang et al., 2015) or determining the effect of enforcement like point-to-point measurements (e.g. Montella et al., 2015). Other indicators that have been used on topics relating to road sections focus mainly on drivers and include, among others, following distance (in space or time), lateral position and lane changing.

7.2.4.5. *Traffic safety aids*

The use of seatbelts belongs to the top five of most researched topics (n = 49). Five studies were found to evaluate the effectiveness of a certain treatment to increase seatbelt use, while the majority of the studies only monitored seatbelt use. Combinations with questionnaires are not uncommon (n = 16, 33%). Further analyses show that in the early 80s studies in the USA and Israel were conducted to investigate the effect of the implementation of the mandatory seatbelt use law (Hakkert et al., 1981; Matthews, 1982; Lund et al., 1984). Observation of the use of other traffic safety aids is limited and regards turn indicator use, protective clothing of motorcyclists and the use of push buttons at traffic signals by pedestrians.

7.2.4.6. *Distractions*

The area of distractions is not extensively researched. The main indicator used are group size and passenger presence for drivers and motorcyclists, describing whether the road user is traveling alone or not. A few studies also included mobile phone use, smoking, carrying items or other forms of distractions like eating and drinking.

7.3. Purpose of road user behaviour observation

The assessment of the available literature showed that road user behaviour observation studies can broadly be used for four different research goals:

- <u>Monitoring</u> (e.g. Walker, I., 2007 and Goddard et al., 2015)
    - One location or multiple (identical) locations are observed to monitor the behaviours performed by road users. The goal of such studies is to ‘look what happens’ and not to examine the influence of a certain (infrastructural) intervention or safety improving measure. Goddard et al., 2015 monitored the behavior of motorized vehicle users on crosswalk to understand the yielding behavior of drivers in terms of racial bias associated with this behavior. The authors concluded by supporting the hypothesis that people of color face discriminating behavior at crosswalks from car users.

- Evaluation of certain measures (e.g. Zhang et al., 2015 and Polders et al., 2015)
    - Using a before-after, with-without or cross-sectional research design, the effect of an (infrastructural) intervention or safety improving measure is evaluated. Behavioural measures (like hand gestures or staring by staged pedestrians) are not considered to be studies testing the effectiveness of certain measures, since these regard the effect of shown behaviour rather than a measure. Zhang et al. 2015 observed the effectiveness of exclusive and concurrent phasing of signal for pedestrian and found that concurrent phasing results in less crashes as compared to exclusive phasing.

- Model development (e.g. Li et al., 2014 and Shiomi et al., 2015)
    - Real world data is used to develop/calibrate/validate predictive models (e.g. microsimulation models). Studies developing explaining models are not regarded as model development. Shiomi et al., (2015) calibrated the model using real world data for the model of lane changing. The lane use of traffic is collected through loop inductors. Li et al., (2015) conducted field observations of pedestrians crossing behavior to validate the model of risk analysis of pedestrians crossing behavior.

- Automated video-analysis software development (e.g. St-Aubin et al., 2015 and Zaki et al., 2012)
    - Video data of traffic events is used to develop and test automated video-analysis tools (e.g. tracking algorithms and road user classification). This type of research goal is an extension of monitoring. Because the development of automated video analysis software is relatively new, publications with this research goal are limited and can only be found in recent years.

As can be seen in Figure 16, the proportions or research goals are similar between the VRU- and driver-studies. The majority of studies have focused on monitoring of road user behaviour, followed by research evaluating the effect of safety improving measures. Model development and testing automated video-analysis software tools only reflect a small portion of behavioural observation studies. When considering the research aims in function of time, again no major differences between VRU- and driver-studies can be found. The different research goals seem to be growing exponentially, although testing automated video-analysis software tools seems to be an emerging topic, since those studies were only found in the last five years.

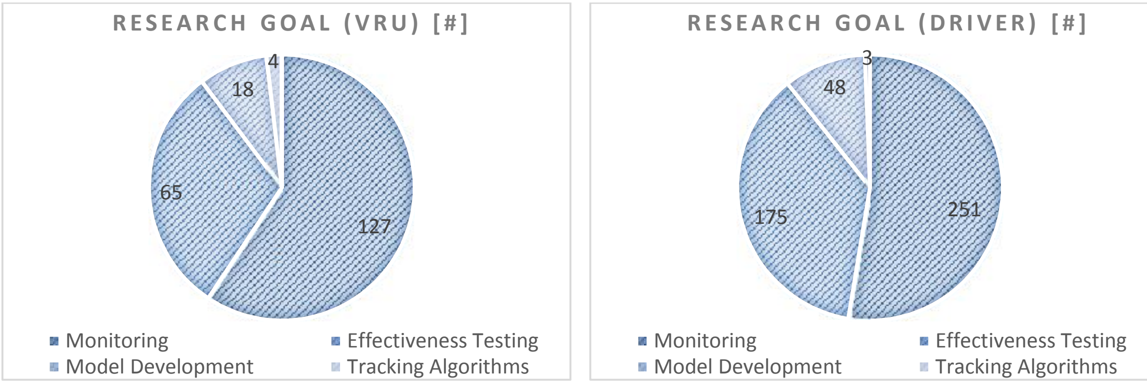


Figure 14 Research Goal for VRU & Driver-studies. On the left the research goal for VRU Studies while on the right is the research goal for included driver-studies.

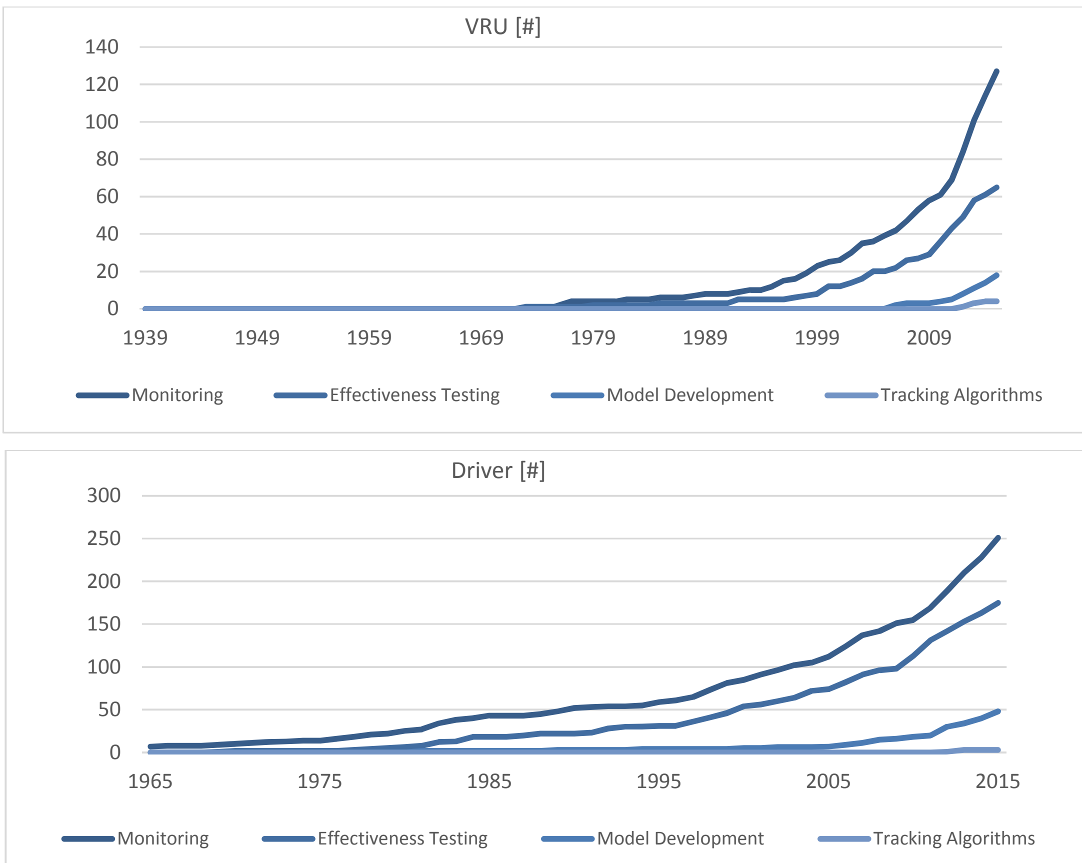


Figure 15 Research Goals Evolution over time. On top, the shares of the research goals. Below, their evolution over time.

7.3.1.Unique Behaviour Monitoring studies

This section describes the unique studies based on the purpose of observation while most monitoring studies focus on the simple observation of road user behaviour, using a pre-specified protocol of indicators of interest. Examples include the examination of seatbelt and child restraint use, yielding behaviour or crossing behaviour at railroad crossings. A few studies were found to be somewhat unique in their approach to monitor behaviour:

- Manan et al (2015) collected data on motorcyclists' behaviour at priority-controlled T-intersections, in which the motorcyclist should yield. In their research design, human observers and video cameras were used to monitor road user behaviour without a pre-defined list of indicators of interest. During data collection, human observers described the behaviour shown by the motorcyclists by speaking into a recording device. Based on these spoken descriptions, relevant indicators were identified and categorized. This approach is unique in the sense that the research did not depart from a list of pre-specified indicators, but that the aim of the research was to create a list of indicators. Such an approach is important to identify which types of behaviour need to be considered for safety evaluation practices.
- Jonasson (1999) used a similar approach, in which he just observed what happened in order to answer his research questions regarding informal traffic rules. Although not much attention in literature is given to informal traffic rules, further research is required since it indicates that the official rules are violated at many occasions. This can lead to safety issues when two conflicting road users adhere to the different rule types (formal versus informal).
- Rosenbloom et al. (2007) observed driver behaviour from inside the car. Female drivers were observed while driving in familiar and unfamiliar surroundings while a friend was recording violations from the passenger seat. This study is unique in the sense that observations were carried out inside the car, but without the awareness of the driver that she was being observed or participated in an experiment.
- Papadimitriou et al. (2011) modelled pedestrian crossing behaviour during a trip. Pedestrians were randomly selected and followed during their walking trip through Athens, Greece. Video recordings were made without violating the privacy of the participants or the awareness of the pedestrians that they were being followed. A similar approach was used by Gates et al. (2011), which followed car drivers when they drove through a work zone.

7.4. Methodological aspects

This section provides an overview of the most important methodological aspects regarding the use of behavioural observation studies. Elements like research design, control groups, data collection techniques, observation periods and sample sizes are briefly discussed.

7.4.1. Research Design

The pie charts in Figure 18 show the proportions of the use of the different research designs. More than 50% of both VRU- and driver-studies used a single observation design to measure road users' behaviour, followed by before-after research. The proportions of with-without and cross-sectional research designs are comparable for both study types and only account for around 20% of all applied research designs. The two graphs below the evolution over time of the use of the different research designs. It can be seen that all of them grow exponentially, but that the use of cross-sectional research designs for VRU-studies have only been used during the last ten years.

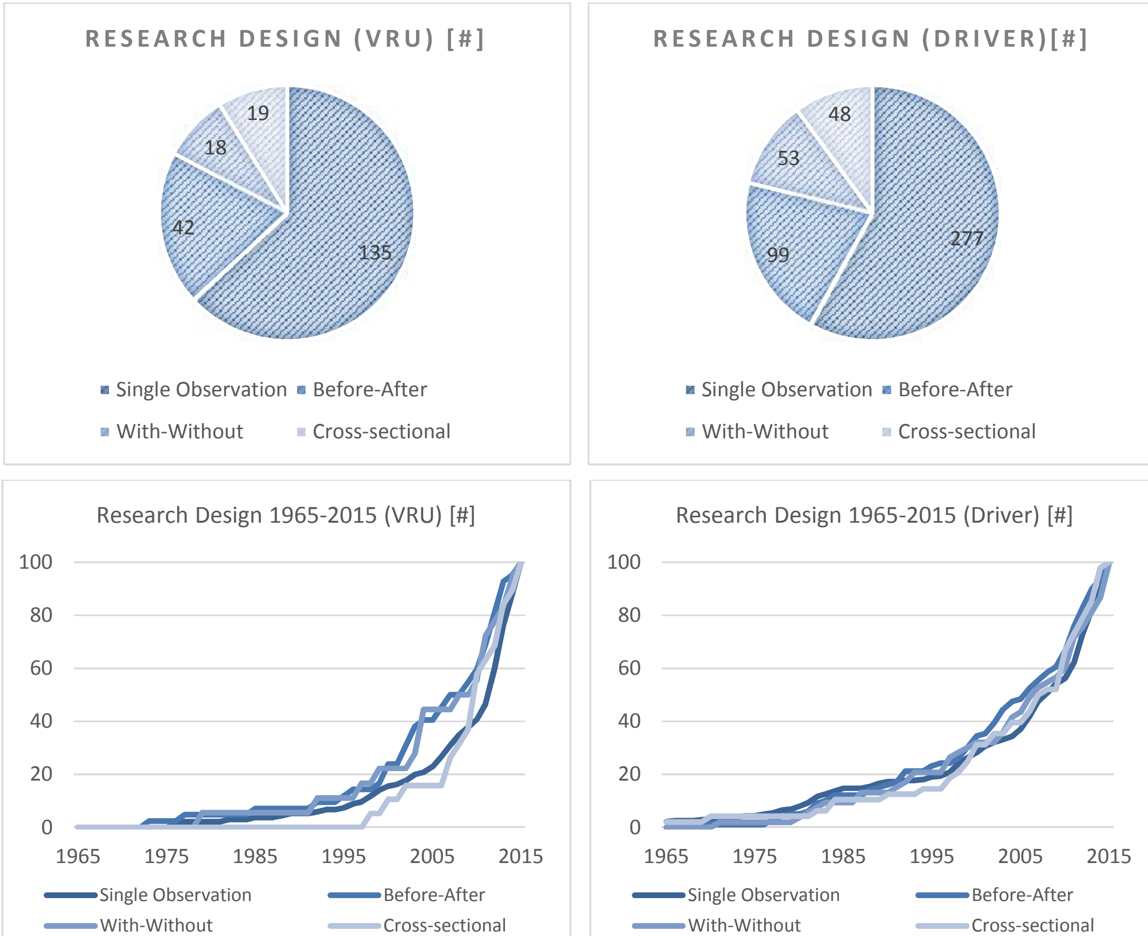


Figure 16 Shares of research designs & their evolution over time

7.4.2.Semi-controlled research

Several studies (n = 33) were found that used an instructed road user to provoke traffic events of interest (Table 6). In this approach, the road user received instructions to behave in a certain way, enabling the collection of data of the other road user during specific events. The majority of these studies used a VRU as instructed road user, in which either yielding towards pedestrians or cyclists (n = 14) or drivers overtaking cyclists (n = 8) was investigated. The yielding studies focused on aspects like ethnicity (Goddard et al., 2015), staring behaviour (Guéguen et al., 2015) and hand gestures (Zhuang and Whu. 2014), while the overtaking studies focused on the lateral distance between drivers and cyclists during the overtaking manoeuvre. The remaining eleven studies made use of instructed car drivers that provoked overtaking manoeuvres (n = 9), tested the position of braking lights (n = 1) and evaluated drivers' aggression (n = 1). The latter one was the only study in which the confederate of the research team hindered other road users in the sense that there was no possibility to pass (Ellison et al., 1995).

Semi-controlled research designs are mainly used to monitor traffic events (64%) or to evaluate the effectiveness of a safety treatment (33%). Our findings suggest that mainly VRU-studies benefit from this approach, since 10% of the VRU-studies used this research design compared to only 2% for driver-studies. Another interesting observation is that of these 10%, almost 64% of the studies were conducted during the last five years.

Table 6 Semi-Controlled Research studies

Instructed Road User	Topic	Number of Studies
Pedestrians	Yielding behaviour of drivers	13
Cyclists	Overtaking behaviour of drivers	8
	Yielding behaviour of drivers	1
Car	Overtaking	9
	Braking lights position	1
	Driver aggression	1

7.4.3.Control groups

In the field of road user behavioural observation studies, the use of control groups is quite rare. Only 21 out of 581 references (4%) used some sort of mechanism to address confounding factors like temporal variability or regression-to-the-mean bias (Table 7). The type of control group can broadly be categorized into sites (n = 17) and road users (n = 4). The studies reported that results needed to be modified, based on the data of the control groups. This could indicate that for evaluation purposes also the domain of road user behavioural observation is in need of control groups. Even more, Islam et al. (2014) emphasized the use of control groups since they found that it affected their results significantly.

Table 7 The use of control groups in road user behavioral observation studies (n=21).

Control group	Element	n	%
Type	Infrastructure type	17	81
	Road user group	4	19
Research Goal	Monitoring	2	10
	Effectiveness testing	19	90
Effect	High	17	81
	Low	4	19

7.4.4.Data collection techniques

Several protocols and devices can be used to collect data. Six types of data collection tools were identified. Figure 19 gives an overview of the amount of studies that used the defined data collection tools. For both VRU- and driver-studies, cameras (either photo or video) have been used most often, followed by human observers. Vehicles equipped with cameras were regarded as separate category, since they enable researchers to observe road user behaviour in time rather than in space (fixed location). The camera equipped vehicles consisted of cars (n = 17), bicycles (n = 4) and helicopters (n = 4). For cars and bicycles, the main use of the cameras was to observe overtaking and passing behaviour, while the helicopters focused on merging manoeuvers. With regard to the use of helicopters, it was pointed that although this technology offers the opportunity to capture data without the risk of occlusion by other road users, it is a relative expensive means of data collection (Polus, 1985).

The results show that speed measurements are mainly collected using speed guns (their share is higher compared to detectors or other sensors). Of ten studies the data collection tools could not be allocated to one of the defined categories. These studies used traffic fines (n = 4) or did not specify the data collection tools (n = 6).

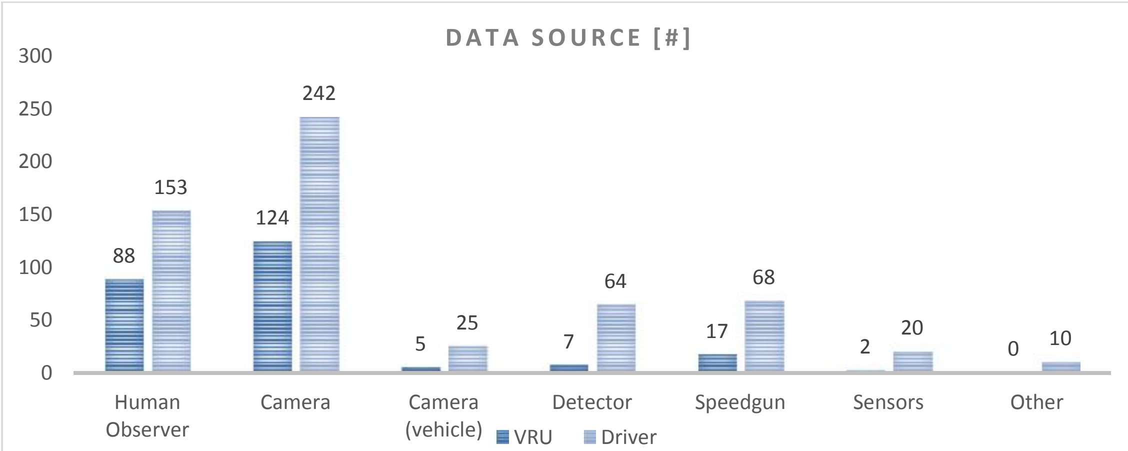
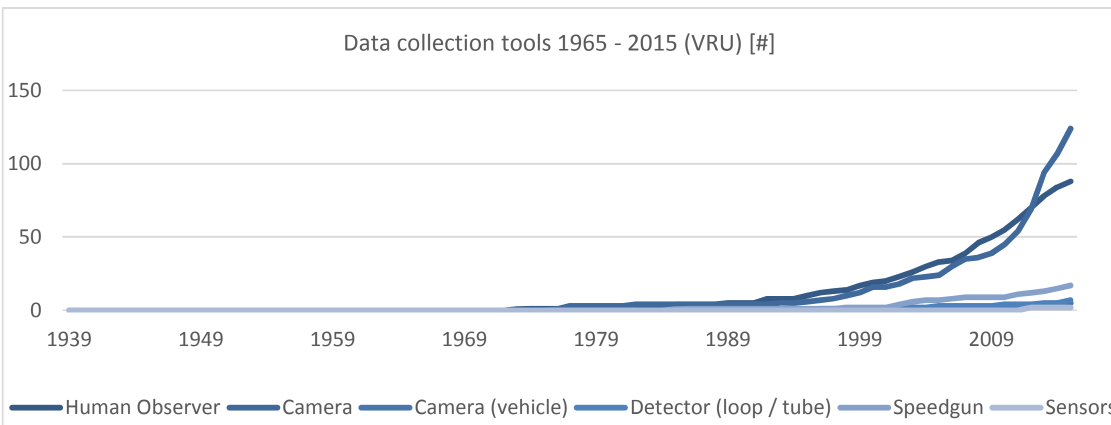


Figure 17 Data Collection tools in the included studies

The cumulative distribution of the use of the data collection tools over time is for both VRU and Driver-studies depicted in Figure 20. The most important observation is that for a long time human observers were the main source of data collection, but that for both study types the use of cameras has become more common during the last five years. It also shows the (slow) increase of all data collection tools over the years.



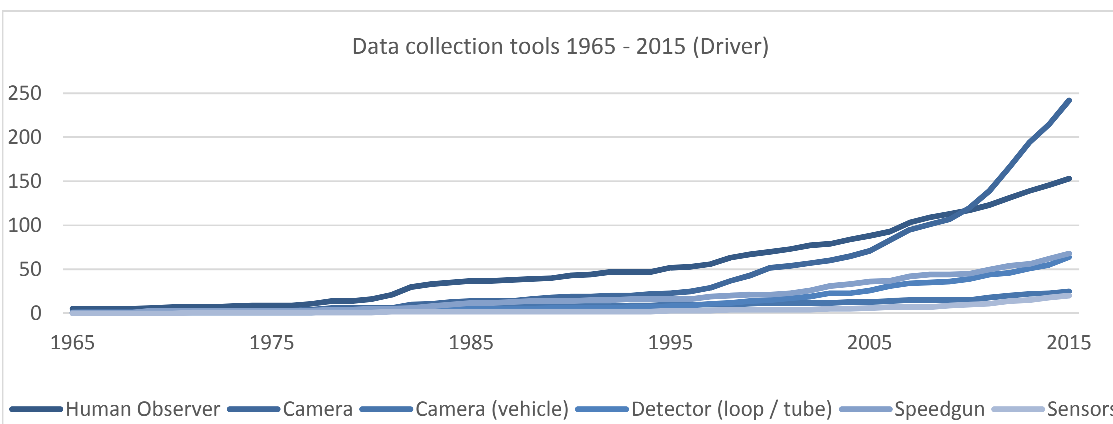


Figure 18 Data Collection Sources evolution over time. The cumulative distribution of the use of data sources for studies in which all road users are included.

With regard to data collection using cameras, one of the main concerns nowadays is the privacy legislation. In many countries current regulations prohibit to film inside vehicles to examine for example looking behaviour. Most probably these regulations have influenced data collection over the years, since only one study was found that positioned cameras in such a manner that behaviour inside cars could be observed (Tenkink & Van der Horst, 1990). Other studies observing inside vehicles made use of human observers.

7.4.5.Combination with other methodologies

Several studies were found that combined the use of behavioural observation studies with another safety evaluation method (Figure 21). Of these, the use of stated behaviour methodologies (questionnaires, interviews and focus groups), was found in 80 studies (13.7%). Their main use is to determine to what extent self-reported behaviour (and attitudes, beliefs and opinions) resemble observed behaviour (e.g. Geller, 1980; Hakkert 1981). The inclusion of crash data was found in 44 (7.5% of all) studies, mostly applied to identify locations of interest for behavioural observations. The combination with microsimulation tools was found in 27 studies, followed by Traffic Conflict Techniques with 20 studies. Combinations with driving simulators or naturalistic driving techniques were found rarely. Finally, five studies were found that complemented observed behaviour with police records (violations and traffic fines).

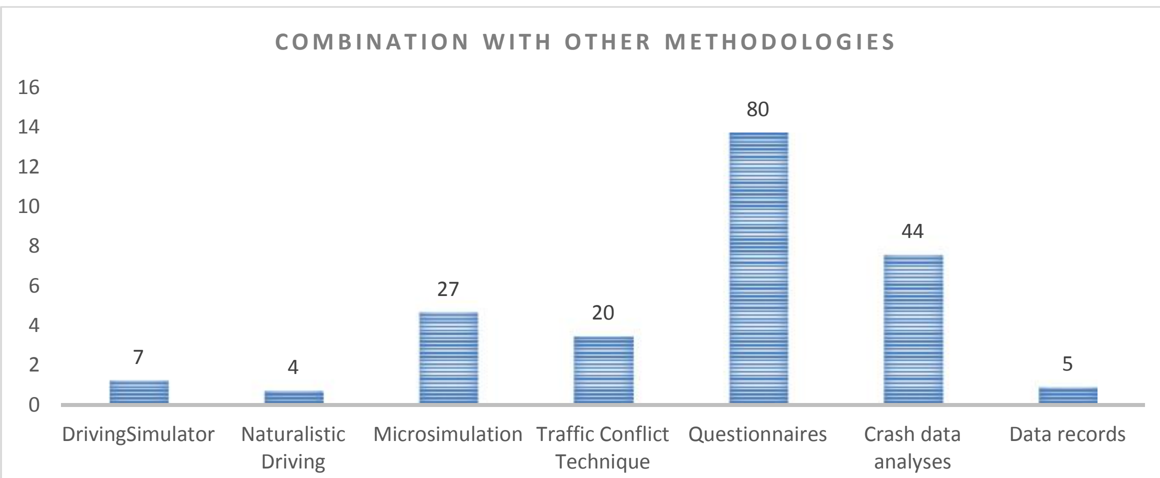


Figure 19 Combination of Naturalistic Behaviour observation studies with other methodologies

7.4.6.Number of sites

The number of (testing) sites used in behavioural observation studies ranges from one single location to 548 locations. Figure 22 provides an overview of the use of study sites related to the research goal (due to a low number of studies (n = 5), the research goal of software development was omitted), in which the range between one and 30 sites is shown. It can be seen that for all research goals the use of only one site is most common and that for the goal of model development almost half of all studies used one location. The graph further shows a that the number of locations used decreases exponentially. It can also be seen that for the goal of effectiveness testing almost 70% of all studies used four or less testing locations. The highest number of testing locations were found for monitoring studies observing seatbelt use (Eustace & Bartel, 2002; Russo et al., 2014) and mobile phone use (Wenners et al., 2013; Cooper et al., 2013).

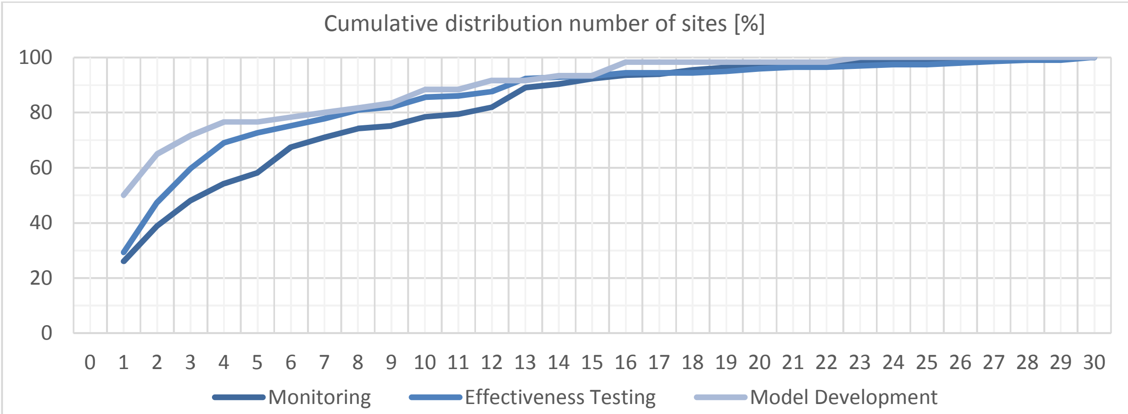


Figure 20 The number of sites based on research goal

7.4.7.Sample sizes

The bar chart in Figure 23 shows the distribution of the sample sizes of the included behavioural observation studies. The majority of the studies used a sample size between 100 and 5.000 records for both VRU- and driver-studies. Studies with less than 100 records were rare and mainly related to monitoring and model development purposes. Studies with more than 100.000 records were also uncommon. These studies mainly focused on speeding using (loop) detectors as data collection tool (e.g. Montella et al., 2015; De Pauw et al., 2014). An exception is the study of Savolainen et al. (2011), who observed 103.047 pedestrians within the urban environment during five stages of enforcement. The lowest sample size was found for the study of Manan & Varhelyi (2015), which focused on identifying relevant behavioural indicators for merging behaviour of motorcyclists. An important remark is that around 18% of the 583 included studies did not report about the sample size. Most articles mentioned the observation period, but did not specify how many data-entries were analysed.

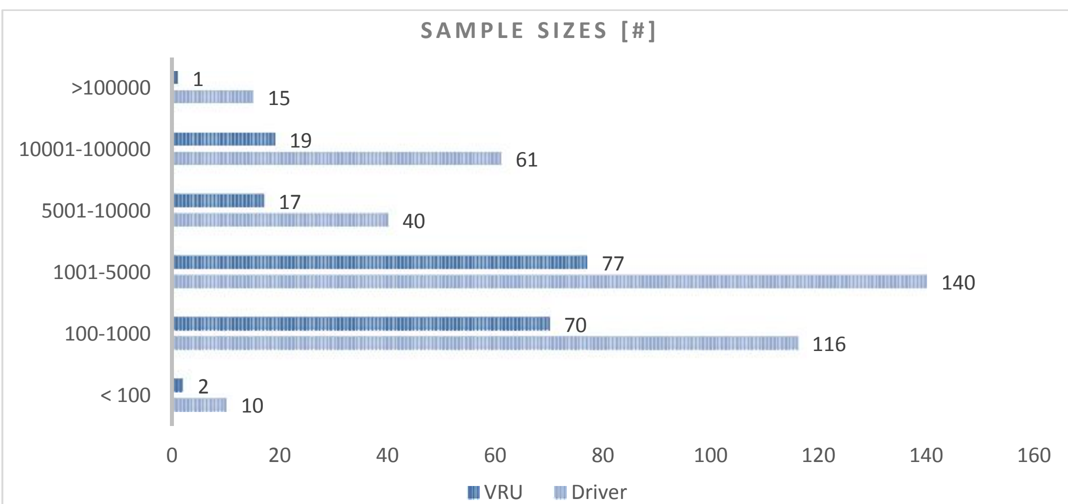


Figure 21 Observed Sample Sizes of included studies

7.4.8.Observation period

The observation period was examined based on three aspects, namely peak or off-peak, daytime or night-time and week or weekend (Figure 24). The findings show that 69 studies (12%) did not report on any of these three aspects at all, making it difficult to compare findings. The element of day- or night-time observations is most often reported (68%), followed by week or weekend (56%) and peak or off-peak (49%) observations. From the information that is being reported, it can be derived that most research takes place during the day on weekdays. Only ten studies were found that only observed during night-time hours, focusing mainly on work zone safety and the effect of road lighting. It can further be seen that only eight pedestrian studies included night-time observations, but always in combination with daytime observations. With regard to peak- and non-peak-hours, no clear statements could be formulated. It is dependent on the research aims if high traffic volumes or free flowing traffic is needed for observing specific road user behaviour.

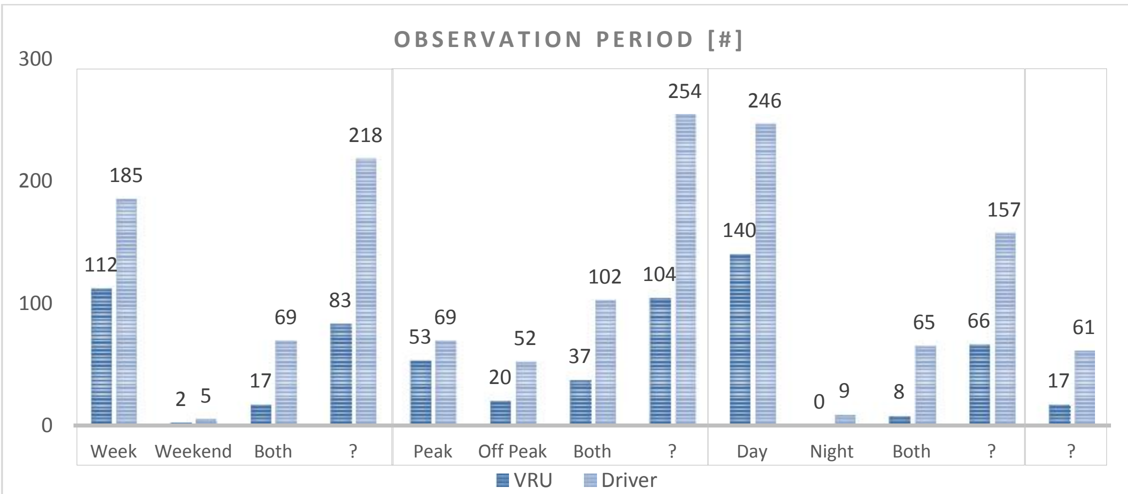


Figure 22 Reported observation periods

Chapter 8: Discussion

This chapter discusses the scoping review which gives an overview of the road user behavioural observation studies that have been published in English in peer-reviewed journals. In total, 583 papers were found eligible and retrievable and were included in this study, from which information regarding topic, indicators and methodological aspects was extracted. This chapter discusses the findings. The chapter is structured as follows: first some remarks regarding the review process will be mentioned, then a SWOT analysis is conducted and finally methodological considerations are discussed.

8.1. Review process

This section will describe the issues which should be taken into account while interpreting the results. Scoping reviews have a systematic approach for retrieval, there is some limitations and bias which may arise, these are discussed here.

8.1.1. Bias

As with any other study, retrieving information from the vast amount of available research is most likely subject to some form of bias. For scoping reviews, bias can be introduced during several stages of the review process. Following is a brief description of the types of bias that might have influenced our results:

- Database bias: When incorrect databases are used for information retrieval, the number of references found does not accurately reflect the total amount of references that can be found. This review only considered the databases of Science Direct, Web of Science and TRID, yielding 2.530, 1.920 and 16.719 results respectively. The assumption was made that these databases are sufficient enough to capture most relevant references, since these databases include the major peer-reviewed journals in transportation and traffic safety sciences.
- Publication bias: Publication bias regards the exclusion of research that has not been published. According to Rothstein et al. (2005) "*publication bias is the term for what occurs whenever the research that appears in the published literature is systematically unrepresentative of the population of the completed studies*". Published studies in medical sciences tend to have more positive results then unpublished studies, which have lower effects or no significant findings. Evidence on publication bias shows that the bias has more to do with the significance of the results than the quality of the study. In our review, we choose to only include studies that have been published in the scientific literature, thereby most likely discarding many research that is linked with road user behavioural observation, but has not been published. However, since the aim of this study is to provide the current state-of-the art, we believe that by using this criterion we capture only references that should be of higher quality. Furthermore, since the aim of this study is not to synthesize all available evidence about a specific topic (e.g. the influence of a safety improving measure), we feel it is justified to only include peer-reviewed journal articles as a first step to gain insights into the usefulness of behavioural observation studies. The unpublished studies may also be of lower methodological quality than published studies, the inclusion of unpublished studies can also introduce bias as the studies that have been located maybe an unrepresentative sample of the all unpublished studies. The reason not

to include the grey literature is the absence of peer-review of unpublished studies. (Cochrane Handbook of for Systematic Reviews of Interventions)

- Article selection bias: Selection bias sometimes also referred as selection effect is the bias which may arise because selection of articles (sample obtained) is not representative of the articles that were intended to be analysed. In order to minimise the risk of losing relevant references, several search terms were tested and compared. We found that a rather broad formulation of terms was needed, resulting in a high number of references. During the first round of screening, only titles and abstracts were used to formulate an in- or exclusion decision. It might be possible that due to unclear titles and abstracts relevant articles were excluded, but it is difficult to determine the extent of this bias. Several steps were taken to minimize this form of bias:
    - Whenever the abstract did not provide a clear indication as to whether to in- or exclude the reference, the methodology section was examined;
    - In case of doubt, the reference was kept for full-paper screening;
    - The entire screening process was carried out by both members of the review team, i.e. both members evaluated all references. Different decisions were discussed and if no consensus was reached, the reference was kept for full-paper screening.

8.1.2.Limitations

The inclusion of selection-criteria unavoidably leads to limitations. However, in order to guarantee the feasibility, transparency and replicability of the review, restraints were needed. The following aspects might be considered as limitations for this study:

- The most important limitation posed in this research regards the inclusion of only peer-reviewed journal articles. This choice is justified by the objective to present the current state of the art in behavioural observation studies. Since peer-reviewed articles follow an extensive review process by experts in the field, we assume that only studies with higher quality are included. Furthermore, limiting the scope to peer-reviewed journal articles only is not uncommon in the field of scoping reviews (Pham et al., 2014). As a result, book sections, conference proceedings and research reports were not taken into account, even though they might contain important information regarding current the use of behavioural observation studies. We have observed that several studies regarding seatbelt and child restraint usage were published as research reports and therefore were not included in this review. It might indicate that the current practice and the state-of-the-art in road user behavioural observation studies differ.
- Only articles in English were considered for inclusion, due to the limitation of the knowledge of (certain) foreign languages. It should be noted that most peer-reviewed articles are published in English anyway: English is the predominant language in contemporary research. Researchers outside the English speaking world who want recognition of their work have little choice but to publish their results in English (Egger et al., 1997). Locating and obtaining a study which is in an infrequently used language and then getting it translated can increase the cost and time of the review process. (Moher et al., 2000)
- The process of reference retrieval was carried out December 2nd, 2015. All peer-reviewed studies that met the criteria and were published or accepted for publication were included. Publications scheduled to be released in 2016 were recoded as 2015 (n = 2). Several papers were not retrievable. The majority of these papers regard publication from before

1985, a time period in which journal articles were not necessarily digitized yet. In order to acquire as much references as possible, a list of missing references was sent out to the project partners, authors were contacted through Research Gate and the UHasselt library was consulted. Despite these efforts, 37 papers could not be located and might influence our results slightly.

8.2. Strengths, weaknesses, opportunities and threats

In total, 583 behavioural observation studies were analysed. Based on the extracted information and the findings of the analysis, a SWOT-analysis was conducted pointing out the advantages and disadvantages of using behavioural observation studies (Table 8). Following is a brief description of the identified elements.

Table 8 SWOT analysis of road user behavioural observation studies

	Positive	**Negative**
Internal factors	<u>Strength</u> Natural driving behaviour Behavioural and situational processes Data quality	<u>Weakness</u> Control of traffic events Control groups Data processing Bias
External factors	<u>Opportunities</u> Amount of data Control group	<u>Threats</u> Privacy legislation Validity

8.2.1. Strengths

The main strength of road user behavioural observation studies is that naturalistic data is gathered without road users' knowledge that they are being observed for research purposes, thereby limiting the effects of behavioural adaptation. In surveys, for example, respondents try to answer questions in such a way that makes them look good (Paulhus, 1984). Natural settings in which road users are unaware of being observed reduces this bias and may lead to risky and aggressive behaviour while driving (Shinar, 1998). Road users may alter the behaviour of interest if they know they are being observed, Porter 2011 discusses an incident where the drivers will wear their seat belts when they identified the observer. So unobtrusive observation helps in revealing the "true" behaviour among road users.

Notion should be made of the trend during recent years to install permanent traffic cameras for monitoring purposes, but we believe that road users have grown accustomed to them and therefore do not adapt their behaviour anymore. Furthermore, using these 'unobtrusive' observations enables researchers to examine natural behaviour of road users, with the opportunity to identify behavioural and situational processes that lead to traffic safety issues. This is important, since other forms of data collection techniques fail to include such information. Current studies have led to the creation of microsimulation models and suggestions as to why road users behave in a certain manner (e.g. informal traffic rules).

Another strength of behavioural observation studies regards the quality of the data. Although earlier studies using human observers reported frequently on inter-observer agreement rates, the application of video cameras enables to watch traffic events of interest as many times as needed. This improves the quality of the data, since real world driving behaviour can be examined multiple times with different perspectives (for example once for identifying looking behaviour and once for examining situational circumstances like weather and road conditions).

8.2.2.Weaknesses

One of the major drawbacks of behavioural observation studies is that researchers are dependent on what happens. Unlike for example driving simulator research or microsimulation, traffic events of interest cannot be triggered without the ability to collect data of al road users involved. Semi-controlled research designs partly overcome this issue by using instructed road users to provoke certain traffic events (e.g. yielding), but are still constrained by the limitation that only data can be collected of the road user that is being 'trapped' in the traffic event of interest.

The findings of the review indicate that the main aim of behavioural observation studies is to observe what happens, rather than to perform specific safety evaluations. If, however, the effects of a safety treatment were tested (n = 202), only sixteen studies (8%) were found that included some sort of a control group. Those studies found that results needed to be adjusted to control for natural variability. This suggests that, as for many other domains, behavioural studies also need control groups when the effectiveness of a safety treatment is tested. However, the review showed that control groups are rarely applied.

Other weaknesses regard the form of data collection. When human observers are used, one should be careful to guarantee the objectivity of data collection and keep track of the inter-observer agreement rates between trained observers. As already mentioned video data can partly address this issue, but one should be aware that technical problems and occlusions by for example other road users can limit its quality. Furthermore, video cameras enable the continuous collection of large samples of data, but the labour and costs that are needed to analyse the data are quite extensive. Current efforts in developing automated video analysis software tools might provide to be a valuable asset for data analysis. However, current accuracy of these software tools are not always able to capture the quality needed for traffic safety evaluation and observation.

Finally, sampling bias can influence the results of behavioural observation studies (and other research methodologies). Behaviour observed is only a small sample of all behaviours that can occur and it can never be concluded that the same behaviours would be conducted by people who have not been observed (Porter, 2011). Although a proper sampling design can minimize this form of bias, it cannot be eliminated.

8.2.3. Opportunities

During recent years the streetscape is changing. Cameras are installed rapidly, with as main purpose to monitor the current state of traffic and the environment. Opportunities exist to use the video footage from these cameras to observe road user behaviour. However, issues regarding the data-storage, privacy legislation and data quality should be taken into account. Combined with the current efforts to improve and develop automated vide-analysis software tools, huge opportunities exist to ease safety evaluation practices. Current software applications are already able to classify road users and trace them through the video image, but once (tracking) accuracy is improved further such software might be exploited to observe crossing and yielding behaviour in more detail.

It was found that almost 14% of the studies combined the observation of behaviour with other methodologies. Such combinations offer the opportunity to compare behaviour in the real driving environment with stated or simulated behaviour. Even more, behavioural observation data might be used as validation tool, since it reflects natural road user behaviour.

8.2.4. Threats

The most important threat for road user behaviour observation studies regards privacy legislations when video cameras are used for data collection. Personal experiences with video observation studies showed that strict rules regarding the collection of personal data exists. Permits are required to be allowed to make video recordings, on which license plates or faces should not be recognizable. A study found on crossing behaviours of drivers at a railroad crossing recorded the looking behaviour of the drivers by using a video camera to look inside the car and observe head movements (Tenkink & Van der Horst, 1990) while this is not possible nowadays as depicted by the research carried out on pedestrians' behaviour by Papadimitriou, Yannis & Golias (2001).

This prohibits to observe inside drivers' vehicles and as a result excludes certain research topics (e.g. seatbelt use, mobile phone use and looking behaviour). These data can be gathered with human observers, but as explained earlier, more risks of human subjectivity exist.

Another important threat regards the validity of the behavioural indicators. The review shows that a wide variety of indicators is used to describe behaviour, but the relation between these behaviours and safety is rarely validated. Literature has shown a relation between speed and safety (Elvik, 2004), but for other indicators no such link has yet been proven. It is generally assumed that the used behavioural indicators are a valid proxy for traffic safety.

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8.3. Methodological considerations

One of the main observations regarding the research design is that road user behavioural observation studies rarely include control groups, when a safety evaluation is being performed. The sixteen studies that used one indicated that results needed to be adjusted due to confounding factors. Although the use for cross-sectional research designs might be less useful or feasible (if locations to be compared are as similar as possible), studies using a before-after and with-without research design should include some type of mechanism to control for confounding factors.

When looking at the number of testing sites, it was found that the majority of the studies only looked at one or two locations, even for studies evaluating the effect of a certain safety improving treatment. For these latter studies, the share of studies limiting themselves to two or less testing sites amounted to 48%. The question is, however, to what extent these limited amount of selected observation sites are representative and, as a result, if conclusions can be generalized. Therefore, it should be encouraged to increase the amount of testing locations. This study found that 20% of the evaluation studies used more than eight locations, showing that the inclusion of multiple testing sites is not uncommon practice.

An important consideration regards the interest of road user type behaviour. Although behavioural observation studies are dependent on what happens, semi-controlled research designs have been used to force traffic events of interest to occur. Although this methodology prevents data collection of the instructed road user, data collection efforts can be used efficiently, observation periods can be reduced and one can control the sample size. The review showed that especially for VRU-studies such designs are useful for monitoring purposes.

Finally, efforts should be allocated into validating the use of behavioural indicators. The review showed that many indicators have been used, but their added value with regard to safety is rarely discussed. It should be noted that it might be difficult to do so, since not all road user behaviour observation studies have as main goal to evaluate traffic safety.

Chapter 9: Conclusion

Road user behavioural observation studies are mainly used to monitor traffic events and to simply observe what happens (> 50%). Evaluation of safety improving measures account for one third of all studies, suggesting that behavioural observation can also be used to directly evaluate traffic safety aspects. From the 583 studies included in this review, 36% included VRUs. Especially during the last fifteen years, an increase in research efforts of VRU safety is observed. Behavioural observations seem very useful for examining how road users interact with other road users or navigate through a crossing. Almost all studies involving a VRU were found to take place at some sort of crossing (e.g. intersection, railroad crossing, pedestrian crossing). For studies involving drivers on the other hand, most current reported research efforts have focussed on road stretches, in which interaction with other road users was not necessarily required.

Some of the reporting issues found in the included studies suggest that authors do not mention specifically the inclusion of heavy vehicle drivers in the study, furthermore one of the main aims of the scoping review was to map out the available literature based on different aspect of the behavioural observation studies. It was found that many authors did not report the observation time, day and/or if the observation was carried out in peak traffic or off peak traffic. It was found that 12% of all studies did not provide any information and that information regarding peak- of off-peak, daytime or night-time and week or weekend observations was missing in 51%, 44% and 32% of the studies respectively. Additionally, 18% of all studies neglected to specify the sample size. With the information of observation periods and sample size, the future research can simply compare the findings with earlier studies but without this information, this can't be achieved, so there should be a reporting guideline for authors to include such information i.e. Observation periods and sample size.

In today's modern age there is a lot of opportunities for future researchers with state of the art cameras and technologies to measure road user behavioural indicators which was not possible in the early days where researchers would only conduct the observation during day times or in well-lit areas in the dark (parking lots). There have been new research goals in recent years with video tracking softwares being employed to calibrate or validate simulation models.

This scoping review limited itself to peer-reviewed journal articles published in English only. Although it was not the aim of this review to depict the current practice everywhere (one is limited in resources), this research suggests that certain topics have not been subject of research much. For example, rail road crossings are considered to be a major safety hazard across the EU (Eurostat, 2016) and powered-two-wheelers are highly represented in crashes (WHO, 2004), but both were only found sporadically in the review.

The review has also found out that the use of new research designs such as the use of a semi-controlled research design seems to be promising, since it enables researchers to provoke certain events of interest. They are very efficient for observing behaviour which is rare and are also less time consuming as the event of interest can be provoked by using research confederates. As the racial bias in Yielding (Goddard et al., 2015), Drivers behaviour to disabled pedestrians (Harrell, 1992), effect of pedestrian stare (Potts et al., 2015) or effect of hand gestures (Zhuang & Wu, 2014) on Yielding behaviour are events that can be very rare on site. The independent variable in these studies is the presence or absence of stare or hand gestures etc. The rareness of these events can be dealt by using the semi controlled research design as they can be less time consuming and efficient to observe the behaviour of road users

Some researchers have their own favoured ways to do reviews but there should be a science behind them “science of reviewing”. This documents provides an overview of all the behavioural observation studies conducted in Natural conditions without road users aware of being observed. The whole process has been properly documented.

This document can help researchers in transportation domain to view the literature available on the subject and available gaps in the literature. The documentation of the whole process can help researchers in replicating results and verifying the review, which was also the aim of the whole process to make this review an explicit one for the readers to verify as the selected studies were based on a search protocol and described inclusion criteria.

The research conducted in this review can be extended in many directions, the review can also be used for a systematic review of a particular topic/domain within the naturalistic behavioural observation studies of road users.

References

9.1 References included in review

Aaberg, L. (1988). DRIVER BEHAVIOR AT FLASHING-LIGHT, RAIL-HIGHWAY CROSSINGS. Accident Analysis & Prevention, 20(1), p. 59-65.

Abbas, K. A., Mabrouk, I., & ElAraby, K. A. (1996). School children as pedestrians in Cairo: Proxies for improving road safety. Journal of Transportation Engineering-Asce, 122(4), 291-299. doi:10.1061/(asce)0733-947x(1996)122:4(291)

Abdul Manan, M. M., & Várhelyi, A. (2015). Exploration of Motorcyclists' Behavior at Access Points of a Malaysian Primary Road – A Qualitative Observation Study. Safety Science, 74, pp 172-183.

Abdul Manan, M. M., & Várhelyi, A. (2015). Motorcyclists' Road Safety Related Behavior at Access Points on Primary Roads in Malaysia – A Case Study. Safety Science, 77, pp 80-94.

Abraham, J., Datta, T. K., & Datta, S. (1998). DRIVER BEHAVIOR AT RAIL-HIGHWAY CROSSINGS. Transportation Research Record(1648), p. 28-34.

Abtahi, S. M., Tamannaei, M., & Haghshenash, H. (2011). Analysis and modeling time headway distributions under heavy traffic flow conditions in the urban highways: case of Isfahan. Transport, 26(4), pp 375-382.

Adebisi, O., & Sama, G. N. (1989). INFLUENCE OF STOPPED DELAY ON DRIVER GAP ACCEPTANCE BEHAVIOR. Journal of Transportation Engineering, 115(3), p. 305-315.

Ahammed, M. A., Hassan, Y., & Sayed, T. A. (2008). Modeling driver behaviour and safety on freeway merging areas. Journal of Transportation Engineering, 134(9), 370-377.

Ahmed, A., Sadullah, A. F. M., & Shukri Yahya, A. (2015). Field study on the behavior of right-turning vehicles in Malaysia and their contribution on the safety of unsignalized intersections. Transportation Research Part F: Traffic Psychology and Behaviour. doi:http://dx.doi.org/10.1016/j.trf.2015.03.006

Al-Ghamdi, A. S. (1998). SPOT SPEED ANALYSIS ON URBAN ROADS IN RIYADH. Transportation Research Record(1635), p. 162-170.

Al-Ghamdi, A. S. (2007). Experimental evaluation of fog warning system. Accident Analysis & Prevention, 39(6), pp. 1065-1072.

Alhajyaseen, W. K. M., Asano, M., & Nakamura, H. (2013). Left-turn gap acceptance models considering pedestrian movement characteristics. Accident Analysis & Prevention, 50, pp 175-185.

Ali, S. Y., Al-Saleh, O., & Koushki, P. A. (1997). EFFECTIVENESS OF AUTOMATED SPEED-MONITORING CAMERAS IN KUWAIT. Transportation Research Record(1595), p. 20-26.

Al-Kaisy, A., Roefaro, S., & Veneziano, D. (2012). Effectiveness of Signal Control at Channelized Right-Turning Lanes: An Empirical Study. Journal of Transportation Safety & Security, 4(1), pp 19-34.

Allpress, J. A., & Leland, L. S. (2010). Reducing traffic speed within roadwork sites using obtrusive perceptual countermeasures. Accident Analysis & Prevention, 42(2), pp 377-383.

Al-Omari, B. H., & Al-Masaeid, H. R. (2003). RED LIGHT VIOLATIONS AT RURAL AND SUBURBAN SIGNALIZED INTERSECTIONS IN JORDAN. Traffic Injury Prevention, 4(2), p. 169-172.

Ambarwati, L., Pel, A. J., Verhaeghe, R., & van Arem, B. (2014). Empirical analysis of heterogeneous traffic flow and calibration of porous flow model. Transportation Research Part C: Emerging Technologies, 48, 418-436. doi:http://dx.doi.org/10.1016/j.trc.2014.09.017

Appiah, J., Rilett, L. R., Naik, B., & Wojtal, R. (2013). Driver Response to an Actuated Advance Warning System. Journal of Transportation Engineering, 139(5), pp 433-440.

Ardeshiri, A., & Jeihani, M. (2014). A Speed Limit Compliance Model for Dynamic Speed Display Sign. Journal of Safety Research, 51, pp 33-40.

Assum, T., Bjørnskau, T., Fosser, S., & Sagberg, F. (1999). Risk compensation—the case of road lighting. Accident Analysis & Prevention, 31(5), 545-553. doi:http://dx.doi.org/10.1016/S0001-4575(99)00011-1

Avineri, E., Shinar, D., & Susilo, Y. O. (2012). Pedestrians' behaviour in cross walks: The effects of fear of falling and age. Accident Analysis & Prevention, 44(1), pp 30-34.

Bai, L., Liu, P., Chen, Y., Zhang, X., & Wang, W. (2013). Comparative analysis of the safety effects of electric bikes at signalized intersections. Transportation Research Part D: Transport and Environment, 20, pp 48-54.

Bai, L., Liu, P., Guo, Y., & Yu, H. (2015). Comparative Analysis of Risky Behaviors of Electric Bicycles at Signalized Intersections. Traffic Injury Prevention, 16(4), pp 424-428.

Bai, Y., & Li, Y. (2011). Determining the drivers' acceptance of EFTCD in highway work zones. Accident Analysis & Prevention, 43(3), 762-768. doi:http://dx.doi.org/10.1016/j.aap.2010.10.023

Bai, Y., Yang, Y., & Li, Y. (2015). Determining the effective location of a portable changeable message sign on reducing the risk of truck-related crashes in work zones. Accident Analysis and Prevention, 83, 197-202. doi:10.1016/j.aap.2015.07.024

Barch, A. M., Nangle, J., & Trumbo, D. (1958). SITUATIONAL CHARACTERISTICS AND TURN-SIGNALLING. Highway Research Board Bulletin(172).

Barnes, E., & Schlossberg, M. (2013). Improving Cyclist and Pedestrian Environment While Maintaining Vehicle Throughput: Before- and After-Construction Analysis. Transportation Research Record: Journal of the Transportation Research Board(2393), pp 85-94.

Barss, P., Al-Obthani, M., Al-Hammadi, A., Al-Shamsi, H., El-Sadig, M., & Grivna, M. (2008). Prevalence and Issues in Non-Use of Safety Belts and Child Restraints in a High-Income Developing Country: Lessons for the Future. Traffic Injury Prevention, 9(3), 256-263. doi:10.1080/15389580802040352

Basch, C. H., Ethan, D., Rajan, S., & Basch, C. E. (2014). Technology-related distracted walking behaviours in Manhattan's most dangerous intersections. Injury Prevention, 20(5), pp 343-346.

Bassani, M., Dalmazzo, D., Marinelli, G., & Cirillo, C. (2014). The effects of road geometrics and traffic regulations on driver-preferred speeds in northern Italy. An exploratory analysis. Transportation Research Part F: Traffic Psychology and Behaviour, 25, Part A, 10-26. doi:http://dx.doi.org/10.1016/j.trf.2014.04.019

Bassani, M., & Mutani, G. (2012). Effects of Environmental Lighting Conditions on Operating Speeds on Urban Arterials. Transportation Research Record: Journal of the Transportation Research Board(2298), pp 78–87.

Beitel, G. A., Sharp, M. C., & Glauz, W. D. (1974). SEAT BELT USE BY NIGHTTIME DRIVERS. Journal of Safety Research, 6(2), p. 72-77.

Bella, F., Calvi, A., & D'Amico, F. (2014). An Empirical Study on Traffic Safety Indicators for the Analysis of Car-Following Conditions. Advances in Transportation Studies, 1(Special Issue), pp 5-16.

Belz, N. P., Aultman-Hall, L., Gårder, P. E., & Lee, B. H. Y. (2014). Event-Based Framework for Noncompliant Driver Behavior at Single-Lane Roundabouts. Transportation Research Record: Journal of the Transportation Research Board(2402), pp 38–46.
Bendak, S. (2011). An In-depth Analysis of Red Light Crossing Problem in Saudi Arabia. Advances in Transportation Studies, 25, pp 67-74.
Ben-David, G., Lewin, I., Haliva, Y., & Tel-Nir, N. (1970). The influence of advisory letters in changing the driving behaviour of private motorists in Israel. Accident Analysis & Prevention, 2(3), 189-200. doi:http://dx.doi.org/10.1016/0001-4575(70)90041-2
Benekohal, R. F., & Wang, L. (1994). RELATIONSHIP BETWEEN INITIAL SPEED AND SPEED INSIDE A HIGHWAY WORK ZONE. Transportation Research Record(1442), p. 41-48.
Bertulis, T., & Dulaski, D. M. (2014). Driver Approach Speed and Its Impact on Driver Yielding to Pedestrian Behavior at Unsignalized Crosswalks. Transportation Research Record: Journal of the Transportation Research Board(2464), pp 46–51.
Bhalla, K., Paichadze, N., Gupta, S., Kliavin, V., Gritsenko, E., Bishai, D., & Hyder, A. A. (2015). Rapid assessment of road safety policy change: relaxation of the national speed enforcement law in Russia leads to large increases in the prevalence of speeding. Injury Prevention, 21(1), pp 53-56.
Bhalla, S. K., Biehl, B., & Seydel, U. (1971). INFLUENCE OF SPEED LIMITS ON DRIVING BEHAVIOR IN AUSTRIA. Accident Analysis & Prevention, 3(4), p. 257-260.
Bham, G. H. (2011). A Simple Lane Change Model for Microscopic Traffic Flow Simulation in Weaving Sections. Transportation Letters: The International Journal of Transportation Research, 3(4), pp 231-251.
Bie, J., Lo, H. K., & Wong, S. C. (2008). Circulatory Markings at Double-Lane Traffic Roundabout: Comparison of Two Marking Schemes. Journal of Transportation Engineering, 134(9), pp 378-388.
Billot, R., El Faouzi, N.-E., & De Vuyst, F. (2009). Multilevel Assessment of the Impact of Rain on Drivers' Behavior: Standardized Methodology and Empirical Analysis. Transportation Research Record: Journal of the Transportation Research Board(2107), pp 134-142.
Bornes, V., & Vaa, T. (2011). Speed Levels of Heavy Vehicles on Norwegian Mountain Pass. Transportation Research Record(2258), 119-130. doi:10.3141/2258-15
Bradbury, K., Stevens, J., Boyle, L. N., & Rutherford, S. (2012). To Go or Not To Go: Pedestrian Behavior at Intersections with Standard Pedestrian Call Buttons. Transportation Research Record: Journal of the Transportation Research Board(2299), pp 174-179.
Brewer, M. A., Fitzpatrick, K., Whitacre, J. A., & Lord, D. (2006). Exploration of Pedestrian Gap-Acceptance Behavior at Selected Locations. Transportation Research Record: Journal of the Transportation Research Board(1982), pp 132-140.
Britt, J. W., Bergman, A. B., & Moffat, J. (1995). LAW ENFORCEMENT, PEDESTRIAN SAFETY, AND DRIVER COMPLIANCE WITH CROSSWALK LAWS: EVALUATION OF A FOUR-YEAR CAMPAIGN IN SEATTLE (WITH DISCUSSION AND CLOSURE). Transportation Research Record(1485), p. 160-167.
Brosseau, M., Zangenehpour, S., Saunier, N., & Miranda-Moreno, L. (2013). The impact of waiting time and other factors on dangerous pedestrian crossings and violations at signalized intersections: A case study in Montreal. Transportation Research Part F-Traffic Psychology and Behaviour, 21, 159-172. doi:10.1016/j.trf.2013.09.010
Brown, H., Sun, C., & Cope, T. (2015). Evaluation of Mobile Work Zone Alarm Systems. Transportation Research Record: Journal of the Transportation Research Board(2485), pp 42–50.
Bunker, J., & Parajuli, A. (2006). Examining lateral positions of cars and heavy vehicles on a two lane, two way motorway. Transport Engineering in Australia, 10(2), 129-139.
Burgum, T. J., Day, C., & Henry, L. J. (2005). The Association of Distraction and Caution Displayed by Pedestrians at a Lighted Crosswalk. Journal of Community Health, 30(4), pp 269-279.
Cambon de Lavalette, B., Tijus, C., Poitrenaud, S., Leproux, C., Bergeron, J., & Thouez, J.-P. (2009). Pedestrian crossing decision-making: A situational and behavioral approach. Safety Science, 47(9), 1248-1253. doi:http://dx.doi.org/10.1016/j.ssci.2009.03.016
Cao, Y., Zuo, Z., & Xu, H. (2014). The Effect of Green Light Countdown Displays on Driving Behavior. Advances in Transportation Studies, 32, pp 89-96.
Carlson, P. J., & Fitzpatrick, K. (1999). VIOLATIONS AT GATED HIGHWAY-RAILROAD GRADE CROSSINGS. Transportation Research Record(1692), p. 66-73.
Carrick, G., & Washburn, S. (2012). The Move Over Law: Effect of Emergency Vehicle Lighting on Driver Compliance on Florida Freeways. Transportation Research Record: Journal of the Transportation Research Board(2281), pp 1–7.
Carsten, O. M. J., Sherborne, D. J., & Rothengatter, J. A. (1998). INTELLIGENT TRAFFIC SIGNALS FOR PEDESTRIANS: EVALUATION OF TRIALS IN THREE COUNTRIES. Transportation Research Part C: Emerging Technologies, 6(4), p. 213-229.
Chan, C.-Y. (2006). Characterization of Driving Behaviors Based on Field Observation of Intersection Left-Turn Across-Path Scenarios. IEEE Transactions on Intelligent Transportation Systems, 7(3), pp 322-331.
Chapman, J. R., & Noyce, D. A. (2012). Observations of Driver Behavior During Overtaking of Bicycles on Rural Roads. Transportation Research Record: Journal of the Transportation Research Board(2321), pp 38–45.
Charlton, S. G. (2003). Restricting intersection visibility to reduce approach speeds. Accident Analysis & Prevention, 35(5), 817-823. doi:http://dx.doi.org/10.1016/S0001-4575(02)00052-0
Charlton, S. G., Mackie, H. W., Baas, P. H., Hay, K., Menezes, M., & Dixon, C. (2010). Using endemic road features to create self-explaining roads and reduce vehicle speeds. Accident Analysis & Prevention, 42(6), 1989-1998. doi:http://dx.doi.org/10.1016/j.aap.2010.06.006
Chaurand, N., Bossart, F., & Delhomme, P. (2015). A naturalistic study of the impact of message framing on highway speeding. Transportation Research Part F: Traffic Psychology and Behaviour, 35, 37-44. doi:http://dx.doi.org/10.1016/j.trf.2015.09.001
Chen, D., Laval, J., Zheng, Z., & Ahn, S. (2012). A behavioral car-following model that captures traffic oscillations. Transportation Research Part B: Methodological, 46(6), 744-761. doi:http://dx.doi.org/10.1016/j.trb.2012.01.009
Chen, G., Meckle, W., & Wilson, J. (2002). Speed and safety effect of photo radar enforcement on a highway corridor in British Columbia. Accident Analysis and Prevention, 34(2), 129-138. doi:10.1016/s0001-4575(01)00006-9
Chen, P., Wu, C., & Zhu, S. (2016). Interaction between vehicles and pedestrians at uncontrolled mid-block crosswalks. Safety Science, 82, 68-76. doi:http://dx.doi.org/10.1016/j.ssci.2015.09.016
Chen, X., Li, Z., Jiang, H., & Li, M. (2015). Investigations of interactions between bus rapid transit and general traffic flows. Journal of Advanced Transportation, 49(3), 326-340. doi:10.1002/atr.1268
Chen, X., Qi, Y., & Liu, G. (2013). Empirical Study of Gap-Acceptance Behavior of Right-Turn-on-Red Drivers on Dual Right-Turn Lanes. Journal of Transportation Engineering, 139(2), pp 173-180.
Chiou, Y.-C., & Chang, C.-H. (2010). Driver responses to green and red vehicular signal countdown displays: Safety and efficiency aspects. Accident Analysis & Prevention, 42(4), 1057-1065. doi:http://dx.doi.org/10.1016/j.aap.2009.12.013
Chu Cong, M., Sano, K., & Matsumoto, S. (2012). Maneuvers of motorcycles in queues at signalized intersections. Journal of Advanced Transportation, 46(1), 39-53. doi:10.1002/atr.144

Cinnamon, J., Schuurman, N., & Hameed, S. M. (2011). Pedestrian Injury and Human Behaviour: Observing Road-Rule Violations at High-Incident Intersections. PLoS One, 6(6), 10p.

Clayton, M. C., & Helms, B. P. (2009). Increasing Seat Belt Use on a College Campus: An Evaluation of Two Prompting Procedures. Journal of Applied Behavior Analysis, 42(1), pp 161-164.

Cobey, K. D., Stulp, G., Laan, F., Buunk, A. P., & Pollet, T. V. (2013). Sex Differences in Risk Taking Behavior among Dutch Cyclists. Evolutionary Psychology, 11(2), pp 350-364.

Cohen, A., Bar-Gera, H., Parmet, Y., & Ronen, A. (2013). Guardrail influence on pedestrian crossing behavior at roundabouts. Accident Analysis & Prevention, 59, pp 452-458.

Coleman, F., & Venkataraman, K. (2001). DRIVER BEHAVIOR AT VEHICLE ARRESTING BARRIERS: COMPLIANCE AND VIOLATIONS DURING THE FIRST YEAR AT THE MCLEAN SITE. Transportation Research Record(1754), p. 68-76.

Cooper, J. F., Ragland, D. R., Ewald, K., Wasserman, L., & Murphy, C. J. (2013). Observational Study of Use of Cell Phone and Texting Among Drivers 66 in California Comparison of Data from 2011 and 2012. Transportation Research Record(2365), 66-72. doi:10.3141/2365-09

Cooper, J. F., Schneider, R. J., Ryan, S., & Co, S. (2012). Documenting Targeted Behaviors Associated with Pedestrian Safety. Transportation Research Record: Journal of the Transportation Research Board(2299), pp 1–10.

Corbett, C. (2001). Explanations for “understating” in self-reported speeding behaviour. Transportation Research Part F: Traffic Psychology and Behaviour, 4(2), 133-150. doi:http://dx.doi.org/10.1016/S1369-8478(01)00019-5

Cramer, S., Mayer, J., & Ryan, S. (2007). College Students Use Cell Phones While Driving More Frequently Than Found in Government Study. Journal of American College Health, 56(2), pp 181-184.

Crowley-Koch, B. J., Van Houten, R., & Lim, E. (2011). Effects of Pedestrian Prompts on Motorist Yielding at Crosswalks. Journal of Applied Behavior Analysis, 44(1), pp 121-126.

Cunningham, C. M., Schroeder, B. J., Vaughan, C., & Hughes, R. G. (2011). Is Ticketing Aggressive Cars and Trucks Effective in Changing Driver Behavior? Evidence from North Carolina. Transportation Research Record: Journal of the Transportation Research Board(2265), pp 100-108.

Daganzo, C. F. (1981). ESTIMATION OF GAP ACCEPTANCE PARAMETERS WITHIN AND ACROSS THE POPULATION FROM DIRECT ROADSIDE OBSERVATION. Transportation Research Part B: Methodological, 15B(1), p. 1-15.

Dang Minh, T., Alhajyaseen, W. K. M., Asano, M., & Nakamura, H. (2012). Development of Microscopic Traffic Simulation Model for Safety Assessment at Signalized Intersections. Transportation Research Record(2316), 122-131. doi:10.3141/2316-14

Daniels, S., Vanrie, J., Dreesen, A., & Brijs, T. (2010). Additional road markings as an indication of speed limits: Results of a field experiment and a driving simulator study. Accident Analysis & Prevention, 42(3), pp 953-960.

Darzentas, J., & McDowell, M. R. C. (1981). DRIVER BEHAVIOUR AT UNLIT NON-URBAN T-JUNCTIONS IN DAYLIGHT AND DARKNESS. Journal of the Operational Research Society, 32(8), p. 721-727.

De Ceunynck, T., Polders, E., Daniels, S., Hermans, E., Brijs, T., & Wets, G. (2013). Road Safety Differences Between Priority-Controlled Intersections and Right-Hand Priority Intersections: Behavioral Analysis of Vehicle–Vehicle Interactions. Transportation Research Record: Journal of the Transportation Research Board(2365), pp 39–48.

de la Riva, M., Garvey, P. M., & Pietrucha, M. T. (2006). Impact of Highway Safety Flares on Driver Behavior. Transportation Research Record: Journal of the Transportation Research Board(1980), pp 39-48.

De Pauw, E., Daniels, S., Brijs, T., Hermans, E., & Wets, G. (2014). Behavioural effects of fixed speed cameras on motorways: Overall improved speed compliance or kangaroo jumps? Accident Analysis and Prevention, 73, 132-140. doi:10.1016/j.aap.2014.08.019

de Waard, D., Schepers, P., Ormel, W., & Brookhuis, K. (2010). Mobile phone use while cycling: Incidence and effects on behaviour and safety. Ergonomics, 53(1), 30-42. doi:10.1080/00140130903381180

Debnath, A. K., Blackman, R., & Haworth, N. (2014). A Tobit model for analyzing speed limit compliance in work zones. Safety Science, 70, 367-377. doi:http://dx.doi.org/10.1016/j.ssci.2014.07.012

Decina, L. E., & Knoebel, K. Y. (1997). Child safety seat misuse patterns in four states. Accident Analysis & Prevention, 29(1), 125-132. doi:http://dx.doi.org/10.1016/S0001-4575(96)00051-6

Decina, L. E., & Lococo, K. H. (2007). Observed LATCH use and misuse characteristics of child restraint systems in seven states. Journal of Safety Research, 38(3), 273-281. doi:http://dx.doi.org/10.1016/j.jsr.2006.08.009

Dell’Acqua, G. (2011). Reducing Traffic Injuries Resulting from Excess Speed: Low-Cost Gateway Treatments in Italy. Transportation Research Record: Journal of the Transportation Research Board(2203), pp 94-99.

Demiroz, Y. I., Onelcin, P., & Alver, Y. (2015). Illegal road crossing behavior of pedestrians at overpass locations: Factors affecting gap acceptance, crossing times and overpass use. Accident Analysis & Prevention, 80, pp 220-228.

Diah, J. M., Rahman, M. Y. A., Adnan, M. A., & Atan, I. (2010). Weaving Section Flow Model at the Weaving Area of Malaysian Conventional Roundabout. Journal of Transportation Engineering, 136(8), pp 782-792.

Dill, J., Monsere, C. M., & McNeil, N. (2012). Evaluation of bike boxes at signalized intersections. Accident Analysis & Prevention, 44(1), pp 126-134.

Dommes, A., Granie, M. A., Cloutier, M. S., Coquelet, C., & Huguenin-Richard, F. (2015). Red light violations by adult pedestrians and other safety-related behaviors at signalized crosswalks. Accident Analysis and Prevention, 80, 67-75. doi:10.1016/j.aap.2015.04.002

Dong, C., Richards, S. H., Yang, Q., & Jiang, X. (2014). Examining the Influence of Speed Limits for Multilane Highways with Curbs and Gutters. Journal of Transportation Engineering, 140(10), Content ID 06014001.

Dougald, L. E., Dittberner, R. A., & Sripathi, H. K. (2012). Safer Midblock Environments for Pedestrian and Bicycle Crossings: Experiment with Zigzag Pavement Markings. Transportation Research Record: Journal of the Transportation Research Board(2299), pp 128–136.

Drory, A., & Shinar, D. (1982). The effects of roadway environment and fatigue on sign perception. Journal of Safety Research, 13(1), 25-32. doi:http://dx.doi.org/10.1016/0022-4375(82)90015-9

Du, W., Yang, J., Powis, B., Zheng, X., Ozanne-Smith, J., Bilston, L., & Wu, M. (2013). Understanding on-road practices of electric bike riders: An observational study in a developed city of China. Accident Analysis and Prevention, 59, 319-326. doi:10.1016/j.aap.2013.06.011

Duduta, N., Zhang, Q., & Kroneberger, M. (2014). Impact of Intersection Design on Pedestrians’ Choice to Cross on Red. Transportation Research Record: Journal of the Transportation Research Board(2464), pp 93–99.

Duthie, J., Brady, J. F., Mills, A. F., & Machemehl, R. B. (2010). Effects of On-Street Bicycle Facility Configuration on Bicyclist and Motorist Behavior. Transportation Research Record: Journal of the Transportation Research Board(2190), pp 37-44.

Eccles, K. A., Tao, R., & Mangum, B. C. (2004). EVALUATION OF PEDESTRIAN COUNTDOWN SIGNALS IN MONTGOMERY COUNTY, MARYLAND. Transportation Research Record(1878), p. 36-41.

Edwards, J. B. (1999). Speed adjustment of motorway commuter traffic to inclement weather. Transportation Research Part F: Traffic Psychology and Behaviour, 2F(1), 1-14.

Edwards, J. B. (2002). Motorway speeds in wet weather: the comparative influence of porous and conventional asphalt surfacings. Journal of Transport Geography, 10(4), 303-311. doi:http://dx.doi.org/10.1016/S0966-6923(02)00044-3

El-Basha, R. H. S., Hassan, Y., & Sayed, T. A. (2007). Modeling Freeway Diverging Behavior on Deceleration Lanes. Transportation Research Record: Journal of the Transportation Research Board(2012), pp 30-37.

Eleonora, P. (2012). Theory and models of pedestrian crossing behaviour along urban trips. Transportation Research Part F: Traffic Psychology and Behaviour, 15(1), pp 75-94.

Ellis, R. D., Van Houten, R., & Kim, J.-L. (2007). In-Roadway "Yield to Pedestrians" Signs: Placement Distance and Motorist Yielding. Transportation Research Record: Journal of the Transportation Research Board(2002), pp 84-89.

Ellison, P. A., Govern, J. M., Petri, H. L., & Figler, M. H. (1995). ANONYMITY AND AGGRESSIVE DRIVING BEHAVIOR: A FIELD STUDY. Journal of Social Behavior and Personality, 10(1), p. 265-272.

Elmitiny, N., Yan, X., Radwan, E., Russo, C., & Nashar, D. (2010). Classification analysis of driver's stop/go decision and red-light running violation. Accident Analysis & Prevention, 42(1), pp 101-111.

Erke, A., Sagberg, F., & Hagman, R. (2007). Effects of route guidance variable message signs (VMS) on driver behaviour. Transportation Research Part F: Traffic Psychology and Behaviour, 10(6), pp 447-457.

Eustace, D. (2001). Pedestrian reaction to crossing signal delay. Journal of the Transportation Research Forum, (IN: Transportation Quarterly)(Winter), 117-128.

Eustace, D., & Bartel, T. M. C. (2002). SEAT BELT USE COMPLIANCE IN KANSAS. Journal of the Transportation Research Forum, 56(4), p. 149-160.

Evans, L., & Wasielewski, P. (1982). DO ACCIDENT-INVOLVED DRIVERS EXHIBIT RISKIER EVERYDAY DRIVING BEHAVIOUR? Accident Analysis & Prevention, 14(1), p. 57-60.

Evans, L., & Wasielewski, P. (1983). Risky driving related to driver and vehicle characteristics. Accident Analysis & Prevention, 15(2), 121-136. doi:http://dx.doi.org/10.1016/0001-4575(83)90068-4

Evans, L., Wasielewski, P., & von Buseck, C. R. (1982). COMPULSORY SEAT BELT USAGE AND DRIVER RISK-TAKING BEHAVIOR. Human Factors: The Journal of the Human Factors and Ergonomics Society, 24(1), p. 41-48.

Fabregas, A., Lin, P.-S., Gonzalez-Velez, E., Datz, A., & Zhou, H. (2011). Safety and Operational Assessment of Yield-to-Bus Electronic Warning Signs on Transit Buses. Transportation Research Record(2218), 1-9. doi:10.3141/2218-01

Farrell, L. V., Cox, M. G., & Geller, E. S. (2007). Prompting safety-belt use in the context of a belt-use law: The flash-for life revisited. Journal of Safety Research, 38(4), 407-411. doi:http://dx.doi.org/10.1016/j.jsr.2007.04.002

Fatema, T., Ismail, K., & Hassan, Y. (2014). Validation of Probabilistic Model for Design of Freeway Entrance Speed Change Lanes. Transportation Research Record: Journal of the Transportation Research Board(2460), pp 97–106.

Faw, H. W. (2013). To signal or not to signal: That should not be the question. Accident Analysis & Prevention, 59, pp 374-381.

Ferrari, P., Cascetta, E., Nuzzolo, A., Treglia, P., & Olivotto, P. (1984). A BEHAVIOURAL APPROACH TO THE MEASUREMENT OF MOTORWAY CIRCULATION COMFORT AND SAFETY. Transportation Research Part A: Policy and Practice, 18A(1), p. 43-59.

Fitzpatrick, C. D., Abrams, D. S., Tang, Y., & Knodler, M. A. (2013). Spatial and Temporal Analysis of Driver Gap Acceptance Behavior at Modern Roundabouts. Transportation Research Record: Journal of the Transportation Research Board(2388), pp 14–20.

Fitzpatrick, C. D., Harrington, C. P., Knodler Jr, M. A., & Romoser, M. R. E. (2014). The Influence of Clear Zone Size and Roadside Vegetation on Driver Behavior. Journal of Safety Research, 49, pp 97-104.

Fitzsimmons, E. J., Souleyrette, R. R., & Nambisan, S. S. (2013). Measuring Horizontal Curve Vehicle Trajectories and Speed Profiles: Pneumatic Road Tube and Video Methods. Journal of Transportation Engineering, 139(3), pp 255-265.

Fockler, S. K. F., & Cooper, P. J. (1990). SITUATIONAL CHARACTERISTICS OF SAFETY BELT USE. Accident Analysis & Prevention, 22(2), p. 109-118.

Fockler, S. K. F., Vavrik, J., & Kristiansen, L. (1998). Motivating drivers to correctly adjust head restraints: assessing effectiveness of three different interventions1. Accident Analysis & Prevention, 30(6), 773-780. doi:http://dx.doi.org/10.1016/S0001-4575(98)00030-X

Foletta, N., Nielson, C., Patton, J., Parks, J., & Rees, R. (2015). Green Shared Lane Markings on Urban Arterial in Oakland, California: Evaluation of Super Sharrows. Transportation Research Record: Journal of the Transportation Research Board(2492), pp 61–68.

Foster, N., Monsere, C. M., & Carlos, K. (2014). Evaluating Driver and Pedestrian Behaviors at Enhanced, Multilane, Midblock Pedestrian Crossings: Case Study in Portland, Oregon. Transportation Research Record: Journal of the Transportation Research Board(2464), pp 59–66.

Fourie, M., Walton, D., & Thomas, J. A. (2011). Naturalistic observation of drivers' hands, speed and headway. Transportation Research Part F: Traffic Psychology and Behaviour, 14(5), pp 413-421.

Frederiksen, N., Frank, G., & Freeman, H. (1939). A Study of Conformity to a Traffic Regulation. Journal of Abnormal and Social Psychology, 34(1), pp 118-123.

Fu, T., Zangenehpour, S., St-Aubin, P., Fu, L., & Miranda-Moreno, L. F. (2015). Using microscopic video data measures for driver behavior analysis during adverse winter weather: opportunities and challenges. Journal of Modern Transportation, 23(2), pp 81-92.

Garber, N. J., & Srinivasan, S. (1998). INFLUENCE OF EXPOSURE DURATION ON THE EFFECTIVENESS OF CHANGEABLE-MESSAGE SIGNS IN CONTROLLING VEHICLE SPEEDS AT WORK ZONES. Transportation Research Record(1650), p. 62-70.

Gates, T. J., Datta, T. K., Savolainen, P. T., & Buck, N. (2009). Evaluation of Pedestrian Safety Educational Program for Elementary and Middle School Children. Transportation Research Record: Journal of the Transportation Research Board(2140), pp 120-127.

Gates, T. J., McGee, H., Moriarty, K., & Maria, H.-U. (2012). Comprehensive Evaluation of Driver Behavior to Establish Parameters for Timing of Yellow Change and Red Clearance Intervals. Transportation Research Record: Journal of the Transportation Research Board(2298), pp 9–21.

Gates, T. J., & Noyce, D. A. (2010). Dilemma Zone Driver Behavior as a Function of Vehicle Type, Time of Day, and Platooning. Transportation Research Record: Journal of the Transportation Research Board(2149), pp 84-93.

Gates, T. J., Noyce, D. A., Laracuente, L., & Nordheim, E. V. (2007). Analysis of Driver Behavior in Dilemma Zones at Signalized Intersections. Transportation Research Record: Journal of the Transportation Research Board(2030), pp 29-39.

Gates, T. J., Savolainen, P. T., Datta, T. K., & Nannapaneni, P. (2011). Impact on Driver Behavior of Steady-Burn Warning Lights on Channelizing Drums in Work Zones. Transportation Research Record: Journal of the Transportation Research Board(2258), pp 25-31.

Gates, T. J., Savolainen, P. T., Datta, T. K., Todd, R. G., Russo, B., & Morena, J. G. (2012). Use of Both Centerline and Shoulder Rumble Strips on High-Speed Two-Lane Rural Roadways: Impact on Lateral Lane Position and Passing Maneuvers of Vehicles. Transportation Research Record: Journal of the Transportation Research Board(2301), pp 36–45.

Gattis, J. L., Alguire, M. S., Townsend, K., & Rao, S. (1997). RURAL TWO-LANE PASSING HEADWAYS AND PLATOONING. Transportation Research Record(1579), p. 27-34.

Geller, E. S. (1980). SEAT BELT USAGE: A POTENTIAL TARGET FOR APPLIED BEHAVIOR ANALYSIS. Journal of Applied Behavior Analysis, 13(4), p. 669-675.
Geller, E. S. (1982). REWARDING SAFETY BELT USAGE AT AN INDUSTRIAL SETTING: TESTS OF TREATMENT GENERALITY AND RESPONSE MAINTENANCE. Journal of Applied Behavior Analysis, 31 p.
Geller, E. S., Paterson, L., & Talbott, E. (1982). A BEHAVIORAL ANALYSIS OF INCENTIVE PROMPTS FOR MOTIVATING SEAT BELT USE. Journal of Applied Behavior Analysis, 15(3), p. 403-415.
Ghanipoor Machiani, S., & Abbas, M. (2015). Safety surrogate histograms (SSH): A novel real-time safety assessment of dilemma zone related conflicts at signalized intersections. Accident Analysis & Prevention. doi:http://dx.doi.org/10.1016/j.aap.2015.04.024
Giuffre, T., & Rinelli, S. (2006). Evaluation of Proneness to Red-Light Violation: Quantitative Approach Suggested by Potential Conflict Analysis. Transportation Research Record: Journal of the Transportation Research Board(1969), pp 35-44.
Gkritza, K., & Mannering, F. L. (2008). Mixed logit analysis of safety-belt use in single- and multi-occupant vehicles. Accident Analysis & Prevention, 40(2), 443-451. doi:http://dx.doi.org/10.1016/j.aap.2007.07.013
Glauz, W. D., Blackburn, R. R., & Heenan, P. J. (1982). Seat belt usage in Kansas City. Journal of Safety Research, 13(2), 89-92. doi:http://dx.doi.org/10.1016/0022-4375(82)90004-4
Goddard, T., Kahn, K. B., & Adkins, A. (2015). Racial Bias in Driver Yielding Behavior at Crosswalks. Transportation Research Part F: Traffic Psychology and Behaviour, 33, pp 1-6.
Goldzweig, I. A., Levine, R. S., Schlundt, D., Bradley, R., Jones, G. D., Zoorob, R. J., & Ekundayo, O. J. (2013). Improving seat belt use among teen drivers: Findings from a service-learning approach. Accident Analysis & Prevention, 59, pp 71-75.
Gordon, D. A. (1970). DRIVER INTERACTIONS AND DELAYS IN FREEWAY TRAFFIC. Highway Research Record(336), pp 76-91.
Gregory, B., Irwin, J. D., Faulks, I. J., & Chekaluk, E. (2016). Differential effects of traffic sign stimuli upon speeding in school zones following a traffic light interruption. Accident Analysis & Prevention, 86, 114-120. doi:http://dx.doi.org/10.1016/j.aap.2015.10.020
Guéguen, N., Meineri, S., & Eyssartier, C. (2015). A Pedestrian’s Stare and Drivers’ Stopping Behavior: A Field Experiment at the Pedestrian Crossing. Safety Science, 75, pp 87-89.
Guéguen, N., Meineri, S., Martin, A., & Charron, C. (2014). Car status as an inhibitor of passing responses to a low-speed frustrator. Transportation Research Part F: Traffic Psychology and Behaviour, 22, pp 245-248.
Gunay, B. (2012). Using Automatic Number Plate Recognition Technology to Observe Drivers’ Headway Preferences. Journal of Advanced Transportation, 46(4), pp 305-317.
Guo, H., Gao, Z., Yang, X., & Jiang, X. (2011). Modeling Pedestrian Violation Behavior at Signalized Crosswalks in China: A Hazards-Based Duration Approach. Traffic Injury Prevention, 12(1), pp 96-103.
Guo, H., Wang, W., Guo, W., Jiang, X., & Bubb, H. (2012). Reliability Analysis of Pedestrian Safety Crossing in Urban Traffic Environment. Safety Science, 50(4), pp 968-973.
Guo, H., Zhao, F., Wang, W., Zhou, Y., Zhang, Y., & Wets, G. (2014). Modeling the Perceptions and Preferences of Pedestrians on Crossing Facilities. Discrete Dynamics in Nature and Society, 2014(Article ID 949475), 8p.
Guo, Y., Liu, P., Bai, L., Xu, C., & Chen, J. (2014). Red Light Running Behavior of Electric Bicycles at Signalized Intersections in China. Transportation Research Record: Journal of the Transportation Research Board(2468), pp 28–37.
Guth, D., Ashmead, D., Long, R., Wall, R., & Ponchillia, P. (2005). Blind and sighted pedestrians’ judgments of gaps in traffic at roundabouts. Human Factors, 47(2), 314-331. doi:10.1518/0018720054679533
Hagenzieker, M. P. (1991). ENFORCEMENT OR INCENTIVES? PROMOTING SAFETY BELT USE AMONG MILITARY PERSONNEL IN THE NETHERLANDS. Journal of Applied Behavior Analysis, 24(1), p. 23-30.
Haglund, M., & Åberg, L. (2000). Speed choice in relation to speed limit and influences from other drivers. Transportation Research Part F: Traffic Psychology and Behaviour, 3(1), 39-51. doi:http://dx.doi.org/10.1016/S1369-8478(00)00014-0
Haglund, M., & Åberg, L. (2002). Stability in drivers’ speed choice. Transportation Research Part F: Traffic Psychology and Behaviour, 5(3), 177-188. doi:http://dx.doi.org/10.1016/S1369-8478(02)00016-5
Hakkert, A. S., & Gitelman, V. (1998). CONSIDERATION OF BOLLARD TREATMENT AT EXIT GORE AREAS. Transportation Research Record(1635), p. 133-139.
Hakkert, A. S., Gitelman, V., & Ben-Shabat, E. (2002). AN EVALUATION OF CROSSWALK WARNING SYSTEMS: EFFECTS ON PEDESTRIAN AND VEHICLE BEHAVIOUR. Transportation Research Part F: Traffic Psychology and Behaviour, 5(4), p. 275-292.
Hakkert, A. S., Gitelman, V., Cohen, A., Doveh, E., & Umansky, T. (2001). THE EVALUATION OF EFFECTS ON DRIVER BEHAVIOR AND ACCIDENTS OF CONCENTRATED GENERAL ENFORCEMENT ON INTERURBAN ROADS IN ISRAEL. Accident Analysis & Prevention, 33(1), p. 43-63.
Hakkert, A. S., Zaidel, D. M., & Sarelle, E. (1981). Patterns of safety belt usage following introduction of a safety belt wearing law. Accident Analysis & Prevention, 13(2), 65-82. doi:http://dx.doi.org/10.1016/0001-4575(81)90021-X
Hall, W. L., & Harkey, D. L. (1999). EVALUATION OF THE ON-ROAD BEHAVIOR OF 16-FT-WIDE MOBILE HOMES IN NORTH CAROLINA. Transportation Research Record(1686), p. 36-41.
Hamdar, S. H., Mahmassani, H. S., & Chen, R. B. (2008). Aggressiveness propensity index for driving behavior at signalized intersections. Accident Analysis & Prevention, 40(1), pp 315-326.
Harkey, D. L., & Carter, D. L. (2006). Observational Analysis of Pedestrian, Bicyclist, and Motorist Behaviors at Roundabouts in the United States. Transportation Research Record: Journal of the Transportation Research Board(1982), pp 155-165.
Harkey, D. L., Mera, R., & Byington, S. R. (1993). EFFECT OF NONPERMANENT PAVEMENT MARKINGS ON DRIVER PERFORMANCE. Transportation Research Record(1409), p. 52-61.
Harré, N., & Wrapson, W. (2004). The evaluation of a central-city pedestrian safety campaign. Transportation Research Part F: Traffic Psychology and Behaviour, 7(3), 167-179. doi:http://dx.doi.org/10.1016/j.trf.2004.07.002
Harrell, W. A. (1992). DRIVER RESPONSE TO A DISABLED PEDESTRIAN USING A DANGEROUS CROSSWALK. Journal of Environmental Psychology, 12(4), p. 345-354.
Harrell, W. A., David-Evans, M., & Gartrell, J. (2004). Failure of a Traffic Control "Fatality" Sign to Affect Pedestrians’ and Motorists’ Behavior. Psychological Reports, 95, pp 757-760.
Hassan, Y., & Easa, S. M. (2003). EFFECT OF VERTICAL ALIGNMENT ON DRIVER PERCEPTION OF HORIZONTAL CURVES. Journal of Transportation Engineering, 129(4), p. 399-407.
Hatfield, J., & Murphy, S. (2007). The Effects of Mobile Phone Use on Pedestrian Crossing Behaviour at Signalised and Unsignalised Intersections. Accident Analysis & Prevention, 39(1), pp 197-205.
Havard, C., & Willis, A. (2012). Effects of Installing a Marked Crosswalk on Road Crossing Behaviour and Perceptions of the Environment. Transportation Research Part F: Traffic Psychology and Behaviour, 15(3), pp 249-260.
Haver, E., Ahlin, F. J., & Bowser, J. S. (1982). SPEED ENFORCEMENT AND SPEED CHOICE. Accident Analysis & Prevention, 14(4), p. 267-278.

Hawkins, N. M., & Atha, V. (1976). A STUDY OF PASSENGER BEHAVIOUR ON A SLOW SPEED TRAVELLATOR SYSTEM. Ergonomics, 19(4), p. 499-517.

Hediyeh, H., Sayed, T., Zaki, M. H., & Ismail, K. (2014). Automated Analysis of Pedestrian Crossing Speed Behavior at Scramble-phase Signalized Intersections Using Computer Vision Techniques. International Journal of Sustainable Transportation, 8(5), pp 382-397.

Hidas, P. (2005). Modelling vehicle interactions in microscopic simulation of merging and weaving. Transportation Research Part C: Emerging Technologies, 13(1), 37-62. doi:http://dx.doi.org/10.1016/j.trc.2004.12.003

Himanen, V., & Kulmala, R. (1988). AN APPLICATION OF LOGIT MODELS IN ANALYSING THE BEHAVIOUR OF PEDESTRIANS AND CAR DRIVERS ON PEDESTRIAN CROSSINGS. Accident Analysis & Prevention, 20(3), p. 187-197.

Hine, J., & Russell, J. (1993). Traffic barriers and pedestrian crossing behaviour. Journal of Transport Geography, 1(4), 230-239. doi:http://dx.doi.org/10.1016/0966-6923(93)90047-4

Hogema, J. H., & Van Der Horst, R. (1997). EVALUATION OF A16 MOTORWAY FOG-SIGNALING SYSTEM WITH RESPECT TO DRIVING BEHAVIOR. Transportation Research Record(1573), p. 63-67.

Hoogendoorn, S. P., Daamen, W., Hoogendoorn, R. G., & Goemans, J. W. (2013). Assessment of Dynamic Speed Limits on Freeway A20 near Rotterdam, Netherlands. Transportation Research Record: Journal of the Transportation Research Board(2380), pp 61–71.

Horberry, T., Bubnich, C., Hartley, L., & Lamble, D. (2001). Drivers' use of hand-held mobile phones in Western Australia. Transportation Research Part F: Traffic Psychology and Behaviour, 4(3), 213-218. doi:http://dx.doi.org/10.1016/S1369-8478(01)00022-5

Horswill, M. S., & Helman, S. (2003). A behavioral comparison between motorcyclists and a matched group of non-motorcycling car drivers: factors influencing accident risk. Accident Analysis and Prevention, 35(4), 589-597. doi:10.1016/s0001-4575(02)00039-8

Hostetter, R. S., & Seguin, E. L. (1969). THE EFFECTS OF SIGHT DISTANCE AND CONTROLLED IMPEDANCE ON PASSING BEHAVIOR. Highway Research Record(292), pp 64-78.

Houten, R. V., & Houten, F. V. (1987). THE EFFECTS OF A SPECIFIC PROMPTING SIGN ON SPEED REDUCTION. Accident Analysis & Prevention, 19(2), p. 115-117.

Huang, H., Wang, D., Zheng, L., & Li, X. (2014). Evaluating time-reminder strategies before amber: Common signal, green flashing and green countdown. Accident Analysis and Prevention, 71, 248-260. doi:10.1016/j.aap.2014.05.018

Huang, H., Zegeer, C., & Nassi, R. (2000). EFFECTS OF INNOVATIVE PEDESTRIAN SIGNS AT UNSIGNALIZED LOCATIONS: THREE TREATMENTS. Transportation Research Record(1705), p. 43-52.

Huang, H. F., & Cynecki, M. J. (2000). EFFECTS OF TRAFFIC CALMING MEASURES ON PEDESTRIAN AND MOTORIST BEHAVIOR. Transportation Research Record(1705), p. 26-31.

Huang, Y.-H., Zhang, W., Murphy, L., Shi, G., & Lin, Y. (2011). Attitudes and behavior of Chinese drivers regarding seatbelt use. Accident Analysis & Prevention, 43(3), pp 889-897.

Huisingh, C., Griffin, R., & McGwin, G. (2015). The Prevalence of Distraction Among Passenger Vehicle Drivers: A Roadside Observational Approach. Traffic Injury Prevention, 16(2), pp 140-146.

Hummer, J. E., & Scheffler, C. R. (1999). DRIVER PERFORMANCE COMPARISON OF FLUORESCENT ORANGE TO STANDARD ORANGE WORK ZONE TRAFFIC SIGNS. Transportation Research Record(1657), p. 55-62.

Hunter, W. W., Harkey, D. L., Stewart, J. R., & Birk, M. L. (2000). EVALUATION OF BLUE BIKE-LANE TREATMENT IN PORTLAND, OREGON. Transportation Research Record(1705), p. 107-115.

Hunter, W. W., Srinivasan, R., & Martell, C. A. (2012). Evaluation of Rectangular Rapid Flash Beacon at Pinellas Trail Crossing in Saint Petersburg, Florida. Transportation Research Record: Journal of the Transportation Research Board(2314), pp 7–13.

Hunter, W. W., Stewart, J. R., & Stutts, J. C. (1999). STUDY OF BICYCLE LANES VERSUS WIDE CURB LANES. Transportation Research Record(1674), p. 70-77.

Hurwitz, D. S., Knodler, M. A., & Nyquist, B. (2011). Evaluation of Driver Behavior in Type II Dilemma Zones at High-Speed Signalized Intersections. Journal of Transportation Engineering, 137(4), pp 277-286.

Hurwitz, D. S., Wang, H., Knodler, M. A., Ni, D., & Moore, D. (2012). Fuzzy sets to describe driver behavior in the dilemma zone of high-speed signalized intersections. Transportation Research Part F: Traffic Psychology and Behaviour, 15(2), pp 132-143.

Huth, V., Sanchez, Y., & Brusque, C. (2015). Drivers' phone use at red traffic lights: A roadside observation study comparing calls and visual–manual interactions. Accident Analysis & Prevention, 74, 42-48. doi:http://dx.doi.org/10.1016/j.aap.2014.10.008

Huybers, S., Van Houten, R., & Malenfant, J. E. L. (2004). REDUCING CONFLICTS BETWEEN MOTOR VEHICLES AND PEDESTRIANS: THE SEPARATE AND COMBINED EFFECTS OF PAVEMENT MARKINGS AND A SIGN PROMPT. Journal of Applied Behavior Analysis, 37(4), p. 445-456.

Islam, M. T., El-Basyouny, K., & Ibrahim, S. E. (2014). The Impact of Lowered Residential Speed Limits on Vehicle Speed Behavior. Safety Science, 62, pp 483-494.

Jain, A., Gupta, A., & Rastogi, R. (2014). Pedestrian Crossing Behaviour Analysis at Intersections. International Journal for Traffic and Transport Engineering, 4(1), pp 103-116.

Jamieson, B. D. (1977). SEX DIFFERENCES AMONG DRIVERS IN YIELDING RIGHT-OF-WAY. Psychological Reports, 41, p. 1243-1248.

Jarvis, J. R. (1983). THE EFFECTIVENESS OF ROAD WORK SPEED LIMIT SIGNS. Australian Road Research, 13(3), p. 185-194.

Jelenova, I. (2006). Observation of Driver Expression of Aggressive Behavior. Studia Psychologica, 48(4), pp 293-302.

Jennings, R. D., Burki, M. A., & Onstine, B. W. (1977). BEHAVIORAL OBSERVATIONS AND THE PEDESTRIAN ACCIDENT. Journal of Safety Research, 9(1), p. 26-33.

Jevtic, V., Vujanic, M., Lipovac, K., Jovanovic, D., & Pesic, D. (2015). The relationship between the travelling speed and motorcycle styles in urban settings: A case study in Belgrade. Accident Analysis and Prevention, 75, 77-85.

Johansson, C., Garder, P., & Leden, L. (2003). TOWARD VISION ZERO AT ZEBRA CROSSINGS: CASE STUDY OF TRAFFIC SAFETY AND MOBILITY FOR CHILDREN AND THE ELDERLY, MALMO, SWEDEN. Transportation Research Record(1828), p. 67-74.

Johansson, C., & Leden, L. (2007). Short-term effects of countermeasures for improved safety and mobility at marked pedestrian crosswalks in Boras, Sweden. Accident Analysis & Prevention, 39(3), pp 500-509.

Johansson, C., Rosander, P., & Leden, L. (2011). Distance between speed humps and pedestrian crossings: Does it matter? Accident Analysis and Prevention, 43(5), 1846-1851. doi:10.1016/j.aap.2011.04.020

Johnson, M. B., Voas, R. B., Lacey, J. H., McKnight, A. S., & Lange, J. E. (2004). LIVING DANGEROUSLY: DRIVER DISTRACTION AT HIGH SPEED. Traffic Injury Prevention, 5(1), p. 1-7.

Jonah, B. A., Dawson, N. E., & Smith, G. A. (1982). EFFECTS OF A SELECTIVE TRAFFIC ENFORCEMENT PROGRAM ON SEAT BELT USAGE. Journal of Applied Psychology, 67(1), p. 89-96.

Jonasson, M. (1999). The ritual of courtesy — creating complex or uneqivocal places? Transport Policy, 6(1), 47-55. doi:http://dx.doi.org/10.1016/S0967-070X(98)00031-6
Jones, M. H. (1979). A REAL-WORLD BICYCLE-PERFORMANCE MEASURE. Transportation Research Record(739), pp 26-29.
Jørgensen, F., & Pedersen, P. A. (2002). Drivers' response to the installation of road lighting. An economic interpretation. Accident Analysis & Prevention, 34(5), 601-608. doi:http://dx.doi.org/10.1016/S0001-4575(01)00058-6
Kadali, B. R., Vedagiri, P., & Rathi, N. (2015). Models for pedestrian gap acceptance behaviour analysis at unprotected mid-block crosswalks under mixed traffic conditions. Transportation Research Part F: Traffic Psychology and Behaviour, 32, pp 114-126.
Kaistinen, J., Nieminen, T., & Summala, H. (2004). Driving behavior on split 2+1 road. Advances in Transportation Studies, 2, 69-81.
Kanagaraj, V., Srinivasan, K. K., & Sivanandan, R. (2010). Modeling Vehicular Merging Behavior Under Heterogeneous Traffic Conditions. Transportation Research Record(2188), 140-147. doi:10.3141/2188-15
Kanagaraj, V., Srinivasan, K. K., Sivanandan, R., & Asaithambi, G. (2015). Study of unique merging behavior under mixed traffic conditions. Transportation Research Part F: Traffic Psychology and Behaviour, 29, 98-112.
Kaparias, I., Bell, M. G. H., Biagioli, T., Bellezza, L., & Mount, B. (2015). Behavioural analysis of interactions between pedestrians and vehicles in street designs with elements of shared space. Transportation Research Part F: Traffic Psychology and Behaviour, 30, pp 115-127.
Karkee, G. J., Nambisan, S. S., & Pulugurtha, S. S. (2010). Motorist Actions at a Crosswalk With an In-Pavement Flashing Light System. Traffic Injury Prevention, 11(6), pp 642-649.
Kasalica, S., Vukadinovic, R., & Lucanin, V. (2012). STUDY OF DRIVERS' BEHAVIOUR AT A PASSIVE RAILWAY CROSSING. PROMET-Traffic & Transportation, 24(3), 193-201. doi:10.7307/ptt.v24i3.312
Kay, J. J., Savolainen, P. T., Gates, T. J., & Datta, T. K. (2014). Driver behavior during bicycle passing maneuvers in response to a Share the Road sign treatment. Accident Analysis & Prevention, 70, pp 92-99.
Kaysi, I., & Alam, G. (2000). Driver behavior end traffic stream interactions at unsignalized intersections. Journal of Transportation Engineering-Asce, 126(6), 498-505. doi:10.1061/(asce)0733-947x(2000)126:6(498)
Kaysi, I. A., & Abbany, A. S. (2007). Modeling aggressive driver behavior at unsignalized intersections. Accident Analysis & Prevention, 39(4), pp 671-678.
Keskinen, E., Ota, H., & Katila, A. (1998). Older drivers fail in intersections: speed discrepancies between older and younger male drivers. Accident Analysis & Prevention, 30(3), 323-330.
Khan, F. M., Jawaid, M., Chotani, H., & Luby, S. (1999). PEDESTRIAN ENVIRONMENT AND BEHAVIOR IN KARACHI, PAKISTAN. Accident Analysis & Prevention, 31(4), p. 335-339.
Khatoon, M., Tiwari, G., & Chatterjee, N. (2013). Impact of grade separator on pedestrian risk taking behavior. Accident Analysis & Prevention, 50, 861-870. doi:http://dx.doi.org/10.1016/j.aap.2012.07.011
Khattak, A. J. (2007). Reducing Undesirable Actions of Motor Vehicle Drivers at Railroad-Highway Grade Crossings. Transportation Research Record: Journal of the Transportation Research Board(2030), pp 54-58.
Khattak, A. J. (2009). Comparison of Driver Behavior at Highway–Railroad Crossings in Two Cities. Transportation Research Record: Journal of the Transportation Research Board(2122), pp 72-77.
Khattak, A. J., & McKnight, G. A. (2008). Gate Rushing at Highway–Railroad Grade Crossings: Drivers' Response to Centerline Barrier. Transportation Research Record: Journal of the Transportation Research Board(2056), pp 104-109.
Kim, K., Brunner, I. M., & Yamashita, E. Y. (2007). Use of Safety Viewgrams to Visualize Driver and Pedestrian Interactions. Transportation Research Record: Journal of the Transportation Research Board(2002), pp 72-77.
Kim, K., Made Brunner, I., & Yamashita, E. (2008). Modeling violation of Hawaii's crosswalk law. Accident Analysis & Prevention, 40(3), 894-904. doi:http://dx.doi.org/10.1016/j.aap.2007.10.004
Kim, W., Zhang, J., Fujiwara, A., Jang, T. Y., & Namgung, M. (2008). Analysis of Stopping Behavior at Urban Signalized Intersections: Empirical Study in South Korea. Transportation Research Record: Journal of the Transportation Research Board(2080), pp 84-91.
King, M. J., Soole, D., & Ghafourian, A. (2009). Illegal pedestrian crossing at signalised intersections: Incidence and relative risk. Accident Analysis & Prevention, 41(3), pp 485-490.
King, M. R., Carnegie, J. A., & Ewing, R. (2003). PEDESTRIAN SAFETY THROUGH A RAISED MEDIAN AND REDESIGNED INTERSECTIONS. Transportation Research Record(1828), p. 56-66.
Knoblauch, R. L., Pietrucha, M. T., & Nitzburg, M. (1996). FIELD STUDIES OF PEDESTRIAN WALKING SPEED AND START-UP TIME. Transportation Research Record(1538), p. 27-38.
Kockelman, K. M., & Ma, J. (2007). Freeway Speeds and Speed Variations Preceding Crashes, Within and Across Lanes. Journal of the Transportation Research Forum, 46(1), pp 43-61.
Koell, H., Bader, M., & Axhausen, K. W. (2004). DRIVER BEHAVIOUR DURING FLASHING GREEN BEFORE AMBER: A COMPARATIVE STUDY. Accident Analysis & Prevention, 36(2), p. 273-280.
Koh, P. P., Wong, Y. D., & Chandrasekar, P. (2014). Safety Evaluation of Pedestrian Behaviour and Violations at Signalised Pedestrian Crossings. Safety Science, 70, pp 143-152.
Koushki, P. A., Ali, S. Y., & Al-Saleh, O. (1998). ROAD TRAFFIC VIOLATIONS AND SEAT BELT USE IN KUWAIT: STUDY OF DRIVER BEHAVIOR IN MOTION. Transportation Research Record(1640), p. 17-22.
Koushki, P. A., Smith, R. L., & Al-Ghadeer, A. M. (1992). URBAN STOP SIGN VIOLATIONS IN SAUDI ARABIA. Transportation Quarterly, 46(3), p. 435-446.
Krivda, V. (2013). Analysis of conflict situations in road traffic on roundabouts. PROMET-Traffic & Transportation, 25(3), pp 295-.
Kroll, B. J., & Ramey, M. R. (1977). EFFECTS OF BIKE LANES ON DRIVER AND BICYCLIST BEHAVIOR. Journal of Transportation Engineering, 103(2), p. 243-256.
Kruszyna, M., & Rychlewski, J. (2013). Influence of approaching tram on behaviour of pedestrians in signalised crosswalks in Poland. Accident Analysis and Prevention, 55, 185-191. doi:10.1016/j.aap.2013.03.015
Kwon, Y., Morichi, S., & Yai, T. (1998). ANALYSIS OF PEDESTRIAN BEHAVIOR AND PLANNING GUIDELINES WITH MIXED TRAFFIC FOR NARROW URBAN STREETS. Transportation Research Record(1636), p. 116-123.
Lamm, R., & Kloeckner, J. H. (1984). INCREASE OF TRAFFIC SAFETY BY SURVEILLANCE OF SPEED LIMITS WITH AUTOMATIC RADAR DEVICES ON A DANGEROUS SECTION OF A GERMAN AUTOBAHN: A LONG-TERM INVESTIGATION. Transportation Research Record(974), pp 8-16.
LaMondia, J. J., & Duthie, J. C. (2012). Analysis of Factors Influencing Bicycle–Vehicle Interactions on Urban Roadways by Ordered Probit Regression. Transportation Research Record: Journal of the Transportation Research Board(2314), pp 81–88.
Lange, F., Haiduk, M., Schwarze, A., & Eggert, F. (2011). The dark side of stimulus control-Associations between contradictory stimulus configurations and pedestrians' and cyclists' illegal street crossing behavior. Accident Analysis and Prevention, 43(6), 2166-2172. doi:10.1016/j.aap.2011.06.008

Lank, C., & Steinauer, B. (2011). Increasing Road Safety by Influencing Drivers' Speed Choice with Sound and Vibration. Transportation Research Record: Journal of the Transportation Research Board(2248), pp 45-52.

Laureshyn, A., Ardoe, H., Svensson, A., & Jonsson, T. (2009). Application of automated video analysis for behavioural studies: concept and experience. IET Intelligent Transport Systems, 3(3), 345-357.

Leden, L., Garder, P., & Johansson, C. (2006). Safe pedestrian crossings for children and elderly. Accident Analysis and Prevention, 38(2), 289-294. doi:10.1016/j.aap.2005.09.012

Leden, L., Wikstrom, P. E., Garder, P., & Rosander, P. (2006). Safety and accessibility effects of code modifications and traffic calming of an arterial road. Accident Analysis and Prevention, 38(3), 455-461. doi:10.1016/j.aap.2005.11.002

Lee, C., & Khan, M. N. (2013). Prediction of Capacity for Roundabouts Based on Percentages of Trucks in Entry and Circulating Flows. Transportation Research Record: Journal of the Transportation Research Board(2389), pp 30–41.

Lee, T.-C., Polak, J. W., Bell, M. G. H., & Wigan, M. R. (2012). The kinematic features of motorcycles in congested urban networks. Accident Analysis & Prevention, 49, pp 203-211.

Leff, J., & Gunn, J. (1973). THE INTERACTION OF MALE AND FEMALE CAR DRIVERS AT ROUNDABOUTS. Accident Analysis & Prevention, 5(4), p. 253-259.

Lennie, S., & Bunker, J. (2006). Following behaviour behind semi-trailers and B-doubles is similar on a motorway section. Transport Engineering in Australia, 10(2), 73-85.

Li, B. (2014). A bilevel model for multivariate risk analysis of pedestrians' crossing behavior at signalized intersections. Transportation Research Part B: Methodological, 65, pp 18-30.

Li, L.-p., Li, G.-l., Cai, Q.-e., Zhang, A. L., & Lo, S. K. (2008). Improper motorcycle helmet use in provincial areas of a developing country. Accident Analysis & Prevention, 40(6), pp 1937-1942.

Li, Y., & Fernie, G. (2010). Pedestrian behavior and safety on a two-stage crossing with a center refuge island and the effect of winter weather on pedestrian compliance rate. Accident Analysis & Prevention, 42(4), pp 1156-1163.

Liang, W. L., Kyte, M., Kitchener, F., & Shannon, P. (1998). EFFECT OF ENVIRONMENTAL FACTORS ON DRIVER SPEED: A CASE STUDY. Transportation Research Record(1635), p. 155-161.

Liapis, E. D., Psarianos, B., & Kasapi, E. (2001). SPEED BEHAVIOR ANALYSIS AT CURVED RAMP SECTIONS OF MINOR INTERCHANGES. Transportation Research Record(1751), p. 35-43.

Limanond, T., Prabjabok, P., & Tippayawong, K. (2010). Exploring impacts of countdown timers on traffic operations and driver behavior at a signalized intersection in Bangkok. Transport Policy, 17(6), pp 420-427.

Lipovac, K., Tešić, M., Marić, B., & Đerić, M. (2015). Self-reported and observed seat belt use – A case study: Bosnia and Herzegovina. Accident Analysis & Prevention, 84, 74-82. doi:http://dx.doi.org/10.1016/j.aap.2015.08.010

Lipovac, K., Vujanic, M., Maric, B., & Nesic, M. (2013). The influence of a pedestrian countdown display on pedestrian behavior at signalized pedestrian crossings. Transportation Research Part F: Traffic Psychology and Behaviour, 20, pp 121-134.

Lipovac, K., Vujanic, M., Maric, B., & Nesic, M. (2013). Pedestrian Behavior at Signalized Pedestrian Crossings. Journal of Transportation Engineering, 139(2), pp 165-172.

Liu, B. S. (2007). Association of intersection approach speed with driver characteristics, vehicle type and traffic conditions comparing urban and suburban areas. Accident Analysis & Prevention, 39(2), 216-223.

Liu, M., Lu, G., Wang, Y., Wang, Y., & Zhang, Z. (2014). Preempt or Yield? An Analysis of Driver's Dynamic Decision Making at Unsignalized Intersections by Classification Tree. Safety Science, 65, pp 36-44.

Liu, M., Lu, G., Wang, Y., & Zhang, Z. (2014). Analyzing drivers' crossing decisions at unsignalized intersections in China. Transportation Research Part F: Traffic Psychology and Behaviour, 24, pp 244-255.

Liu, M., Wang, Y., Lu, G., & Zhang, Z. (2014). Logit-Based Merging Behavior Model for Uncontrolled Intersections in China. Journal of Transportation Engineering, 140(12), Content ID 04014059.

Liu, P., Zhang, X., Wang, W., & Xu, C. (2011). Driver Response to Automated Speed Enforcement on Rural Highways in China. Transportation Research Record: Journal of the Transportation Research Board(2265), pp 109-117.

Liu, Y., Chang, G.-L., & Yu, J. (2012). Empirical Study of Driver Responses during the Yellow Signal Phase at Six Maryland Intersections. Journal of Transportation Engineering, 138(1), pp 31-42.

Llorca, C., Moreno, A. T., García, A., & Pérez-Zuriaga, A. M. (2013). Daytime and Nighttime Passing Maneuvers on a Two-Lane Rural Road in Spain. Transportation Research Record: Journal of the Transportation Research Board(2358), pp 3-11.

Llorca, C., Moreno, A. T., Lenorzer, A., Casas, J., & Garcia, A. (2015). Development of a new microscopic passing maneuver model for two-lane rural roads. Transportation Research Part C: Emerging Technologies, 52, 157-172. doi:http://dx.doi.org/10.1016/j.trc.2014.06.001

Lobb, B., Harre, N., & Terry, N. (2003). AN EVALUATION OF FOUR TYPES OF RAILWAY PEDESTRIAN CROSSING SAFETY INTERVENTION. Accident Analysis & Prevention, 35(4), p. 487-494.

Long, K., Han, L. D., & Yang, Q. (2011). Effects of countdown timers on driver behavior after the yellow onset at Chinese intersection. Traffic Injury Prevention, 12(5), 538-544.

Long Xuan, N., Hanaoka, S., & Kawasaki, T. (2012). Describing Non-Lane-Based Motorcycle Movements in Motorcycle-Only Traffic Flow. Transportation Research Record(2281), 76-82. doi:10.3141/2281-10

Loskorn, J., Mills, A. F., Brady, J. F., Duthie, J. C., & Machemehl, R. B. (2013). Effects of Bicycle Boxes on Bicyclist and Motorist Behavior at Intersections in Austin, Texas. Journal of Transportation Engineering, 139(10), 1039-1046. doi:10.1061/(asce)te.1943-5436.0000584

Love, D. C., Breaud, A., Burns, S., Margulies, J., Romano, M., & Lawrence, R. (2012). Is the three-foot bicycle passing law working in Baltimore, Maryland? Accident Analysis & Prevention, 48, pp 451-456.

Lovegrove, S. A. (1978). APPROACH SPEEDS AT UNCONTROLLED INTERSECTIONS WITH RESTRICTED SIGHT DISTANCES. Journal of Applied Psychology, 63(5), p. 635-643.

Lu, G., Liu, M., Wang, Y., Wan, H., & Tian, D. (2015). Logit-Based Analysis of Drivers' Crossing Behavior at Unsignalized Intersections in China. Human Factors, 57(7), 1101-1114. doi:10.1177/0018720815592097

Lu, G., Wang, Y., Wu, X., & Liu, H. X. (2015). Analysis of yellow-light running at signalized intersections using high-resolution traffic data. Transportation Research Part A: Policy and Practice, 73, 39-52. doi:http://dx.doi.org/10.1016/j.tra.2015.01.001

Lum, K. M., & Halim, H. (2006). A before-and-after study on green signal countdown device installation. Transportation Research Part F: Traffic Psychology and Behaviour, 9(1), 29-41. doi:http://dx.doi.org/10.1016/j.trf.2005.08.007

Lum, K. M., & Tan, Y. W. (2003). DRIVER RESPONSE AT A SIGNALIZED T-INTERSECTION DURING AN AMBER BLACKOUT. Transportation Research Part F: Traffic Psychology and Behaviour, 6(3), p. 183-195.

Lum, K. M., & Wong, Y. D. (2002). A STUDY OF STOPPING PROPENSITY AT MATURED RED LIGHT CAMERA T-INTERSECTIONS. Journal of Safety Research, 33(3), p. 355-369.

Lum, K. M., & Wong, Y. D. (2003). A BEFORE-AND-AFTER STUDY OF DRIVER STOPPING PROPENSITY AT RED LIGHT CAMERA INTERSECTIONS. Accident Analysis & Prevention, 35(1), p. 111-120.

Lum, K. M., & Wong, Y. D. (2003). Impacts of red light camera on violation characteristics. Journal of Transportation Engineering-Asce, 129(6), 648-656. doi:10.1061/(asce)0733-947x(2003)129:6(648)
Lund, A. K., & Zador, P. L. (1984). MANDATORY BELT USE AND DRIVER RISK TAKING. Risk Analysis, 4(1), p. 41-53.
Luoma, J. (1995). IN-TRAFFIC DRIVER BEHAVIOR: DEVELOPMENT OF MEASURES AND EVALUATION OF DIFFERENCES BETWEEN FINLAND AND MICHIGAN. Transportation Research Record(1485), p. 71-79.
Lyles, R. W. (1982). ADVISORY AND REGULATORY SPEED SIGNS FOR CURVES: EFFECTIVE OR OVERUSED? ITE Journal, 52(8), p. 20-22.
Ma, S., Tran, N., Klyavin, V. E., Zambon, F., Hatcher, K. W., & Hyder, A. A. (2012). Seat Belt and Child Seat Use in Lipetskaya Oblast, Russia: Frequencies, Attitudes, and Perceptions. Traffic Injury Prevention, 13(sup1), pp 76-81.
Ma, W., Liu, Y., & Yang, X. (2010). Investigating the Impacts of Green Signal Countdown Devices: Empirical Approach and Case Study in China. Journal of Transportation Engineering, 136(11), pp 1049-1055.
MacCarley, C. A., Ackles, C., & Watts, T. (2006). Highway Traffic Response to Dynamic Fog Warning and Speed Advisory Messages. Transportation Research Record: Journal of the Transportation Research Board(1980), pp 95-104.
Mackie, H. W., Charlton, S. G., Baas, P. H., & Villasenor, P. C. (2013). Road user behaviour changes following a self-explaining roads intervention. Accident Analysis & Prevention, 50, pp 742-750.
Malenfant, J. E. L., & Van Houten, R. (2008). Observations of how drivers fasten their seatbelts in relation to various startup tasks. Accident Analysis & Prevention, 40(1), 309-314. doi:http://dx.doi.org/10.1016/j.aap.2007.06.009
Malkhamah, S., Tight, M., & Montgomery, F. (2005). The development of an automatic method of safety monitoring at Pelican crossings. Accident Analysis & Prevention, 37(5), 938-946. doi:http://dx.doi.org/10.1016/j.aap.2005.04.012
Manan, M. M. A. (2014). Motorcycles entering from access points and merging with traffic on primary roads in Malaysia: Behavioral and road environment influence on the occurrence of traffic conflicts. Accident Analysis and Prevention, 70, 301-313. doi:10.1016/j.aap.2014.04.009
Marczak, F., Daamen, W., & Buisson, C. (2013). Merging behaviour: Empirical comparison between two sites and new theory development. Transportation Research Part C-Emerging Technologies, 36, 530-546. doi:10.1016/j.trc.2013.07.007
Martinez, K. L. H., & Porter, B. E. (2006). Characterizing Red Light Runners Following Implementation of a Photo Enforcement Program. Accident Analysis & Prevention, 38(5), pp 862-870.
Matírnez, A., Mántaras, D. A., & Luque, P. (2013). Reducing posted speed and perceptual countermeasures to improve safety in road stretches with a high concentration of accidents. Safety Science, 60, 160-168. doi:http://dx.doi.org/10.1016/j.ssci.2013.07.003
Matsuura, T., Ishida, T., & Ishimatsu, K. (2002). CHANGES IN SEATBELT USE AFTER LICENSING: A DEVELOPMENTAL HYPOTHESIS FOR NOVICE DRIVERS. Transportation Research Part F: Traffic Psychology and Behaviour, 5(1), p. 1-13.
Matthews, M. L. (1978). FIELD STUDY OF THE EFFECTS OF DRIVERS' ADAPTATION TO AUTOMOBILE VELOCITY. Human Factors: The Journal of the Human Factors and Ergonomics Society, 20(6), p. 709-716.
Matthews, M. L. (1979). IMPACT OF HIGHWAY METRICATION ON TRAFFIC ACCIDENTS AND LONG-TERM TRENDS IN VEHICLE SPEEDS FOR ROADS WITH RESULTANT INCREASED SPEED LIMITS. Human Factors: The Journal of the Human Factors and Ergonomics Society, 21(4), p. 503-507.
Matthews, M. L. (1982). Seat belt use in Ontario four years after mandating legislation. Accident Analysis & Prevention, 14(6), 431-438. doi:http://dx.doi.org/10.1016/0001-4575(82)90056-2
McEachern, C. (1949). A FOUR-WAY STOP-SIGN SYSTEM AT URBAN INTERSECTIONS. Traffic Quarterly, 3(2), p. 128-137.
McIlvenny, S., Al Mahrouql, F., Al Busaidi, T., Al Nabhani, A., Al Hikmani, F., Al Kharousi, Z., . . . Al Kahrousi, I. (2004). REAR SEAT BELT USE AS AN INDICATOR OF SAFE ROAD BEHAVIOUR IN A RAPIDLY DEVELOPING COUNTRY. Journal of the Royal Society of Health, 124(6), p. 280-283.
Meeker, F., Fox, D., & Weber, C. (1997). A comparison of driver behavior at railroad grade crossings with two different protection systems. Accident Analysis & Prevention, 29(1), 11-16. doi:http://dx.doi.org/10.1016/S0001-4575(96)00055-3
Meeker, F. L., & Barr, R. A. (1989). An observational study of driver behavior at a protected railroad grade crossing as trains approach. Accident Analysis & Prevention, 21(3), 255-262. doi:http://dx.doi.org/10.1016/0001-4575(89)90016-X
Mehmood, A. (2010). Evaluating Impact of Demerit Points System on Speeding Behavior of Drivers. European Transport Research Review, 2(1), pp 25-30.
Meng, L. K. (2006). Pedestrian and driver behavioural interactions at zebra crossings in Singapore. Road and Transport Research, 15(3), 50-62.
Michael, P. G., Leeming, F. C., & Dwyer, W. O. (2000). HEADWAY ON URBAN STREETS: OBSERVATIONAL DATA AND AN INTERVENTION TO DECREASE TAILGATING. Transportation Research Part F: Traffic Psychology and Behaviour, 3(2), p. 55-64.
Michaels, R. M., & Fazio, J. (1989). DRIVER BEHAVIOR MODEL OF MERGING. Transportation Research Record(1213), p. 4-10.
Miles, J. D., Pratt, M. P., & Carlson, P. J. (2006). Evaluation of Erratic Maneuvers Associated with Installation of Rumble Strips. Transportation Research Record: Journal of the Transportation Research Board(1973), pp 73-79.
Mirabella, J. A., & Zhang, Y. (2014). Understanding Pedestrian and Bicyclist Compliance and Safety Impacts of Walk Modes at Signalized Intersections for a Livable Community. Transportation Research Record: Journal of the Transportation Research Board(2464), pp 77–85.
Mirza, S., Mirza, M., Chotani, H., & Luby, S. (1999). Risky behavior of bus commuters and bus drivers in Karachi, Pakistan. Accident Analysis & Prevention, 31(4), 329-333. doi:http://dx.doi.org/10.1016/S0001-4575(98)00025-6
Misaghi, P., & Hassan, Y. (2005). Modeling Operating Speed and Speed Differential on Two-Lane Rural Roads. Journal of Transportation Engineering, 131(6), pp 408-418.
Mitman, M. F., Cooper, D., & DuBose, B. (2010). Driver and Pedestrian Behavior at Uncontrolled Crosswalks in Tahoe Basin Recreation Area of California. Transportation Research Record: Journal of the Transportation Research Board(2198), pp 23-31.
Mitman, M. F., Ragland, D. R., & Zegeer, C. V. (2008). Marked-Crosswalk Dilemma: Uncovering Some Missing Links in a 35-Year Debate. Transportation Research Record: Journal of the Transportation Research Board(2073), pp 86-93.
Molen, H. H. v. d. (1982). BEHAVIOR OF CHILDREN AND ACCOMPANYING ADULTS AT A PEDESTRIAN CROSSWALK. Journal of Safety Research, 13(3), p. 113-119.
Montella, A., Imbriani, L. L., Marzano, V., & Mauriello, F. (2015). Effects on speed and safety of point-to-point speed enforcement systems: Evaluation on the urban motorway A56 Tangenziale di Napoli. Accident Analysis & Prevention, 75, pp 164-178.
Montella, A., Punzo, V., Chiaradonna, S., Mauriello, F., & Montanino, M. (2015). Point-to-point speed enforcement systems: Speed limits design criteria and analysis of drivers' compliance. Transportation Research Part C-Emerging Technologies, 53, 1-18. doi:10.1016/j.trc.2015.01.025
Morenikeji, W., & Umaru, E. (2012). Flying Without Navigational Aids – The Case of Commercial Motorcyclists in Minna, Nigeria. Transportation Research Part F: Traffic Psychology and Behaviour, 15(3), pp 311-318.

Mortimer, R. G., Goldsteen, K., Armstrong, R. W., & Macrina, D. (1990). Effects of incentives and enforcement on the use of seat belts by drivers. Journal of Safety Research, 21(1), 25-37. doi:http://dx.doi.org/10.1016/0022-4375(90)90045-D

Moukhwas, D. (1987). ROAD JUNCTION CONVEX MIRRORS. Applied Ergonomics, 18(2), p. 133-136.

Muchuruza, V., Moses, R., & Thuo, G. (2007). Evaluation of a Behavioral Cellular-Based Traffic Model. Advances in Transportation Studies, 13, pp 27-40.

Mutabazi, M., & Dindial, R. (2007). Field Evaluation of New Pedestrian Crossing in Trinidad and Tobago: Effect of Flashing Light Operation. Transportation Research Record: Journal of the Transportation Research Board(2038), pp 93-97.

Nagraj, R., & Vedagiri, P. (2013). Modeling Pedestrian Delay and Level of Service at Signalized Intersection Crosswalks Under Mixed Traffic Conditions. Transportation Research Record: Journal of the Transportation Research Board(2394), pp 70–76.

Nambisan, S. S., Pulugurtha, S. S., Vasudevan, V., Dangeti, M. R., & Virupaksha, V. (2009). Effectiveness of Automatic Pedestrian Detection Device and Smart Lighting for Pedestrian Safety. Transportation Research Record: Journal of the Transportation Research Board(2140), pp 27-34.

Nasar, J., Hecht, P., & Wener, R. (2008). Mobile telephones, distracted attention, and pedestrian safety. Accident Analysis & Prevention, 40(1), pp 69-75.

Nasar, J. L. (2003). PROMPTING DRIVERS TO STOP FOR CROSSING PEDESTRIANS. Transportation Research Part F: Traffic Psychology and Behaviour, 6(3), p. 175-182.

Nau, P. A., & Van Houten, R. (1981). THE EFFECTS OF PROMPTS, FEEDBACK AND AN ADVERTISING CAMPAIGN ON THE USE OF SAFETY BELTS BY AUTOMOBILE DRIVERS IN NOVA SCOTIA. Journal of Environmental Systems, 11(4), p. 351-361.

Nepal, K. P. (2015). An assessment of existing bicycle advisory pavement marking on urban roads. Road and Transport Research, 24(2), 42-53.

Newman, B. R., Washburn, S. S., & Nihan, N. L. (1998). MOTORIST BEHAVIOR AND OPINIONS TOWARD HIGH-OCCUPANCY VEHICLE LANES AT RAMP METERS. Transportation Research Record(1634), p. 78-85.

Ng, O. K., & Saccomanno, F. F. (2010). Speed Reduction Profiles Affecting Vehicle Interactions at Level Crossings with No Trains. Transportation Research Record(2149), 108-114. doi:10.3141/2149-13

Ni, Y., & Li, K. (2014). Estimating Rear-End Accident Probabilities at Signalized Intersections: A Comparison Study of Intersections With and Without Green Signal Countdown Devices. Traffic Injury Prevention, 15(6), pp 583-590.

Noyce, D. A., & Fambro, D. B. (1998). ENHANCED TRAFFIC CONTROL DEVICES AT PASSIVE HIGHWAY-RAILROAD GRADE CROSSINGS. Transportation Research Record(1648), p. 19-27.

Noyce, D. A., Fambro, D. B., & Kacir, K. C. (2000). TRAFFIC CHARACTERISTICS OF PROTECTED/PERMITTED LEFT-TURN SIGNAL DISPLAYS. Transportation Research Record(1708), p. 28-39.

Okamura, K., Fujita, G., Kihira, M., Kosuge, R., & Mitsui, T. (2012). Predicting motivational determinants of seatbelt non-use in the front seat: A field study. Transportation Research Part F: Traffic Psychology and Behaviour, 15(5), pp 502-513.

Okinaka, T., & Shimazaki, T. (2011). The Effects of Prompting And Reinforcement on Safe Behavior of Bicycle and Motorcycle Riders. Journal of Applied Behavior Analysis, 44(3), pp 671-674.

Olsen, R. A., & Hostetter, R. S. (1976). DESCRIBING AND SHAPING MERGING BEHAVIOR OF FREEWAY DRIVERS. Transportation Research Record(605), pp 7-13.

Onelcin, P., & Alver, Y. (2015). Illegal crossing behavior of pedestrians at signalized intersections: Factors affecting the gap acceptance. Transportation Research Part F: Traffic Psychology and Behaviour, 31, pp 124-132.

Orlowske, L. L., & Luyben, P. D. (2009). Risky Behavior: Cell Phone Use While Driving. Journal of Prevention & Intervention in the Community, 37(3), pp 221-229.

Osberg, J. S., & Stiles, S. C. (1998). BICYCLE USE AND SAFETY IN PARIS, BOSTON, AND AMSTERDAM. Transportation Quarterly, 52(4), p. 61-76.

Ossen, S., & Hoogendoorn, S. P. (2011). Heterogeneity in car-following behavior: Theory and empirics. Transportation Research Part C: Emerging Technologies, 19(2), 182-195. doi:http://dx.doi.org/10.1016/j.trc.2010.05.006

Ottomanelli, M., Iannucci, G., & Sassanelli, D. (2012). Simplified Model for Pedestrian–Vehicle Interactions at Road Crossings Based on Discrete Events System. Transportation Research Record: Journal of the Transportation Research Board(2316), pp 58–68.

Oxley, J., Fildes, B., Ihsen, E., Charlton, J., & Day, R. (1997). DIFFERENCES IN TRAFFIC JUDGEMENTS BETWEEN YOUNG AND OLD ADULT PEDESTRIANS. Accident Analysis & Prevention, 29(6), p. 839-847.

Padget, E. D., Knapp, K. K., & Thomas, G. B. (2001). INVESTIGATION OF WINTER-WEATHER SPEED VARIABILITY IN SPORT UTILITY VEHICLES, PICKUP TRUCKS, AND PASSENGER CARS. Transportation Research Record(1779), p. 116-124.

Pai, C.-W., Hsu, J.-J., Chang, J.-L., & Kuo, M.-S. (2013). Motorcyclists violating hook-turn area at intersections in Taiwan: An observational study. Accident Analysis and Prevention, 59, 1-8. doi:10.1016/j.aap.2013.04.034

Pai, C.-W., & Jou, R.-C. (2014). Cyclists' red-light running behaviours: An examination of risk-taking, opportunistic, and law-obeying behaviours. Accident Analysis & Prevention, 62, pp 191-198.

Pant, P. D., & Balakrishnan, P. (1994). NEURAL-NETWORK FOR GAP ACCEPTANCE AT STOP-CONTROLLED INTERSECTIONS. Journal of Transportation Engineering-Asce, 120(3), 432-446. doi:10.1061/(asce)0733-947x(1994)120:3(432)

Papadimitriou, E., Yannis, G., & Golias, J. (2010). Theoretical Framework for Modeling Pedestrians' Crossing Behavior along a Trip. Journal of Transportation Engineering, 136(10), pp 914-924.

Papageorgiou, M., Kosmatopoulos, E., & Papamichail, I. (2008). Effects of Variable Speed Limits on Motorway Traffic Flow. Transportation Research Record: Journal of the Transportation Research Board(2047), pp 37-48.

Papaioannou, P. (2007). Driver behaviour, dilemma zone and safety effects at urban signalised intersections in Greece. Accident Analysis & Prevention, 39(1), 147-158. doi:http://dx.doi.org/10.1016/j.aap.2006.06.014

Papakostopoulos, V., Nathanael, D., Portouli, E., & Marmaras, N. (2015). The effects of changes in the traffic scene during overtaking. Accident Analysis and Prevention, 79, 126-132. doi:10.1016/j.aap.2015.02.025

Parada, M. A., Cohn, L. D., Gonzalez, E., Byrd, T., & Cortes, M. (2001). The validity of self-reported seatbelt use: Hispanic and non-Hispanic drivers in El Paso. Accident Analysis & Prevention, 33(1), 139-143. doi:http://dx.doi.org/10.1016/S0001-4575(00)00012-9

Pau, M. (2002). SPEED BUMPS MAY INDUCE IMPROPER DRIVERS' BEHAVIOR: CASE STUDY IN ITALY. Journal of Transportation Engineering, 128(5), p. 472-479.

Pau, M., & Angius, S. (2001). Do speed bumps really decrease traffic speed? An Italian experience. Accident Analysis & Prevention, 33(5), 585-597. doi:http://dx.doi.org/10.1016/S0001-4575(00)00070-1

Pawar, D. S., & Patil, G. R. (2015). Pedestrian Temporal and Spatial Gap Acceptance at Mid-Block Street Crossing in Developing World. Journal of Safety Research, 52, pp 39-46.

Perco, P., Marchionna, A., & Falconetti, N. (2012). Prediction of the Operating Speed Profile Approaching and Departing Intersections. Journal of Transportation Engineering, 138(12), pp 1476-1483.

Pfeffer, K., Fagbemi, H. P., & Stennet, S. (2010). Adult Pedestrian Behavior When Accompanying Children on the Route to School. Traffic Injury Prevention, 11(2), pp. 188-193.

Phillips, R. O., Bjornskau, T., Hagman, R., & Sagberg, F. (2011). Reduction in car-bicycle conflict at a road-cycle path intersection: Evidence of road user adaptation? Transportation Research Part F: Traffic Psychology and Behaviour, 14(2), pp 87-95.

Polders, E., Cornu, J., De Ceunynck, T., Daniels, S., Brijs, K., Brijs, T., . . . Wets, G. (2015). Drivers' behavioral responses to combined speed and red light cameras. Accident Analysis & Prevention, 81, pp 153-166.

Polus, A., Craus, J., Livneh, M., & Katznelson, S. (1999). Analysis of flow, safety and warrants for paved shoulders on two-lane rural highways. Road and Transport Research, 8(1), 42-56.

Polus, A., Livneh, M., & Factor, J. (1985). VEHICLE FLOW CHARACTERISTICS ON ACCELERATION LANES. Journal of Transportation Engineering, 111(6), p. 595-606.

Polus, A., Livneh, M., & Frischer, B. (2000). EVALUATION OF THE PASSING PROCESS ON TWO-LANE RURAL HIGHWAYS. Transportation Research Record(1701), p. 53-60.

Porter, B. E., & England, K. J. (2000). PREDICTING RED-LIGHT RUNNING BEHAVIOR: A TRAFFIC SAFETY STUDY IN THREE URBAN SETTINGS. Journal of Safety Research, 31(1), p. 1-8.

Porter, B. E., Johnson, K. L., & Bland, J. F. (2013). Turning off the cameras: Red light running characteristics and rates after photo enforcement legislation expired. Accident Analysis & Prevention, 50, pp 1104-1111.

Postans, R. L., & Wilson, W. T. (1983). CLOSE-FOLLOWING ON THE MOTORWAY. Ergonomics, 26(4), p. 317-327.

Potts, I. B., Fitzpatrick, K., Lucas, L. M., Bauer, K. M., Hutton, J. M., & Fees, C. A. (2015). Effect of Beacon Activation and Traffic Volume on Driver Yielding Behavior at Rapid Flashing Beacons. Transportation Research Record: Journal of the Transportation Research Board(2492), pp 78–83.

Prashker, J. N., & Mahalel, D. (1989). THE RELATIONSHIP BETWEEN AN OPTION SPACE AND DRIVERS' INDECISION AT SIGNALIZED INTERSECTION APPROACHES. Transportation Research Part B: Methodological, 23B(6), p. 401-413.

Prat, F., Planes, M., Gras, M. E., & Sullman, M. J. M. (2015). An observational study of driving distractions on urban roads in Spain. Accident Analysis & Prevention, 74, 8-16. doi:http://dx.doi.org/10.1016/j.aap.2014.10.003

Preusser, D. F., Lund, A. K., Williams, A. F., & Blomberg, R. D. (1988). BELT USE BY HIGH-RISK DRIVERS BEFORE AND AFTER NEW YORK'S SEAT BELT USE LAW. Accident Analysis & Prevention, 20(4), p. 245-250.

Pulugurtha, S. S., Vasudevan, V., Nambisan, S. S., & Dangeti, M. R. (2012). Evaluating Effectiveness of Infrastructure-Based Countermeasures for Pedestrian Safety. Transportation Research Record: Journal of the Transportation Research Board(2299), pp 100–109.

Qi, Y., Ishak, S., Wolshon, B., & Alecsandru, C. (2012). Traffic Behavior and Compliance to Truck-Restriction Policies on Four-Lane Rural Freeways. Journal of Transportation Safety & Security, 4(2), pp 160-177.

Quistberg, D. A., Koepsell, T. D., Boyle, L. N., Jaime Miranda, J., Johnston, B. D., & Ebel, B. E. (2014). Pedestrian signalization and the risk of pedestrian-motor vehicle collisions in Lima, Peru. Accident Analysis and Prevention, 70, 273-281. doi:10.1016/j.aap.2014.04.012

Rabideau, G. F., & Young, P. B. (1979). EFFECTS OF VEHICLE RUNNING LIGHTS AND OTHER TRAFFIC VARIABLES ON DRIVERS' GAP ACCEPTANCE DECISIONS AT URBAN STOP-SIGNED INTERSECTIONS. Ergonomics, 22(6), p. 763.

Ragnarsson, R. S., & Bjorgvinsson, T. (1991). EFFECTS OF PUBLIC POSTING ON DRIVING SPEED IN ICELANDIC TRAFFIC. Journal of Applied Behavior Analysis, 24(1), p. 53-58.

Rahman, A., & Lownes, N. E. (2012). Analysis of rainfall impacts on platooned vehicle spacing and speed. Transportation Research Part F: Traffic Psychology and Behaviour, 15(4), pp. 395-403.

Rama, P. (1999). EFFECTS OF WEATHER-CONTROLLED VARIABLE SPEED LIMITS AND WARNING SIGNS ON DRIVER BEHAVIOR. Transportation Research Record(1689), p. 53-59.

Rama, P., & Kulmala, R. (2000). EFFECTS OF VARIABLE MESSAGE SIGNS FOR SLIPPERY ROAD CONDITIONS ON DRIVING SPEED AND HEADWAYS. Transportation Research Part F: Traffic Psychology and Behaviour, 3(2), p. 85-94.

Rasanen, M. (2005). Effects of a rumble strip barrier line on lane keeping in a curve. Accident Analysis and Prevention, 37(3), 575-581. doi:10.1016/j.aap.2005.02.001

Räsänen, M., Koivisto, I., & Summala, H. (1999). Car Driver and Bicyclist Behavior at Bicycle Crossings Under Different Priority Regulations. Journal of Safety Research, 30(1), 67-77. doi:http://dx.doi.org/10.1016/S0022-4375(98)00062-0

Rasanen, M., & Summala, H. (2000). CAR DRIVERS' ADJUSTMENTS TO CYCLISTS AT ROUNDABOUTS. Transportation Human Factors, 2(1), p. 1-17.

Reading, J. B. (1973). PEDESTRIAN PROTECTION THROUGH BEHAVIOR MODIFICATION. Traffic Engineering, 43(10), 8 p.

Reinfurt, D. W., Campbell, B. J., Stewart, J. R., & Stutts, J. C. (1990). Evaluating the North Carolina safety belt wearing law. Accident Analysis & Prevention, 22(3), 197-210. doi:http://dx.doi.org/10.1016/0001-4575(90)90012-A

Ren, G., Zhou, Z., Wang, W., Zhang, Y., & Wang, W. (2011). Crossing Behaviors of Pedestrians at Signalized Intersections: Observational Study and Survey in China. Transportation Research Record: Journal of the Transportation Research Board(2264), pp 65-73.

Retting, R. A., & Williams, A. F. (1996). Characteristics of red light violators: Results of a field investigation. Journal of Safety Research, 27(1), 9-15. doi:http://dx.doi.org/10.1016/0022-4375(95)00026-7

Rice, P. W. (1952). THE 'YIELD-RIGHT-OF-WAY' SIGN. Traffic Quarterly, 6(1), p. 51-58.

Richardson, M., & Caulfield, B. (2015). Investigating traffic light violations by cyclists in Dublin City Centre. Accident Analysis and Prevention, 84, 65-73. doi:10.1016/j.aap.2015.08.011

Richter, T., & Zierke, B. (2010). Effect of a New Cross-Section Design on Low-Volume Roads. Transportation Research Record: Journal of the Transportation Research Board(2195), pp 14-19.

Rietgraf, A., & Schattler, K. L. (2013). Behavior of Left-Turning Drivers During Permissive Interval of Protected–Permissive Operation: Effect of Signal Display. Transportation Research Record: Journal of the Transportation Research Board(2384), pp 35–44.

Ring, J. B., & Sadek, A. W. (2012). Predicting Lane Utilization and Merge Behavior at Signalized Intersections with Auxiliary Lanes in Buffalo, New York. Journal of Transportation Engineering-Asce, 138(9), 1143-1150. doi:10.1061/(asce)te.1943-5436.0000426

Robertson, H. D. (1976). URBAN INTERSECTIONS: PROBLEMS IN SHARING SPACE. Traffic Engineering, 46(2), p. 22-25.

Ros, B. G., Knoop, V. L., van Arem, B., & Hoogendoorn, S. P. (2014). Empirical analysis of the causes of stop-and-go waves at sags. IET Intelligent Transport Systems, 8(5), 499-506. doi:10.1049/iet-its.2013.0102

Rosenbloom, T. (2006). Driving performance while using cell phones: an observational study. Journal of Safety Research, 37(2), 207-212. doi:http://dx.doi.org/10.1016/j.jsr.2005.11.007

Rosenbloom, T. (2009). Crossing at a red light: Behaviour of individuals and groups. Transportation Research Part F: Traffic Psychology and Behaviour, 12(5), pp 389-394.

Rosenbloom, T. (2011). Traffic light compliance by civilians, soldiers and military officers. Accident Analysis & Prevention, 43(6), pp 2010-2014.

Rosenbloom, T., Ben-Eliyahu, A., & Nemrodov, D. (2008). Children's crossing behavior with an accompanying adult. Safety Science, 46(8), 1248-1254. doi:http://dx.doi.org/10.1016/j.ssci.2007.07.004

Rosenbloom, T., Ben-Eliyahu, A., Nemrodov, D., Biegel, A., & Perlman, A. (2009). Committing driving violations: An observational study comparing city, town and village. Journal of Safety Research, 40(3), 215-219. doi:http://dx.doi.org/10.1016/j.jsr.2009.03.006

Rosenbloom, T., Nemrodov, D., & Barkan, H. (2004). For heaven's sake follow the rules: pedestrians' behavior in an ultra-orthodox and non-orthodox city. Transportation Research Part F: Traffic Psychology and Behaviour, 7F(6), 395-404.

Rosenbloom, T., Nemrodov, D., & Ben Eliyahu, A. (2006). Yielding Behavior of Israeli Drivers: Interaction of Age and Sex. Perceptual and Motor Skills, 103(2), pp 387-390.

Rosenbloom, T., & Pereg, A. (2012). A within-subject design of comparison of waiting time of pedestrians before crossing three successive road crossings. Transportation Research Part F: Traffic Psychology and Behaviour, 15(6), pp 625-634.

Rosenbloom, T., Pereg, A., & Perlman, A. (2014). Compliance with Traffic Laws by Traffic Police Officers, Non-Traffic Police Officers, and Civilian Drivers. Traffic Injury Prevention, 15(5), pp 446-450.

Rosenbloom, T., Perlman, A., & Shahar, A. (2007). Women Drivers' Behavior in Well-Known Versus Less Familiar Locations. Journal of Safety Research, 38(3), pp 283-288.

Rosenbloom, T., Shahar, A., & Perlman, A. (2008). Compliance of Ultra-Orthodox and secular pedestrians with traffic lights in Ultra-Orthodox and secular locations. Accident Analysis and Prevention, 40(6), 1919-1924. doi:10.1016/j.aap.2008.08.004

Rudloff, C., Matyus, T., Seer, S., & Bauer, D. (2011). Can Walking Behavior Be Predicted? Analysis of Calibration and Fit of Pedestrian Models. Transportation Research Record: Journal of the Transportation Research Board(2264), pp 101-109.

Rudloff, C., Schoenauer, R., & Fellendorf, M. (2013). Comparing Calibrated Shared Space Simulation Model with Real-Life Data. Transportation Research Record(2390), 44-52. doi:10.3141/2390-05

Russam, K. (1984). MOTORWAY SIGNALS AND THE DETECTION OF INCIDENTS. Transportation Planning and Technology, 9(2), p. 99-108.

Russo, B. J., Kay, J. J., Savolainen, P. T., & Gates, T. J. (2014). Assessing characteristics related to the use of seatbelts and cell phones by drivers: Application of a bivariate probit model. Journal of Safety Research, 49, 137.e131-142. doi:http://dx.doi.org/10.1016/j.jsr.2014.03.001

Russo, F., Fric, S., Biancardo, S. A., & Gavran, D. (2015). Driver Speed Behavior on Circular Curves of Undivided Two-Lane Rural Roads: Serbian and Italian Case Studies. Transportation Research Record: Journal of the Transportation Research Board(2472), pp 117-128.

Rys, M. J., Shah, H. D., & Russell, E. E. (2009). Study of Driver's Behavior at Passive Railroad-Highway Grade Crossings. Journal of the Transportation Research Forum, 48(2), pp 39-50.

Sagberg, F., Fosser, S., & Saetermo, I. A. F. (1997). An investigation of behavioural adaptation to airbags and antilock brakes among taxi drivers. Accident Analysis and Prevention, 29(3), 293-302. doi:10.1016/s0001-4575(96)00083-8

Sakshaug, L., Laureshyn, A., Svensson, A., & Hyden, C. (2010). Cyclists in roundabouts-Different design solutions. Accident Analysis and Prevention, 42(4), 1338-1351. doi:10.1016/j.aap.2010.02.015

Salamati, K., Schroeder, B. J., Geruschat, D. R., & Rouphail, N. M. (2013). Event-Based Modeling of Driver Yielding Behavior to Pedestrians at Two-Lane Roundabout Approaches. Transportation Research Record: Journal of the Transportation Research Board(2389), pp 1–11.

Samuel, S., Romoser, M. R. E., Gerardino, L. R., Hamid, M., Gómez, R. A., Knodler, M. A., . . . Fisher, D. L. (2013). Effect of Advance Yield Markings and Symbolic Signs on Vehicle–Pedestrian Conflicts: Field Evaluation. Transportation Research Record: Journal of the Transportation Research Board(2393), pp 139–146.

Sarvi, M. (2013). Heavy Commercial Vehicles-Following Behavior and Interactions with Different Vehicle Classes. Journal of Advanced Transportation, 47(6), pp 572-580.

Sarvi, M., & Kuwahara, M. (2009). Improving the Efficiency of Freight Traffic at Congested Freeway Merging Sections. Transportation Letters: The International Journal of Transportation Research, 1(4), pp 309-322.

Savolainen, P. T., Datta, T. K., Ghosh, I., & Gates, T. J. (2010). Effects of Dynamically Activated Emergency Vehicle Warning Sign on Driver Behavior at Urban Intersections. Transportation Research Record: Journal of the Transportation Research Board(2149), pp 77-83.

Savolainen, P. T., Gates, T. J., & Datta, T. K. (2011). Implementation of Targeted Pedestrian Traffic Enforcement Programs in an Urban Environment. Transportation Research Record: Journal of the Transportation Research Board(2265), pp 137-145.

Savolainen, P. T., Gates, T. J., Todd, R. G., Datta, T. K., & Morena, J. G. (2012). Lateral Placement of Motor Vehicles When Passing Bicyclists: Assessing Influence of Centerline Rumble Strips. Transportation Research Record: Journal of the Transportation Research Board(2314), pp 14–21.

Sayed, T., Zaki, M. H., & Autey, J. (2013). Automated safety diagnosis of vehicle–bicycle interactions using computer vision analysis. Safety Science, 59, 163-172. doi:http://dx.doi.org/10.1016/j.ssci.2013.05.009

Schattler, K. L., & Datta, T. K. (2004). DRIVER BEHAVIOR CHARACTERISTICS AT URBAN SIGNALIZED INTERSECTIONS. Transportation Research Record(1862), p. 17-23.

Schattler, K. L., Wakim, J. G., Datta, T. K., & McAvoy, D. (2007). Evaluation of pedestrian and driver Behaviors at countdown pedestrian signals in Peoria, Illinois. Transportation Research Record(2002), 98-106. doi:10.3141/2002-13

Schmidt, R. E. (1954). HIGHWAY SPEEDS VS. HORSEPOWER. Traffic Quarterly, 8(3), p. 339-350.

Schnüll, R., & Lange, J. (1992). Speed reduction on through roads in nordrhein-westfalen. Accident Analysis & Prevention, 24(1), 67-74. doi:http://dx.doi.org/10.1016/0001-4575(92)90073-R

Schroeder, B. J., & Rouphail, N. M. (2011). Event-Based Modeling of Driver Yielding Behavior at Unsignalized Crosswalks. Journal of Transportation Engineering, 137(7), pp 455-465.

Schroeder, B. J., Rouphail, N. M., & Hughes, R. G. (2009). Working Concept of Accessibility: Performance Measures for the Usability of Crosswalks by Pedestrians with Vision Impairments. Transportation Research Record: Journal of the Transportation Research Board(2140), pp 103-110.

Sharma, A., Bullock, D., & Peeta, S. (2011). Estimating dilemma zone hazard function at high speed isolated intersection. Transportation Research Part C: Emerging Technologies, 19(3), 400-412. doi:http://dx.doi.org/10.1016/j.trc.2010.05.002

Sheffi, Y., & Mahmassani, H. (1981). MODEL OF DRIVER BEHAVIOR AT HIGH SPEED SIGNALIZED INTERSECTIONS. Transportation Science, 15(1), p. 50-61.

Shelby, M. D., & Tutt, P. R. (1958). VEHICLE SPEED AND PLACEMENT SURVEY. Highway Research Board Bulletin(170).

Shi, J., Chen, Y., Ren, F., & Rong, J. (2007). Research on Pedestrian Behavior and Traffic Characteristics at Unsignalized Midblock Crosswalk: Case Study in Beijing. Transportation Research Record: Journal of the Transportation Research Board(2038), pp 23-33.

Shinar, D., & Compton, R. (2004). Aggressive driving: an observational study of driver, vehicle, and situational variables. Accident Analysis & Prevention, 36(3), 429-437. doi:http://dx.doi.org/10.1016/S0001-4575(03)00037-X

Shiomi, Y., Taniguchi, T., Uno, N., Shimamoto, H., & Nakamura, T. (2015). Multilane first-order traffic flow model with endogenous representation of lane-flow equilibrium. Transportation Research Part C: Emerging Technologies, 59, 198-215. doi:http://dx.doi.org/10.1016/j.trc.2015.07.002

Simons-Morton, B., Lerner, N., & Singer, J. (2005). The observed effects of teenage passengers on the risky driving behavior of teenage drivers. Accident Analysis & Prevention, 37(6), 973-982. doi:http://dx.doi.org/10.1016/j.aap.2005.04.014

Siques, J. T. (2002). EFFECTS OF PEDESTRIAN TREATMENTS ON RISKY PEDESTRIAN BEHAVIOR. Transportation Research Record(1793), p. 62-70.

Sisiopiku, V. P., & Akin, D. (2003). PEDESTRIAN BEHAVIORS AT AND PERCEPTIONS TOWARDS VARIOUS PEDESTRIAN FACILITIES: AN EXAMINATION BASED ON OBSERVATION AND SURVEY DATA. Transportation Research Part F: Traffic Psychology and Behaviour, 6(4), p. 249-274.

Siuhi, S., & Kaseko, M. (2013). Nonlinear Acceleration and Deceleration Response Behavior in Stimulus-Response Car-Following Models. Advances in Transportation Studies(31), pp 81-96.

Sivak, M., Post, D. V., Olson, P. L., & Donohue, R. J. (1981). DRIVER RESPONSES TO HIGH-MOUNTED BRAKE LIGHTS IN ACTUAL TRAFFIC. Human Factors: The Journal of the Human Factors and Ergonomics Society, 23(2), p. 231-235.

Smith, R. G., & Lovegrove, A. (1983). DANGER COMPENSATION EFFECTS OF STOP SIGNS AT INTERSECTIONS. Accident Analysis & Prevention, 15(2), p. 95-104.

Solberg, P., & Oppenlander, J. C. (1966). LAG AND GAP ACCEPTANCES AT STOP-CONTROLLED INTERSECTIONS. Highway Research Record(118), pp 48-67.

Song, M., Wang, J.-H., & Maier-Speredelozzi, V. (2011). Tailgating on Urban Highways and Possible Means to Mitigate Tailgating Behavior. Journal of Transportation of the Institute of Transportation Engineers, 2(1), pp 71-89.

Spacek, P. (2005). Track Behavior in Curve Areas: Attempt at Typology. Journal of Transportation Engineering, 131(9), pp 669-676.

Spek, A. C. E., Wieringa, P. A., & Janssen, W. H. (2006). Intersection Approach Speed and Accident Probability. Transportation Research Part F: Traffic Psychology and Behaviour, 9(2), pp 155-171.

St-Aubin, P., Miranda-Moreno, L., & Saunier, N. (2013). An automated surrogate safety analysis at protected highway ramps using cross-sectional and before–after video data. Transportation Research Part C: Emerging Technologies, 36, 284-295. doi:http://dx.doi.org/10.1016/j.trc.2013.08.015

St-Aubin, P., Saunier, N., Miranda-Moreno, L. F., & Ismail, K. (2013). Use of Computer Vision Data for Detailed Driver Behavior Analysis and Trajectory Interpretation at Roundabouts. Transportation Research Record: Journal of the Transportation Research Board(2389), pp 65–77.

Steele, D. A., & Vavrik, W. R. (2010). Improving the Safety of Mobile Lane Closures. Transportation Research Record: Journal of the Transportation Research Board(2169), pp 11-20.

Steyvers, F., & de Waard, D. (2000). Road-edge delineation in rural areas: effects on driving behaviour. Ergonomics, 43(2), 223-238. doi:10.1080/001401300184576

Strawderman, L., Rahman, M. M., Huang, Y., & Nandi, A. (2015). Driver behavior and accident frequency in school zones: Assessing the impact of sign saturation. Accident Analysis & Prevention, 82, pp 118-125.

Strong, C., & Ye, Z. (2010). Spillover effects of yield-to-pedestrian channelizing devices. Safety Science, 48(3), pp 342-347.

Styles, T., Cairney, P., Studwick, G., & Purtill, S. (2004). Effects of self-activated pavement markers on driver behaviour. Road and Transport Research, 13(2), 98-100.

Sueur, C., Class, B., Hamm, C., Meyer, X., & Pele, M. (2013). Different risk thresholds in pedestrian road crossing behaviour: A comparison of French and Japanese approaches. Accident Analysis and Prevention, 58, 59-63. doi:10.1016/j.aap.2013.04.027

Sullman, M. J. M. (2012). An Observational Study of Driver Distraction in England. Transportation Research Part F: Traffic Psychology and Behaviour, 15(3), pp 272-278.

Summala, H. (1980). HOW DOES IT CHANGE SAFETY MARGINS IF OVERTAKING IS PROHIBITED: A PILOT STUDY. Accident Analysis & Prevention, 12(2), p. 95-103.

Summala, H., Pasanen, E., Räsänen, M., & Sievänen, J. (1996). Bicycle accidents and drivers' visual search at left and right turns. Accident Analysis & Prevention, 28(2), 147-153. doi:http://dx.doi.org/10.1016/0001-4575(95)00041-0

Sun, C., Edara, P., Hou, Y., & Robertson, A. (2012). Safety Evaluation of Sequential Warning Lights in Tapers at Nighttime Work Zones. Transportation Research Record: Journal of the Transportation Research Board(2272), pp 1–8.

Sun, C., Edara, P., & Zhu, Z. (2013). Evaluation of Temporary Ramp Metering for Work Zones. Transportation Research Record: Journal of the Transportation Research Board(2337), pp 17–24.

Sun, J., Dong, S., Bing, X., & Ni, Y. (2012). Comparative Study of Impacts of Red Light Cameras in China. Transportation Research Record: Journal of the Transportation Research Board(2317), pp 68–75.

Sze, N. N., Wong, S. C., Pei, X., Choi, P. W., & Lo, Y. K. (2011). Is a combined enforcement and penalty strategy effective in combating red light violations? An aggregate model of violation behavior in Hong Kong. Accident Analysis & Prevention, 43(1), pp 265-271.

Tageldin, A., Sayed, T., Shaaban, K., & Zaki, M. H. (2015). Automated Analysis and Validation of Right-Turn Merging Behavior. Journal of Transportation Safety & Security, 7(2), pp 138-152.

Tang, K., Dong, S., Wang, F., Ni, Y., & Sun, J. (2012). Behavior of Riders of Electric Bicycles at Onset of Green and Yellow at Signalized Intersections in China. Transportation Research Record: Journal of the Transportation Research Board(2317), pp 85–96.

Tang, K., Xu, Y., Wang, P., & Wang, F. (2015). Impacts of Flashing Green on Dilemma Zone Behavior at High-Speed Intersections: Empirical Study in China. Journal of Transportation Engineering, 141(7), Content ID 04015005.

Tarawneh, T. M., Singh, V. A., & McCoy, P. T. (1999). INVESTIGATION OF EFFECTIVENESS OF MEDIA ADVERTISING AND POLICE ENFORCEMENT IN REDUCING RED-LIGHT VIOLATIONS. Transportation Research Record(1693), p. 37-45.

Tarrall, M. B., & Dixon, K. K. (1998). CONFLICT ANALYSIS FOR DOUBLE LEFT-TURN LANES WITH PROTECTED-PLUS-PERMITTED SIGNAL PHASES. Transportation Research Record(1635), p. 105-112.

Tay, R., Churchill, A., & de Barros, A. G. (2011). Effects of roadside memorials on traffic flow. Accident Analysis & Prevention, 43(1), pp 483-486.

Tay, R., & De Barros, A. (2011). Should traffic enforcement be unpredictable? The case of red light cameras in Edmonton. Accident Analysis & Prevention, 43(3), pp 955-961.

Teed, N., Lund, A. K., & Knoblauch, R. (1993). The duration of speed reductions attributable to radar detectors∗. Accident Analysis & Prevention, 25(2), 131-137. doi:http://dx.doi.org/10.1016/0001-4575(93)90052-X

Teknomo, K. (2006). Application of Microscopic Pedestrian Simulation Model. Transportation Research Part F: Traffic Psychology and Behaviour, 9(1), pp 15-27.

Tenkink, E., & Van Der Horst, R. (1990). CAR DRIVER BEHAVIOR AT FLASHING LIGHT RAILROAD GRADE CROSSINGS. Accident Analysis & Prevention, 22(3), p. 229-239.

Tey, L.-S., Kim, I., & Ferreira, L. (2012). Evaluating Safety at Railway Level Crossings with Microsimulation Modeling. Transportation Research Record: Journal of the Transportation Research Board(2298), pp 70-77.

Thom, R. G., & Clayton, A. M. (1992). LOW-COST OPPORTUNITIES FOR MAKING CITIES BICYCLE-FRIENDLY BASED ON A CASE STUDY ANALYSIS OF CYCLIST BEHAVIOR AND ACCIDENTS (WITH DISCUSSION AND CLOSURE). Transportation Research Record(1372), p. 90-101.

Thompson, J. E., & Fry, A. T. (1980). MAJOR FINDINGS OF A STUDY OF HEAVY VEHICLE SPEED AND OPERATIONAL SAFETY IN VICTORIA. Traffic Quarterly, 34(3), p. 377-395.

Thompson, L. L., Rivara, F. P., Ayyagari, R. C., & Ebel, B. E. (2013). Impact of social and technological distraction on pedestrian crossing behaviour: an observational study. Injury Prevention, 19(4), pp 232-237.

Thompson, S. J., Fraser, E. J., & Howarth, C. I. (1985). DRIVER BEHAVIOUR IN THE PRESENCE OF CHILD AND ADULT PEDESTRIANS. Ergonomics, 28(10), p. 1469-1474.

Tiwari, G., Bangdiwala, S., Saraswat, A., & Gaurav, S. (2007). Survival analysis: Pedestrian risk exposure at signalized intersections. Transportation Research Part F: Traffic Psychology and Behaviour, 10(2), pp 77-89.

Tom, A., & Granié, M.-A. (2011). Gender differences in pedestrian rule compliance and visual search at signalized and unsignalized crossroads. Accident Analysis & Prevention, 43(5), 1794-1801. doi:http://dx.doi.org/10.1016/j.aap.2011.04.012

Townsend, M. (2006). Motorists' use of hand held cell phones in New Zealand: An observational study. Accident Analysis & Prevention, 38(4), 748-750. doi:http://dx.doi.org/10.1016/j.aap.2006.01.007

Triggs, T. J. (1980). INFLUENCE OF ONCOMING VEHICLES ON AUTOMOBILE LATERAL POSITION. Human Factors: The Journal of the Human Factors and Ergonomics Society, 22(4), p. 427-433.

Troutbeck, R. J. (1984). OVERTAKING BEHAVIOUR ON NARROW TWO- LANE TWO WAY RURAL ROADS. Australian Road Research, 12(5), p. 105-116.

Ugwuegbu, D. C. (1977). THE STOP SIGN IS FOR THE OTHER GUY: A NATURALISTIC OBSERVATION OF DRIVING BEHAVIOR OF NIGERIANS. Journal of Applied Psychology, 62(5), p. 574-577.

Ullman, G. L. (2000). SPECIAL FLASHING WARNING LIGHTS FOR CONSTRUCTION, MAINTENANCE, AND SERVICE VEHICLES: ARE AMBER BEACONS ALWAYS ENOUGH? Transportation Research Record(1715), p. 43-50.

Ulmer, R. G., Preusser, C. W., Preusser, D. F., & Cosgrove, L. A. (1995). EVALUATION OF CALIFORNIA'S SAFETY BELT LAW CHANGE FROM SECONDARY TO PRIMARY ENFORCEMENT. Journal of Safety Research, 26(4), p. 213-220.

Vaa, T. (1997). Increased police enforcement: Effects on speed. Accident Analysis & Prevention, 29(3), 373-385. doi:http://dx.doi.org/10.1016/S0001-4575(97)00003-1

Van Der Horst, R. (1988). DRIVER DECISION MAKING AT TRAFFIC SIGNALS. Transportation Research Record(1172), p. 93-97.

Van Houten, R., Ellis, R. D., Sanda, J., & Kim, J.-L. (2006). Pedestrian Push-Button Confirmation Increases Call Button Usage and Compliance. Transportation Research Record: Journal of the Transportation Research Board(1982), pp 99-103.

Van Houten, R., Malenfant, J. E. L., Van Houten, J., & Retting, R. A. (1997). USING AUDITORY PEDESTRIAN SIGNALS TO REDUCE PEDESTRIAN AND VEHICLE CONFLICTS. Transportation Research Record(1578), p. 20-22.

Van Houten, R., Malenfant, J. E. L., Zhao, N., Ko, B., & Van Houten, J. (2005). Evaluation of Two Methods of Prompting Drivers to Use Specific Exits on Conflicts Between Vehicles at the Critical Exit. Journal of Applied Behavior Analysis, 38(3), pp 289-301.

van Houten, R., & Malenfant, L. (1992). The influence of signs prompting motorists to yield before marked crosswalks on motor vehicle-pedestrian conflicts at crosswalks with flashing amber. Accident Analysis & Prevention, 24(3), 217-225.

Van Houten, R., Malenfant, L., & Rolider, A. (1985). INCREASING DRIVER YIELDING AND PEDESTRIAN SIGNALING WITH PROMPTING, FEEDBACK, AND ENFORCEMENT. Journal of Applied Behavior Analysis, 18(2), p. 103-110.

Van Houten, R., McCusker, D., Huybers, S., Malenfant, J. E. L., & Rice-Smith, D. (2002). ADVANCE YIELD MARKINGS AND FLUORESCENT YELLOW-GREEN RA 4 SIGNS AT CROSSWALKS WITH UNCONTROLLED APPROACHES. Transportation Research Record(1818), p. 119-124.

Van Houten, R., Retting, R. A., Farmer, C. M., & Van Houten, J. (2000). FIELD EVALUATION OF A LEADING PEDESTRIAN INTERVAL SIGNAL PHASE AT THREE URBAN INTERSECTIONS. Transportation Research Record(1734), p. 86-92.

Van Houten, R., Van Houten, J., Malenfant, J. E. L., & Andrus, D. (1999). USE OF ANIMATED "EYES" SO THAT MOTORISTS LEAVING AN INDOOR PARKING GARAGE LOOK FOR PEDESTRIANS. Transportation Research Record(1674), p. 57-60.

Van Houten, R. G., Ellis, R. D., & Marmolejo, E. (2008). Stutter-Flash Light-Emitting-Diode Beacons to Increase Yielding to Pedestrians at Crosswalks. Transportation Research Record: Journal of the Transportation Research Board(2073), pp 69-78.

van Nes, N., Christoph, M., Hoedemaeker, M., & van der Horst, R. A. (2013). The value of site-based observations complementary to naturalistic driving observations: A pilot study on the right turn manoeuvre. Accident Analysis & Prevention, 58, 318-329. doi:http://dx.doi.org/10.1016/j.aap.2013.06.026

VanWagner, M., Van Houten, R., & Betts, B. (2011). The Effects of a Rectangular Rapid-Flashing Beacon on Vehicle Speed. Journal of Applied Behavior Analysis, 44(3), pp 629-633.

Várhelyi, A. (1998). Drivers' speed behaviour at a zebra crossing: a case study. Accident Analysis & Prevention, 30(6), 731-743. doi:http://dx.doi.org/10.1016/S0001-4575(98)00026-8

Vasconcelos, L., Silva, A. B., Seco, Ã., & Rouxinol, G. (2012). Estimation of Critical Headways at Unsignalized Intersections: A Microscopic Approach. Advances in Transportation Studies(SPECIAL ISSUE 1), pp 59-72.

Vasudevan, V., Pulugurtha, S. S., Nambisan, S. S., & Dangeti, M. R. (2011). Effectiveness of Signal-Based Countermeasures for Pedestrian Safety: Findings from Pilot Study. Transportation Research Record: Journal of the Transportation Research Board(2264), pp 44-53.

Vecellio, R. L., & Culpepper, T. H. (1984). WORK AREA TRAFFIC CONTROL: EVALUATION AND DESIGN. Journal of Transportation Engineering, 110(4), p. 412-430.

Vingilis, E., Adalf, E. M., & Chung, L. (1982). Comparison of age and sex characteristics of police-suspected impaired drivers and roadside-surveyed impaired drivers. Accident Analysis & Prevention, 14(6), 425-430. doi:http://dx.doi.org/10.1016/0001-4575(82)90055-0

Vis, A. A., Dijkstra, A., & Slop, M. (1992). Safety effects of 30 km/h zones in the Netherlands. Accident Analysis & Prevention, 24(1), 75-86. doi:http://dx.doi.org/10.1016/0001-4575(92)90074-S

Vujanić, M., Pešić, D., Antić, B., & Smailović, E. (2014). Pedestrian Risk at the Signalized Pedestrian Crossing Equipped with Countdown Display. International Journal for Traffic and Transport Engineering, 4(1), pp 52-61.

Walker, E. J., Lanthier, S. N., Risko, E. F., & Kingstone, A. (2012). The Effects of Personal Music Devices on Pedestrian Behaviour. Safety Science, 50(1), pp 123-128.

Walker, I. (2007). Drivers overtaking bicyclists: Objective data on the effects of riding position, helmet use, vehicle type and apparent gender. Accident Analysis & Prevention, 39(2), 417-425. doi:http://dx.doi.org/10.1016/j.aap.2006.08.010

Walker, I., Garrard, I., & Jowitt, F. (2014). The influence of a bicycle commuter's appearance on drivers' overtaking proximities: An on-road test of bicyclist stereotypes, high-visibility clothing and safety aids in the United Kingdom. Accident Analysis & Prevention, 64, 69-77. doi:http://dx.doi.org/10.1016/j.aap.2013.11.007

Walmsley, D. J., & Lewis, G. J. (1989). THE PACE OF PEDESTRIAN FLOWS IN CITIES. Environment and Behavior, 21(2), p. 123-150.

Walter, L., Broughton, J., & Knowles, J. (2011). The effects of increased police enforcement along a route in London. Accident Analysis & Prevention, 43(3), pp 1219-1227.

Walton, D., & Buchanan, J. (2012). Motorcycle and scooter speeds approaching urban intersections. Accident Analysis & Prevention, 48, pp 335-340.

Walton, D., & Thomas, J. A. (2005). Naturalistic observations of driver hand positions. Transportation Research Part F: Traffic Psychology and Behaviour, 8(3), 229-238. doi:http://dx.doi.org/10.1016/j.trf.2005.04.010

Wang, L., Zhang, L., Zhou, K., Zhang, W.-B., & Wang, X. (2012). Prediction of Red-Light Running on Basis of Inductive-Loop Detectors for Dynamic All-Red Extension. Transportation Research Record: Journal of the Transportation Research Board(2311), pp 44–50.

Wang, M.-H., Benekohal, R. F., Ramezani, H., Nassiri, H., Medina, J. C., & Hajbabaie, A. (2011). Safety and Headway Characteristics in Highway Work Zones with Automated Speed Enforcement. Advances in Transportation Studies, 23, pp 67-76.

Wang, M.-H., Schrock, S. D., Bornheimer, C., & Rescot, R. (2013). Effects of Innovative Portable Plastic Rumble Strips at Flagger-Controlled Temporary Maintenance Work Zones. Journal of Transportation Engineering, 139(2), pp 156-164.

Wang, X., Xu, Y., Tremont, P. J., & Yang, D. (2012). Moped Rider Violation Behavior and Moped Safety at Intersections in China. Transportation Research Record: Journal of the Transportation Research Board(2281), pp 83–91.

Wang, Z. (2000). THE EFFECTS OF REFERENCE LINE POSITIONING ON GAP ACCEPTANCE DATA. Road and Transport Research, 9(4), p. 20-28.

Ward, N. J., & Wilde, G. J. S. (1995). FIELD OBSERVATION OF ADVANCE WARNING/ADVISORY SIGNAGE FOR PASSIVE RAILWAY CROSSINGS WITH RESTRICTED LATERAL SIGHTLINE VISIBILITY: AN EXPERIMENTAL INVESTIGATION. Accident Analysis & Prevention, 27(2), p. 185-197.

Wasielewski, P. (1984). Speed as a measure of driver risk: Observed speeds versus driver and vehicle characteristics. Accident Analysis & Prevention, 16(2), 89-103. doi:http://dx.doi.org/10.1016/0001-4575(84)90034-4

Weaver, G. D., & Glennon, J. C. (1972). DESIGN AND STRIPING FOR SAFE PASSING OPERATIONS. Highway Research Record(390), pp 36-39.

Wei, H., Lee, J. J., Li, Q., & Li, C. J. (2000). OBSERVATION-BASED LANE-VEHICLE ASSIGNMENT HIERARCHY: MICROSCOPIC SIMULATION ON URBAN STREET NETWORK. Transportation Research Record(1710), p. 96-103.

Wei, H., Li, Z., & Ai, Q. (2009). Observation-Based Study of Intersection Dilemma Zone Natures. Journal of Transportation Safety & Security, 1(4), pp. 282-295.

Weidemann, R., Kwon, T. M., Lund, V., & Boder, B. (2011). Determining the Effectiveness of an Advanced LED Warning System for Rural Intersections. Transportation Research Record: Journal of the Transportation Research Board(2250), pp 25-31.

Weng, J., & Meng, Q. (2014). Rear-end crash potential estimation in the work zone merging areas. Journal of Advanced Transportation, 48(3), 238-249. doi:10.1002/atr.211

Weng, J., Xue, S., Yang, Y., Yan, X., & Qu, X. (2015). In-depth analysis of drivers' merging behavior and rear-end crash risks in work zone merging areas. Accident Analysis & Prevention, 77, pp 51-61.

Wenners, K. E., & Knodler, M. A. (2014). Examination of Limitations Associated with Observing Driver Distraction. Transportation Research Record: Journal of the Transportation Research Board(2434), pp 135–139.

Wenners, K. E., Knodler, M. A., Jr., Kennedy, J. R., & Fitzpatrick, C. D. (2013). Large-Scale Observational Study of Drivers' Cell Phone Use. Transportation Research Record: Journal of the Transportation Research Board(2365), pp 49–57.

Wigglesworth, E. C. (1978). EFFECTS OF LOCAL KNOWLEDGE AND SIGHT RESTRICTIONS ON DRIVER BEHAVIOR AT OPEN RAILWAY CROSSINGS. Journal of Safety Research, 10(3), p. 100-107.

Willett, P. (1978). EVALUATION OF THREE-WAY INTERSECTION REGULATION. Australian Road Research, 8(2), p. 39-43.

Williams, A. F., Kyrychenko, S. Y., & Retting, R. A. (2006). Characteristics of speeders. Journal of Safety Research, 37(3), 227-232. doi:http://dx.doi.org/10.1016/j.jsr.2006.04.001

Williams, A. F., Wells, J. K., & Lund, A. K. (1983). Voluntary seat belt use among high school students. Accident Analysis & Prevention, 15(2), 161-165. doi:http://dx.doi.org/10.1016/0001-4575(83)90071-4

Wilson, T., & Best, W. (1982). DRIVING STRATEGIES IN OVERTAKING. Accident Analysis & Prevention, 14(3), p. 179-185.

Woldeamanuel, M. (2012). Stopping Behavior of Drivers at Stop-Controlled Intersections: Compositional and Contextual Analysis. Journal of the Transportation Research Forum, 51(3), pp 109-123.

Wong, S. C., Sze, N. N., Loo, B. P. Y., Chow, A. S. Y., Lo, H. K., & Hung, W. T. (2012). Performance Evaluations of the Spiral-Marking Roundabouts in Hong Kong. Journal of Transportation Engineering, 138(11), pp 1377-1387.

Wong, Y. D., & Nicholson, A. (1992). DRIVER BEHAVIOR AT HORIZONTAL CURVES: RISK COMPENSATION AND THE MARGIN OF SAFETY. Accident Analysis & Prevention, 24(4), p. 425-436.

Woo, T. H., Ho, S.-M., & Chen, H.-L. (2007). Monitoring Displays Coupled with Speed Cameras: Effectiveness on Speed Reduction. Transportation Research Record: Journal of the Transportation Research Board(2009), pp 30-36.

Worral, R. D., Drake, J. S., Buhr, J. H., & Soltman, T. J. (1965). STUDY OF OPERATIONAL CHARACTERISTICS OF LEFT-HAND ENTRANCE AND EXIT RAMPS ON URBAN FREEWAYS. Highway Research Record(99), pp 244-273.

Wrapson, W., Harré, N., & Murrell, P. (2006). Reductions in driver speed using posted feedback of speeding information: Social comparison or implied surveillance? Accident Analysis & Prevention, 38(6), 1119-1126. doi:http://dx.doi.org/10.1016/j.aap.2006.04.021

Wu, C., Yao, L., & Zhang, K. (2012). The red-light running behavior of electric bike riders and cyclists at urban intersections in China: An observational study. Accident Analysis & Prevention, 49, pp 186-192.

Wu, X., Vall, N. D., Liu, H. X., Cheng, W., & Jia, X. (2013). Analysis of Drivers' Stop-or-Run Behavior at Signalized Intersections with High-Resolution Traffic and Signal Event Data. Transportation Research Record: Journal of the Transportation Research Board(2365), pp 99–108.

Xiao, Y., Ran, Q., Yang, J., & Wang, Z. (2011). Analysis and Modeling of Crossing Behavior at Urban Intersections in China. Journal of Transportation Engineering, 137(2), pp 121-127.

Yan, X., Abdel-Aty, M., Radwan, E., Wang, X., & Chilakapati, P. (2008). Validating a driving simulator using surrogate safety measures. Accident Analysis & Prevention, 40(1), pp 274-288.

Yan, X., & Radwan, E. (2007). Effect of restricted sight distances on driver behaviors during unprotected left-turn phase at signalized intersections. Transportation Research Part F: Traffic Psychology and Behaviour, 10(4), pp 330-344.

Yan, X., & Radwan, E. (2008). Influence of Restricted Sight Distances on Permitted Left-Turn Operation at Signalized Intersections. Journal of Transportation Engineering, 134(2), pp 68-76.

Yang, C. Y. D., & Najm, W. G. (2007). Examining Driver Behavior Using Data Gathered from Red Light Photo Enforcement Cameras. Journal of Safety Research, 38(3), pp 311-321.

Yang, H., Bartin, B., Ozbay, K., & Chien, S. I. J. (2014). Investigating Motorists' Behaviors in Response to Supplementary Traffic Control Devices at Land Surveying Work Sites. Traffic Injury Prevention, 15(4), pp 424-430.

Yang, H., Ozbay, K., & Bartin, B. (2015). Effectiveness of Temporary Rumble Strips in Alerting Motorists in Short-Term Surveying Work Zones. Journal of Transportation Engineering, 141(10). doi:10.1061/(asce)te.1943-5436.0000789

Yang, J., Deng, W., Wang, J., Li, Q., & Wang, Z. (2006). Modeling Pedestrians' Road Crossing Behavior in Traffic System Micro-simulation in China. Transportation Research Part A: Policy and Practice, 40A(3), pp 280-290.

Yang, X., Abdel-Aty, M., Huan, M., Peng, Y., & Gao, Z. (2015). An accelerated failure time model for investigating pedestrian crossing behavior and waiting times at signalized intersections. Accident Analysis & Prevention, 82, pp 154-162.

Yang, X., Huan, M., Abdel-Aty, M., Peng, Y., & Gao, Z. (2015). A hazard-based duration model for analyzing crossing behavior of cyclists and electric bike riders at signalized intersections. Accident Analysis & Prevention, 74, pp 33-41.

Yang, Y., & Sun, J. (2013). Study on Pedestrian Red-Time Crossing Behavior: Integrated Field Observation and Questionnaire Data. Transportation Research Record: Journal of the Transportation Research Board(2393), pp 117–124.

Yannis, G., Golias, J., & Papadimitriou, E. (2007). Modeling Crossing Behavior and Accident Risk of Pedestrians. Journal of Transportation Engineering, 133(11), pp 634-644.

Yao, L., & Wu, C. (2012). Traffic Safety for Electric Bike Riders in China: Attitudes, Risk Perception, and Aberrant Riding Behaviors. Transportation Research Record: Journal of the Transportation Research Board(2314), pp 49–56.

Ye, F., & Zhang, Y. (2009). Vehicle Type-Specific Headway Analysis Using Freeway Traffic Data. Transportation Research Record(2124), 222-230. doi:10.3141/2124-22

Yeung, J. S., & Wong, Y. D. (2014). The effect of road tunnel environment on car following behaviour. Accident Analysis and Prevention, 70, 100-109. doi:10.1016/j.aap.2014.03.014

Yousif, S., Alterawi, M., & Henson, R. R. (2014). Red light running and close following behaviour at urban shuttle-lane roadworks. Accident Analysis & Prevention, 66, 147-157. doi:http://dx.doi.org/10.1016/j.aap.2014.01.021

Yu, J. C. (1969). Driver performance related to median visibility. Accident Analysis & Prevention, 1(2), 143-151. doi:http://dx.doi.org/10.1016/0001-4575(69)90110-9

Yu, L., Qiao, F., & Zhang, Y. (2005). Improved Framework and Systematic Calibration for Left-Turn Signal Change Intervals. Transportation Research Record: Journal of the Transportation Research Board(1925), pp 112-122.

Zaki, M., Sayed, T., & Mori, G. (2013). Classifying Road Users in Urban Scenes Using Movement Patterns. Journal of Computing in Civil Engineering, 27(4), pp 395-406.

Zaki, M. H., & Sayed, T. (2014). Automated Analysis of Pedestrians' Nonconforming Behavior and Data Collection at an Urban Crossing. Transportation Research Record: Journal of the Transportation Research Board(2443), pp 123–133.

Zaki, M. H., Sayed, T., & Cheung, A. (2013). Computer Vision Techniques for the Automated Collection of Cyclist Data. Transportation Research Record: Journal of the Transportation Research Board(2387), pp 10–19.

Zaki, M. H., Sayed, T., Ismail, K., & Alrukaibi, F. (2012). Use of Computer Vision to Identify Pedestrians' Nonconforming Behavior at Urban Intersections. Transportation Research Record: Journal of the Transportation Research Board(2279), pp 54–64.

Zaki, M. H., Sayed, T., & Shaaban, K. (2014). Use of Drivers' Jerk Profiles in Computer Vision-Based Traffic Safety Evaluations. Transportation Research Record(2434), 103-112. doi:10.3141/2434-13

Zaki, M. H., Sayed, T., Tageldin, A., & Hussein, M. (2013). Application of Computer Vision to Diagnosis of Pedestrian Safety Issues. Transportation Research Record: Journal of the Transportation Research Board(2393), pp 75–84.

Zamani-Alavijeh, F., Bazargan, M., Shafiei, A., & Bazargan-Hejazi, S. (2011). The frequency and predictors of helmet use among Iranian motorcyclists: A quantitative and qualitative study. Accident Analysis and Prevention, 43(4), 1562-1569. doi:10.1016/j.aap.2011.03.016

Zeedyk, M. S., & Kelly, L. (2003). BEHAVIOURAL OBSERVATIONS OF ADULT-CHILD PAIRS AT PEDESTRIAN CROSSINGS. Accident Analysis & Prevention, 35(5), p. 771-776.

Zeedyk, M. S., Wallace, L., & Spry, L. (2002). Stop, look, listen, and think?: What young children really do when crossing the road. Accident Analysis & Prevention, 34(1), 43-50. doi:http://dx.doi.org/10.1016/S0001-4575(00)00101-9

Zegeer, C. V., & Cynecki, M. J. (1985). DETERMINATION OF MOTORIST VIOLATIONS AND PEDESTRIAN-RELATED COUNTERMEASURES RELATED TO RIGHT-TURN-ON-RED. Transportation Research Record(1010), pp 16-28.

Zeng, W., Chen, P., Nakamura, H., & Iryo-Asano, M. (2014). Application of social force model to pedestrian behavior analysis at signalized crosswalk. Transportation Research Part C: Emerging Technologies, 40, pp 143-159.

Zhang, L., Wang, L., Zhou, K., Zhang, W.-B., & Misener, J. A. (2010). Use of Field Observations in Developing Collision-Avoidance System for Arterial Red Light Running Factoring Headway and Vehicle-Following Characteristics. Transportation Research Record(2189), 78-88. doi:10.3141/2189-09

Zhang, W., Huang, Y. H., Roetting, M., Wang, Y., & Wei, H. (2006). Driver's views and behaviors about safety in China - What do they NOT know about driving? Accident Analysis and Prevention, 38(1), 22-27. doi:10.1016/j.aap.2005.06.015

Zhang, Y., & Wu, C. (2013). The effects of sunshields on red light running behavior of cyclists and electric bike riders. Accident Analysis and Prevention, 52, 210-218. doi:10.1016/j.aap.2012.12.032

Zhao, D., Wang, W., Li, C., Li, Z., Fu, P., & Hu, X. (2013). Modeling of Passing Events in Mixed Bicycle Traffic with Cellular Automata. Transportation Research Record(2387), 26-34. doi:10.3141/2387-04

Zhao, L., Sun, J., & Zhang, H. M. (2013). Observations and Analysis of Multistep-Approach Lane Changes at Expressway Merge Bottlenecks in Shanghai, China. Transportation Research Record(2395), 73-82. doi:10.3141/2395-09

Zheng, D., Qin, X., Tillman, R., & Noyce, D. A. (2013). Measuring Modern Roundabout Traffic Conflict Exposure. Journal of Transportation Safety & Security, 5(3), pp 208-223.

Zheng, Z., Ahn, S., Chen, D., & Laval, J. (2011). Freeway traffic oscillations: Microscopic analysis of formations and propagations using Wavelet Transform. Transportation Research Part B: Methodological, 45(9), 1378-1388. doi:http://dx.doi.org/10.1016/j.trb.2011.05.012

Zheng, Z., Ahn, S., Chen, D., & Laval, J. (2013). The effects of lane-changing on the immediate follower: Anticipation, relaxation, and change in driver characteristics. Transportation Research Part C: Emerging Technologies, 26, pp 367-379.

Zheng, Z., & Washington, S. (2012). On selecting an optimal wavelet for detecting singularities in traffic and vehicular data. Transportation Research Part C: Emerging Technologies, 25, 18-33. doi:http://dx.doi.org/10.1016/j.trc.2012.03.006

Zhou, H., Lownes, N. E., Ivan, J. N., Gårder, P. E., & Ravishanker, N. (2015). Left-Turn Gap Acceptance Behavior of Elderly Drivers at Unsignalized Intersections. Journal of Transportation Safety & Security, 7(4), pp 324-344.

Zhu, Z., Edara, P., & Sun, C. (2015). Case Study of an Alternative Merging Sign Design for Temporary Traffic Control in Work Zones. Journal of Transportation Engineering, Content ID 05015005.
Zhuang, X., & Wu, C. (2011). Pedestrians' crossing behaviors and safety at unmarked roadway in China. Accident Analysis & Prevention, 43(6), pp 1927-1936.
Zhuang, X., & Wu, C. (2012). The safety margin and perceived safety of pedestrians at unmarked roadway. Transportation Research Part F: Traffic Psychology and Behaviour, 15(2), pp 119-131.
Zhuang, X., & Wu, C. (2013). Modeling Pedestrian Crossing Paths at Unmarked Roadways. IEEE Transactions on Intelligent Transportation Systems, 14(3), pp 1438-1448.
Zhuang, X., & Wu, C. (2014). Pedestrian gestures increase driver yielding at uncontrolled mid-block road crossings. Accident Analysis & Prevention, 70, 235-244. doi:http://dx.doi.org/10.1016/j.aap.2013.12.015
Zohdy, I., & Rakha, H. A. (2012). Agent-Based Framework for Modeling Gap Acceptance Behavior of Drivers Turning Left at Signalized Intersections. Transportation Research Record(2316), 1-10. doi:10.3141/2316-01
Zohdy, I., & Rakha, H. A. (2012). Framework for Intersection Decision Support in Adverse Weather Conditions: Use of Case-Based Reasoning Algorithm. Transportation Research Record: Journal of the Transportation Research Board(2324), pp 20–28.
Zohdy, I., Rakha, H. A., Alfelor, R., Yang, C. Y. D., & Krechmer, D. (2011). Impact of Inclement Weather on Left-Turn Gap Acceptance Behavior of Drivers. Transportation Research Record(2257), 51-61. doi:10.3141/2257-06
Zou, X., & Levinson, D. M. (2006). Modeling Pipeline Driving Behaviors: Hidden Markov Model Approach. Transportation Research Record: Journal of the Transportation Research Board(1980), pp 16-23.

9.2 Additional references in report

Armstrong, R., Hall, B.J., Doyle, J., & Waters, E. (2011) Cochrane Update. 'Scoping the scope' of a Cochrane review. Journal of Public Health 33(1), pp 147-150
Bédard, M.B., Parkkari, M., Weaver, B., Riendeau, J., Dahlquist, M. (2010). Assessment of driving performance using a simulator protocol: Validity and reproducibility. The American Journal of Occupational Therapy 64, 336-340.
Buss, M.D. (2004) Evolutionary Psychology: the new Science of the Mind. Second edition, Pearson, Boston.
Chin, H. C., & Quek, S. T. (1997). Measurement of traffic conflicts. Safety Science, 26(3), 169–185.
De Leur, P., & Sayed, T. (2003). A framework to proactively consider road safety within the road planning process. Canadian Journal of Civil Engineering, 30(4), 711–719.
Dodge, R. (1923). The human factor in highway regulation and safety. Highway Research Board Proceedings, 2(32), pp. 73-78.
Drew, L., Royal, D., Moulton, B., Peterson, A., & Haddix, D. (2010) National survey of drinking and driving attitudes and behaviors 2008. U.S. Department of Transportation, NHTSA-DOT-HS 811342. Washington, DC.
Egger, M., Zahner, T.Z., Schenider, M., Junker, C., Lengeler, C., Antes, G., (1997) Language bias in randomized controlled trials published in English and German. The Lancet 350(9074), pp. 326-329
Elliott M.A., Baughan C.J., Sexton B.F. (2007) Errors and violations in relation to motorcyclists' crash risk. Accident Analysis and Prevention 39(3), pp. 491–499
Elvik, R., & Mysen, B. (1999). Incomplete Accident Reporting. Meta-Analysis of Studies Made in 13 countries. Transportation Research Record, 1665, 133–140.
Elvik, R., Christensen, P., and Amundsen, A., (2004) Speed and Road Accidents: An Evaluation of the Power Model. Oslo, Norway, Transportokonomisk Institutt.
Elvik, R., Hoye, A., Vaa, T., & Sorenson, M., (2009) The Handbook of Road Safety Measures. Emerald Group Publishing, 2009
EU (2009) Car Telephone Use and Car Safety, Jeanee Breen Consulting. European Commission, Brussels
EU (2015). Road Safety in the European Union. *Trends, statistics and main challenges*. European Commission, Brussels
Evans, L., (2004) Traffic Safety. Bloomfield Hills, MI: Science Serving Society, 2004.
Greenshields, B.D., (1934) The photographic method of studying traffic behavior. Proceedings of the 13th annual Meeting of the Highway Research Board, 1934.
Higgins JPT, Green S (editors). *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.1.0 [updated March 2011]. The Cochrane Collaboration, 2011. Available from www.cochrane-handbook.org.
Hydén, C. (1987). The development of a method for traffic safety evaluation: The Swedish Traffic Conflicts Technique. Lund Institute of Technology, Lund, Sweden.
Islam, M. T., El-Basyouny, K., & Ibrahim, S. E. (2014). The Impact of Lowered Residential Speed Limits on Vehicle Speed Behavior. Safety Science, 62, pp 483-494.
Jenness J.W (2007) .Supporting highway safety culture by addressing anonymity. AAA Foundation for traffic Safety
Laureshyn, A. (2010). Application of automated video analysis to road user behaviour. Lund Institute of Technology, Lund, Sweden.
Mallett, R., Hagen-Zanker, J., Slater, R., & Duvendack, M. (2012). The benefits and challenges of using systematic reviews in international development research. Journal of Development Effectiveness 4(3), pp. 445-455
Mays, N., Roberts, E., & Popay, J. (2001) Synthesizing research evidence. In: *Studying the Organisation and Delivery of Health Services: Research Methods*. London, Routledge, pp. 188-220.
Ozkan, T., Lajunen, T., & Summala, H. (2006). Driver Behaviour Questionnaire: a follow-up study. Accident; analysis and prevention, 38(2), 386-395.
Paulhus, D. L. (1984). Two-component models of socially desirable responding. Journal of Personality and Social Psychology, 46(3), 598-609
Pham, M.T., Rajic, A., Greig, J.D., Sargeant, J.M., Papadopoulos, A., & McEwen, S.A., (2014) A scoping review on scoping reviews: advancing the approach and enhancing the consistency. Research Synthesis Methods 5, pp. 371-385
Reason, J., Hollnagel, E., & Paries, J. (2006) Revisiting the Swiss Cheese Model of accidents. Project Safbuild – EEC Note No. 13/06, Brétigny-sur-Orge
Rothstein, H. R., Sutton, A. J., & Borenstein, M. (2005b). Publication bias in meta-analysis: Prevention, assessment, and adjustments. West Sussex, UK: Wiley
Shechtman, O., Classen, S., Awadzi, K., Mann, W. (2009). Comparison of driving errors between on-the-road and simulated driving assessment: a validation study. Traffic Injury Prevention 10, 379-385.
Shinar, D. (1998). Aggressive driving: The contribution of the drivers and the situation. Transportation Research Part F: Traffic Psychology and Behaviour, 1(2), 137-160. doi: 10.1016/S1369-8478(99)00002-9
Statistical Office of the European Communities. (2016). *EUROSTAT: Regional statistics:* Annual number of accidents by type of accident. Luxembourg: Eurostat.

Svensson, A., & Hydén, C. (2006). Estimating the severity of safety related behaviour. Accident Analysis and Prevention, 38(2), 379–385.

Wang, Y., Mehler, B., Reimer, B., Lammers, V., D'Ambrosio, L.A., Coughlin, J.F. (2010) The validity of driving simulation for assessing differences between in-vehicle informational interfaces: A comparison with field testing. Ergonomics 53 (3), 404-420

Wee, B. van, & Banister, D., (2016) How to write a literature review paper? Transport Reviews 36(2), pp 278-288

Wegman, F.C.M., & Aarts, L.T. (2006). Advancing sustainable safety : National Road Safety Outlook for 2005-2020. SWOV Research Institute for Road Safety Research, Leidschendam, the Netherlands, ISBN-13 978-90-807958-7-7.

WHO. (2004). World report on road traffic injury prevention: summary. World Health Organization, Geneva, ISBN: 92 4 159131 5.

Wilson, M.G., Lavis, J.N., & Guta, A., (2012) Community-based organizations in the health sector: a scoping review. Health Research Policy and Systems 10(36).

Yagil, D. (1998) Gender and age-related differences in attitudes toward traffic laws and traffic violations. Transportation Research Part F 1, pp. 123-135

9.3 Potential relevant but irretrievable references

TRAFFIC HUMPS. (1983). VOICE OF THE PEDESTRIAN, p. 44-66.

Ackroyd, L. W., & Madden, A. J. (1974). VEHICLE SPEEDS AND PATHS DURING FREE-FLOW MOTORWAY MERGING AND EXITING. Publication of: Planning and Transport Res and Computation Co Ltd, p. 264-289.

Batz, T. M. (1989). EVALUATION OF NEW PASSING ZONE GORE DESIGN. Transportation Research Record(1239), p. 41-53.

Benekohal, R. F., Wang, L., Orloski, R., & Kastel, L. M. (1992). SPEED-REDUCTION PATTERNS OF VEHICLES IN A HIGHWAY CONSTRUCTION ZONE. Transportation Research Record(1352), p. 35-45.

Bowman, B. L., & Brinkman, P. (1988). EFFECT OF LOW-COST ACCIDENT COUNTERMEASURES ON VEHICLE SPEED AND LATERAL PLACEMENT AT NARROW BRIDGES. Transportation Research Record(1185), p. 11-23.

Byrne, B. F., & Kabariti, A. (1976). EFFECT OF GUARDRAILS ON INTERSTATE BRIDGES ON VEHICLE SPEED AND LATERAL PLACEMENT (ABRIDGMENT). Transportation Research Record(601), pp 76-78.

Chang, M.-s., Messer, C. J., & Santiago, A. (1984). EVALUATION OF ENGINEERING FACTORS AFFECTING TRAFFIC SIGNAL CHANGE INTERVAL. Transportation Research Record(956), p. 18-21.

Chang, M.-s., Messer, C. J., & Santiago, A. J. (1985). TIMING TRAFFIC SIGNAL CHANGE INTERVALS BASED ON DRIVER BEHAVIOR. Transportation Research Record(1027), pp 20-30.

Cleveland, D. E., & Keese, C. J. (1961). INTERSECTIONS AT NIGHT. Traffic Quarterly, 15(3), p. 480-498.

Crum, R. W. (1951). A TOPICAL REPORT ON HIGHWAY TRAFFIC RESEARCH. Traffic Quarterly, 5(1), p. 15-26.

Fambro, D. B., Heathington, K. W., & Richards, S. H. (1989). EVALUATION OF TWO ACTIVE TRAFFIC CONTROL DEVICES FOR USE AT RAILROAD-HIGHWAY GRADE CROSSINGS. Transportation Research Record(1244), p. 52-62.

Flener, B. R. (1972). A STUDY OF TRAFFIC OPERATIONS AND SAFETY AT EXIT GORE AREAS: FINDINGS AND APPLICATIONS. Am Assoc State Highway Officials Proc, 7 p.

Forbes, T. W., & Reiss, R. J. (1952). 35-MILLIMETER AIRPHOTOS FOR THE STUDY OF DRIVER BEHAVIOR. Highway Research Board Bulletin(60).

Fricker, J. D., & Larsen, R. J. (1989). SAFETY BELTS AND TURN SIGNALS: DRIVER DISPOSITION AND THE LAW. Transportation Research Record(1210), p. 47-52.

Grayson, G. B. (1975). CHILD PEDESTRIANS. New Behaviour, 2(5), p. 180-181.

H.G.R., K. (2015). The relation between speed environment, age and injury outcome for bicyclists struck by a motorized vehicle – a comparison with pedestrians. Accident Analysis and Prevention, 76, pp 57-63.

Hanscom, F. R., & Berger, W. G. (1978). EVALUATING HIGHWAY GUIDE SIGNING. ABRIDGMENT. Transportation Research Record(667), pp 74-76.

Hauber, A. R. (1983). THE SOCIAL PSYCHOLOGY OF DRIVING BEHAVIOUR AND THE TRAFFIC ENVIRONMENT: RESEARCH ON AGGRESSIVE BEHAVIOUR IN TRAFFIC. VOICE OF THE PEDESTRIAN, p. 33-40.

Hauck, J. (1979). WELL-MARKED CROSSWALKS AR A PEDESTRIAN'S BEST FRIEND. Rural and Urban Roads, 17(3), p. 26-28.

Heathington, K. W., Fambro, D. B., & Richards, S. H. (1989). FIELD EVALUATION OF A FOUR-QUADRANT GATE SYSTEM FOR USE AT RAILROAD-HIGHWAY GRADE CROSSINGS. Transportation Research Record(1244), p. 39-51.

Kallberg, V.-P. (1993). REFLECTOR POSTS--SIGNS OF DANGER? Transportation Research Record(1403), p. 57-66.

Knoblauch, R. L., Tobey, H. N., & Shunaman, E. M. (1984). PEDESTRIAN CHARACTERISTICS AND EXPOSURE MEASURES. Transportation Research Record(959), pp 35-41.

Mahalel, D., & Prashker, J. N. (1987). A BEHAVIORAL APPROACH TO RISK ESTIMATION OF REAR-END COLLISIONS AT SIGNALIZED INTERSECTIONS. Transportation Research Record(1114), pp 96-102.

Malo, A. F., Mika, H. S., & Walbridge, V. P. (1960). TRAFFIC BEHAVIOR ON AN URBAN EXPRESSWAY. Highway Research Board Bulletin(235).

Maroney, S., & Dewar, R. (1987). ALTERNATIVES TO ENFORCEMENT IN MODIFYING THE SPEEDING BEHAVIOR OF DRIVERS. Transportation Research Record(1111), p[121-126.

Normann, O. K. (1958). COMPARISON OF DRIVER BEHAVIOR ON LIGHTED AND UNLIGHTED HIGHWAYS. Highway Research Board Bulletin(191).

Ong, C. K., & Tierney, A. J. H. (1989). SIGNPOSTING TRIAL AT UNCONTROLLED RAILWAY LEVEL CROSSINGS. Publication of: Australian Road Research Board, 19(2), p. 164-172.

Pant, P. D., Huang, X. H., & Krishnamurthy, S. A. (1992). STEADY-BURN LIGHTS IN HIGHWAY WORK ZONES: FURTHER RESULTS OF STUDY IN OHIO. Transportation Research Record(1352), p. 60-66.

Papacostas, C. S. (1984). INFLUENCE OF LEADING VEHICLE TURN SIGNAL USE ON FOLLOWING VEHICLE LANE CHOICE AT SIGNALIZED INTERSECTIONS. Transportation Research Record(996), pp 37-44.

Richards, S. H., & Heathington, K. W. (1990). ASSESSMENT OF WARNING TIME NEEDS AT RAILROAD-HIGHWAY GRADE CROSSINGS WITH ACTIVE TRAFFIC CONTROL. Transportation Research Record(1254), p. 72-84.

Richards, S. H., Heathington, K. W., & Fambro, D. B. (1990). EVALUATION OF CONSTANT WARNING TIMES USING TRAIN PREDICTORS AT A GRADE CROSSING WITH FLASHING LIGHT SIGNALS. Transportation Research Record(1254), p. 60-71.

Rouphail, N. M. (1984). MIDBLOCK CROSSWALKS: A USER COMPLIANCE AND PREFERENCE STUDY. Transportation Research Record(959), pp 41-47.

Summala, H. (1981). LATENCIES IN VEHICLE STEERING: IT IS POSSIBLE TO MEASURE DRIVERS RESPONSE LATENCIES AND ATTENTION UNOBTRUSIVELY ON THE ROAD. Publication of: Human Factors Society, p. 711-715.

Summmala, H. (2002). BEHAVIOURAL ADAPTATION AND DRIVERS' TASK CONTROL. HUMAN FACTORS FOR HIGHWAY ENGINEERS, p. 189-200.

Taragin, A. (1958). DRIVER BEHAVIOR AS RELATED TO SHOULDER TYPE AND WIDTH ON TWO-LANE HIGHWAYS. Highway Research Board Bulletin(170).

Taragin, A., & Rudy, B. M. (1960). TRAFFIC OPERATIONS AS RELATED TO HIGHWAY ILLUMINATION AND DELINEATION. Highway Research Board Bulletin(255).

Williston, R. M. (1960). EFFECT OF PAVEMENT EDGE MARKINGS ON OPERATOR BEHAVIOR. Highway Research Board Bulletin(266).

Zegeer, C. V., Hummer, J., & Hanscom, F. (1990). OPERATIONAL EFFECTS OF LARGER TRUCKS ON RURAL ROADWAYS. Transportation Research Record(1281), p. 28-39.

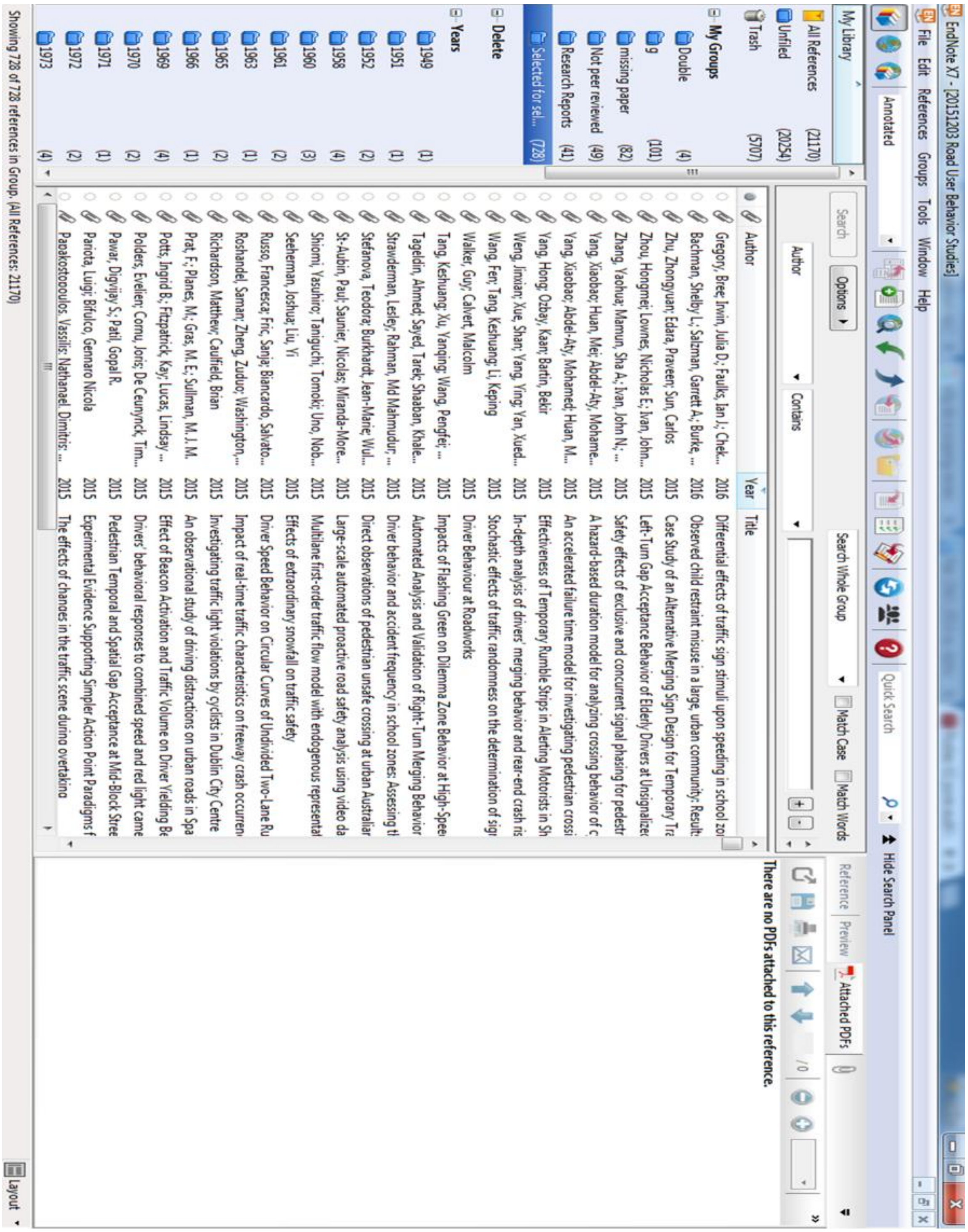
ANNEX 1

. In order to guarantee the feasibility and the effectiveness of the search protocol, several options in the databases were selected prior to the reference retrieval process The table below shows how the search terms were defined and which filters were used.

Search term: Traffic Behavior AND "Observation OR Safety"		
TRID	Web of Science	Science Direct
“Result Type” Only articles and papers **“Subject Category”** Design Highways Pedestrians and Bicyclists Policy Research Transportation (General) Vehicles and equipment **“Languages”** English	**"Research Areas"** Transportation Sciences Behavioral Sciences	**"Publication Title"** Accident Analysis & Prevention Journal of Safety Research Journal of Transport Geography Procedia – Social and Behavioral Sciences Safety Science Transportation Research Part A Transportation Research Part B Transportation Research Part C Transportation Research Part F Transport Policy **"Topic"** Unite state Driver Vehicle Traffic Network Europe Road Human Accident

ANNEX 2

EndNote was used to management of references and retrieval of articles as a database of all the studies. It also included the excluded articles (duplcates, not peer reviewed, research reports etc)



ANNEX 3

Codebook

Behavioral Observation Studies

InDeV

ID: 0 | Coder: MSR | Research Goal: Model development | Traffic Safety | Mobility | Year: 2016 | Frequency: Once

REFERENCE: Chen, P., Wu, C., Zhu, S. (2016) Interaction between vehicles and pedestrians at uncontrolled mid-block crosswalks. Safety Science 82, pp. 68-76, http://dx.doi.org/10.1016/j.ssci.2015.09.016

Comments (if any):

Exclude

Inaccessable

Topic

Signalized Intersection	Pedestrian Crossing	Yielding	Gap acceptance	Mobile phone use
Priority Controlled	Cyclist Crossing	Crossing Behavior	Merging	Seatbelt usage
Priority from the right	Roundabout	Dilemma Zone	Lane change	Child restraint use
Stop controlled	Channelized Right-Turn	Red-Light Running	Overtaking	Driving Under Influence
Work zone	Railroad crossing	Phase Change Warning	Car Following	Turn indicator use
Road section	Shared Space	Speeding:	Weather	Protective clothing
Curves	Highway	Shared Space	Driver distractions	
	Parking lot	Other topic, namely:		

General Information

Road Users Involved

Pedestrians, Staged Pedestrians, Cyclists, Staged Cyclists, Powered-Two-Wheelers, E-Bikes, Car Drivers, Heavy vehicles (specifically)

Combined with (if applicable):

Driving Simulator, Naturalistic Driving, Questionnaires, Traffic Conflict Technique, Microsimulation, Crash data analysis

Characteristics

Type: Single Observation | Country: Australia

Number of sites: | Location:

Number of records:

Observation period, please specify:

Weekdays, Peak, Day

Weekend, Off peak, Night

Focus: Multiple Road users

Comments (if any):

Data Collection

Source

Human observer

Video cameras, Photocamera

Camera equipped car, ANPR cameras

Camera equipped bike, Helicopter

Loop Detectors, Pneumatic Tubes

Speedguns, Radar

Sensors, Traffic Fines

Parameters

Speed	Space/time headway	Lateral position	Gap Acceptance	GapSize
Yielding behavior	Yielding Distance	Stop sign compliance	Looking behavior	
Waiting position	Waiting time	Crossing Time	Crossing path	
Stop-or-Go	Red light running	Yellow Light Running	Intersection entry time	
Distance to stop line	Overtaking	Overtaking attempts	Wrong-way-driving	
Traffic Conflicts (Indicators)	Traffic Conflict Counts	Evasive Action	Merging	Lane change
Age	Gender	Ethnicity	License Plate	Merging distance
Groupsize	Car passenger	Carrying items	Push Button Usage	
Turn indicator	Seatbelt	Mobile phone	Lights	Helmet wearing, Smoking

Comments (if any):

Auteursrechtelijke overeenkomst

Ik/wij verlenen het wereldwijde auteursrecht voor de ingediende eindverhandeling:
Naturalistic Behaviour Observation of Road Users: A Scoping Review

Richting: **Master of Transportation Sciences-Traffic Safety**
Jaar: **2016**

in alle mogelijke mediaformaten, - bestaande en in de toekomst te ontwikkelen - , aan de Universiteit Hasselt.

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Voor akkoord,

Riaz, Malik Sarmad

Datum: **18/08/2016**