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Make way for pedestrian: An examination of driver-pedestrian interaction in the sociophysical traffic environment in a Mexican city

Doctoral Proposal

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Con la presente me permito informar a Usted, que el trabajo doctoral titulado **“Make way for pedestrian: An examination of driver-pedestrian interaction in the sociophysical traffic environment in a Mexican city”**, que fue desarrollado por la estudiante del Posgrado Integral en Ciencias Sociales Marc Yancy Lucas, cumple con los requisitos teóricos-metodológicos de un trabajo de investigación doctoral, y cuenta con el decoro académico suficiente para se defendido en su examen de defensa de grado.

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Abstract

Motor vehicle accidents involving pedestrians represent a serious public safety concern throughout the world. Studies suggest the problem may be more pronounced in developing nations and low-income communities. Recently, traffic studies have shifted focus away from risky driving (i.e. aggressive and distracted) towards more positive aspects of driving behaviors and attitudes (i.e. pro-social and forgiving). However, the relationship between the socio-physical environment and these positive aspects has not been extensively examined. This study will apply Positive Environment Model to the phenomenon of driver-pedestrian interaction (DPI) in a northern Mexican city across three distinct socioeconomic locations (SELs: low, medium, and high). Part I consists of a non-experimental, correlational examination of driving behaviors and attitudes as they relate to psychological wellbeing and sustainable driving environments. Correlations were assessed using a structural equation model derived from a probabilistic sample of 350 drivers (based on city population). Part II consisted of a quasi-experimental manipulation of the socio-physical environment and examination of its effects on DPI. Independent variables (positive signage and prosocial prompt) were intentionally manipulated to observe their effects on the dependent variable (positive and negative interactions). The non-probabilistic sample was selected by convenience, consisting of a of four weeks of observation (pre- and post- baseline as well as two weeks of treatment at target location).

Keywords: driver-pedestrian interaction, traffic psychology, environmental psychology, driving behavior, positive environment model

Resumen

Los accidentes de coches que involucran a peatones representan un serio problema de seguridad pública en todo el mundo. Los estudios sugieren que el problema puede ser más pronunciado en los países en desarrollo y en comunidades de bajos recursos. Recientemente, los estudios de tráfico han cambiado el enfoque de manejo riesgoso (i.e. agresivo y distraído) hacia aspectos más positivos de los comportamientos de manejo y actitudes (i.e. prosocial e indulgente). Sin embargo, la relación entre el ambiente socio-físico y los aspectos positivos no ha sido ampliamente examinado. El estudio propuesto aplicará el Modelo de Ambiente Positivos al fenómeno de la interacción conductor-peatón (ICP) en una ciudad del norte de México en tres ubicaciones socioeconómicas distintas (USE; baja, media y alta). La Parte I consiste en un estudio no experimental y correlacional acerca de las conductas y actitudes de manejo en relación con el bienestar psicológico y los entornos sostenibles de manejo. Las correlaciones se evaluaron utilizando un modelo de ecuaciones estructurales derivado de una muestra probabilística de 350 conductores. La Parte II consiste en una manipulación cuasiexperimental del entorno socio-físico y el estudio de sus efectos en la ICP. Las variables independientes (indicaciones peatonales, refuerzo social, señalización/marcas en las calles) se manipularon intencionalmente para observar sus efectos sobre la variable dependiente (proporción de parada). El análisis espacial demográfico (a través de ArcGIS) se utilizó para identificar las USEs que cuentan con cruces peatonales marcados (según criterios de selección). La muestra no probabilística se seleccionó por conveniencia, y consistió en un total de 50 cruces para cada manipulación en cada USE identificada.

Palabras claves: interacción conductor-peatón, psicología de tráfico, psicología ambiental, comportamientos de manejo, el modelo positivo ambiental.

Introduction: Drivers, Pedestrians, and the Sociophysical Traffic Environment

The study of psychology as a modern science and the prevalence of the automobile in European and American society occurred in the same relatively short span of human existence. The 1880s to 1930s witnessed radical advancements in industrial capabilities, technological advancement, and scientific enquiry. Traffic psychology found itself located at the intersection of these influential forces. In outlining their theory of behavioral fields of force, Gibson and Crooks used the operation of a motor vehicle as a case study for it function and manifestation (Gibson & Crooks, 1938). The field of safe travel thus is a spatial field, but not one fixed in physical space. Individuals travel through that field avoiding interaction with other vehicles or obstacles on the road like the way individuals traverse busy city sidewalks without constantly bumping into each other. Gibson and Crooks referred to the inherent danger of the activity stating, "driving an automobile is certainly the most important to the individual in the sense at least that a defect in it is the greatest threat to his life" (Gibson & Crooks, 1938, p. 453).

Indeed, early studies of driving behavior tended to focus on the negative aspects of risky or dangerous driving; personality traits, attitudes, and intentions dominated research. However, a recent trend towards aspects of the sociophysical traffic environment that promote pro-social and forgiving driving approaches has presented appealing avenues for study. Likewise, the increasing inclusion of environmental considerations in traffic psychology models presents a unique opportunity to investigate correlations between the decisions made by drivers and the socio-physical driving environment. As such, the sub-discipline of environmental psychology may provide the opportunity for a more expansive understanding of drivers and the ways they interact with, and are shaped by, the sociophysical environment.

The *sociophysical traffic environment* can be understood as the holistic sum of the human and physical setting in which vehicles, pedestrians, and nature interact. The actions of drivers in this setting are impacted by a myriad of factors including weather, visibility, road conditions, the speed and flow of other drivers, as well as pedestrians and unexpected threats (such as wildlife crossing the road). The general principle underlying this definition is that operating a vehicle takes place in a complex, setting-dependent environment comprised of social and physical affordances, impediments, and barriers. As such, it is crucial to examine the behaviors of pedestrians and drivers through this multidimensional lens as driving is not simply a result of the built or constructed setting, but of the entirety of elements interacting simultaneously within the sociophysical traffic environment. The ideal thus being a safe, or sustainable, traffic environment.

Recent trends in the literature target the study of forgiving, conscientious, and pro-social driving behavior (Arthur & Graziano, 1996; Harris et al., 2014; Moore & Dahlen, 2008a). Historically, the focus has been on outcome measurements (such as previous accidents) and attitudinal/motivational factors (such as behavioral intent and propensity for aggressive, angry, or risky driving). The development of the Prosocial and Aggressive Driving Inventory (PADI) targets not only risky driving, but also, “driving behaviors that potentially protect the well-being of passengers, other drivers, and pedestrians, and that promotes effective cooperation with others in the driving environment” (Harris et al., 2014, p. 4). Individuals practicing these types of safe behaviors can be understood as promoting a sustainable traffic environment and will thus be referred to as *sustainable drivers*.

The study of the relationship and interface between pedestrians and motor vehicle drivers, often referred to as the driver pedestrian interaction (DPI), sometimes the vehicle pedestrian interaction, is another important aspect of traffic psychology. Two general undercurrents exist in the literature on driver-pedestrian interaction: the attitude behavior relationship and the impact of the sociophysical environmental context. The relationship between cultural norms, attitudes, and behaviors as they relate to driving and pedestrian behaviors has been extensively studied (Elliott et al., 2003; Fleiter & Watson, 2006; Nordfjærn & Şimşekoğlu, 2013). Fewer studies have examined the ways in which the driving environment is impact by *sociophysical* contexts.

The investigation applies an environmental psychology model to the study of traffic behavior. While pedestrian-related traffic accidents have numerous and varied causes most previous studies have focused on risky driving (i.e. aggressive, angry, and distracted). This approach provides a useful perspective and helps to identify potentially dangerous drivers; however, it excludes important factors that may help drivers avoid accidents and promote cooperation with others in the traffic environment (Harris et al., 2014). The proposed study aims to contribute to the analysis of the pro-social behaviors, contextual factors, and personal attitudes that may lead to cooperative traffic environment. Likewise, a series of simple, easily repeatable quasi-experimental manipulations of the sociophysical environment have been undertaken to examine their impact on DPI. Some involved manipulation of the physical environment (signage) while others tested the influence of social factors like positive reinforcement (Guéguen et al., 2015, 2016; Harrell, 1993; Nasar, 2003). This study brings these concepts together by examining the impact of different types of manipulations of the sociophysical environment (signage, social prompt).

The overarching goal of this study is to examine the traffic environment from a comprehensive, holistic perspective. The perhaps ambitious effort required a two-pronged approach. The first prong involved a quantitative study of traffic behaviors, environmental perceptions, conservation practices, and wellbeing measurements. The second featured a quasi-experimental study of pedestrian-driver interaction before, during, and after the implementation of a pedestrian safety intervention. While the two prongs represent disparate measures (including a wide range of methodological approaches) both are designed to complement each other and provide an in-depth picture of the sociophysical traffic environment from a different perspective. A snapshot of the sociophysical traffic environment.

The first prong (Part I) of the proposed study consists of a questionnaire examining a wide range of behaviors, perceptions, and attitudes. The intent is to better understand behaviors in the traffic environment by understanding how those behaviors relate to other self-care and conservation attitudes, behaviors and beliefs. To this end, the investigation applies the positive environment model (PEM) to the study of traffic psychology, specifically the driver-pedestrian interaction, DPI (Corral & Frías, 2016). The research is in keeping with recent studies that have focused on the role of positive and pro-social behaviors and environments in driving behavior. A Spanish translation and validation of the PADI was undertaken at University of Sonora (Hermosillo), which helped to inform the questionnaire that was developed. This prong also responds directly to perceived gaps in the literature and proposes the development of novel measurements of perception of the sociophysical environment and attitudes toward DPI.

The second prong (Part II) examined the effect of manipulations to the sociophysical environment on driver behavior. This quasi-experimental study consisted of four-weeks of recording DPI before (1 week), during (2 weeks), and after (1 week) the implementation of an intervention aimed at alerting drivers to imminent interactions with pedestrians. An intersection with high rates of DPI was selected to receive the treatment intervention as it met a series of prerequisites (including high rates of DPI, relatively low vehicle speeds, and a painted crosswalk with a pedestrian crossing light). Two manipulations were implemented (signage and social prompt) and pre- and post-effect was measured using a detailed scoring system.

This research can contribute to a better understanding of the psychological underpinnings of driving attitudes and behaviors. As cities grow and populations swell, particularly in urban environments, improving pedestrian infrastructure, accessibility, and safety can ease vehicle traffic congestion and provide access to healthier alternative modes of transportation. With the recent development of multi-use and mixed-use zoning in cities like Hermosillo, opportunities exist to foster such alternatives. These types of urban planning approaches depend upon effective pedestrian connectivity to thrive and reach their full potential; pedestrian safety is equally dependent upon the decisions made by drivers.

Section 1 of this dissertation will present the problem: driver-pedestrian interactions and sociophysical factors of the environment that lead to cooperative interactions. Section 2 will justify the study approach and methodology as well as discuss its scientific contribution. Section 3 will outline the theoretical framework that underlies the investigation as well as antecedents, approach, and procedures. Section 4 will discuss data analysis, translation and validation, and results. Section 5 will include author remarks, study limitations, and potential future avenues of study.

Chapter 1: Study Relevance

1.1 The Problem

Motor vehicle accidents involving pedestrians represent a significant public safety concern throughout the world. Studies demonstrate that the problem is more pronounced in developing nations (Cropper & Kopits, 2005; Híjar et al., 2003; Zegeer & Bushell, 2012) and in low-income communities (Day, 2006; Piff et al., 2012). In the State of Sonora (Mexico) 44 people were killed in traffic accidents involving pedestrians in 2015. The figure represented over 20% of all vehicle related deaths during that year, a trend that has persisted over the past 18 years (an average of 26% of all vehicle related deaths involved a pedestrian during the period) (INEGI, 2016). Numerous studies have examined pedestrian behavior, contextual factors, and personal attitudes toward pedestrian-vehicle interactions (Harré & Wrapson, 2004; Jacobsen et al., 2009; Lugo, 2013; Mehta, 2008, 2009; Şimşekoğlu, 2015a). However, fewer efforts have focused on motorist behavior and attitudes toward pedestrian vehicle interactions. (Crowley-Koch et al., 2011; Nasar, 2003; Van Houten & Malenfant, 2004). The proposed investigation builds upon the latter field of study by examining the impact of contextual factors and pro-social prompts on motorist behavior and attitudes.

Similarly, behavior in the sociophysical traffic environment is influenced by cultural and contextual variables. Limited studies have examined these types of driving behaviors in general with fewer focused on countries like Mexico. Previous validation studies have demonstrated contextual nuances when applying English driving scales to Mexican populations. A Spanish validation of the Driving Anger Expression Inventory (DAX) (Deffenbacher et al., 2002) demonstrated a distinction in expressed anger in a sample of Mexican drivers. Verbal aggression accompanied nonverbal aggression in the original DAX and were loaded together; however, they formed different factors in the Mexican sample, implying respondents considered verbal and nonverbal aggression as different entities (Alcázar-Olán et al., 2018). Likewise, the Driving Anger Scale (DAS) (Deffenbacher et al., 1994) did not demonstrate high relationships with measures of general anger and anger expression when applied to a sample of Mexican drivers (Alcázar-Olán et al., 2019).

Similarly, adaptive/constructive forms of anger expression, while more commonly reported than maladaptive forms, have demonstrated variation across populations and cultural contexts (Gras et al., 2016; Stephens & Sullman, 2014). Research has shown that females tend to report more adaptive/constructive anger reduction techniques than males (Jovanovic et al., 2011) and that males tend to employ more personal physical aggressive expression (Eşiyok et al., 2007). However, a translation and validation of the DAX in a sample of Spanish drivers did not demonstrate gender differences in expressions of anger, but did demonstrate that younger drivers reported more maladaptive driving behaviors (Herrero-Fernández, 2011).

Prosocial driving behavior and its impact on the actions of others in the traffic environment has not been well studied. However, several studies have shown that prosocial behaviors can be encouraged by individual behavior as well as elements of the sociophysical environment. One line of inquiry demonstrated that general prosocial (Greitemeyer & Osswald, 2010) and prosocial driving (Greitemeyer, 2013) behavior was increased after exposure to prosocial video games. A study of adolescents in the Netherlands found peers could have both a positive and negative impact on prosocial behavior (van Hoorn et al., 2016). Similarly, an examination of U.S. drivers found that peer reinforcement impacted motorist propensity to yield for pedestrians crossing the street (Nasar, 2003). Indeed, even movement appears to have an influence on adaptive behavior. A meta-analysis of the relationship between synchrony, the matching of movement with others, and response found synchronous movements and vocalizations increased prosocial behaviors as compared with non-synchronous conditions (Mogan et al., 2017). If prosocial behavior is thus influenced by sociophysical environmental factors, better understanding prosocial driving in individuals can help inform efforts aimed at promoting those behaviors in others.

1.2 Study Justification

The investigation combines elements of environmental psychology and traffic research to examine the driver-pedestrian interaction and the role of the sociophysical environment. Understanding why drivers make the decisions they do can significantly improve urban and suburban planning efforts. Furthermore, understanding how driver behavior is influenced by the physical environment and the behaviors (and anticipated behaviors) of others in the traffic environment can inform psychological understanding of the underpinnings of prosocial and sustainable behavior. Finally, to what degree (if any) are prosocial, safe, and sustainable driving behaviors related to other sustainability indicators such as altruism, frugality, pro-environmentalism, equitable behavior, and wellbeing? As such, the study is the first to test the Positive Environment Model (which is composed of these elements) from the perspective of safe, adaptive behaviors in the traffic environment (Corral & Frías, 2016).

Indeed, the role of setting is of great importance when considering driving behavior. A safe driver does not behave the same way in a crowded pedestrian area as they do on a freeway.

Similarly, subtle variations in setting exist in each of these scenarios which require a variety of responses. As such, this study aims to bridge something of a theoretical divide between the disciplines of traffic study and environmental psychology. Similarly, it draws from recent trends towards the study of positive and pro-social driving behaviors and beliefs and incorporates experimental elements such as pedestrian and environmental manipulation/intervention to study pro-social driving as it relates to pedestrians. No similar studies have been uncovered in the specialized literature.

Examining the relationship between prosocial driving and general sustainable or pro-environmental behaviors (pro-ecological, frugal, equitable, and altruistic) and wellbeing can provide much information about the theoretical underpinnings of “positive” behavior. No studies found to date examine this interrelationship in this way. Good psychometric instruments are required to assess these relationships which were likewise not found at the time of publishing. Addressing this apparent gap in the literature is one of the primary goals of this study. The study likewise develops, and tests new instruments meant to evaluate driver-pedestrian environment quality and positive traffic environment. These scales help gain knowledge on the environments that promote sustainable driving and optimal driver-pedestrian interactions. The following subsections will outline the contributions of the investigation.

1.2.1 Quantitative: The Positive Environment Model and the driver-pedestrian interaction

The study examines driving behaviors and the perceptions of the sociophysical traffic environment. To this end, Positive Environment Model (PEM) was applied to the study of driving behavior, and specifically, driver-pedestrian interaction (DPI). Five core constructs of driver-pedestrian environment quality, sustainable behaviors, socio-physical environmental conservation, psychological well-being, and positive traffic environment were tested. The proposed approach is in-line with recent trends toward more positive models of pro-social and forgiving driving (Harris et al., 2014; Moore & Dahlen, 2008a), as well as studies that examine character traits such as happiness in relation to driving behaviors and attitudes (Isler & Newland, 2017a). Constructs of driving attitudes and behaviors, environmental perception, and driving behaviors were examined in relation to psychosocial wellbeing and sustainable driving behavior.

As previously mentioned, the model is designed to examine some of the underpinnings of sustainable driving behavior by investigating relationships to other general sustainable behaviors and measures of wellbeing. The complexity of the elements that comprise the sociophysical traffic environment seemed well-suited for analysis from the perspective of environmental psychology. If drivers move through a spatial field that is *not a fixed physical environment*, then physical infrastructure alone is not enough to change behavior. One first step is to identify what kinds of drivers promote positive environments, and how such positive behaviors manifest themselves in other parts of their lives. This understanding reaches far beyond driving behavior and touches on some of the underlying traits that are demonstrated by prosocial people fostering positive environments and how those behaviors can positively impact the behavior of others.

1.2.2 The sociophysical traffic environment and driver-pedestrian interaction

The quasi-experimental portion of the study examined the impact of manipulations of the sociophysical traffic environment (pedestrian signage and social prompt) on outcome behaviors (specifically driver stopping rates and conflict behaviors, such as obstructing pedestrians and evasion maneuvers). Pedestrian signage consisted of poster-sized informational (50x90 cm) signage displaying the message “Be careful of pedestrians, please yield” (“Tenga precaución con los peatones, por favor ceda el paso”). Positive social reinforcement was performed by a research assistant carrying the sign, waving, and smiling at passing motorists near the intersection. The goal of this intervention was to create a positive environment aimed at encouraging drivers to yield for pedestrians when crossing at the lighted intersection. Pre- and post-baseline observations allowed for a measure of the interventions effect (if any) as well as continued influence after the manipulation is removed.

The elements of this study allow for an investigation that serves both theoretical and applied purposes. The design approach allows for a context specific evaluation of previously validated studies examining these interactions (Crowley-Koch et al., 2011; Huybers et al., 2004a; Nasar, 2003), few if any of which have focused on Mexican populations. Furthermore, it allows for examinations of two distinct forms of manipulation that have demonstrated success in previous studies: pedestrian signage and social reinforcement. From an applied perspective, the local municipal planning department (IMPLAN) has long-term plans to develop a pedestrian and bicycle route through the target area allowing the results of the study to help inform this future initiative.

1.2.3 Pro-social driving and positive traffic environments.

Traffic studies and traffic psychology have tended to focus on risky driving behaviors and their underlying causes. However, a recent investigative trend has focused on positive features of sociophysical environments such as trait forgiveness and consideration of future consequences (Moore & Dahlen, 2008b), happiness orientations of meaning and engagement (Isler & Newland, 2017b), and threat appraisal and positive feedback (Orit Taubman - Ben-Ari et al., 2004). Additionally, personality traits such as altruism (Ge et al., 2014) and conscientiousness (M. Guo et al., 2016) have demonstrated associations with positive driving outcomes. Of particular importance to this study, the Prosocial Aggressive Driving Inventory (PADI; Harris et al., 2014) combines elements of risky driving behaviors (aggressive driving subscale) with measures of safe driving practices (the prosocial driving subscale) and is well-suited for the positive environment perspective. The validation of a translated version of the PADI undertaken as part of this research represents a significant contribution to the field and can inform future avenues of study, particularly in contexts where Spanish is the dominant language. The literature likewise informed the novel instruments developed for this study that measure perceptions and behaviors associated with positive, sustainable traffic environments.

Chapter 2: Theoretical Foundation

2.1 Theoretical Framework

2.1.1 The positive environment model.

The investigation is theoretically couched in the *Positive Environment Model (PEM)* as developed by Corral and Frias (2016). The model provides a new framework for positive environmental research based on the study of positive behavior-environment interactions. The approach emerges from ecological psychology perspectives that focus the environment as both provider and receiver. The environment *provides* the individual with resources and *requires* sustainable behavior if present and future resources are to be guaranteed. Within this framework psychological well-being arises from positive environments, but also through sustainable behaviors and socio-physical environmental conservation. Well-being is thus attainable without requiring negative environmental impact (Corral & Frías, 2016).

*Positive environment*s *(PE)* are understood as “places that promote peoples’ optimal development, health, personal growth, material and subjective well-being” (Corral & Frías, 2016, p. 965). Contrary to the focus on immediate resource need favored by traditional psychology, the ecological nature of PE promotes a long-term vision of resource sustainable resource use. In this way PE fosters “behaviors and experiences that manifest in wellbeing, psychological growth, positive emotions, and the development of human capacities that lead to the development of sustainable behaviors” (Corral & Frías, 2016, p. 967). PE can thus be conceptualized as sustainable “behavior generating machines” (Bechtel & Churchman, 2002, p. 115) not unlike those first described by Roger Barker. Barker’s goal was to develop an eco-behavioral science that strove to understand “the lawful ways in which environmental contexts structure the social actions of individuals and groups” (Heft, 2008, p. 236). His approach shifted the focus of behavior studies as a biproduct of psychological constructs of structure and function to one that views action as structured by the environmental context that likewise impacts the social actions of an individual or group (Heft, 2008).

The adaptation of the PEM used here feature~~s~~ four central theoretical constructs, (a) driver-pedestrian environment quality (D-PEQ), (b) sustainable behavior, (c) psychological well-being, (d) sociophysical environmental conservation, and (e) positive traffic environment. The *D-PEQ* will examine the degree to which the socio-physical context promotes safe vehicle-pedestrian interaction by providing a comfortable and secure traffic environment. *Psychological well-being (PWB)* and Social Wellbeing will also be included in the model. Psychological Wellbeing will be conceptualized as a self-evaluation of life quality and functioning. (Verdugo et al., 2009; Watson et al., 2012), whereas social wellbeing will assess the optimal functioning in society, a component of eudemonic wellbeing, from a social perspective (Keyes, 1998). *Sustainable behaviors (SB)* refer to deliberate actions that conserve the sociophysical environment. The approach adopts an ecological holistic posture that examines the impact of both the physical (built, natural) and social environments, collectively understood as the sociophysical environment (Tapia-Fonllem et al., 2013). Finally, Positive driver-pedestrian interactions will be conceptualized as a pattern of safe driving and walking behaviors that protect the wellbeing of drivers, passengers, and pedestrians in the traffic environment based on effective cooperation (Harris et al., 2014).

While PE shares some core tenets with positive psychology (PP), there are some critical distinctions that should be considered. PE and PP both challenge traditional psychology’s focus on negative aspects of human interaction. They both seek to identify the variables that influence individual resilience. However, PP does not consider the *person-in-environment* construct that serves as the basic unit of analysis for environmental psychology (Bechtel & Churchman, 2002; Corral & Frías, 2016). Just as the promotion of a positive mind is difficult without positive environments, it is likewise difficult to promote positive traits of the *individual* without addressing positive *institutions* that foster personal well-being and sustainability. PE criticizes the way PP conceptualizes happiness in individualistic terms centered around character traits as an approach that fails to adequately consider the impact of the myriad of variables in the sociophysical environmental that promote or inhibit happiness (Corral & Frías, 2016).

The interrelationship between PE, PWB, environmental conservation, and SB has been extensively studied. The relationship between PE and PWB has been investigated through empirical studies of growth contingent upon the environment's ability to sustain the needs of individuals that in turn promotes environmental positivity (Brown & Werner, 2012; Fisk, 2000; Schulte & Vainio, 2010; Valdez & Mehrabian, 1994; van den Berg et al., 2007). The relationship between PE and sustainable behavior have demonstrated an association between PE and pro-social and pro-environmental behaviors (Carrus et al., 2013; Hartig et al., 2001, 2007; Jabareen, 2006). The relationship between sustainable behavior and well-being has focused on pro-social and pro-environmental behaviors, which demonstrate covariance with well-being and positive psychological states (Bechtel & Corral, 2010; Brown & Kasser, 2005; De Young, 2000). The relationship between sustainable behavior and environmental conservation has been investigated from the perspective of the ways pro-social and pro-environmental behaviors affect (are affected by) an environment of conservation (Geller, 2002; Jenks & Jones, 2010; Wu et al., 2013). The relationship between environmental conservation, individual well-being and PE has been also been examined (Hartig et al., 2001; Sen et al., 2009).

2.1.2 The study of driving behavior.

Studies of driving behavior are based on several underlying assumptions about motor vehicle operation. Talib Rothengatter (2001) described a three-tiered hierarchy of tasks involved in traffic participation: (a) strategic, (b) tactical, and (c) operational. Strategic tasks include route choice and route realization. Tactical tasks involve vehicle maneuvering such as decision to pass. Operational tasks are based on decisions about speed and course control. Task levels are “hierarchical which implies that decisions on a higher level determine the constraints for a decision on a lower level” (Barjonet, 2001, p. 4). This assortment of actions comprises the basis for driving behavior. Traffic psychology makes the explicit assumption that “driving behavior represents a relatively stable and enduring characteristic of the driver” (Harris et al., 2014, p. 5).

Driving behavior measurements can also be understood as a “dichotomy” between those that measure individual driving style and driving skill (Elander et al., 1993, p. 280). Driving style refers the amalgamation of an individual’s habitual driving behaviors. It is distinct from driving skill in that it is determined by choice and can perhaps best be understood as driving “personality” (Arthur & Graziano, 1996). Driving style includes (but is not limited to) “choice of driving speed, headway, and habitual level of general attentiveness and assertiveness” and is influenced by attitudes, beliefs, and more general needs and values (Taubman-Ben-Ari et al., 2004, p. 2). Driving skill, on the other hand, “concerns limits to performance on elements of the driving task. These include use of steering wheel to track the road and time taken to detect and respond to hazards” (Elander et al., 1993, p. 279). Experience, training, and practice can improve driver skill (Elander et al., 1993).

The psychological study of *risky driving behaviors* (RDBs) has been extensively investigated from several perspectives. RDBs can be defined as those that “obviously endanger or at least have the potential to put the driver and/or other people in danger” (Jafarpour & Rahimi-Movaghar, 2014). These acts, viewed in a holistic capacity as driving style, can be either deliberate (violations) or unintentional (errors, distraction) (Jafarpour & Rahimi-Movaghar, 2014). RDBs are examined via aggressive, angry, vengeful, distracted, stressed, and anxious driving behaviors. RDBs as a construct are considered distinct from risk seeking or risky driving style as outlined in Taubman (2003) for example. This study focuses on psychological and behavioral predictors of RDBs through disparate measures ranging from self-report to quasi-experimental behavioral manipulations.

Recently, the trend has shifted toward the study of forgiving, conscientious, and pro-social driving behavior (Arthur & Graziano, 1996; Harris et al., 2014; Moore & Dahlen, 2008a). Özkan and Lajunen (2005) demonstrated a negative correlation between pro-social driving behavior and driving errors and violations. The development of the Prosocial and Aggressive Driving Inventory (PADI) targets not only risky driving, but also, “driving behaviors that potentially protect the well-being of passengers, other drivers, and pedestrians, and that promotes effective cooperation with others in the driving environment” (Harris et al., 2014, p. 4). Similarly, Isler and Newland (2017a) demonstrated an inverse relationship between global happiness and driver violations.

2.1.3 Transaction and applying the positive environment model (PEM) to the study of the driver-pedestrian interaction (DPI).

An environmental psychology study of driver-pedestrian interaction would not be comprehensive without a discussion of the concept of transaction. Transaction, as described by Reser and Scherl (1988), is dependent upon “clear and unambiguous feedback” (Reser & Scherl, 1988, p. 273). Feedback driven transaction can thus be understood as the ongoing exchange of information from internal (individual psycho-physiological response) and external (stimuli that affects sensory receptors) environmental sources. As such, the process of transactional feedback brings “behavior into reasonable balance with setting, activity, and behavioral objective demands” (Reser & Scherl, 1988, p. 274). Feedback both produces and is dependent upon individual response to the internal-external factors.

This theoretical approach is relevant to the study of driving behavior but presents specific challenges in a quasi-experimental setting. Individual responses to internal-external factors in the driving environment form the foundation of the feedback loop previously discussed. However, operationalizing variables based on this system is difficult given the design of this study. Part I examines some of the internal factors that influence behavior (excluding physiological response), while Part II focuses on manipulation of the socio-physical environment (external). Neither part examines both internal and external factors simultaneously, and as such, this study will implement some of the core foundational concepts but will not attempt to operationalize variables from the transactional perspective.

Given the difficulty in operationalization and application of a transactional model to the study of driver-pedestrian interaction, this work will instead examine the phenomenon through the lends of the positive environment model (PEM). The theoretical framework lends itself better to variable operationalization and its application can open avenues for future examinations of the relationship between the sociophysical traffic environment and individual behavior. This research will specifically investigate the four factors of the PEM: Five core constructs driver-pedestrian environment quality, sustainable behaviors, socio-physical environmental conservation, psychological well-being, and positive traffic environment.

2.1.4 The application of attitudes and behavior metrics to driver-pedestrian interface.

The study of the relationship between the attitudes, behaviors, and pedestrian interface has been studied in a number of different contexts including in Santiago de Chile (Moyano Díaz, 1997), Cali, Colombia (Echeverry et al., 2005), urban and rural Norway (Nordfjærn et al., 2010), Bogota, Colombia (Barrero et al., 2013), urban Turkey (Nordfjærn & Şimşekoğlu, 2013), Buenos Aires, Argentina (Petit, Córdoba, & Folco, 2013). Similarly the study of the relationship between attitudes and behaviors derive from numerous applications of Ajzen's (1985) *Theory of Planned Behavior (TPB)* to traffic studies. Parker (1992) examined intention for rule violation, Elliott (2003) focused on relation to driver speed compliance, and Iverson (2004) investigated TPB as it relates to traffic safety attitudes. Other topics include focus on the impact of age, gender, and driver status on intention to cross at a crosswalk (Holland & Hill, 2007) as well as locus of control (Holland et al., 2010), the impact of fatigue on TPB variables (Rosenbloom et al., 2011).

2.1.5 Perception of the socio-physical environment

Individual driver perception of the sociophysical traffic environment in relation to driver pedestrian interface has not been well studied. The historic focus typically targeted pedestrian perceptions of the built environment (Sisiopiku & Akin, 2003). Recent literature in this area has tended to come from behavioral and simulation studies. The impact of context manipulation (social, built) including the effect of intervention campaigns aimed at improving driver pedestrian interface (Harrell, 1993), the impact of signage (Asaithambi et al., 2016; Bennett et al., 2014), impact of community based pedestrian injury prevention (Sandt et al., 2016). The effects of specific context (setting) have been likewise been examined including the effect of variables of the built environment and context specifics (such as speed and visibility) (Katz et al., 1975) and crosswalk marking in elderly populations (Koepsell, 2002).

Saelens (2003) developed the *Neighborhood Environment Walkability Scale (NEWS)* to examine the "negative effects of low density, auto-mobile-dependent, segregated land use patterns of land and transport system development" (Saelens et al., 2003, p. 1152). It developed out of the need for an empirical measure of perception of the sociophysical environment in public health studies literature. The goal was to identify the influences that discourage physical activity. The NEWS has since become a commonly used measure of environmental perception (particularly in traffic psychology studies) and has undergone a series of iterations (Cerin et al., 2006a, 2009).

Some studies have peripherally examined the relationship between perception of the sociophysical environment and driver pedestrian interface. Şimşekoğlu (2015b) examined pedestrian behavior as it relates to attitudes, personality traits and driving behavior. The study included brief mention of a "satisfaction level with traffic infrastructure and environment" (Şimşekoğlu, 2015b, p. 85). Similarly, Factor 3 (Inside the Car and Visibility subscale) of the ISST measures both internal and external influences on perception of the sociophysical environment (Dorantes Argandar et al., 2016).

2.1.6 Psychological and social well-being.

Psychological well-being (PWB) and Social Wellbeing were included in the model. Psychological Wellbeing can be understood as a self-evaluation of life quality and functioning. (Verdugo et al., 2009; Watson et al., 2012), whereas social wellbeing assesses optimal functioning in society, a component of eudemonic wellbeing, from a social perspective (Keyes, 1998). As previously mentioned, the PEM posits that PWB arises from positive environments, but also through sustainable behaviors and sociophysical environmental conservation (Corral & Frías, 2016).

2.1.6 Sustainable behavior.

Sustainable behaviors (SB) are actions that conserve the sociophysical environment and are often defined as a deliberate and effective approach that is active, anticipatory and future-oriented. SB posits that the complex interaction between the social and physical environment requires a similarly holistic, ecological perspective and approach (Tapia-Fonllem et al., 2013). SB is distinct from pro-environmental behaviors, such as those developed by Kollmuss and Agyeman (2002), in that they consider pro-environmental behaviors as they relate to both the natural/built and social environment. Kurz (2002) suggested four primary psychological approaches to SB, (a) rational-economic models, (b) social-dilemmas models, (c) attitude models, and (d) models based on behavior modification. Schwartz (1977) conceptualized SB as a function of pro-sociality and altruism through the *Norm Activation Model*, while Ajzen and

Fishbein (1980) favored a cost-benefit model through the *Theory of Reasoned Action* (Saunders, 2003).

SB is a central facet of the PEM, and has been conceptualized as a combination of (a) pro-ecological, (b) frugal, (c) altruistic, and (d) equitable behaviors (Corral & Frías, 2016). *Pro-ecological behaviors* refer to deliberate, effective actions that conserve natural resources and environments. Previous psychological studies have tended to focus on pro-ecological conducts (e.g. recycling, water conservation, energy saving behaviors), promotion of pro-ecological behaviors (e.g. lobbying, intervention campaigns), and pro-ecological planning initiatives (e.g. design, building, conservation). *Frugal behaviors* refer to practices aimed at minimizing consumption and mitigating the negative environmental impacts of human behavior. Frugality consists not only reduction in consumptive behaviors, but also consideration of what types of items should be bought and how they should be reused, recycled or disposed of. *Altruistic Behaviors* can be understood as a motivational state that promotes well-being in others, and whose actions benefit others more than the individual. Altruistic actions are distinct from previous constructs of pro-environmental action in that it is performed with no interest in personal gain. *Equitable behaviors* refer to the consideration of future needs in relation to the satisfaction of current needs. The intra- and inter-generationally equitable approach strives for a sustainable balance between human well-being and ecosystem integrity (Tapia-Fonllem et al., 2013).

2.1.7 Manipulation of the socio-physical environment: street signage and advanced pavement marking.

The traffic signage manipulation portion of this investigation is modeled after Huyber, Van Houten and Malefant's (2004a) study of the impact of signage and pavement markings on stopping rates. The article developed out of the safe behavior prompts and driver feedback literature aimed at improving overall traffic safety. Several studies have focused on prompting strategies covering different perspectives ranging from *drivers* (Retting & Van Houten, 2000; Van Houten & Malefant, 2001) to *pedestrians* (Retting, Van Houten, Malefant, Farmer, & Van Houten, 1996; Van Houten, Malenfant, Van Houten, & Retting, 1997) as well as *driver feedback* (Malenfant & Van Houten, 1990; Van Houten et al., 1985).

The present investigation was also influenced by the study of *multiple threat crash* (Zegeer et al., 2001), which found advisory prompts located further back from uncontrolled crosswalks were more effective at reducing pedestrian-vehicle incidents. The study likewise emerged out of studies of the impact of the built environment on driver stopping rates such as the impact of *color and fluorescence* (K. Clark et al., 1996; Schneider et al., 2001), implementation of *advance street markings* (Van Houten et al., 1985), and *advance yield markings* (Van Houten et al., 2002).

Traffic signage manipulation is modeled, in part, on Huyber, Van Houten and Malefant's (2004a) examination of the impact of signage and pavement markings on stopping rates. The article developed out of the safe behavior prompts and driver feedback literature aimed at improving overall transit safety and better understanding driver-pedestrian interaction. The authors reference a myriad of prompting strategies relating to drivers (Retting & Van Houten, 2000; Van Houten & Malefant, 2001), pedestrians (Retting, Van Houten, Malefant, Farmer, & Van Houten, 1996; Van Houten, Malenfant, Van Houten, & Retting, 1997) and driver feedback (Malenfant & Van Houten, 1990; Van Houten et al., 1985). Primary outcome measurements were evasion conflicts and motorist yield distance. Evasion conflicts focused on either motorist (abrupt braking or swerving to avoid a pedestrian) or pedestrian (run, jump, lunge forward/backward to avoid contact with a vehicle) behaviors. Percentage of evasion conflicts were calculated by dividing number of conflict incidents by total number of pedestrians crossing when vehicle was present. Motorist yield distance was measured with the aid of 3-m intervals in advance of the crosswalk. Interobserver agreement between the two participant observers. Interobserver agreement was 100% for conflicts, and average of 90% for motorist yield distance (range 75% - 100%) (Huybers et al., 2004a).

The study examined the influence of three types of apparatus that inform drivers of oncoming pedestrian interaction (white signs, yellow-green signs, and advance yield pavement markings) on driver and pedestrian behavior. White signs with the message “Yield here to pedestrian” had a white, reflective background with an icon of a crossing pedestrian. Apart from the fluorescent background, yellow-green signs were identical. Advance yield pavement marking*s* were made of reflective material placed directly on the street. Signs and advance yield pavement markings were placed 10 meters to 25 meters in front of the crosswalk. Informational apparatus was installed at different locations in a staggered manner to isolate individual and combined effects. The study began with baseline observations followed by implementation of the white sign alone, then the yellow-green sign alone, and finally the white sign and advanced street markings together (Huybers et al., 2004a).

Every weekday during the study period two participant observers scored motorist and pedestrian behaviors at each location. Data was collected at various time intervals between 7:30 am and 5:00 pm from June to late November (based on peak traffic hours per location). Each session involved 20 pedestrian crossings, with sessions averaging between 45 minutes and 1 hour. Participant observers scored evasion conflicts and motorist yield distance. The study found that signage alone reduced evasion conflicts as well as improved motorist yield distance, but that including another element (such as advanced street markings) added to this effect. There was not a significant difference between the white and yellow-green sign despite the general assumption in planning and civil engineering that the latter is more visible (Huybers et al., 2004a).

2.1.8 Manipulation of the sociophysical traffic environment: social prompt.

The social prompt manipulation is modeled after a 2003 study of Ohio motorists (Nasar, 2003). Two study stations were set-up a distance apart from each other. At the first study station a participant attempted to cross at the crosswalk. If the participant was successful, a second study participant displayed a green, thumbs up “Thank you for stopping” sign. If the motorist failed to yield to the first participant, the second participant held up a pink, thumbs down “Please stop next time” sign. Further down the road, at the second study station, motorists were presented with another pedestrian attempting to cross at a crosswalk and again signage was displayed based on motorist response. The objective of this paper was “to evaluate the effectiveness of written signs with social assistance to increase the proportion of drivers stopping for pedestrians in crosswalk” (Nasar, 2003, p. 175). The study hypothesized that hand-held signs would increase driver stop rates and that the “effect would generalize *downstream* to other pedestrians not using the signs” (Nasar, 2003, p. 175).

The study emerges from the community *behavioral intervention* literature that involves direct reinforcement and written prompts to improve community health, welfare and safety. Similar to the PEM, the approach encourages *active care* for the behavioral, human environment (Geller, 1995) and future environmental *preservation* (Geller et al., 1982). The *operant model* has been used to promote pro-environmental behaviors (Cone & Hayes, 1980), *written prompts* have been used to encourage seat-belt usage (Geller & Lehman, 1991), as well as community driven initiatives for a safer traffic environment (Durdan et al., 1985; Geller et al., 1985).

To account for several variables that impact driver stopping rates (including number, timing, and direction of pedestrians as well as traffic flow) the study implemented a controlled manipulation. Eight research assistants served as pedestrian crossers and observers. Intersections were examined using an ABA experimental approach. Weeks 1 and 3 were baseline crossing tested without treatment (A). Week 2 featured the intervention (B). Each participant pedestrian crossed a total of 10 times and thus stopping rates were based on a 0-10 score for each crossing sequence. Observation took place simultaneously at both recording locations. The design did not attempt to track the actions of participants previously interacted with at the intervention location, but rather examine its indirect effect on driver behavior (Nasar, 2003).

For the intervention, the participant crosser carried a small sign with a page sized (8.5 x 12 inch) “Thanks for Stopping” message. If the driver stopped for the pedestrian participant, she or he would smile and hold up the thumbs up “Thanks for Stopping” card. If the driver did not stop a second participant (approximately 15 feet down the road) would hold up the thumbs down “Please Stop Next Time”. Thus, driver who yielded for the pedestrian received a consequence (thumbs up, smile) while those who did not yield received a consequence (thumbs down) and a prompt (please stop next time). Crossing rates were likewise measured at the downstream location, but without the treatment described in this paragraph (Nasar, 2003).

2.2 Foundational Antecedents

2.2.1 The emergence of the study of driving behaviors.

James Gibson, a founder of the ecological perception movement, is one of the seminal authors in the psychological study of driving behavior. Gibson's theories were heavily influenced by Kurt Lewin and the Gestaltists. He favored the holistic approach of the Gestaltists, stressing the importance of environmental factors on behavior. Lewin's construct of hodological space (which divides space into distinct, non-overlapping regions) was based on the concepts that (a) behavior is directed toward a goal and away from dangerous regions and (b) distinguishing between specific points in some regions of physical space is difficult (Kadar & Shaw, 2000). His approach combined this construct of physical space with psychological factors associated with need (Kadar & Shaw, 2000).

Lewin's model would go on to influence Gibson's development of "fields of safe travel" and "minimum stopping zones". These models represented some of the earliest psychological theories of driving behavior. Fields of safe travel represent unimpeded paths in finite space. It is both a subjective measure of the experiencing driver and an objective measure of safe operation of a vehicle. The construct influences minimum stopping zone, which measures the distance required to safely stop if necessary. Minimum stopping zone is based on several factors including vehicle weight, road conditions, brake conditions, etc. While Gibson's constructs are focused on field-theory and fields of perception, they represent some of the seminal studies in safe/unsafe driving behavior from a psychological perspective. Similarly, they represent contributions to the concept of organism-environment constructs of behavior (as opposed to stimulus-response) (Kadar & Shaw, 2000).

Driving an automobile served as the foundational basis of investigation for some of the seminal works in cognitive science. Fitts and Posner's (1967) book *Human Performance*, influenced by the environmental-organism approach favored by Gibson, makes repeated mention of driving as a complex, feedback dependent behavior:

> In driving an automobile, for example, one does not randomly respond to stimuli on the road. Instead, one makes responses in accordance with some internal model which involves reaching a destination at a certain time while obeying various traffic regulations, accommodating oneself to the other traffic on the road, and adapting one's driving in numerous other ways to the immediate environmental situation. (p. 3)

Baddeley (1987) examined attentiveness while driving (a central factor in RDBs). He offered the example of listening to a football game as a way in which "different aspects of Working Memory can be concurrently used to support quite different behaviours" (Groeger, 2002, p. 238). Groeger & Rothengatter (1998) and Groeger (2002) provide expanded reviews of cognitive psychological studies of driving (Groeger, 2002; Groeger & Rothengatter, 1998).

2.2.2 Predictors of risky driving behaviors

The psychological study of *risky driving behaviors* (RDBs) has covered a substantial range of academic foci. The historic focus has tended to favor the study of individual *personality* traits as predictors of negative driving behaviors (collectively referred to as risky or dangerous driving) (Arthur & Graziano, 1996; Dahlen et al., 2005; Dahlen & White, 2006; Harris et al., 2014; Jenks & Jones, 2010; Matthews et al., 1991). These predictors are used in studies of different driving styles such as *aggressive* and *angry* driving (Deffenbacher et al., 2002; Dula & Ballard, 2003; Hennessy & Wiesenthal, 2002; Shinar, 1998), *sensation seeking* and *risk-taking* driving (Clarke et al., 2005; Jonah, 1986), *stressed* and *anxious* driving (Clapp et al., 2011; Fairclough et al., 2006; Gulian et al., 1989), *distracted* driving (Beede & Kass, 2006; Young, Kristie et al., 2007). Inversely, a recent trend toward *positive* driving has emerged (Harris et al., 2014; Isler & Newland, 2017a). The development of the Pro-Social and Aggressive Driving Inventory (PADI) (Harris et al., 2014) represented a general shift in traffic psychology toward identification and promotion of the positive personality traits and effects of prosocial driving style.

Jafarpour and Rahimi-Movaghar (2014) defined RDBs as behaviors that "obviously endanger or at least have the potential to put the driver and/or other people in danger" (Jafarpour & Rahimi-Movaghar, 2014, p. 2). These acts, viewed in a holistic capacity as driving style, can be either deliberate (violations) or unintentional (errors, distraction) (Jafarpour & Rahimi-Movaghar, 2014). RDBs are also examined via aggressive, angry, vengeful, distracted, stressed, and anxious driving behaviors. Furthermore, RDBs as a construct can be considered distinct from risk seeking or risky driving style as outlined in Taubman (2003). Individual differences as predictors of RDBs have focused on (a) personality, (b) demographics, (c) cognitive factors, and (d) motivational factors. Five Factor Model (FFM) studies of RDB have demonstrated good predictive utility for extroversion, neuroticism, and conscientiousness (Dahlen & White, 2006). Anger, sensation seeking, impulsiveness, and propensity to boredom have likewise demonstrated good predictive utility for RDBs (Dahlen et al., 2005).

Measurements of driving behaviors tend to focus on (a) previous driving events and (b) likelihood of future driving behavior. The *previous driving events* metrics measure previous occurrence of specific events such as motor vehicle accidents, traffic violations, and aggressive acts while driving (Dahlen & White, 2006). Motor vehicle accident occurrence is the primary indicator of risky or unsafe driving in a majority of transportation and transit studies focused on RDBs (F. Guo & Fang, 2013). *Likelihood of future driving behavior* is typically elicited through self-report on individual driving practices (i.e. likelihood to exceed posted speed limits, follow too closely to lead vehicle, and overtake in risky situations) and social driving practices (i.e. likelihood to partake in aggressive or risky acts against other drivers such as honking, rude gesturing, or physical violence) (Jafarpour & Rahimi-Movaghar, 2014).

Predictors of RDB tend to fall into various categories such as demographic, perceptual and cognitive, social psychological, driver state, and individual factors. Demographic predictors focus on age, gender, and socioeconomic differences in predictive utility for RBDs. Social psychological predictors focus on (a) attitude-behavior relationship and (b) social cognitive theory. The attitude-behavior relationship construct The Theory of Planned Behavior as developed by Icek Ajzen (1985), has been extensively studied as it relates to RDBs (Elliott et al., 2003; Nordfjærn et al., 2010). Studies have focused on the impact of age, gender, and driver status on intention to cross at a crosswalk (Holland & Hill, 2007) as well as locus of control (Holland et al., 2010), the impact of fatigue on TPB variables (Rosenbloom et al., 2011).

2.2.3 Prosocial driving and sustainable behaviors.

Prosocial driving can be understood “as a pattern of safe driving behaviors that potentially protect the well-being of passengers, other drivers, and pedestrians, and that promotes effective cooperation with others in the driving environment” (Harris et al., 2014, p. 4). Prosocial behavior is thought to derive from four primary sources of motivation (1) self-interest based on behavior aimed at receiving reward or avoiding punishment (i.e. egoism), (2) selfless interest in helping others (i.e., altruism), 3) interest in promoting the welfare of one's group (i.e., collectivism), or; 4) the desire to remain consistent to morals or ideals (principlism) The Prosocial Aggressive Driving Inventory (PADI) (Harris et al., 2014) combines elements of the aggressive driving subscale with measures of self-reported safe driving practices (the prosocial driving subscale). Initial testing has demonstrated an inverse relationship between prosocial driving and motor vehicle accidents. In general, safe driving practices have not been well tested as predictors of RDBs (Harris et al., 2014).

Use of the term adaptive driving as defined herein draws from recent examinations of the prosocial behaviors that promote and encourage safety in the traffic environment. Adaptive driving is a forgiving, defensive approach to actions in the traffic environment. Adaptive drivers minimize risk and are aware of the potentially catastrophic consequences of driving. Indeed, trait forgiveness has demonstrated an inverse relationship to "driving anger, aggressive and risky driving, [and] maladaptive driving anger expression" (Moore & Dahlen, 2008a). Consideration of future consequences has likewise demonstrated an inverse relationship with "aggressive and risky driving, physically aggressive driving anger expression, [and] use of the vehicle to express anger" and a positive association to adaptive driving anger expression (Moore & Dahlen, 2008a). Little is known about the factors that lead to prosocial and sustainable driving highlighting the importance of the present investigation.

Chapter 3: Study Approach and Methods

3.1 Objectives & Hypotheses

The primary objective of this study was to examine factors of the sociophysical traffic environment that lead to safe driver-pedestrian interactions and that promote sustainable driving environments. To this end, the research plan cast a wide net to address the issue from different methodological and theoretical perspectives. The holistic approach represents an intersection between traffic studies and environmental psychology. Ideally, the results of this research will inform both fields and be applicable to the study of a wider range of human behavior.

The emergence of prosocial driving behavior as a focus of traffic psychology has wide ranging potential. One important contribution of this work is the preparation of instruments for measurement of prosocial driving behavior across cultures and contexts. As such, the first phase of this research study was a translation and validation of the PADI. The process informed the development of scales for Part I as well as provided an important contribution to for psychological traffic research. Part I of the study applied the PEM to the study not only to examine driving behavior but also to assess whether sustainable drivers manifest positive environments and wellbeing in other ways. Part II tested the effect of manipulations of the sociophysical environment on drivers' decisions to yield (or not) to pedestrian waiting at a marked crosswalk. The combination of multiple methodologies served the same specific focus; how does the socio-physical traffic environment relate to psychological well-being and sustainable behavior and how do they effect driver decisions to yield for pedestrians?

The pilot, Part I, and Part II of this study function independently of each other and are organized as such to examine a single issue, the development of a safe traffic environment for drivers and pedestrians, from different perspectives and through employing various disparate methodologies. However, the parts are designed to inform and complement each other and to provide greater insight into the psychological underpinnings that "drive" human behavior in the traffic environment. They are not intertwined in an organized manner per se, though it is likely some individuals took part in more than one portion of this study. Given sufficient time and resources, future studies of the relationship between factors of the sociophysical traffic environment and individual behavior would track the same individuals through auto-report and observable driving behavior either through simulation or ride-along test in real-time. This type of organized interaction between individual behaviors and perceptions was not feasible given the scope of this study.

3.1.1 Specific objective 1: The correlational model.

Part I featured self-report questionnaires that were analyzed using a structural equation model. The general aim was to examine positive traffic environments and their sociophysical determinants using the PEM model.

Hypothesis 1:The PEM model has not been previously tested within the traffic psychology context however given previous literature showing positive environment quality is positively associated with greater wellbeing, sustainable and conservation behaviors it is predicted that this will be true within the driver-pedestrian interaction context (Bechtel & Corral, 2010; Corral & Frías, 2016;

Corral Verdugo, 2012; Victor Corral-Verdugo et al., 2011). Moreover, these interactions will further predict increased positive (prosocial) traffic environments. This general objective will be accomplished through 6 different specific aims:

Specific Objective 1a: Investigate the relationship between driver-pedestrian environmental quality and sustainable behaviors.

Specific Objective 1b: Investigate the relationship between driver-pedestrian environmental quality and psychosocial wellbeing.

Specific Objective 1c: Investigate the association between driver-pedestrian environmental quality and sociophysical environment conservation.

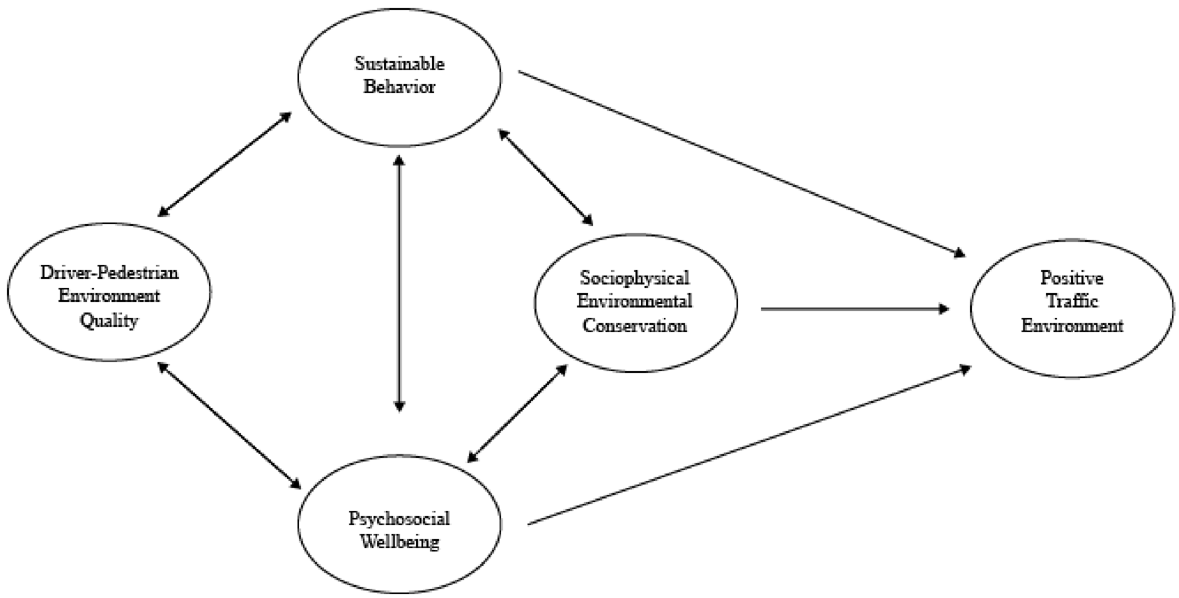
Specific Objective 1d: Investigate the association between psychosocial wellbeing and positive traffic environments.

Specific Objective 1e: Investigate the association between sociophysical environment conservation and positive traffic environments.

Specific Objective 1f: Investigate the association between sustainable behavior and positive traffic environments.

Figure 1 (below) represents the proposed model for Part I. The design applies the Positive Environment Model (PEM) to the sociophysical traffic environment, conceptualizing "positive environment A" as a measure of perceived environment quality (neighborhood level) and "positive environment B" as a resulting positive traffic environment.

Figure 1: Structural equation model applying the Positive Environment Model (PEM) to the study of driving behavior and environment quality



3.1.2 Specific objective 2: Quasi-experimental manipulation of the socio-physical environment.

Part II of the study evaluated the impact of manipulation of the sociophysical environment on motorist behavior (driver yield, right obstruction, and left obstruction) in a sample of northern Mexican drivers (Hermosillo, Sonora).

Hypothesis 2: Due to previous literature demonstrating that both signage and social prompts lead to increased stopping rates in the United States (Huybers et al., 2004b; Nasar, 2003) *we predict that a positive sociophysical environment encouraging pedestrian safety will increase driver stopping rates and reduce conflict interactions in Hermosillo, Sonora*.

Specific Objective 2a: Examine the impact of signage encouraging drivers to yield for pedestrians at a marked crossing.

Specific Objective 2b: Examine the impact of social prompts encouraging drivers to yield for pedestrians at a marked crossing.

Following a piloting and calibration phase, Part II was significantly revamped to address limitations and/or cultural/contextual issues. The initial strategy for the quasi-experimental study relied upon orchestrated pedestrian crossing with manipulation and in-time observation; however, it became clear following extensive piloting/calibration that the protocol as established was problematic. Initial calibration resulted in extremely high yield rates for pedestrians at the baseline observation level (98%-100% yield rate), which would hinder efforts to measure any effect from manipulation of the sociophysical environment. The rigid safety protocol derived from previous studies (Crowley-Koch et al., 2011; Nasar, 2003) required vehicles to come to a complete stop or motion the pedestrian to cross.

All participating research assistants expressed the opinion that the approach required by the safety protocol felt unnatural and resulted in a stilted, uncomfortable crossing. Some drivers likewise appeared frustrated with the somewhat unusual and slower pedestrian crossing, which may serve to undermine the “positive traffic environment” the intervention aimed to promote. Most observed natural crossings (not involving assistants) at the same locations did not adhere to such strict safety parameters. However, given safety concerns, relaxing protocols was deemed not in the best interest of research assistants or the traffic environment in general. As such, the decision was made to alter the design of the study itself. The variations in approach to pedestrian crossing across populations in the United States and Mexico should be more closely examined and represents an important avenue for future research given adequate time and resources. However, it is beyond the scope of this work to bridge this methodological gap, which would require additional consultation with civil engineers, traffic safety/law enforcement, and other representatives of the public/private sector.

The updated study design focused on natural pedestrian crossings recorded in real-time using high-definition audio-video equipment. It is important to note that while the techniques and methodologies were altered to better fit contextual specificities, the underlying focus on the impact of the sociophysical environment on pedestrian crossings continues to remain the primary goal of this investigation. In a strictly scientific sense, the approach may have allowed for a more objective, standardized analysis of behavioral interaction as observations and scoring did not need to be performed on-location in real time where interactions could be missed.

Arhin et. al. (2016) used video recorded at intersections with significant pedestrian-vehicle interaction to examine the impact of a targeted enforcement intervention. Like Van Houten & Malenfant (2004), metropolitan police stopped vehicles and issues citations (fines) for several illegal driver behaviors. However, this study also included measures of pedestrian and cyclist behaviors as well as targeted enforcement of illegal behavior such as crossing during the "Don't Walk" period. Closed-circuit television (CCTV) cameras allowed for pre- and post-intervention scoring of behaviors. Conflict behaviors between vehicles and pedestrians were reduced significantly following the enforcement intervention ranging from 50% to 66%. The intervention was less effective at reducing illegal behavior in pedestrians and, in fact, illegal behaviors *increased* following the intervention at three of the four treatment locations (Arhin et al., 2016).

The study design described in Arhin et. al. (2016) served as a theoretical framework for the restructured intervention. *Figure 2* (below) is a basic schematic of the location selected for the quasi-experimental study. A camera with high-quality audio-video recording capability was set-up to observe pedestrians crossing east-west in the marked pedestrian crossing during the pedestrian green-light cycle. Given the timing of the intersection light cycles, right turning vehicles from Avenida Colosio represent the greatest danger to pedestrians crossing during their right of way as well as the most likely to interact with pedestrians. Vehicles turning left onto Calle Galeana from Colosio were less likely to interact with pedestrians as their right of way was often blocked by oncoming traffic. However, left turning vehicles were often traveling at a higher rate of speed, making their interactions more dangerous. Notwithstanding, visibility and other impediments for left turning vehicles made an intervention difficult for vehicles traveling from this direction. As such, manipulations of the sociophysical environment occured along the sidewalks on the south side of Colosio, west of the intersection with Galeana.

The general recording area is outlined in blue. The purpose of this angle is to record pedestrians crossing east-west on Galeana in the marked pedestrian crosswalk. The pedestrian crossing light is clearly captured in frame and allows for efficient, accurate observation and scoring. Pedestrians crossing Galeana during the green cycle were required to be aware of both right- and left-turning vehicles from Colosio. Additionally, pedestrians had to contend with children being dropped off at the elementary school as well as vehicles attempting to enter the Foreign Languages parking lot (on several occasions vehicles were observed stopped in the middle of the marked pedestrian crosswalk, effectively blocking it from pedestrian use).

3.2 Methodological Approach

3.2.1 Type of investigation and study design.

The translation and validation of the PADI served as a helpful first step in the development of novel instruments created for this study. The self-report survey utilized similar measurements to those used for validation of the original English version of the PADI examining personality factors, sensation seeking, and general aggression (Harris et al., 2014). The validation targeted a younger, university population, likewise similar to that used in the initial study. This subset of drivers is of particular interest in traffic studies given that younger drivers represent the riskiest drivers with the highest rates of accidents and violations (Orit Taubman - Ben-Ari et al., 2004; Simons-Morton et al., 2005).

Part I of the investigation (see Figure 1) was a non-experimental cross-sectional correlational study based on self-report questionnaires of drivers and pedestrians in a northern Mexican city (Hermosillo, Sonora). During the creation of the scales content validity was taken into consideration. Specifically, each item was evaluated for relevance, representativeness, and comprehensiveness. Newly created scales were validated by testing criterion validity (*Does test predict important non-test outcomes?*), divergent validity (*How does test relate to measures of other constructs?*), and homogeneity (*Are the items related to each other?*). Both criterion and divergent validity were tested using correlational analysis whereas homogeneity was tested using

Cronbach alpha and average interitem correlation (AIC). Once scales are validated, correlations will be assessed using a structural equation model to test relationships between construct variables.

It is important to note that these types of instruments are not without limitations. Social desirability bias could constitute a significant threat bias, particularly when it comes to actions like prosocial driving and pro-environmental behavior with implicit associated value judgements. However, perhaps due to driving's trait-like manifestation, previous research has demonstrated limited effect of social desirability on self-report driver behavior. Lajunen and Summala (2003) found social desirability did not significantly effect responses to the Driving Behavior Questionnaire (DBQ). Sullman's (2010) follow-up of the DBQ and Driving Riding and Avoidance Scale (DRAS) similarly demonstrated limited social desirability bias. Wåhlberg (2010) recommends the addition of a lie scale in lieu of additional behavioral investigation. Such a measure may be included in the piloting planned for Part I.

Part II of the investigation is a quasi-experimental study (see Figure 2) based on manipulation of the sociophysical traffic environment and examination of its effects on driver behavior. The independent variables (positive signage, prosocial prompts) were intentionally manipulated to observe their effects on the dependent variable (yield rates and conflict actions). The intervention followed an ABCA study design wherein A = baseline, B = signage intervention, and C = social prompt intervention.

Each segment of the ABCA design was one week in length. Time interval windows were selected to cover a range of daily activity and achieve a somewhat representative sample of interactions. Each week consisted of four observation windows of about an hour in length (30 green light cycles). Observation windows took place at approximately the same time on the same day across each of the four segments to allow for comparison before and after manipulation. Recording sessions took place Monday mornings between around 8:30 and 10:30 am, Tuesday afternoon between 2:00 and 4:00 pm, Thursday morning between 10:00 am to 12:00 pm, and Friday afternoon between 2:30 and 4:30 pm. The spread of time slots was also influenced by schedules and availability of researchers and research assistants.

The pilot study, Part I, and Part II were cross-sectional investigations with data collection carried out in a single moment. The depth of the analysis was correlational-causal, given that the purpose of the study was to describe the relationship between variables.

3.2.2 Sampling and participants.

3.2.2.1 Pilot Study Sample (PADI Translation & Validation)

All drivers over 18 were included in the study. Possession of a valid driver's license, a common criterion in driving studies, was not required for inclusion in this study as those without licenses represented nearly half (46.9%) of the sample. Failure to include such a sizable percentage of younger drivers may reduce sample representativeness of typical drivers. The final sample included 244 participants (75.7% female, 24.3% male). Average age was 21.77 (SD= 5.10, range= 18-49) of which a majority were students (86.8 %). Participants were mostly single (88.1% single, 6.7% married, 2.9% cohabitate with their partner and 2.4% divorced) with an average educational attainment of 13.53 years (SD=2.74), equivalent to completed high school and at least one year of undergraduate education (Lucas et al., in review).

Most of the participants were recruited via convenience sample and snowball effect. Due to the nature of the study, a large percentage of participants were young drivers (students, over the age of 18). This target sample was specifically selected as younger drivers represent the most dangerous segment of the driving community (Orit Taubman - Ben-Ari et al., 2004; Simons-Morton et al., 2005). Similarly, the original validation of the PADI featured a young demographic of drivers. The software program Qualtrics allowed for digital completion of the survey. The link was distributed to interested participants who could respond via computer or smart phone/tablet.

3.2.2.2 Part I Sample

The Part I sample (n=283; mean age 26.31, SD=11.50) consisted of 75% women (.04% non-binary and 1.1% prefer not to respond) was selected from a convenience, snowball sample and was specifically targeted to catch a cross-section of the city population. Most of the sample were college students (59%), in part a result of viability limitations of the study. An effort was made to capture feedback from a range of respondents along the socioeconomic spectrum. Research Assistants setup a booth at a local swap meet ("tianguis") and offered raffle tickets for a 250-peso (approximately USD$12.75) raffle for completing the survey consisted (47 responses) and electronic versions of the questionnaire were given to college students as well as other participants in a snowball style sampling approach. Only respondents over the age of 18 were included in the study and informed consent was received from each person (as such 16 minors were removed from the data pool).

Overall, the sample appears to be an adequate cross-section (though not statistically representative) of drivers and pedestrians in the target city. The following basic socioeconomic indicators provide a snapshot of the sample population. The respondents' highest educational attainment was elementary school (1.4%), middle school (8.2%), high school (63.3%), undergraduate (23.1%), specialty degree (.7%), master's degree (7.5%), doctorate (.7%). Of the sample, 59% were students, 6.9% some type of professional, 6.9% business proprietor, 6.3% administrator, 5.7% educator, 2.3% technician, 1.7% executive, 1.1% manager, 3% other. Household monthly income: less than 4,000 pesos (15.95%), 4,000-9,000 pesos (23.8%), 9,000-20,000 pesos (33.8%), 20,000-40,000 pesos (17.9%), 40,000-85,000 pesos (7.3%), and more than 85,000 pesos per month (1.3%). Of the sample, only 57.8% reported having an active license within the last three years and 24.3% reported near-miss accidents within the last year.

3.2.2.3 Part II Sample

The Part II sample was non-probabilistic selected by convenience at the target intersection. A total of four weeks of observational recordings were performed. Each recording window consisted of 30 pedestrian green light cycles (approximately one hour of total recording time). Time intervals spanned a wide range of daylight hours to provide the most representative sample possible. Time interval windows were consistent throughout all four weeks (meaning each Friday, for example, the same time window was observed to control for other variables in flow, traffic load, pedestrian schedules etc.)

Identifying the location for the intervention was a comprehensive process and certain basic parameters were required to be considered a candidate setting. The intersection needed to demonstrate steady pedestrian-vehicle interaction and include a marked pedestrian crosswalk with a lighted pedestrian crossing signal. Ideally, the location would be near the local University to improve potential treatment diffusion in the target population (primarily younger drivers) and allow for easier logistical access for student research assistants (who often lack access to dependable personal transportation). The intervention location was based on input from both individuals familiar with the circulation issues associated with the University of Sonora and its surrounding areas and professionals from the City of Hermosillo's planning body, IMPLAN. Furthermore, both students and professors expressed concerns over the safety of pedestrian crossings at this intersection.

3.3 Instruments

3.3.1 Part I: Questionnaire Item Construction.

To examine the traffic environment from the perspective of the Positive Environment Model (Corral & Frías, 2016) a series of self-report tests was constructed. Dimension constructs aimed at measuring (a) driver-pedestrian environment quality (D-PEQ), (b) sustainable behavior, (c) psychological well-being, (d) socio-physical environmental conservation and (e) positive traffic environment were developed. See *Addendum 1: Test Construction* for a complete item listing. Each dimension was constructed using the *homogeneous item construct (clusters) (HIC)* method to ensure systematic sampling (Murphy & Lee, 1994; Simms & Watson, 2007).

The distinction between homogeneity and internal consistency is critical. Simms and Watson (2007) posit, "whereas internal consistency indexes the overall degree of interrelation among a set of items, homogeneity (or unidimensionality) refers to the extent to which all of the items on a given scale tap a single factor." (Simms & Watson, 2007, p. 251) Thus, by combining multiple unidimensional facets of a construct HIC is designed to identify the its full width, potential redundancy, and issues of scale length that can increase internal consistency but result in a narrower scale with more limited validity. (L. A. Clark & Watson, 1995; Simms & Watson,

2007) The approach is somewhat driven by the idea that "no statistical procedure can identify content that should have been included, but wasn't." (Watson, 2018, p. 12)

3.3.1.1 Driver-Pedestrian Environment Quality (D-PEQ).

The Driver Pedestrian Environment Quality (D-PEQ) construct examines the degree to which the sociophysical context promotes safe vehicle-pedestrian interaction by providing a comfortable and secure traffic environment. Locations with a high degree of D-PEQ would be characterized by safe and well-maintained spaces that provide for connectivity as well as promote the safety of all in the traffic environment. The dimension construct is divided into distinct aspects of neighborhood connectivity, street quality, traffic calming, pedestrian safety, and perceived crime.

3.3.1.1.1 Aspects of D-PEQ.

Neighborhood connectivity examines proximity to commercial, residential, and community land-use types within a 5- to 10-minute walking radius from one's home. *Infrastructure Quality* measured the physical quality of street infrastructure as it relates to pedestrian safety and comfort (Cerin et al., 2006b). *Traffic Calming* features included the measurement of street design features aimed at reducing traffic speed and flow. (Retting, Ferguson, & McCartt, 2003). *Pedestrian Safety* included measuring behaviors that encourage driving and pedestrian safety. Finally, *Perception of Crime* evaluated perceived crime and its impact on driver and pedestrian behavior. (Cerin et al., 2006b)

3.3.1.2 Sustainable Behavior.

Sustainable behaviors are defined as actions aimed at protecting the sociophysical environment (Victor Corral-Verdugo et al., 2011; de Groot & Steg, 2008). They can be understood as actions that signify a desire for equal treatment of others, even when those behaviors may run contrary to one's own interests. Also, by a restrained material consumption and a dedication to preserve and protect environmental quality. The dimension construct is divided into distinct aspects of equity, altruism, frugality, and pro-ecological behaviors.

3.3.1.2.1 Aspects of Sustainable Behaviors.

Equity is defined as the importance of equal opportunity and voice for all members of the community. *Altruism* is a commitment to help and care for others without expecting reward or direct benefit. (Büssing et al., 2013; Lee & Ashton, 2004) *Frugality* is the degree to which consumers are restrained in acquiring economic goods and services as well as the resourceful use of those goods and services to achieve long-term goals. *Pro-ecological behaviors* are those that actively promote the quality of nature and the natural environment. (Verdugo et al., 2009)

3.3.1.3 Sociophysical Environmental Conservation (SPEC).

Sociophysical environmental conservation (SPEC) is characterized by actions and attitudes that contribute to the preservation of physical (both built and natural) and social systems (Seitz & Razzouk, 2001). Time and space are critical components of this construct which places the immediate and long-term decisions of people at the forefront of environmental protection. SPEC is typified by community involvement and support as well as a belief in the role of humanity in the preservation of social, natural, and built environments. It is likewise demonstrated in social settings and influences that promote such attitudes, behaviors, and beliefs. The dimension construct is divided into aspects of social conservation behaviors, ecological conservation attitudes, and social orientation in environmental conservation.

3.3.1.3.1. Aspects of SPEC.

Social conservation behaviors are actions that contribute to conservation of optimal community function. *Ecological conservation attitudes* are personal beliefs about the importance of environmental preservation and the impact of individual agency toward that end. *Social orientation in environmental conservation* is the degree to which communal opinions, social norms, and social pressure drive conservation behavior.

3.3.1.4 Psychosocial Wellbeing (PWB).

Psychosocial wellbeing (PWB) is defined as a holistic measure that examines both individual psychological wellbeing and the social wellbeing of the community. Individual psychological wellbeing is characterized by positive individual affect wherein the efforts of a person are directed towards a specific purpose or life goal. Social wellbeing is typified by optimal functioning in society and is a component of eudemonic wellbeing (from a social perspective). Social wellbeing is divided into aspects of social actualization, social integration, and social contribution. (Keyes, 1998)

3.3.1.4.1 Aspects of PsW.

Psychological wellbeing is a self-evaluation of life quality and functioning. (Verdugo et al., 2009; Watson et al., 2012) *Social actualization* is the belief that society is evolving positively, has the potential to become more positive, and is realizing that potential. *Social integration* is a sentiment of community belonging and support based on shared commonality. *Social contribution* is belief in one's ability to contribute positively to society and that those contributions are valued by the community. (Keyes, 1998)

3.3.1.5 Positive Traffic Environment (PTE).

A Positive Traffic Environment (PTE) centers around effective cooperation and is a holistic measure of safe driving and walking behaviors that protect the safety and wellbeing of drivers, passengers, and pedestrians. A PTE requires the concerted effort of all participants of the traffic environment to protect themselves and others through prosocial actions and is typified by adherence to traffic regulations, attentional focus, and caution. The measure represents a novel instrument not found in previous literature. PTE is divided into aspects of prosocial driving towards pedestrians and cyclists, prosocial driving toward other vehicles, safe driving behaviors, and safe pedestrian crossing behaviors.

3.3.1.5.1 Aspects of PTE

Prosocial driving towards pedestrians and cyclists are driving behaviors aimed at the protection of pedestrians and cyclists in the traffic environment. *Prosocial driving towards other vehicles* are driving behaviors that promote a safe and harmonious traffic environment amongst drivers. These aspects are derived from the previously mentioned Prosocial and Aggressive

Driving Inventory (PADI). (Harris et al., 2014) *Safe driving behaviors* are general driving behaviors or perceptions of behaviors that encourage a safe driving environment. *Safe pedestrian crossing behaviors* are pedestrian actions aimed at safe interactions in the traffic environment.

3.3.2 Quasi-experimental study of driving behaviors.

The primary empirical unit of measure were yield rates and conflict interactions in keeping with previous research. Yield rates, sometimes stopping rates, have been become a standard statistical measurement for examining the impact of experimental variables related to driver pedestrian interaction. Essentially, it is a proportion of the total drivers who make way for pedestrians (i.e. if 3 out of 10 drivers yield to pedestrians attempting to cross the street the yield rate would be 30%).

In accordance with previous studies (Arhin et al., 2016; Crowley-Koch et al., 2011), a series of driver behaviors and conflict interactions were used for scoring and evaluating the potential impact of the intervention. Simple proportion comparisons across the four segments of the study were used to measure potential differences pre and post treatment. Vehicles were scored for yield proportion as well as conflict interactions (obstruction [right turning vehicles], obstruction [left turning vehicles], and evasion maneuvers [pedestrians forced to make an action to avoid an oncoming vehicle]). Other measures were recorded to provide more in-depth information on the sociophysical traffic environment including pedestrian counts (individuals and groups) and crossings without vehicle-pedestrian interaction.

It is important to note that pedestrian traffic patterns were heavily influenced by university passing periods and nearby school pick-ups and drop-offs, and as such, some green light cycles did not feature any vehicle-pedestrian interactions while others featured several. To control for these variations, crossings were summed as a total of 30 consecutive green light cycles (approximately one hour) per time window. The spacing of time windows across a range of days and hours was likewise an attempt to control for hourly trends in vehicle and pedestrian traffic. Additionally, large numbers of pedestrians crossed during the pedestrian red-light cycle and are not included in pedestrian counts or scoring for the purpose of this study. However, examining these illegal pedestrian crossings provides interesting opportunities for potential future study.

3.4 Procedure

3.4.1 Pilot Study: Translation and validation, self-report procedures

The translation and validation of the PADI features a convenience, snowballing sample. Participants were provided with a link to a digital version of the questionnaire. The survey could be filled out on any computer or smart device with access to the internet. The format was most appropriate for this younger cohort. An additional benefit of using digital forms is reduction in error and workload required to manually enter paper-and-pencil responses into databases.

The PADI was initially translated from the original English version to Spanish by a bilingual researcher. A second bilingual researcher then back translated the Spanish items into English. A third, native English speaking, bilingual researcher compared the original English version with the back-translated English version to check for consistency and equivalence. Finally, a senior researcher examined the Spanish translation to ensure legibility as well as cultural/contextual clarity for the target population of Mexican participants. Minor wording adjustments were made where necessary, resulting in the finalized Spanish version used for this study. All additional measurements were captured through previously translated and validated instruments.

3.4.2 Part I: Self-report procedures

Part I self-report was conducted using a convenience sample of drivers and pedestrians in the target city. Paper-and-pencil questionnaires were distributed and a raffle for a nominal financial gain (250 Mexican pesos, approximately USD$12.75) was offered for participation in the survey. The questionnaire was also digitized using Qualtrics online survey software. Links were distributed for participation via home computer or smart phone. Research assistants were made available to administer questionnaires to individuals who requested or required additional assistance. Interested participants were briefed on the scope investigation and its objectives; following this discussion, they were required to sign informed consent forms prior to participation in the study.

3.4.3 Part II: Quasi-experimental procedures

The study design was divided into four segments (weeks) consisting of a preliminary observation period, one week of manipulation using only a mounted sign encouraging drivers to yield for pedestrians, one week of manipulation with research assistants holding signs encouraging drivers to yield for pedestrians (50% male/female), and one week of post-manipulation observation. Pedestrian vehicle interactions were scored as discussed previously. Each week consisted of four observation windows of approximately an hour of uninterrupted video runtime (30 green light cycles). Observation windows took place at the same time on the same day across each of the four segments to allow for comparison before and after manipulation.

The revised approach featured video recordings of interactions at a lighted pedestrian crossing. The study included only crossings made during the pedestrian “green light”. However, continuous recordings were made of both light cycles, which will allow for potential future examinations of pedestrian crossings during the pedestrian “red light” (and how pedestrian behavior may be impacted by manipulations aimed at increasing vehicle yielding). Each recording window lasted approximately an hour with a minimum of 30 individual green light cycles (some extra recording was performed to allow for potential issues during recording). The red and green pedestrian crossing cycles lasted about 1 minute each.

The site for initial observation was selected based on input from both individuals familiar with the circulation issues associated with the University of Sonora and its surrounding areas and city planning experts from the City of Hermosillo’s primary planning body, IMPLAN. Students and professors alike have expressed concerns over the safety of pedestrian crossings at this intersection. Also worthy of mention, the street has been identified by IMPLAN as a potential future pedestrian and bicycle route, providing much needed north-south non-vehicle connectivity. As such, the intersection was deemed an ideal location for recording vehicle pedestrian interactions and any effect from manipulation of the sociophysical environment.

The intersection chosen is located at the corner of Avenida Luis Donald Colosio (Colosio) and Calle Galeana (Galeana) in the city of Hermosillo, Sonora in Mexico. Colosio is a major two-way east-west city corridor with heavy traffic loads and a relatively fast traffic flow. Galeana is a smaller one-way arterial street running south (though at this location it runs at a northeast-southwest angle) with lower loads and slower moving traffic. The main campus of the University of Sonora runs along a substantial stretch of the north side of Colosio. The campus’ Foreign Languages building is located on the southeast corner of the intersection. A steady flow of pedestrian traffic moves north-south crossing Colosio and east-west to cross Galeana to circulate between the main campus and the extension Foreign Languages Building.

3.5 Analysis

3.4.3.1 Analysis: Pilot Study (PADI Translation & Validation)

Confirmatory Factor Analyses (CFAs) were run using the EQS v6 software package. Given the relatively small sample size for structural equation models, items were divided into parcels in keeping with previous research (Hau & Marsh, 2004). Fit index indicators evaluated the degree to which the data supported the proposed hypothetical model. In this study, two types of indicators were considered: practical and statistical. One statistical indicator was used, namely, chi square (χ 2), which measures the difference between the proposed models and the saturated $\chi 2$. If the theoretical model is not different from the saturated $\chi 2$ will not be significant ($p > .05$). Relative $\chi 2$ was used to reduce dependency on sample size. Relative $\chi 2$ is calculated by dividing the $\chi 2$ fit index by the degrees of freedom. If the ratio is less than 5, the data is deemed to have good fit (Schumacker & Lomax, 2010). Because statistical indicators are particularly sensitive to sample size, practical indicators were additionally considered. Practical indicators included the Comparative Fit Index (CFI), Bentler-Bonnet Normed Fit Index (NFI), and Tucker Lewis Index (TLI). These indices should have a value higher than .90 (Bentler, 2007a). The Root Mean Square Error of Approximation (RMSEA), an absolute measure of fit, was also included (values should be $\leq .09$) (Browne & Cudeck, 1992a).

3.4.3.2 Analysis: Part I

We used structural equations modeling to test the theoretical model proposed above. As with CFA analysis we used EQS v6 software. Likewise, we used two types of indicators: practical and statistical. We used the relative $\chi 2$ as well as practical indicators. The practical indicators used were the Comparative Fit Index (CFI), Bentler-Bonnet Normed Fit Index (NFI), and Tucker Lewis Index (TLI) as well as the Root Mean Square Error of Approximation (RMSEA).

3.4.3.3 Analysis: Part II

In congruence with previous quasi-experimental studies of the sociophysical traffic environment, behavioral variation analysis associated with Part II was performed via comparison of summed proportions of outcome measurements (Crowley-Koch et al., 2011; Huybers et al., 2004b; Nasar, 2003). Three primary driver outcome measurements were analyzed (proportions of pedestrian yield as well as right and left obstructions toward pedestrians). Total number of incidents for each week were summed and divided by the total number of pedestrians involved in a vehicle interaction. To provide a measure of control, two types of measurements were taken for pedestrian crossings: those with and without interaction with vehicles. Final analysis compared only pedestrians involved at least one of the three driver outcome measurements. Those who crossed without interaction with at least one vehicle were as such not included. The output score for each outcome measurement is thus represented as a percentage of all pedestrian interactions for that week. It is important to note that multiple vehicle outcomes can occur for a single pedestrian. For example, if three vehicles perform a right obstruction and a fourth yields, then a total of four vehicle outcomes are scored for one pedestrian crossing.

Chapter 4: Results

4.1 Translation and Validation: The Prosocial and Aggressive Driving Inventory (PADI)

One of the specific aims of this paper was to translate and validate a Spanish version of the Prosocial and Aggressive Driving Inventory (PADI) developed by Harris et al., (2014). In order to validate the PADI for use in Mexico, items were translated, back-translated, then checked by bilingual researchers.

Like the original English validation, Mexican participants here were more likely to report prosocial (Mean: 5.09 ± 1.03) as opposed to aggressive driving (2.55 ± 0.95) behavior ($t_{(478)} = 28.00$; $p<.001$). However, unlike the previous validation we did not find sex differences which may be due to largely female sample (73%). Items from within the prosocial and aggressive driving behavior subscales were randomly parceled (using the *list randomizer* found at www.random.org) and averaged to allow for confirmatory factor analysis. The prosocial subscale was divided into three groups of four items and one group of five items; the aggressive subscale was split into three groups of four items. *Table 1* below represents the randomized groups and the items included in each (Lucas et al., in review).

Table 1: Randomized item parcels for the Prosocial and Aggressive Driving Inventory

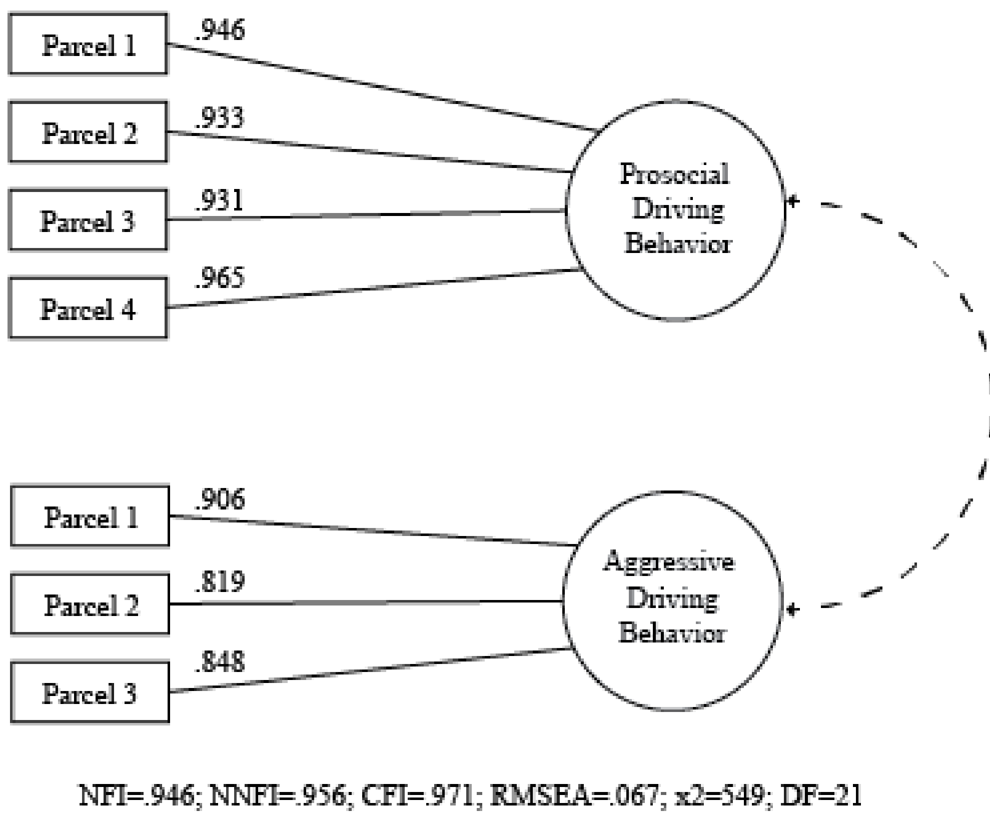
Prosocial Subscale	Item Number	Aggressive Subscale	Item Number
Group 1	13, 9, 14, 15	Group 1	26, 19, 25, 20
Group 2	5, 11, 7, 6	Group 2	24, 27, 21, 22
Group 3	4, 16, 10, 8	Group 3	28, 29, 23, 18
Group 4	1, 17, 2, 3, 12		

As previously mentioned, both practical and statistical adjustment indicators were considered in this study. Chi square (χ^2) and three practical indicators, including the Comparative Adjustment Index (CFI), the Bentler-Bonnet Normalized Adjustment Index (NFI) and the Tucker Lewis Index (TLI), expecting values of these practical indexes > .90 (Bentler, 2007b). Finally, the mean square approximation error (RMSEA) was utilized, an absolute measure of adjustment (values must be ≤ .09) (Browne & Cudeck, 1992b). The robust method was likewise implemented given high Mardia scores (15.83).

Correlations and differences of means were tested to examine variables associated with aggressive driving behaviors. Normality tests were run with both PADI subscales demonstrating a non-normal distribution (D (232) =.18, $p<.001$; D (232) =.10, $p<.001$). As a result, non-parametric statistical tests were used to measure associations (Spearman's rho) and differences (Wilcoxon signed rank test).

A two-factor model was tested. The results of the fit quality of this model were acceptable (NFI = .946; NNFI = 956; RMSEA = .067; CFI = .971; and $\chi 2$ = 549 (df=21). See *Figure 3* for model and factor loadings (Lucas et al., in review).

Figure 3: Relationship between prosocial and aggressive driving behavior and personality factors



PADI Translation & Validation: Reliability

The Prosocial Driving subscale of the PADI demonstrated high reliability (α=.970; See *Table 2*) (Lucas et al., in review).

Table 2: Alphas if item removed, mean, and standard deviation of a Spanish Translation of the Prosocial Driving Behavior subscale (PADI)

	Mean (SD)	α	α*
Prosocial Subscale		**.970**	
Item 1	5.25 (1.291)		.968
Item 2	5.18 (1.222)		.968
Item 3	5.17 (1.258)		.968
Item 4	5.16 (1.178)		.968
Item 5	5.20 (1.202)		.968
Item 6	4.93 (1.371)		.969
Item 7	5.08 (1.235)		.968
Item 8	5.16 (1.247)		.968
Item 9	4.94 (1.252)		.969
Item 10	5.00 (1.236)		.968
Item 11	4.87 (1.341)		.969
Item 12	4.88 (1.306)		.969
Item 13	4.94 (1.314)		.968
Item 14	5.00 (1.267)		.969
Item 15	4.87 (1.128)		.968
Item 16	4.88 (1.329)		.969
Item 17	5.04 (1.162)		.968

Table 2 presents Cronbach's Alpha and mean (standard deviation) for the prosocial subscale of the Prosocial Aggressive Driving Inventory (PADI). The α*represents reliability if item is removed.

Likewise, the Aggressive Driving subscales of the PADI showed high reliability (α=.887 respectively, See *Table 3*) (Lucas et al., in review).

Table 3: Alphas if item removed, mean, and standard deviation of a Spanish Translation of the Aggressive Driving Behavior subscale (PADI)

	Mean (SD)	α	α*
Aggressive Driving Subscale		**.887**	
Item 18	3.74 (1.612)		.889
Item 19	2.43 (1.419)		.876
Item 20	2.52 (1.414)		.871
Item 21	2.43 (1.425)		.875
Item 22	2.37 (1.349)		.872
Item 23	2.85 (1.464)		.876
Item 24	2.29 (1.339)		.876
Item 25	2.23 (1.481)		.874
Item 26	2.14 (1.455)		.877
Item 27	3.16 (1.576)		.886
Item 28	2.34 (1.340)		.878
Item 29	2.33 (1.313)		.879

Table 3 presents Cronbach's Alpha and mean (standard deviation) for the aggresive driving subscale of the Prosocial Aggressive Driving Inventory (PADI). The α* represents reliability if item is removed.

Most scales and subscales, except two sensation seeking subscales ("thrill and adventure seeking" and "boredom susceptibility"), demonstrated acceptable reliability (*see Table 4*). The prosocial and aggressive subscales of the PADI demonstrated excellent (.97) and good reliability (.88) respectively. "Agreeableness" (.64) and "conscientiousness" (.69) from the FFM demonstrated somewhat low reliability, while "openness" (.79), "extroversion" (.80) and "neuroticism" (.80) resulted in good reliability. All subscales of the Buss-Perry Aggression Questionnaire demonstrated acceptable reliability (PA=.78, Ho=.78, An=.70, and VA=.73). From the Sensation Seeking Scale (Form V), "disinhibition" (.70) demonstrated acceptable and "experience seeking" (.80) demonstrated good reliability, while neither "thrill and adventure seeking" nor "boredom susceptibility" reached the level of significance. Both nonsignificant subscales were used in the original English validation of the PADI (Lucas et al., in review).

Table 4: Mean, standard deviation, and reliability for target scales

	Mean (SD)	Reliability
Prosocial Driving Inventory (PADI)		
Prosocial driving	5.09 (1.03)	.97
Aggressive driving	2.57 (0.96)	.88
Five-Factor Model (FFM)		
Agreeableness	3.60 (0.60)	.64
Conscientiousness	3.35 (0.58)	.69
Extroversion	3.09 (0.79)	.80
Neuroticism	3.03 (0.78)	.80
Openness	3.70 (0.61)	.79
Buss-Perry Aggression Questionnaire		
Physical aggression	1.99 (0.67)	.78
Hostility	2.60 (0.74)	.78
Anger	2.31 (0.74)	.70
Verbal aggression	2.93 (0.73	.73
Sensation Seeking Scale (Form V)		
Experience seeking	1.42 (0.28)	.80
Thrill and adventure seeking	NS	NS
Disinhibition	1.62 (0.24)	.70
Boredom susceptibility	NS	NS

PADI Translation & Validation: Validity

Congruent with the original scale validation, a two-factor model was run which showed acceptable goodness-of-fit indices (NFI = .94, NNFI = .94, RMSEA = .07, CFI = .96, and χ^2 = 549.19 (21 df), p = .321). The results of the CFA can be found in *Table 5* below. All but one item loaded into one of two factors. Item 18 regarding weaving in and out of lanes did not load into either factor.

Table 5: Item loadings for Principal Component Analysis with Varimax Rotation for a Spanish version of the PADI

Prosocial Driving Behaviors	**Factor loading**	**Factor loading**
1. Manejar con mucho cuidado cuando haya peatones	**0.846**	0.014
2. Poner atención especial al acercarse a las intersecciones	**0.854**	0.024
3. Manejar con mucho cuidado cuando haya ciclistas	**0.840**	-0.041
4. Poner atención especial al dar la vuelta	**0.868**	0.031
5. Prestar atención al tráfico y a mis alrededores mientras manejo	**0.837**	0.095
6. Frenar suficientemente despacio para alertar a los conductores detrás de mí	**0.774**	-0.007
7. Reducir la velocidad para adaptarse a las malas condiciones de la carretera	**0.818**	0.009
8. Usar los espejos y revisar los puntos ciegos al cambiar de carril	**0.824**	0.066
9. Conducir con más cuidado para adaptarme a las personas o vehículos al lado del camino (es decir, reducir la velocidad, hacerse a un lado)	**0.806**	0.001
10. Mantener una distancia segura al seguir otros vehículos	**0.852**	-0.077
11. Reducir la velocidad en zonas de construcción	**0.803**	-0.130
12. Frenar por completo en los señalamientos de alto	**0.771**	-0.064
13. Reducir la velocidad para adaptarse a las malas condiciones climatológicas	**0.842**	-0.054
14. Ceder el paso cuando el otro vehículo tiene preferencia	**0.766**	0.021
15. Obedecer los señalamientos de tráfico	**0.858**	-0.005
16. Obedecer los señalamientos de límite de velocidad en zonas escolares	**0.783**	-0.113
17. Utilizar las direccionales para notificar a los otros conductores de mi intención de dar la vuelta	**0.851**	0.036
18. Moverse dentro y fuera de los carriles para adelantar el tráfico	0.290	0.482
19. Aumentar la velocidad cuando otro vehículo trata de rebasarme	0.018	**0.687**
20. Seguir muy de cerca el vehículo frente a mí para evitar que otros vehículos se metan delante	-0.014	**0.776**
21. Pasar delante de un vehículo a menos de un carro de distancia	-0.008	**0.706**
22. Unirme al tráfico incluso cuando otro conductor trata de reducir el espacio entre los vehículos	-0.018	**0.768**
23. Aumentar la velocidad en una intersección cuando la luz del semáforo está cambiando de amarillo a rojo	0.094	**0.692**
24. Conducir 25 kilómetros por encima del límite de velocidad marcado en los señalamientos	-0.071	**0.695**
25. Echar las luces altas a un vehículo que viaja a menor velocidad para que se aparte de mi camino	0.017	**0.721**
26. Hacer gestos groseros a otros conductores cuando hacen algo que no me agrada	-0.080	**0.683**
27. Tocar la bocina cuando otro conductor hace algo inapropiado	0.155	**0.519**
28. Rebasar otros vehículos por el carril de la derecha	-0.080	**0.672**
29. Seguir un vehículo a menos de un carro de distancia	0.040	**0.648**

To test scale validity relationships between the prosocial and aggressive subscales of the PADI were compared to instruments measuring five factor personality traits (BFI), sensation seeking, and aggression. Prosocial driving behavior was positively related to agreeableness, conscientiousness, and openness. Aggressive driving behavior was positively associated with extraversion, neuroticism, anger, hostility, physical aggression, verbal aggression, emotion seeking, and disinhibition and negatively associated with openness *(see Table 6)* (Lucas et al., in review).

Table 6: Relationship between prosocial and aggressive driving behavior and personality factors

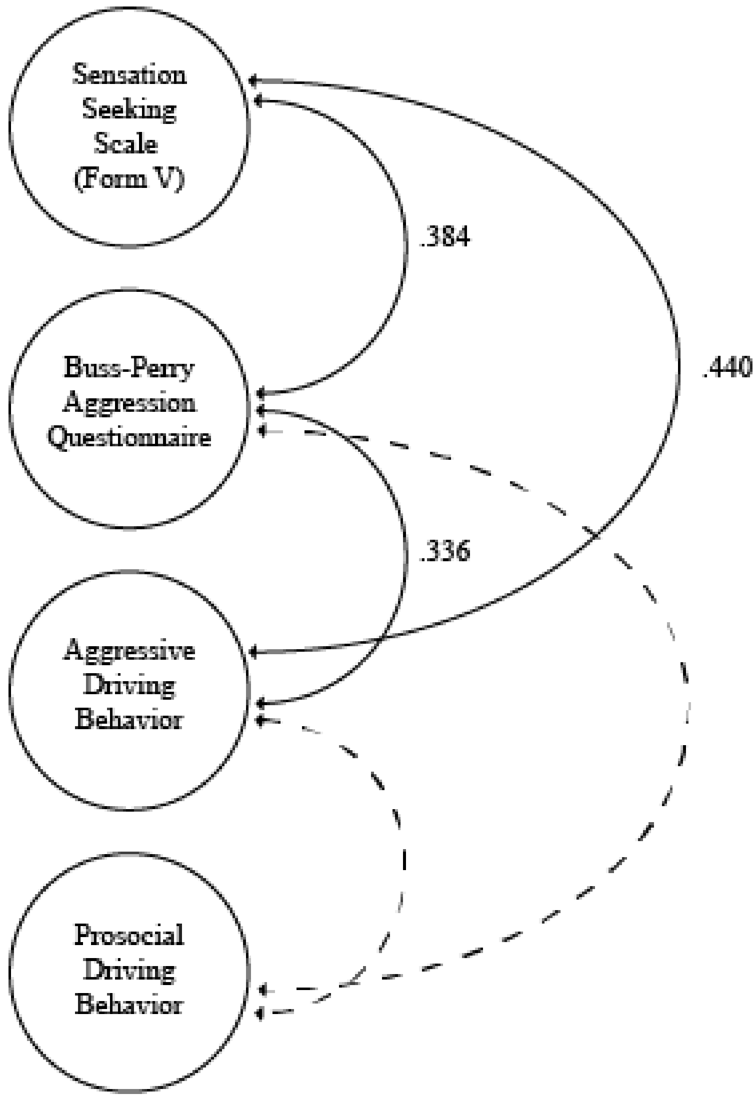
	Prosocial Driving Behavior (PADI)	**Aggressive Driving Behavior (PADI)**
Agreeableness	.245**	-.103
Conscientiousness	.106	-.045
Extraversion	.130*	.160*
Neuroticism	-.108	.143*
Openness	.333**	-.730**
Anger	-.068	.208**
Hostility	.023	.204**
Physical aggression	-.118	.336**
Verbal aggression	-.004	.199**
Emotion seeking	-.004	.187**
Disinhibition	-.056	.350**

Robust method, Spearman correlations used due to non-normal data; *= p<.05, **= p<.001.

In congruence with the English version validation (Harris et al., 2014), Mexican participants reported higher rates of prosocial behaviors (*Mdn* = 5.29) than aggressive behaviors (*Mdn* = 2.41), (T (243) = 13.01, p <.001). However, unlike the original study gender differences were not demonstrated, which may be due to the high percentage of female participants (75.7%). Aggressive driving behavior was associated with self-report aggressive [physical (rho = .33 $p <.001$) and verbal aggression (rho = .20 $p <.001$), anger (rho = .20 $p <.001$), hostility (rho = .20 $p <.001$)], and sensation seeking behaviors [emotion seeking ($r = .18$ $p <.01$), and disinhibition ($r = .35$ $p <.001$)]. Aggressive driving behaviors were also associated with personality traits of openness (rho = -.17 $p <.01$), extraversion (rho = .16, $p <.05$), and neuroticism (rho = .14 $p <.05$). Prosocial driving behaviors had a significant relationship with primarily positive personality traits. A significant association was found with agreeableness (rho = .24 $p <.001$), openness (rho = .32 $p <.001$), extraversion (rho = .13, $p <.05$) (Lucas et al., in review).

Figure 4 demonstrates structural relationships between constructs. Significant covariance was found between sensation seeking and aggression (.384), aggression and aggressive driving (.336), and sensation seeking and aggressive driving (.440). In keeping with the original validation, no significant relationship was found between prosocial and aggressive driving or between aggression and prosocial driving (Lucas et al., in review).

Figure 4: Structural equation model demonstrating convergent and divergent validity



4.2 Part I: Results

The results of Part I demonstrate promising while somewhat paradoxical findings (see *Table 7*). Most of the scales demonstrated acceptable to excellent Cronbach's alphas. However, the "equity" (.657), "frugality" (.659), "social contribution" (.623), "ecological conservation attitudes" (.688), and "safe driving behaviors subscales" were questionable, while "neighborhood quality" (.588) and "traffic calming" (.519) did not exceed poor alpha scores.

Table 7: Mean, standard deviation, and reliability for construct subscales.

	Cronbach's Alpha	Mean (SD)	Number of Items
Neighborhood Connectivity	.588	3.61 (.75)	5
Infrastructure Quality	.753	2.53 (.62)	13
Traffic Calming	.519	2.60 (.77)	5
Safe Driver-Pedestrian Interaction	.751	2.73 (.68)	9
Perception of Crime	.784	2.72 (.93)	5
Equity	.657	4.53 (.53)	5
Altruism	.787	3.79 (.68)	8
Pro-ecological Behavior	.841	3.78 (.71)	12
Frugality	.659	3.73 (.66)	7
Psychological Wellbeing	.940	3.97 (.84)	12
Social Actualization	.741	2.87 (.77)	5
Social Integration	.910	2.95 (1.01)	6
Social Contribution	.623	3.47 (.71)	5
Social Conservation Behaviors	.748	3.05 (.72)	8
Ecological Conservation Attitudes	.688	3.94 (.59)	8
Prosocial Driving Behavior (towards Pedestrians and Cyclists)	.870	4.11 (.73)	10
Prosocial Driving Behavior (towards other Vehicles)	.935	4.04 (.70)	6
Safe Driving Behaviors	.688	4.20 (.83)	8
Safe Pedestrian Crossing	.706	3.91 (.68)	8

NFI=.903, NNFI=.929, CFI=.945, RMSEA=.06

Figure 5: Structural equation applying the Positive Environment Model (PEM) to examine the sociophysical factors that promote and produce safe driving and positive traffic environments.

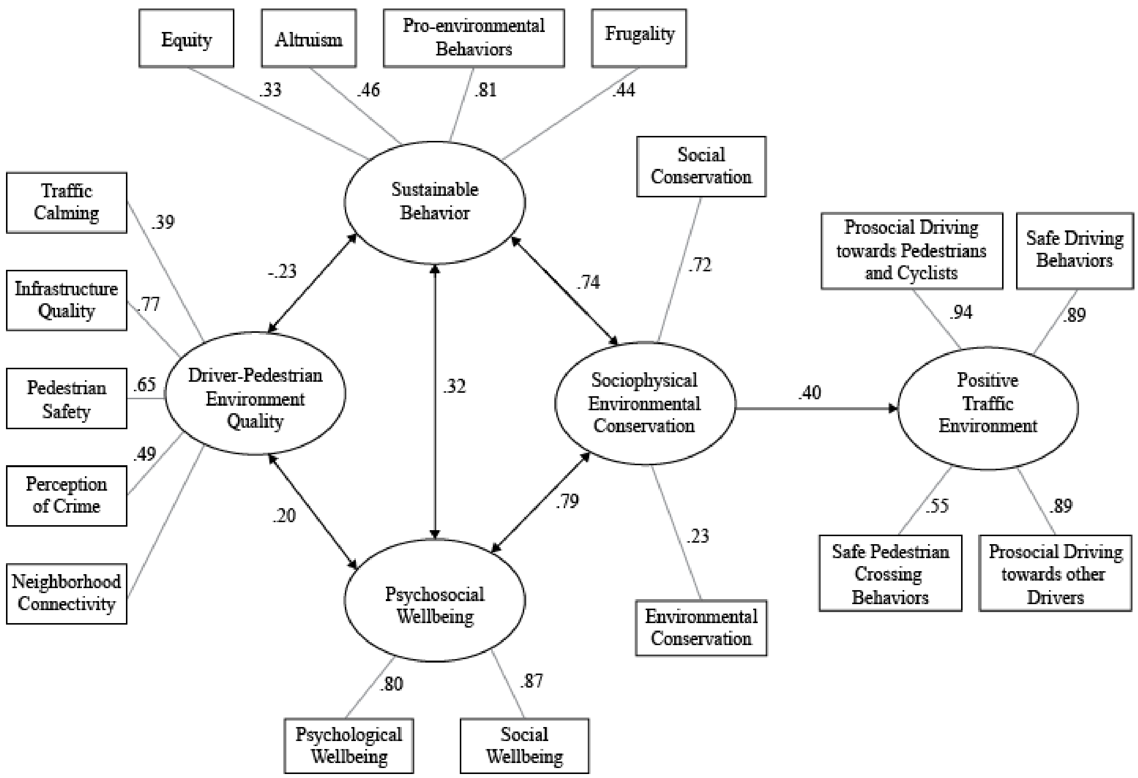


Figure 5 above is a graphic depiction of the relationships for the initial model. Seventeen indexes (indicators) were considered which formed into five factors: driver-pedestrian environmental quality, sustainable behavior, psychosocial wellbeing, sociophysical environmental conservation, and positive traffic environment. The driver-pedestrian environmental quality scale was initially comprised of indexes: neighborhood connectivity, infrastructure quality, traffic calming, pedestrian safety, and perception of crime. However, neighborhood connectivity and traffic calming performed poorly on initial analysis with the latter being removed from the model.

Four indexes of equity, altruism, pro-ecological behaviors, and frugality form the factor of sustainable behavior. Psychosocial wellbeing was formed by indexes of psychological wellbeing and social wellbeing. Sociophysical environmental conservation was formed by indexes of social conservation and environmental conservation. The factor of positive traffic environment was formed by prosocial driving towards pedestrians and cyclists, prosocial driving towards other vehicles, safe driving behaviors, and safe pedestrian crossing behaviors. Salient and significant (p <.05) factor loadings indicated convergent construct validity for all factors. The goodness of fit indicators included a nonsignificant X^2=201.68 (99 *df*), p<.001 and practical goodness of fit indicators close to 1 (*BBNFI*=.903, *BBNNFI*=.929, *CFI*=.929, *RMSEA*=.06). These results confirm that the theoretical model is supported by the data.

The model presents some interesting findings that can be expounded upon by focusing on specific elements within it. Of particular note is the inverse relationship between the "driver-pedestrian environment quality" and "sustainable behavior" constructs. This is contrary to other studies that found socioeconomic status (often a proxy for neighborhood quality) predicted sustainable behaviors in individuals (Herrera, 1992; Torgler et al., 2011). The more predictable strong covariance between sustainable behavior, sociophysical environmental conservation, and psychological wellbeing is congruent with previous studies (Corral & Frías, 2016; Tapia-Fonllem et al., 2013). However, it is important to note that some components of the model did not load well on their factors, such as "neighborhood connectivity" (.21), "equity" (.33), and "environmental conservation" (.23).

Testing a transactional model such as the one defined in this study presents some specific statistical and methodological challenges. Covariances do not allow for examining casual relationships. Additionally, given that some of the measures in the original model did not perform well, another model was designed which tested a mediational relationship between constructs. *Figure 6* demonstrates the new mediational model. The "sociophysical environmental conservation" construct was amalgamated and added as a subscale to the sustainable behavior construct. It is important to note that this significantly improved the performance of the new subscale of "civic behavior" (.85); however, the "equity" subscale was lowered from .33 to .18. Similarly, "frugality" reduced from .44 to .31. This may be due to overlapping concepts between the subscales.

Figure 6: Revised structural equation applying the Positive Environment Model (PEM) to examine the sociophysical factors that promote and produce safe driving and positive traffic environments.

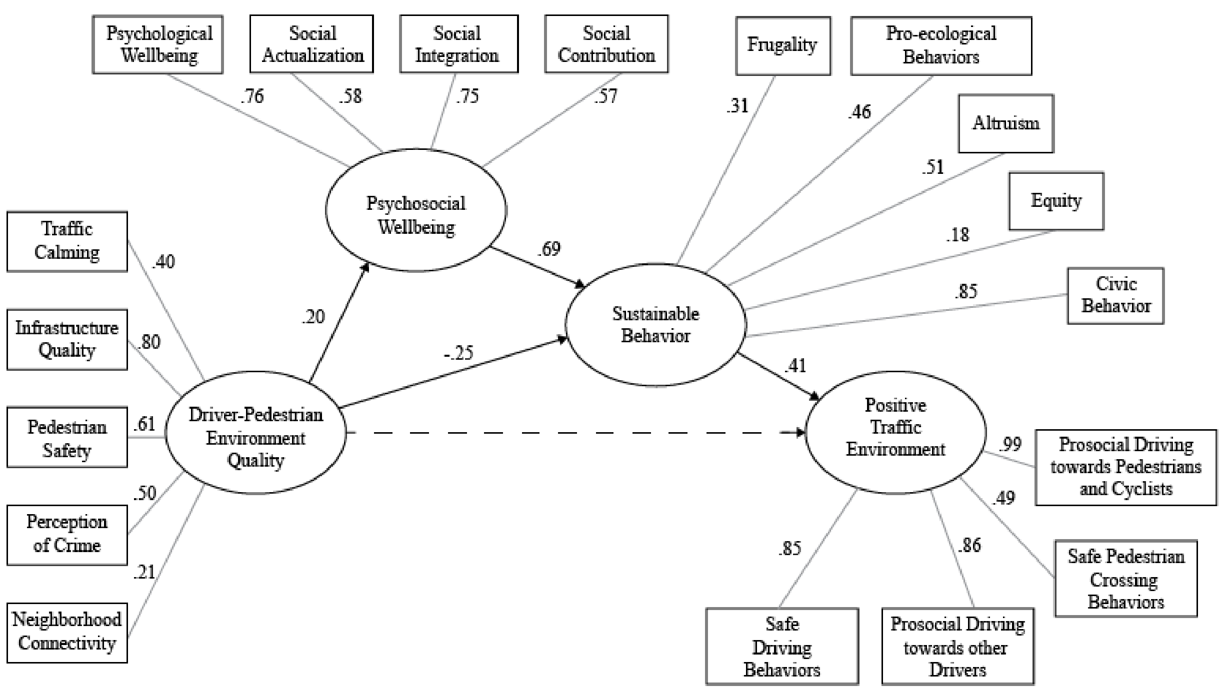


Figure #: Model of prosocial traffic behavior predicted by physical road infrastructure, sustainable behaviors, and wellbeing. Goodness of fit: x^2=407.40 (115 df), p=.00001; NFI=1.00, NNFI=1.00, CFI=1.00, RMSEA=.000, R^2=.17.

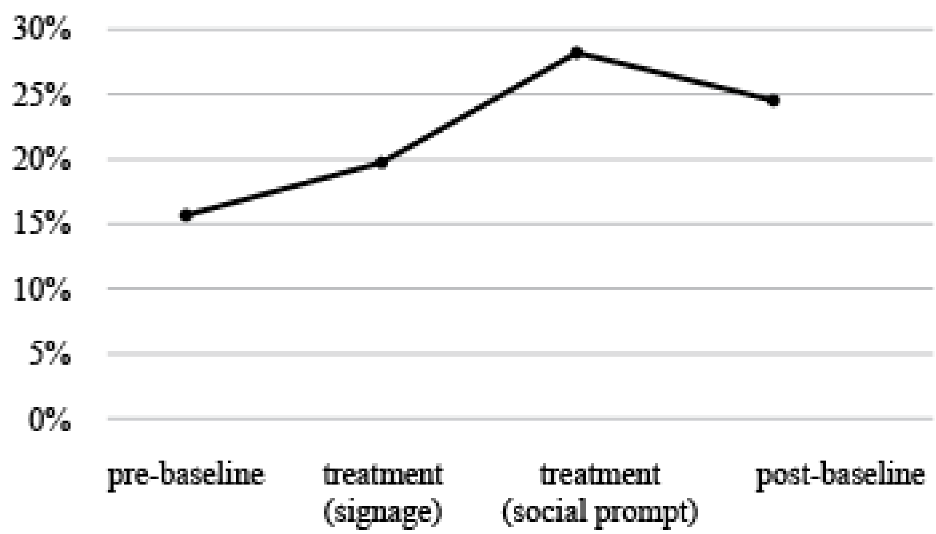
The revised model demonstrates some interesting mediational relationships. As previously mentioned, the "sociophysical environmental conservation" construct was removed and included as a “civic behavior” subscale of the “sustainable behavior” construct. Driver-pedestrian environment quality did not have a direct impact on the “positive traffic environment” construct. However, an indirect relationship exists with psychosocial wellbeing and sustainable behavior as mediator variables. Like the original model, an inverse relationship exists between driver-pedestrian environment quality and sustainable behavior.

4.3 Part II: Results

The results of Part II demonstrate promising results for interventions of the sociophysical traffic environment aimed at improving driver-pedestrian interaction. The study, while limited by the relatively short time frame of its scope, appeared to show improvement of DPI during both the manipulation (weeks 2 and 3) and post baseline observation phases (week 4). As previously mentioned, outcome behavior totals were summed for each week and compared with the total number of pedestrians involved in interactions with vehicles during that period (pedestrians who crossed without being involved in a driver interaction were thus not scored). The final output score is a percentage of a given outcome behavior over the course of that week. Ideally, “pedestrian yield” percentages will increase and “right obstruction” percentages will decrease. Given that the treatment was only applied to right-turning vehicles, the “left obstruction” outcome measure should serve as a control of the intervention effect as rates of this conflict interaction should remain somewhat static.

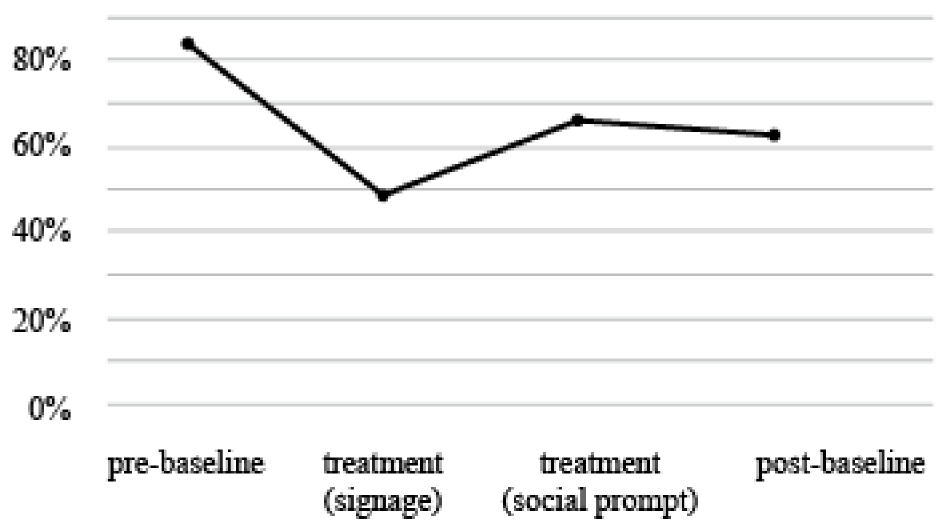
The results of the intervention of the sociophysical traffic environment are displayed below. Generally, the treatments appeared to perform as anticipated. Pedestrian yield rates increased from 16% during the pre-baseline observations to 20% during the signage treatment before topping out at 29% during the social prompt treatment. The post-baseline observations resulted at 25%, nearly 10% above the pre-baseline scores (See *Graph 1*). Generally, yield rates nearly doubled between the pre-treatment and the social prompt treatment. Similarly, the social prompt treatment appeared to have a greater impact of driver yield behavior than the signage alone. In keeping with previous studies, the effect appeared to persist after the treatment phase.

Graph 1: Proportion of pedestrian yield (vehicle yield to pedestrian in the crosswalk with a lighted pedestrian crossing signal) pre- and post-treatment



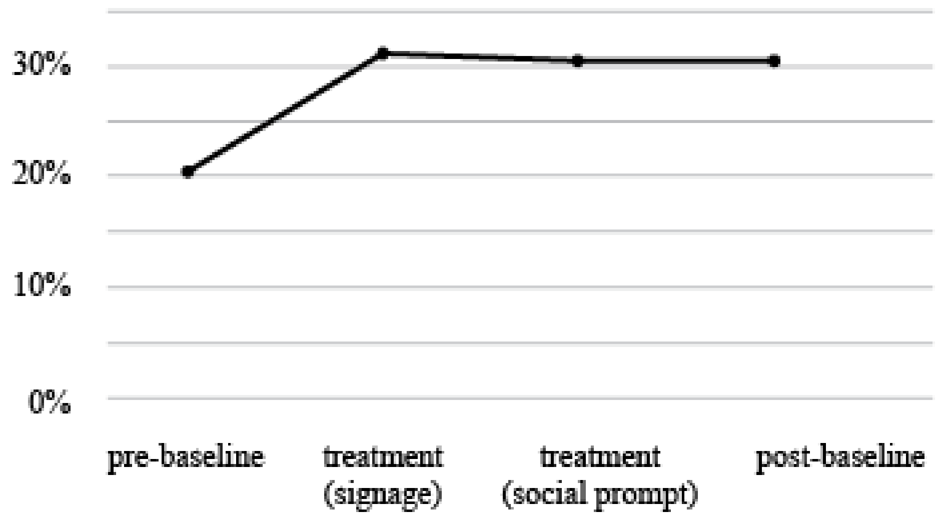
The “right obstruction” represents a negative outcome that measures the percentage of vehicles that failed to cede the right of way to a pedestrian during their legal crossing period (as compared to the total number of driver pedestrian interactions during that period). Like the “pedestrian yield” measure, the “right obstruction” scores appeared to perform as expected. The pre-baseline observation percentage of 84% dropped to its lowest point of 49% during treatment 1 before rising again to 66% during treatment 2 and settling at 63% for post-baseline observations (See *Graph 2*). While the initial reduction of right obstruction was not sustained, the two following weeks both demonstrate lower rates that the pre-baseline observation. It is important to note that this measure can be heavily influenced by the behavior of pedestrians attempting to cross (i.e. more aggressive crossers tend to have fewer right obstructions) and as such results should be considered accordingly.

Graph 2: Proportion of right obstruction (right-turning vehicle impedes the a pedestrian crossing in the crosswalk during the pedestrian crossing light) pre- and post-treatment



The “left obstruction” measurement represents a form of study control as treatment was only applied to drivers heading in the direction of the right turn on Colosio. Like the other measures, “left obstruction” performed as expected and remained somewhat static throughout the study. Starting at 21% for pre-baseline measures, the outcome plateaued to 31% for all three of the following phases (See *Graph 3*). This kind of consistency supports the effect of the treatments directed towards right turning vehicles during the second and third week.

Graph 3: Proportion of left obstruction (left-turning vehicle impedes the a pedestrian crossing in the crosswalk during the pedestrian crossing light) pre- and post-treatment



Section 5: Concluding Remarks, Study Limitations, and Future Directions

The primary objective of this study was to examine factors of the sociophysical traffic environment that lead to safe driver-pedestrian interactions and that promote sustainable driving environments. As mentioned in the results section, to this end, this study appears to have borne fruit. The application of the PEM to the study of sustainable, prosocial driving behaviors and attitudes presented both predictable and paradoxical results. In our pilot study, risky driving and negative driving outcomes were associated with personality factors of extroversion, neuroticism, aggression, and sensation seeking behaviors in congruence with antecedent research (Arthur & Graziano, 1996; Dahlen & White, 2006; Harris et al., 2014). Safe driving was associated with agreeableness and appeared to be impacted by social encouragement and prompting like previous studies (Huybers et al., 2004a; Nasar, 2003). However, in our Part I sample we found an inverse relationship between neighborhood quality and sustainable behaviors which may appear somewhat paradoxical given that socioeconomic indicators (often used as proxy for neighborhood quality) are often associated with such actions (Herrera, 1992; Torgler et al., 2011). Perhaps interestingly, the results are in keeping with a weighted, representative US sample (N=2044) which found a similar inverse relationship between socioeconomic status and willingness to protect the environment, though it is important to note that the authors acknowledged this was an unusual result (Mukherjee & Onel, 2012). Such mixed results suggest future avenues for research in these types of relationships.

The ramifications of the indirect impact of neighborhood quality on the promotion of safe traffic environments through mediating variables such as sustainable behavior and psychological wellbeing should be seriously considered by psychologists and city planners alike. These findings suggest behaviors and decisions made by individuals in the traffic environment represent a holistic amalgamation of that person in that specific context. Put another way, the purely physical orientation of streets, sidewalks and crosswalks are as relevant as the cultural, contextual, and learned experiences of the individual. Likewise, it appears that sustainable behaviors elsewhere in life manifest in seemingly unrelated arenas such as driving. These concepts could have a potentially significant impact on the way we understand human behavior in the built environment and the ways in which those behaviors are promoted and encouraged.

Driving and riding in an automobile is perhaps the most dangerous activity people are involved with on a regular basis. A common adage in traffic studies is that driving is quite safe, and that it is this safety that can result in complacency. Distracted, angry, and aggressive drivers, long the focus of traffic studies, need to be addressed and efforts to curtail risky driving are of critical importance. However, this should not come completely at the cost of examining the positive behaviors individuals can take part in that serve to promote safety in the traffic environment. As people support the environment the environment tends to support them. Thus, a sustainable traffic environment may serve to reduce stress and improve wellbeing. Indeed, wellbeing has demonstrated relationships with other traffic indicators such as walkability (Anciaes et al., 2019). This type of psychosocial atmosphere may further inoculate against risky behaviors. The cycle comes full-circle and, like the PEM, the sociophysical environment relates to sustainable behavior, conservation of the physical and social milieus, and wellbeing of individuals within it, from which a new positive environment emerges.

The sociophysical traffic environment consists of a myriad of moving parts, is quickly changing, and at times unpredictable, while driving behavior is a relatively stable and unchanging trait of the individual. When driving one does not merely consider the physical infrastructure of the roads, intersections, and medians but also the actions and anticipated actions of other drivers, pedestrians, and cyclists around them. Those who act sustainably and provide the opportunity for others to do the same help to create a sustainable traffic environment. Identifying these types of positive influences in the sociophysical environment would do much to inform initiatives aimed at improving safety and reducing dangerous behaviors.

This study is not without its limitations. Part I depends upon self-report, which can lead to social desirability bias and other measurement error. Particularly when referring to behaviors such as safe driving and conservation that tend to have value judgements associated with them. The sample is mostly younger drivers and individuals who do not drive regularly were included which may impact some of the measures. Furthermore, a mistake in the printing of the paper-and-pencil version of the questionnaires resulted in errors for two items “There are speed bumps in the area where I live” and “Climate change is caused by human action.” These items were removed from hand-written questionnaires that were affected (unless explicitly marked).

The “traffic calming” “neighborhood connectivity” subscales underperformed (.588 and .519 respectively). This is likely due to the multidimensional nature of the items involved. For example, a neighborhood may have speed bumps but not sidewalks, or cars parked in bike lanes but not pedestrian lights. Similarly, these kinds of either-or choices may not be well-suited for Likert-type responses. As such, the subscales did not demonstrate high internal consistency. However, the included items represent important facets of the sociophysical traffic environment, particularly when considering driver-pedestrian interaction. Considering these issues, traffic calming and neighborhood connectivity may function better as a weighted checklist. Cut scores could identify areas that demonstrate relatively high, medium, and low traffic calming and connectivity infrastructure (or similar designations) while avoiding some of the statistical challenges faced by multidimensional instruments. To adjust for this, summation scores were used in the structural equation modeling. As such, internal consistency of these scales should not influence their functionality in the model.

The revised mediational model associated with Part I was not without its own limitations. Combining “civic behavior” to the “sustainable behavior” construct reduced scores for both “equity” and “frugality” (which themselves were already underperforming). Similarly, “neighborhood connectivity” and “traffic calming” do not perform well. However, the new model allows for a more causal examination of the variables. It is interesting to note that this model suggests physical, infrastructural measures alone do not account entirely for behavior, but does appear to capture some of the variance when considered in the greater context of a person’s perception of themselves as individuals and as they relate their environment and others around them. This opens exciting avenues for potential future applications of the PEM to other planning related issues such as land use, walkability, and circulation.

Part II of the study was likewise not without its limitations. The scope of the investigation covered only four weeks. These types of investigations are typically performed over longer timetables and with considerable resources (Arhin et al., 2016; Van Houten & Malenfant, 2004). Indeed, they often are the result of public-private collaborations between universities, traffic departments, and law enforcement (Huybers et al., 2004a; Nasar, 2003). This study was not performed under such conditions and some critical elements were unable to be addressed. For example, the painted crosswalk, while visible, has faded over time. Ideally, this would have been repainted in concert with the intervention portion of this study to further measure relationships to yield behaviors. Similarly, the influence of enforcement often coincides with these types of intervention efforts. This was not possible due to viability issues and may be further complicated by cultural norms wherein traffic enforcement is not as common as it might be in places like Europe or the United States where most of the previous investigations took place. Both limitations of the physical infrastructure and enforcement represent promising avenues for future study.

While the results of the quasi-experimental study are promising it is difficult to generalize to different locations (even within the same city). Yielding behaviors may be higher in and around the university area and sociophysical prompts may not have the same effect if applied in different contexts. However, what these results do suggest is that positive behaviors can be encouraged by sociophysical prompts and that those behaviors appear to continue, for at least some period, after the treatment has no longer been applied. This can have far-reaching implications for the fields of both psychology and development and can help to shape efforts at making cities more accessible and safer for pedestrians and drivers alike.

In a general sense, these findings highlight the importance of examining the factors that promote sustainable, adaptive traffic environments. Drivers that employ such behaviors may not only experience fewer negative driving outcomes for themselves, they may also serve to promote adaptive/constructive behaviors in others. Indeed, driving is a social act. It depends up synchrony and a mutual agreement to abide by the same set of rules. A meta-analysis of the influence of synchrony found that synchronous actions improved prosocial actions, as compared with a non-synchronous control group (Mogan et al., 2017). Additionally, empathy has been associated with prosocial behaviors, albeit to varying degrees. One meta-analysis found in-situ, non-hypothetical scenarios elicit greater prosocial responses (Eisenberg & Miller, 1987). Driving would certainly fall into this category. Taken in concert, inferences can be made about further variables that influence the sociophysical traffic environment to promote safe behavior.

Finally, capturing a significant portion of the variation in a nuanced behavior like prosocial driving is perhaps more difficult than inherently dangerous actions of aggressive and risky driving, particularly given the tendency of traffic studies to focus on negative outcomes as dependent variables (such as accidents, moving violations, and near misses, which in themselves are difficult to standardize across cultures). One notable takeaway from the pilot study is the low amount of issued moving violations among participants (n=21). This may be partly a result of limitations in the sample population, which skewed towards younger drivers. Likewise, traffic enforcement is not universally applied (even within the same city) and accident frequency varies significantly across locations. As such, developing and testing positive driving outcome measurements is another critical next step for the study of prosocial driving.

The study of prosocial driving can inform not only traffic, environmental, and behavioral psychology, it can better inform initiatives aimed at improving safety which can save lives. Elements of the sociophysical driving environment have demonstrated associations with improvement in adaptive behaviors (Taubman - Ben-Ari & Katz - Ben-Ami, 2012). Furthermore, internal and external influences appear to influence positive actions like pro-environmental behaviors (C. F. Clark et al., 2003). As such, a more comprehensive understanding of the psychological underpinnings of prosocial driving behaviors could serve to better inform safety efforts and reduce risk. Similarly, examining how prosocial individuals promote pro-sociality in others can elucidate relationships that promote safe, positive environments outside of the realm of traffic studies.

Overall, this research examined the phenomenon of driver-pedestrian interactions in the context of the sociophysical traffic environment in which they occur. The pilot study examined prosocial driving and contributed a translation and validation of an important instrument for measuring safe driving. Part I identified relationships between sustainable driving behaviors and other sustainable practices as well as measures of socio-environmental conservation, wellbeing, and physical infrastructure. The strong relationships between the constructs suggests their interconnected roles in construction of a positive traffic environment. Part II took the concept further and examined the ways in which prompts in the sociophysical driving environment may impact behaviors. Taken together, these parts provide a multi-faceted glimpse at both the factors that promote sustainable behavior and the affordances provided by the sociophysical driving setting that foster a safe, sustainable traffic environment. If pro-sociality in individuals begets pro-sociality in others, then identifying and supporting people that "generate" sustainable driving behaviors may do as much to improve vehicle-pedestrian interaction and safety in general as enforcement campaigns and costly infrastructural improvements. Our findings suggest actions are a result of the lived experience of an individual placed in the behavior setting of a specific context. As such, understanding the psychological underpinnings of prosocial behavior in individuals can inform efforts at fostering those environments for the greater population, improving safety, and promoting wellbeing through shared behavior.

This study represents the intersection between theoretical behavioral analysis, environmental psychology, and applied traffic psychology. Ultimately, I believe the research was successful in allowing each field to inform and complement the other. The combination of disparate methodologies and techniques allowed for a holistic perspective and invited comparisons between concepts that might otherwise not be considered. The work has identified numerous opportunities for future research and has provided a comprehensive examination of the creation of prosocial, sustainable environments and behaviors across a myriad of interests. Focused research on specific topics can suggest generalizable tendencies in human behavior that may rise above technological and temporal variables that might render them obsolete. Drivers of the future may be automated vehicles specifically designed to foment safety; however, humans will (hopefully) continue to strive to create prosocial, sustainable environments through their behavior. To this end, research into how to accomplish such lofty ideals is critical as humanity moves forward.

References

Ajzen, I., & Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behavior*. Prentice Hall.

Ajzen, Icek. (1985). From Intentions to Actions: A Theory of Planned Behavior. In J. Kuhl & J. Beckmann (Eds.), *Action Control: From Cognition to Behavior* (pp. 11–39). Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-642-69746-3_2

Alcázar-Olán, R., Deffenbacher, J. L., Betancour-Ocampo, D., Hernández-Guzmán, L., & Casas-Henaine, G. (2019). La escala de la ira al conducir: Un estudio de validez en México (The Driving Anger Scale: A validity study in Mexico). *Eureka: Revista Científica de Psicología*, *16*(1), 60–72.

Alcázar-Olán, R., Deffenbacher, J. L., Reyes-Pérez, V., Hernández-Guzmán, L., & Casas-Henaine, G. (2018). Validity of the Driving Anger Expression Inventory (DAX) in a Mexican Sample. *IOSR Journal of Humanities and Social Sciences (IOSR-JHSS)*, *23*(7), 80–81. https://doi.org/10.9790/0837-2307058188

Anciaes, P. R., Stockton, J., Ortegon, A., & Scholes, S. (2019). Perceptions of road traffic conditions along with their reported impacts on walking are associated with wellbeing. *Travel Behaviour and Society*, *15*, 88–101. https://doi.org/10.1016/j.tbs.2019.01.006

Arhin, S., Jones, P., & Anderson, F. (2016). Evaluation of safety surrogates of traffic enforcement at signalized intersections. *Journal of Safety Engineering*, *5*(1), 1–7. https://doi.org/10.5923/j.safety.20160501.01

Arthur, W., & Graziano, W. G. (1996). The Five-Factor Model, Conscientiousness, and Driving Accident Involvement. *Journal of Personality*, *64*(3), 593–618. https://doi.org/10.1111/j.1467-6494.1996.tb00523.x

Asaithambi, G., Kuttan, M. O., & Chandra, S. (2016). Pedestrian Road Crossing Behavior Under Mixed Traffic Conditions: A Comparative Study of an Intersection Before and After Implementing Control Measures. *Transportation in Developing Economies*, *2*(2). https://doi.org/10.1007/s40890-016-0018-5

Barjonet, P.-E. (Ed.). (2001). *Traffic Psychology Today*. Springer US. https://doi.org/10.1007/978-1-4757-6867-1

Barrero, L. H., Sánchez, A., Forero, A., Quiroga, J., Felknor, S., & Quintana, L. A. (2013). Pedestrians' Beliefs about Road Crossing in Bogotá: Questionnaire Development. *Universitas Psychologica*, *12*(2). https://doi.org/10.11144/Javeriana.UPSY12-2.pbrc

Bechtel, & Corral, V. (2010). Happiness and sustainable behavior. In V. Corral-Verdugo, C. García, & M. Frías (Eds.), *Psychological approaches to sustainability* (pp. 433–450). Nova Science Publishers.

Bechtel, R. flwefle, & Churchman, A. (Eds.). (2002). *Handbook of environmental psychology*. J. Wiley & Sons.

Beede, K. E., & Kass, S. J. (2006). Engrossed in conversation: The impact of cell phones on simulated driving performance. *Accident Analysis & Prevention*, *38*(2), 415–421. https://doi.org/10.1016/j.aap.2005.10.015

Bennett, M. K., Manal, H., & Van Houten, R. (2014). A comparison of gateway in-street sign configuration to other driver prompts to increase yielding to pedestrians at crosswalks: GATEWAY TREATMENT TO INCREASE YIELDING. *Journal of Applied Behavior Analysis*, *47*(1), 3–15. https://doi.org/10.1002/jaba.103

Bentler, P. M. (2007a). On tests and indices for evaluating structural models. *Personality and Individual Differences*, *42*(5), 825–829. https://doi.org/10.1016/j.paid.2006.09.024

Bentler, P. M. (2007b). On tests and indices for evaluating structural models. *Personality and Individual Differences*, *42*(5), 825–829. https://doi.org/10.1016/j.paid.2006.09.024

Brown, & Kasser, T. (2005). Are Psychological and Ecological Well-being Compatible? The Role of Values, Mindfulness, and Lifestyle. *Social Indicators Research*, *74*(2), 349–368. https://doi.org/10.1007/s11205-004-8207-8

Brown, & Werner, C. (2012). Healthy physical activity and eating environmental supports for health. In S. Clayton (Ed.), *The Oxford handbook of environmental and conservation psychology* (pp. 459–484). Oxford University Press.

Browne, M. W., & Cudeck, R. (1992a). Alternative Ways of Assessing Model Fit. *Sociological Methods & Research*, *21*(2), 230–258. https://doi.org/10.1177/0049124192021002005

Browne, M. W., & Cudeck, R. (1992b). Alternative Ways of Assessing Model Fit. *Sociological Methods & Research*, *21*(2), 230–258. https://doi.org/10.1177/0049124192021002005

Büssing, A., Kerksieck, P., Günther, A., & Baumann, K. (2013). Altruism in adolescents and young adults: Validation of an instrument to measure generative altruism with structural equation modeling. *International Journal of Children's Spirituality*, *18*(4), 335–350. https://doi.org/10.1080/1364436X.2013.849661

Carrus, G., Pirchio, S., Passiatori, Y., & Scopelliti, M. (2013). The cognitive and social benefits of contact with nature; research findings with adults and children. *XXXIV Interamerican Congress of Psychology*.

Cerin, E., Conway, T. L., Saelens, B. E., Frank, L. D., & Sallis, J. F. (2009). Cross-validation of the factorial structure of the Neighborhood Environment Walkability Scale (NEWS) and its abbreviated form (NEWS-A). *International Journal of Behavioral Nutrition and Physical Activity*, *6*(1), 32. https://doi.org/10.1186/1479-5868-6-32

Cerin, E., Saelens, B. E., Sallis, J. F., & Frank, L. D. (2006a). Neighborhood Environment Walkability Scale: Validity and Development of a Short Form. *Medicine & Science in Sports & Exercise*, *38*(9), 1682–1691. https://doi.org/10.1249/01.mss.0000227639.83607.4d

Cerin, E., Saelens, B. E., Sallis, J. F., & Frank, L. D. (2006b). Neighborhood Environment Walkability Scale: Validity and Development of a Short Form. *Medicine & Science in Sports & Exercise*, *38*(9), 1682–1691. https://doi.org/10.1249/01.mss.0000227639.83607.4d

Cerin, E., Saelens, B. E., Sallis, J. F., & Frank, L. D. (2006c). Neighborhood Environment Walkability Scale: Validity and Development of a Short Form. *Medicine & Science in Sports & Exercise*, *38*(9), 1682–1691. https://doi.org/10.1249/01.mss.0000227639.83607.4d

Clapp, J. D., Olsen, S. A., Danoff-Burg, S., Hagewood, J. H., Hickling, E. J., Hwang, V. S., & Beck, J. G. (2011). Factors contributing to anxious driving behavior: The role of stress history and accident severity. *Journal of Anxiety Disorders*, *25*(4), 592–598. https://doi.org/10.1016/j.janxdis.2011.01.008

Clark, C. F., Kotchen, M. J., & Moore, M. R. (2003). Internal and external influences on pro-environmental behavior: Participation in a green electricity program. *Journal of Environmental Psychology*, *23*(3), 237–246. https://doi.org/10.1016/S0272-4944(02)00105-6

Clark, K., Hummer, J., & Dutt, N. (1996). Field Evaluation of Fluorescent Strong Yellow-Green Pedestrian Warning Signs. *Transportation Research Record: Journal of the Transportation Research Board*, *1538*, 39–46. https://doi.org/10.3141/1538-05

Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological Assessment*, *7*(3), 309.

Clarke, D. D., Ward, P., & Truman, W. (2005). Voluntary risk taking and skill deficits in young driver accidents in the UK. *Accident Analysis & Prevention*, *37*(3), 523–529. https://doi.org/10.1016/j.aap.2005.01.007

Cone, J. D., & Hayes, S. C. (1980). *Environmental problems/behavioral solutions*. Brooks/Cole Pub. Co.

Corral, V., & Frías, M. (2016). The sustainability of positive environments. *Environment, Development and Sustainability*, *18*(4), 965–984. https://doi.org/10.1007/s10668-015-9701-7

Corral Verdugo, V. (2012). The positive psychology of sustainability. *Environment, Development and Sustainability*, *14*(5), 651–666. https://doi.org/10.1007/s10668-012-9346-8

Corral-Verdugo, Victor, Mireles-Acosta, J. F., Tapia-Fonllem, C., & Fraijo-Sing, B. (2011). Happiness as Correlate of Sustainable Behavior: A Study of Pro-Ecological, Frugal, Equitable and Altruistic Actions That Promote Subjective Wellbeing. *Human Ecology Review*, *18*(2), 95–104.

Cropper, M., & Kopits, E. (2005). *Why Have Traffic Fatalities Declined In Industrialized Countries ? Implications For Pedestrians And Vehicle Occupants*. The World Bank. http://elibrary.worldbank.org/doi/book/10.1596/1813-9450-3678

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), 121–126. https://doi.org/10.1901/jaba.2011.44-121

Dahlen, E. R., Martin, R. C., Ragan, K., & Kuhlman, M. M. (2005). Driving anger, sensation seeking, impulsiveness, and boredom proneness in the prediction of unsafe driving. *Accident Analysis & Prevention*, *37*(2), 341–348. https://doi.org/10.1016/j.aap.2004.10.006

Dahlen, E. R., & White, R. P. (2006). The Big Five factors, sensation seeking, and driving anger in the prediction of unsafe driving. *Personality and Individual Differences*, *41*(5), 903–915. https://doi.org/10.1016/j.paid.2006.03.016

Day, K. (2006). Active Living and Social Justice: Planning for Physical Activity in Low-income, Black, and Latino Communities. *Journal of the American Planning Association*, *72*(1), 88–99. https://doi.org/10.1080/01944360608976726

de Groot, J. I. M., & Steg, L. (2008). Value Orientations to Explain Beliefs Related to Environmental Significant Behavior: How to Measure Egoistic, Altruistic, and

Biospheric Value Orientations. *Environment and Behavior*, *40*(3), 330–354. https://doi.org/10.1177/0013916506297831

De Young, R. (2000). Expanding and evaluating motives for environmentally responsible behavior. *Journal of Social Issues*, *56*, 509–526.

Deffenbacher, J. L., Lynch, R. S., Oetting, E. R., & Swaim, R. C. (2002). The Driving Anger Expression Inventory: A measure of how people express their anger on the road. *Behaviour Research and Therapy*, *40*(6), 717–737. https://doi.org/10.1016/S0005-7967(01)00063-8

Deffenbacher, J. L., Oetting, E. R., & Lynch, R. S. (1994). Development of a Driving Anger Scale. *Psychological Reports*, *74*(1), 83–91. https://doi.org/10.2466/pr0.1994.74.1.83

Dorantes Argandar, G., Tortosa Gil, F., & Ferrero Berlanga, J. (2016). Measuring situations that stress Mexicans while driving. *Transportation Research Part F: Traffic Psychology and Behaviour*, *37*, 154–161. https://doi.org/10.1016/j.trf.2015.12.014

Dula, C. S., & Ballard, M. E. (2003). Development and Evaluation of a Measure of Dangerous, Aggressive, Negative Emotional, and Risky Driving1. *Journal of Applied Social Psychology*, *33*(2), 263–282. https://doi.org/10.1111/j.1559-1816.2003.tb01896.x

Durdan, C. A., Reeder, G. D., & Hecht, P. R. (1985). Litter in a University Cafeteria: Demographic Data and the Use of Prompts as an Intervention Strategy. *Environment and Behavior*, *17*(3), 387–404. https://doi.org/10.1177/0013916585173007

Echeverry, A., Mera, J. J., Villota, J., & Zarate, L. C. (2005). Actitudes y comportamientos de los peatones en los sitios de alta accidentalidad en Cali. *Colombia Medica*, *36*(2).

Eisenberg, N., & Miller, P. A. (1987). The relation of empathy to prosocial and related behaviors. *Psychological Bulletin*, *101*(1), 91–119. https://doi.org/10.1037/0033-2909.101.1.91

Elander, J., West, R., & French, D. (1993). Behavioral correlates of individual differences in road-traffic crash risk: An examination of methods and findings. *Psychological Bulletin*, *113*(2), 279–294. https://doi.org/10.1037/0033-2909.113.2.279

Elliott, M. A., Armitage, C. J., & Baughan, C. J. (2003). Drivers' compliance with speed limits: An application of the theory of planned behavior. *Journal of Applied Psychology*, *88*(5), 964–972. https://doi.org/10.1037/0021-9010.88.5.964

Eşiyok, B., Yasak, Y., & Korkusuz, I. (2007). Anger expression on the road: Validity and reliability of the driving anger expression inventory. *Turk Psikiyatri Dergisi = Turkish Journal of Psychiatry*, *18*(3), 231–243.

Fairclough, S. H., Tattersall, A. J., & Houston, K. (2006). Anxiety and performance in the British driving test. *Transportation Research Part F: Traffic Psychology and Behaviour*, *9*(1), 43–52. https://doi.org/10.1016/j.trf.2005.08.004

Fisk, W. J. (2000). Estimates of potential nationwide productivity and health benefits from better indoor environments: An update. In J. D. Spengler, M. Samet, & J. F. McCarthy (Eds.), *Indoor air quality handbook* (pp. 4.1-4.36). McGraw Hill.

Fitts, & Posner. (1967). *Human performance*. Brooks/Cole Pub. Co.

Fleiter, J., & Watson, B. (2006). The speed paradox: The misalignment between driver attitudes and speeding behaviour. *Journal of Australasian College of Road Safety*.

Ge, Y., Qu, W., Jiang, C., Du, F., Sun, X., & Zhang, K. (2014). The effect of stress and personality on dangerous driving behavior among Chinese drivers. *Accident Analysis & Prevention*, *73*, 34–40. https://doi.org/10.1016/j.aap.2014.07.024

Geller. (2002). The challenge of increasing pro-environment behavior. In R. B. Bechtel & A. Churchman (Eds.), *Handbook of Environmental Psychology* (pp. 525–540). Wiley.

Geller, E. S. (1995). Actively Caring for the Environment: An Integration of Behaviorism and Humanism. *Environment and Behavior*, *27*(2), 184–195. https://doi.org/10.1177/0013916595272004

Geller, E. S., Bruff, C. D., & Nimmer, J. G. (1985). "Flash for life": Community-based prompting for safety belt promotion. *Journal of Applied Behavior Analysis*, *18*(4), 309–314. https://doi.org/10.1901/jaba.1985.18-309

Geller, E. S., & Lehman, G. R. (1991). The buckle-up promise card: A versatile intervention for large-scale behavior change. *Journal of Applied Behavior Analysis*, *24*(1), 91–94. https://doi.org/10.1901/jaba.1991.24-91

Geller, E. S., Winett, R. A., & Everett, P. B. (1982). *Preserving the environment: New strategies for behavior change*. Pergamon Press.

Gibson, J. J., & Crooks, L. E. (1938). A Theoretical Field-Analysis of Automobile-Driving. *The American Journal of Psychology*, *51*(3), 453. https://doi.org/10.2307/1416145

Gras, M.-E., Font-Mayolas, S., Patiño, J., Baltasar, A., Planes, M., & Sullman, M. J. M. (2016). Resilience and the expression of driving anger. *Transportation Research Part F: Traffic Psychology and Behaviour*, *42*, 307–316. https://doi.org/10.1016/j.trf.2015.09.005

Greitemeyer, T. (2013). Exposure to media with prosocial content reduces the propensity for reckless and risky driving. *Journal of Risk Research*, *16*(5), 583–594. https://doi.org/10.1080/13669877.2012.726248

Greitemeyer, T., & Osswald, S. (2010). Effects of prosocial video games on prosocial behavior. *Journal of Personality and Social Psychology*, *98*(2), 211–221. https://doi.org/10.1037/a0016997

Groeger. (2002). Trafficking in cognition: Applying cognitive psychology to driving. *Transportation Research Part F: Traffic Psychology and Behaviour*, *5*(4), 235–248. https://doi.org/10.1016/S1369-8478(03)00006-8

Groeger, & Rothengatter. (1998). Traffic psychology and behaviour. *Transportation Research Part F: Traffic Psychology and Behaviour*, *1*(1), 1–9. https://doi.org/10.1016/S1369-8478(98)00007-2

Guéguen, N., Eyssartier, C., & Meineri, S. (2016). A pedestrian's smile and drivers' behavior: When a smile increases careful driving. *Journal of Safety Research*, *56*, 83–88. https://doi.org/10.1016/j.jsr.2015.12.005

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*, 87–89. https://doi.org/10.1016/j.ssci.2015.01.018

Gulian, E., Matthews, G., Glendon, A. I., Davies, D. R., & Debney, L. M. (1989). Dimensions of driver stress. *Ergonomics*, *32*(6), 585–602. https://doi.org/10.1080/00140138908966134

Guo, F., & Fang, Y. (2013). Individual driver risk assessment using naturalistic driving data. *Accident Analysis & Prevention*, *61*, 3–9. https://doi.org/10.1016/j.aap.2012.06.014

Guo, M., Wei, W., Liao, G., & Chu, F. (2016). The impact of personality on driving safety among Chinese high-speed railway drivers. *Accident Analysis & Prevention*, *92*, 9–14. https://doi.org/10.1016/j.aap.2016.03.014

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. https://doi.org/10.1016/j.trf.2004.07.002

Harrell, W. A. (1993). The Impact of Pedestrian Visibility and Assertiveness on Motorist Yielding. *The Journal of Social Psychology*, *133*(3), 353–360. https://doi.org/10.1080/00224545.1993.9712153

Harris, P. B., Houston, J. M., Vazquez, J. A., Smither, J. A., Harms, A., Dahlke, J. A., & Sachau, D. A. (2014). The Prosocial and Aggressive Driving Inventory (PADI): A self-report measure of safe and unsafe driving behaviors. *Accident Analysis & Prevention*, *72*, 1–8. https://doi.org/10.1016/j.aap.2014.05.023

Hartig, T., Kaiser, F. G., & Bowler, P. A. (2001). Psychological Restoration in Nature as a Positive Motivation for Ecological Behavior. *Environment and Behavior*, *33*(4), 590–607. https://doi.org/10.1177/00139160121973142

Hartig, T., Kaiser, F. G., & Strumse, E. (2007). Psychological restoration in nature as a source of motivation for ecological behaviour. *Environmental Conservation*, *34*(04). https://doi.org/10.1017/S0376892907004250

Hau, K.-T., & Marsh, H. W. (2004). The use of item parcels in structural equation modelling: Non-normal data and small sample sizes. *British Journal of Mathematical and Statistical Psychology*, *57*(2), 327–351. https://doi.org/10.1111/j.2044-8317.2004.tb00142.x

Heft, H. (2008). *Ecological psychology in context: James Gibson, Roger Barker, and the legacy of William James's radical empiricism*. Psychology Press.

Hennessy, D. A., & Wiesenthal, D. L. (2002). The Relationship Between Driver Aggression, Violence, and Vengeance. *Violence and Victims*, *17*(6), 707–718. https://doi.org/10.1891/vivi.17.6.707.33719

Herrera, M. (1992). Environmentalism and Political Participation: Toward a New System of Social Beliefs and Values? *Journal of Applied Social Psychology*, *22*(8), 657–676. https://doi.org/10.1111/j.1559-1816.1992.tb00996.x

Herrero-Fernández, D. (2011). Psychometric adaptation of the Driving Anger Expression Inventory in a Spanish sample: Differences by age and gender. *Transportation Research Part F: Traffic Psychology and Behaviour*, *14*(4), 324–329. https://doi.org/10.1016/j.trf.2011.03.001

Híjar, M., Trostle, J., & Bronfman, M. (2003). Pedestrian injuries in Mexico: A multi-method approach. *Social Science & Medicine*, *57*(11), 2149–2159. https://doi.org/10.1016/S0277-9536(03)00067-4

Holland, C., Geraghty, J., & Shah, K. (2010). Differential moderating effect of locus of control on effect of driving experience in young male and female drivers. *Personality and Individual Differences*, *48*(7), 821–826. https://doi.org/10.1016/j.paid.2010.02.003

Holland, C., & Hill, R. (2007). The effect of age, gender and driver status on pedestrians' intentions to cross the road in risky situations. *Accident Analysis & Prevention*, *39*(2), 224–237. https://doi.org/10.1016/j.aap.2006.07.003

Huybers, S., Van Houten, R., & Malenfant, J. E. L. (2004a). 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), 445–456. https://doi.org/10.1901/jaba.2004.37-445

Huybers, S., Van Houten, R., & Malenfant, J. E. L. (2004b). 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), 445–456. https://doi.org/10.1901/jaba.2004.37-445

INEGI. (2016). *Accidentes de tránsito terrestre en zonas urbanas y suburbanas* [Online data set]. Insituto Nacional de Estadística y Geografía.

Isler, R. B., & Newland, S. A. (2017a). Life satisfaction, well-being and safe driving behaviour in undergraduate psychology students. *Transportation Research Part F: Traffic Psychology and Behaviour*, *47*, 143–154. https://doi.org/10.1016/j.trf.2017.04.010

Isler, R. B., & Newland, S. A. (2017b). Life satisfaction, well-being and safe driving behaviour in undergraduate psychology students. *Transportation Research Part F: Traffic Psychology and Behaviour*, *47*, 143–154. https://doi.org/10.1016/j.trf.2017.04.010

Iversen, H. (2004). Risk-taking attitudes and risky driving behaviour. *Transportation Research Part F: Traffic Psychology and Behaviour*, *7*(3), 135–150. https://doi.org/10.1016/j.trf.2003.11.003

Jabareen, Y. R. (2006). Sustainable Urban Forms: Their Typologies, Models, and Concepts. *Journal of Planning Education and Research*, *26*(1), 38–52. https://doi.org/10.1177/0739456X05285119

Jacobsen, P. L., Racioppi, F., & Rutter, H. (2009). Who owns the roads? How motorised traffic discourages walking and bicycling. *Injury Prevention*, *15*(6), 369–373. https://doi.org/10.1136/ip.2009.022566

Jafarpour, S., & Rahimi-Movaghar, V. (2014). Determinants of risky driving behavior: A narrative review. *Medical Journal of the Islamic Republic of Iran (MJIRI)*, *28*(142).

Jenks, M., & Jones, C. (Eds.). (2010). *Dimensions of the sustainable city*. Springer.

Jonah, B. A. (1986). Accident risk and risk-taking behaviour among young drivers. *Accident Analysis & Prevention*, *18*(4), 255–271. https://doi.org/10.1016/0001-4575(86)90041-2

Jovanovic, D., Stanojević, P., & Stanojević, D. (2011). Motives for, and Attitudes About, Driving-Related Anger and Aggressive Driving. *Social Behavior and Personality: An International Journal*, *39*(6), 755–764. https://doi.org/10.2224/sbp.2011.39.6.755

Kadar, E. E., & Shaw, R. E. (2000). Toward an Ecological Field Theory of Perceptual Control of Locomotion. *Ecological Psychology*, *12*(2), 141–180. https://doi.org/10.1207/S15326969ECO1202_02

Katz, A., Zaidel, D., & Elgrishi, A. (1975). An Experimental Study of Driver and Pedestrian Interaction during the Crossing Conflict. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, *17*(5), 514–527. https://doi.org/10.1177/001872087501700510

Keyes, C. L. M. (1998). Social Well-Being. *Social Psychology Quarterly*, *61*(2), 121. https://doi.org/10.2307/2787065

Koepsell, T. (2002). Crosswalk Markings and the Risk of Pedestrian–Motor Vehicle Collisions in Older Pedestrians. *JAMA*, *288*(17), 2136. https://doi.org/10.1001/jama.288.17.2136

Kollmuss, A., & Agyeman, J. (2002). Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, *8*(3), 239–260. https://doi.org/10.1080/13504620220145401

Kurz, T. (2002). The Psychology of Environmentally Sustainable Behavior: Fitting Together Pieces of the Puzzle. *Analyses of Social Issues and Public Policy*, *2*(1), 257–278. https://doi.org/10.1111/j.1530-2415.2002.00041.x

Lajunen, T., & Summala, H. (2003). Can we trust self-reports of driving? Effects of impression management on driver behaviour questionnaire responses. *Transportation Research Part F: Traffic Psychology and Behaviour*, *6*(2), 97–107. https://doi.org/10.1016/S1369-8478(03)00008-1

Lee, K., & Ashton, M. C. (2004). Psychometric Properties of the HEXACO Personality Inventory. *Multivariate Behavioral Research*, *39*(2), 329–358. https://doi.org/10.1207/s15327906mbr3902_8

Lucas, Y., Corral-Frías, N. S., & Corral Verdugo, V. (in review). Determinants of driving behavior: A Spanish translation of the Prosocial and Aggressive Driving Inventory (PADI) in a northwestern Mexican sample. *Accident Analysis & Prevention*.

Lugo, A. E. (2013). CicLAvia and human infrastructure in Los Angeles: Ethnographic experiments in equitable bike planning. *Journal of Transport Geography*, *30*, 202–207. https://doi.org/10.1016/j.jtrangeo.2013.04.010

Malenfant, J. E. L., & Van Houten, R. (1990). Increasing the percentage of drivers yielding to pedestrians in three Canadian cities with a multifaceted safety program. *Health Education Research*, *5*(2), 275–279. https://doi.org/10.1093/her/5.2.275

Matthews, G., Dorn, L., & Ian Glendon, A. (1991). Personality correlates of driver stress. *Personality and Individual Differences*, *12*(6), 535–549. https://doi.org/10.1016/0191-8869(91)90248-A

Mehta, V. (2008). Walkable streets: Pedestrian behavior, perceptions and attitudes. *Journal of Urbanism: International Research on Placemaking and Urban Sustainability*, *1*(3), 217–245. https://doi.org/10.1080/17549170802529480

Mehta, V. (2009). Look Closely and You Will See, Listen Carefully and You Will Hear: Urban Design and Social Interaction on Streets. *Journal of Urban Design*, *14*(1), 29–64. https://doi.org/10.1080/13574800802452658

Mogan, R., Fischer, R., & Bulbulia, J. A. (2017). To be in synchrony or not? A meta-analysis of synchrony's effects on behavior, perception, cognition and affect. *Journal of Experimental Social Psychology*, *72*, 13–20. https://doi.org/10.1016/j.jesp.2017.03.009

Moore, M., & Dahlen, E. R. (2008a). Forgiveness and consideration of future consequences in aggressive driving. *Accident Analysis & Prevention*, *40*(5), 1661–1666. https://doi.org/10.1016/j.aap.2008.05.007

Moore, M., & Dahlen, E. R. (2008b). Forgiveness and consideration of future consequences in aggressive driving. *Accident Analysis & Prevention*, *40*(5), 1661–1666. https://doi.org/10.1016/j.aap.2008.05.007

Moyano Díaz, E. (1997). Teoría del comportamiento planificado e intención de infringir normas de transito en peatones. *Estudos de Psicologia (Natal)*, *2*(2), 335–348. https://doi.org/10.1590/S1413-294X1997000200008

Mukherjee, A., & Onel, N. (2012). Analysis of the Predictors of Environmentally Sensitive Behavior. *Analysis of the Predictors of Environmentally Sensitive Behavior*, *4*(1), 55–67.

Murphy, K. R., & Lee, S. L. (1994). Personality variables related to integrity test scores: The role of conscientiousness. *Journal of Business and Psychology*, *8*(4), 413–424. https://doi.org/10.1007/BF02230957

Nasar, J. L. (2003). Prompting drivers to stop for crossing pedestrians. *Transportation Research Part F: Traffic Psychology and Behaviour*, *6*(3), 175–182. https://doi.org/10.1016/S1369-8478(03)00024-X

Nordfjærn, T., Jørgensen, S. H., & Rundmo, T. (2010). An investigation of driver attitudes and behaviour in rural and urban areas in Norway. *Safety Science*, *48*(3), 348–356. https://doi.org/10.1016/j.ssci.2009.12.001

Nordfjærn, T., & Şimşekoğlu, Ö. (2013). The role of cultural factors and attitudes for pedestrian behaviour in an urban Turkish sample. *Transportation Research Part F: Traffic Psychology and Behaviour*, *21*, 181–193. https://doi.org/10.1016/j.trf.2013.09.015

Orit Taubman - Ben-Ari, Mikulincer, M., & Iram, A. (2004). A multi-factorial framework for understanding reckless driving—Appraisal indicators and perceived environmental determinants. *Transportation Research Part F: Traffic Psychology and Behaviour*, *7*(6), 333–349. https://doi.org/10.1016/j.trf.2004.10.001

Özkan, T., & Lajunen, T. (2005). Multidimensional Traffic Locus of Control Scale (T-LOC): Factor structure and relationship to risky driving. *Personality and Individual Differences*, *38*(3), 533–545. https://doi.org/10.1016/j.paid.2004.05.007

Parker, D., Manstead, A. S., Stradling, S. G., & Reason, J. T. (1992). Determinants of intention to commit driving violations. *Accident; Analysis and Prevention*, *24*(2), 117–131.

Petit, L, Córdoba, EH, & Folco, M. (2013). *NORMA DE TRÁNSITO Y COMPORTAMIENTO NORMATIVO EN PEATONES ALUMNOS DE AUTOESCUELAS*. V Congreso Internacional de Investigación y Práctica Profesional en Psicología XX Jornadas de Investigación Noveno Encuentro de Investigadores en Psicología del MERCOSUR.

Piff, P. K., Stancato, D. M., Cote, S., Mendoza-Denton, R., & Keltner, D. (2012). Higher social class predicts increased unethical behavior. *Proceedings of the National Academy of Sciences*, *109*(11), 4086–4091. https://doi.org/10.1073/pnas.1118373109

Reser, J. P., & Scherl, L. M. (1988). Clear and unambiguous feedback: A transactional and motivational analysis of environmental challenge and self-encounter. *Journal of Environmental Psychology*, *8*(4), 269–286. https://doi.org/10.1016/S0272-4944(88)80034-3

Rosenbloom, T., Beigel, A., & Eldror, E. (2011). Attitudes, Behavioral Intentions, and Risk Perceptions of Fatigued Pedestrians. *Social Behavior and Personality: An International Journal*, *39*(9), 1263–1270. https://doi.org/10.2224/sbp.2011.39.9.1263

Saelens, B. E., Sallis, J. F., Black, J. B., & Chen, D. (2003). Neighborhood-Based Differences in Physical Activity: An Environment Scale Evaluation. *American Journal of Public Health*, *93*(9), 1552–1558. https://doi.org/10.2105/AJPH.93.9.1552

Sandt, L. S., Marshall, S. W., Rodriguez, D. A., Evenson, K. R., Ennett, S. T., & Robinson, W. R. (2016). Effect of a community-based pedestrian injury prevention program on driver yielding behavior at marked crosswalks. *Accident Analysis & Prevention*, *93*, 169–178. https://doi.org/10.1016/j.aap.2016.05.004

Saunders, C. D. (2003). The Emerging Field of Conservation Psychology. *Human Ecology Review*, *Vol. 10, No. 2*(Special Issue: Conservation Psychology (Winter 2003)), 137–149.

Schneider, K. J., Bugental, J. F. T., & Pierson, J. F. (Eds.). (2001). *The handbook of humanistic psychology: Leading edges in theory, research, and practice*. Sage Publications.

Schulte, P., & Vainio, H. (2010). Well-being at work: Overview and perspective. *Scandanavian Journal of Work, Environment and Health*, *36*, 422–429.

Schumacker, R. E., & Lomax, R. G. (2010). *A beginner's guide to structural equation modeling* (3rd ed). Routledge.

Schwartz, S. H. (1977). Normative influences on altruism. In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology* (pp. 221–229). Academic Press.

Seitz, V. A., & Razzouk, N. (2001). The Influence of Consumers' Environmental Sensitivity on Product Choices: An Empirical Study. *Journal of Promotion Management*, *6*(1–2), 133–146. https://doi.org/10.1300/J057v06n01_11

Sen, A., Stiglitz, J. E., & Fitoussi, J.-P. (2009). Report by the commission on the measurement of economic performance and social progress. *The Commission on the Measurement of Economic Performance and Social Progress*.

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. https://doi.org/10.1016/S1369-8478(99)00002-9

Simms, L. J., & Watson, D. (2007). The construct validation approach to personality scale construction. *Handbook of Research Methods in Personality Psychology*, 240–258.

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. https://doi.org/10.1016/j.aap.2005.04.014

Şimşekoğlu, Ö. (2015a). How Do Attitudes, Personality Traits, and Driver Behaviors Relate to Pedestrian Behaviors?: A Turkish Case. *Traffic Injury Prevention*, *16*(1), 84–89. https://doi.org/10.1080/15389588.2014.880785

Şimşekoğlu, Ö. (2015b). How Do Attitudes, Personality Traits, and Driver Behaviors Relate to Pedestrian Behaviors?: A Turkish Case. *Traffic Injury Prevention*, *16*(1), 84–89. https://doi.org/10.1080/15389588.2014.880785

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), 249–274. https://doi.org/10.1016/j.trf.2003.06.001

Stephens, A. N., & Sullman, M. J. M. (2014). Development of a short form of the driving anger expression inventory. *Accident Analysis & Prevention*, *72*, 169–176. https://doi.org/10.1016/j.aap.2014.06.021

Sullman, M. J. M., & Taylor, J. E. (2010). Social desirability and self-reported driving behaviours: Should we be worried? *Transportation Research Part F: Traffic Psychology and Behaviour*, *13*(3), 215–221. https://doi.org/10.1016/j.trf.2010.04.004

Tapia-Fonllem, C., Corral-Verdugo, V., Fraijo-Sing, B., & Durón-Ramos, M. (2013). Assessing Sustainable Behavior and its Correlates: A Measure of Pro-Ecological, Frugal, Altruistic and Equitable Actions. *Sustainability*, *5*(2), 711–723. https://doi.org/10.3390/su5020711

Taubman - Ben-Ari, O., & Katz - Ben-Ami, L. (2012). The contribution of family climate for road safety and social environment to the reported driving behavior of young drivers. *Accident Analysis & Prevention*, *47*, 1–10. https://doi.org/10.1016/j.aap.2012.01.003

Taubman-Ben-Ari, O., Mikulincer, M., & Gillath, O. (2004). The multidimensional driving style inventory—Scale construct and validation. *Accident Analysis & Prevention*, *36*(3), 323–332. https://doi.org/10.1016/S0001-4575(03)00010-1

Torgler, B., García-Valiñas, M. A., & Macintyre, A. (2011). Participation in environmental organizations: An empirical analysis. *Environment and Development Economics*, *16*(5), 591–620. https://doi.org/10.1017/S1355770X11000106

Valdez, P., & Mehrabian, A. (1994). Effects of color on emotions. *Journal of Experimental Psychology: General*, *123*(4), 394–409. https://doi.org/10.1037/0096-3445.123.4.394

van den Berg, A. E., Hartig, T., & Staats, H. (2007). Preference for Nature in Urbanized Societies: Stress, Restoration, and the Pursuit of Sustainability. *Journal of Social Issues*, *63*(1), 79–96. https://doi.org/10.1111/j.1540-4560.2007.00497.x

van Hoorn, J., van Dijk, E., Meuwese, R., Rieffe, C., & Crone, E. A. (2016). Peer Influence on Prosocial Behavior in Adolescence. *Journal of Research on Adolescence*, *26*(1), 90–100. https://doi.org/10.1111/jora.12173

Van Houten, R., Louis Malenfant, J. E. L., Van Houten, J., & Retting, R. (1997). Using Auditory Pedestrian Signals To Reduce Pedestrian and Vehicle Conflicts. *Transportation Research Record: Journal of the Transportation Research Board*, *1578*, 20–22. https://doi.org/10.3141/1578-03

Van Houten, R., & Malenfant, J. E. L. (2004). Effects of a driver enforcement program on yielding to pedestrians. *Journal of Applied Behavior Analysis*, *37*(3), 351–363. https://doi.org/10.1901/jaba.2004.37-351

Van Houten, R., Malenfant, J. E. L., & Rolider, A. (1985). Increasing driver yielding and pedestrian signaling with prompting, feedback, and enforcement. *Journal of Applied Behavior Analysis*, *18*(2), 103–110. https://doi.org/10.1901/jaba.1985.18-103

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: Journal of the Transportation Research Board*, *1818*, 119–124. https://doi.org/10.3141/1818-18

Verdugo, V. C., Fonllem, C. T., Armenta, M. F., Sing, B. F., & González, D. (2009). Orientación a la sostenibilidad como base para el comportamiento pro-social y pro-ecológico. *Medio Ambiente y Comportamiento Humano: Revista Internacional de Psicología Ambiental*, *10*(3), 195–215.

Wåhlberg, A. E. af, Dorn, L., & Kline, T. (2010). The effect of social desirability on self reported and recorded road traffic accidents. *Transportation Research Part F: Traffic Psychology and Behaviour*, *13*(2), 106–114. https://doi.org/10.1016/j.trf.2009.11.004

Watson, D. (2018). *Test Construction: Psychological Assessment I (Fall 2018)*.

Watson, D., O'Hara, M. W., Naragon-Gainey, K., Koffel, E., Chmielewski, M., Kotov, R., Stasik, S. M., & Ruggero, C. J. (2012). Development and Validation of New Anxiety and Bipolar Symptom Scales for an Expanded Version of the IDAS (the IDAS-II). *Assessment*, *19*(4), 399–420. https://doi.org/10.1177/1073191112449857

Wu, D. W. –L., DiGiacomo, A., & Kingstone, A. (2013). A Sustainable Building Promotes Pro-Environmental Behavior: An Observational Study on Food Disposal. *PLoS ONE*, *8*(1), e53856. https://doi.org/10.1371/journal.pone.0053856

Young, Kristie, Regan, Michael, & Hammer, M. (2007). Driver distraction: A review of the literature. In Faulks, I.J., Regan, M., Stevenson, M., Brown, J., Porter A., & Irwin, J.D. (Eds.), *Distracted driving* (pp. 379–405). Australasian College of Road Safety.

Zegeer, C., & Bushell, M. (2012). Pedestrian crash trends and potential countermeasures from around the world. *Accident Analysis & Prevention*, *44*(1), 3–11. https://doi.org/10.1016/j.aap.2010.12.007

Zegeer, C., Stewart, J., Huang, H., & Lagerwey, P. (2001). Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations: Analysis of Pedestrian Crashes in 30 Cities. *Transportation Research Record: Journal of the Transportation Research Board*, *1773*, 56–68. https://doi.org/10.3141/1773-07

Addendum 1: Test Construction

Conectividad de la Colonia: Proximidad a diferentes tipos de uso de tierra como comercial, residencial y comunitario que están en distancia para caminar de su casa (5 a 10 minutos). (Cerin et al., 2006c).

A continuación, te haremos algunas preguntas acerca de tu colonia o el área donde tú vives. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. Totalmente en descuerdo
2. En desacuerdo
3. Ni en desacuerdo, ni en acuerdo
4. De acuerdo
5. Totalmente de acuerdo

1. En el área donde vivo, hay comercios a los que me puedo ir caminando desde mi casa.
2. Hay bastante espacio público cerca de mi casa (ej. áreas comunes, parques).
3. En el área en la que vivo hay casas accesibles en cuestión de precio que están cerca de áreas comerciales.
4. Las entradas de los comercios y/o oficinas están cerca de la banqueta.
5. Hay escuelas a las que me puedo ir caminando.

Calidad de la infraestructura: Calidad física de la estructura de las calles relacionado con seguridad para los peatones y comodidad (Cerin et al., 2006c).

A continuación, te haremos algunas preguntas acerca de tu colonia o el área donde tú vives. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. Totalmente en descuerdo
2. En desacuerdo
3. Ni en desacuerdo, ni en acuerdo
4. De acuerdo
5. Totalmente de acuerdo

1. Las calles en el área donde vivo están en buena condición.
2. Las calles en el área donde vivo tienen baches (hoyos).
3. La condición de calles en el área donde vivo facilita que la gente camine.
4. La condición de calles en el área donde vivo facilita que la gente anda en bicicleta.
5. Las banquetas en el área donde vivo están en buena condición.
6. Los cruces peatonales están bien señalados.
7. Las rutas para peatones y ciclistas están claramente delineadas.
8. Las calles en el área donde vivo cuentan un punto intermedio seguro para cruzar calles anchas.
9. En el área donde vivo hay carros estacionados, pasto o tierra entre la banqueta y la calle.
10. Las calles en el área en el que vivo están muy anchas.
11. Las cocheras dominan los patios de las casas cerca de donde vivo.
12. El área donde vivo está dominada por áreas de estacionamiento.
13. En el área donde vivo hay basura o vidrios rotos en las calles y banquetas.

Calmantes de tráfico: diseño de calles con el objetivo de reducir la velocidad y flujo del tráfico (Retting, Ferguson, & McCartt, 2003)

A continuación, te haremos algunas preguntas acerca de tu colonia o el área donde tú vives. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. Totalmente en desacuerdo
2. En desacuerdo
3. Ni en desacuerdo, ni en acuerdo
4. De acuerdo
5. Totalmente de acuerdo

1. Hay topes en el área donde vivo.
2. Hay semáforos peatonales en el área donde vivo.
3. Los límites de velocidad están reducidos en las áreas que atraen grandes cantidades de peatones (e.g. escuelas, parques, hospitales, centros comerciales).
4. En el área donde vivo, hay suficientes patrullas que revisan el cumplimiento de las leyes de tráficos.
5. Hay muchas intersecciones de cuatro altos en el área donde vivo.

Comportamientos Seguros en la interacción conductor-peatón: Comportamientos de los conductores que fomentan el paso seguro de los peatones y comportamientos de los peatones que fomentan una buena interacción con el tráfico.

A continuación, te haremos algunas preguntas acerca de tu colonia o el área donde tú vives. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. Totalmente en descuerdo
2. En desacuerdo
3. Ni en desacuerdo, ni en acuerdo
4. De acuerdo

5. Totalmente de acuerdo

1. En el área donde vivo, los conductores no ceden el paso a los peatones.
2. En el área donde vivo, las acciones de los conductores hacen que no sea seguro que camine.
3. Las acciones de los peatones hacen que no sea seguro que yo maneje en el área donde vivo.
4. Los peatones solo cruzan en lugares seguros como cruces peatonales e intersecciones.
5. En el área donde vivo, los carros van tan rápido que asustan a los peatones.
6. Los conductores se paran completamente en los altos.
7. Los conductores bajan la velocidad cuando hay condiciones adversas relacionadas con el clima.
8. Los conductores obedecen las señales de tráfico.
9. Los conductores reducen su velocidad en áreas de construcción.

Percepción del crimen: percepción del crimen y su impacto en los comportamientos de los peatones y conductores.

A continuación, te haremos algunas preguntas acerca de tu colonia o el área donde tú vives. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. Totalmente en desacuerdo
2. En desacuerdo
3. Ni en desacuerdo, ni en acuerdo
4. De acuerdo
5. Totalmente de acuerdo

1. En el área donde vivo hay poco crimen (desde robo hasta asesinato).
2. El crimen hace que sea peligroso caminar en el área donde vivo durante el día.
3. El crimen hace que sea peligroso caminar en el área donde vivo durante la noche.
4. En el área donde vivo, es tan seguro que me sentiría a gusto en dejar a un niño de 10 años caminar solo durante el día.
5. No manejo en la noche porque tengo miedo del crimen que ocurre en el área donde vivo.

Equidad: La importancia de la igualdad de oportunidades y voz para todos los miembros de la comunidad (Verdugo et al., 2009).

A continuación, te haremos algunas preguntas acerca de ti y tus comportamientos. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. No me describe para nada
2. No me describe
3. Me describe poco
4. Me describe algo
5. Me describe perfectamente

1. La gente debe ser tratada con igualdad sin importar su estatus socioeconómico.

2. Los niños y niñas tienen el mismo derecho que los adultos a tomar decisiones importantes para la familia.
3. Hombres y mujeres tienen el mismo derecho al tomar decisiones sobre cualquier cosa.
4. Hombres y mujeres tienen las mismas obligaciones en el aseo de la casa.
5. Las niñas tienen la misma oportunidad de estudiar (hasta donde quieran) que los niños

Altruismo: un compromiso de ayudar y cuidar a otros sin esperar recompensa o beneficio directo (Verdugo et al., 2009).

A continuación, te haremos algunas preguntas acerca de ti y tus comportamientos. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. No me describe para nada
2. No me describe
3. Me describe poco
4. Me describe algo
5. Me describe perfectamente

1. Siento simpatía por las personas que son menos afortunadas que yo.
2. Dono tiempo o dinero a gente necesitada.
3. Ayudo a otros incluso cuando no hay un beneficio directo para mí.
4. Si alguien que no conozco me pide ayuda, lo ayudaría de inmediato.
5. Si alguien que no conozco me pide que le preste algo que es importante para mí, se lo prestaría.
6. Podría renunciar a riquezas materiales si es que fuera bueno para el bien común.
7. Pregunto cómo puedo ayudar cuando veo a personas necesitadas.
8. Soy voluntario en causas que ayudan a los demás en mi tiempo libre.

Comportamiento proecológico: comportamientos que promueven activamente la calidad de la naturaleza y el entorno natural (Verdugo et al., 2009)

A continuación, te haremos algunas preguntas acerca de ti y tus comportamientos. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. No me describe para nada
2. No me describe
3. Me describe poco
4. Me describe algo
5. Me describe perfectamente

1. Nunca tiro basura en la calle.
2. Participo en proyectos de limpieza comunitaria.
3. Compro productos ecológicos incluso si cuestan más.
4. Riego las plantas por la noche.
5. Conservo y reutilizo el papel.
6. Espero tener una carga completa de ropa antes de meterla a la lavadora

7. Cuando es posible reciclo.
8. Compro productos en paquetes que puedo reutilizar.
9. Compro frutas y verduras que son de temporada.
10. Uso la secadora de ropa.
11. Hablo con amigos sobre problemas ambientales.
12. Uso insecticidas.
13. En el verano apago el aire acondicionado o el cooler si no voy a estar en la casa por más de 4 horas.
14. Reutilizo artículos cuando es posible.
15. Animo a mis amigos a reciclar.

Frugalidad: Grado en que se restringe en la adquisición de bienes y servicios económicos, así como el uso ingenioso de dichos bienes y servicios para lograr objetivos a largo plazo.

A continuación, te haremos algunas preguntas acerca de ti y tus comportamientos. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. No me describe para nada
2. No me describe
3. Me describe poco
4. Me describe algo
5. Me describe perfectamente

1. Reparo las cosas en lugar de comprarlas nuevas.
2. No compro algo nuevo a menos que esté seguro de haber usado el anterior más allá de su vida normal.
3. Compro más cosas de las que realmente necesito.
4. Cuando me sobra comida la guardo para comerla en otro momento.
5. Seguido como en casa o traigo mi lonche en lugar de comer afuera.
6. A menudo tiro cosas que todavía pueden ser útiles.
7. Ahorro gasolina caminando o andando en bicicleta.

Bienestar psicológico: Autoevaluación de la calidad de vida y funcionamiento. (Verdugo et al., 2009; Watson et al., 2012)

A continuación, te haremos algunas preguntas acerca de ti y tus comportamientos. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. Totalmente en descuerdo
2. En desacuerdo
3. Ni en desacuerdo, ni en acuerdo
4. De acuerdo
5. Totalmente de acuerdo

1. Me siento optimista.
2. Estoy orgulloso de mi mismo.
3. Siento que he logrado mucho.

4. Espero las cosas con entusiasmo.
5. Me siento con esperanza para el futuro.
6. Siento que tengo mucho por delante.
7. Siento que tengo muchas cosas interesantes que hacer.
8. Siento que tengo mucha energía.
9. Me siento bien cuando pienso en las cosas que he logrado.
10. Mis metas son una fuente de satisfacción.
11. Tengo una dirección clara en mi vida.
12. Estoy orgulloso de quien soy y de la vida que vivo.

Actualización social: La creencia de que la sociedad está evolucionando positivamente, tiene el potencial de volverse más positiva y está realizando ese potencial. (Keyes, 1998).

A continuación, te haremos algunas preguntas acerca de ti y cómo te sientes. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. Totalmente en descuerdo
2. En desacuerdo
3. Ni en desacuerdo, ni en acuerdo
4. De acuerdo
5. Totalmente de acuerdo

1. La sociedad ha mejorado para gente como yo.
2. Mi comunidad está progresando.
3. La sociedad ha dejado de progresar.
4. Las instituciones sociales como la ley y el gobierno mejoran mi vida.
5. El mundo se está convirtiendo en un lugar mejor para todos.

Integración social: Un sentimiento de pertenencia y apoyo a la comunidad basada en elementos comunes compartidos (Keyes, 1998).

A continuación, te haremos algunas preguntas acerca de ti y como te sientes. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. Totalmente en desacuerdo
2. En desacuerdo
3. Ni en desacuerdo, ni en acuerdo
4. De acuerdo
5. Totalmente de acuerdo

1. Me siento parte de mi comunidad.

2. Mi comunidad es una fuente de comodidad.
3. Mantengo contacto cercano con mis vecinos.
4. Me siento cerca de la gente que conforma mi comunidad.
5. Siento que soy una parte importante de mi comunidad.
6. Si tengo algo que decir, las personas de mi comunidad me escucharán.

Contribución social: Creer en la capacidad de uno para contribuir positivamente a la sociedad y que esas contribuciones son valoradas por la comunidad. Basado en (Keyes, 1998).

A continuación, te haremos algunas preguntas acerca de ti y como te sientes. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. Totalmente en desacuerdo
2. En desacuerdo
3. Ni en desacuerdo, ni en acuerdo
4. De acuerdo
5. Totalmente de acuerdo

1. Mis actividades diarias aportan algo que vale la pena a la sociedad.
2. Mi comunidad no valora las contribuciones que hago a la sociedad.
3. Tengo algo valioso para ofrecer al mundo.
4. No tengo nada importante que aportar a la sociedad.
5. No tengo el tiempo ni la energía para aportar algo a mi comunidad.

Comportamientos de Conservación social: Acciones que contribuyen a la conservación de la función óptima de la comunidad.

A continuación, te haremos algunas preguntas acerca de ti y como te sientes. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. Totalmente en desacuerdo
2. En desacuerdo
3. Ni en desacuerdo, ni en acuerdo
4. De acuerdo
5. Totalmente de acuerdo

1. Estoy involucrado en la asociación de vecinos de mi colonia.
2. Contribuyo en los quehaceres familiares.
3. Hago actividades de vinculación en mi comunidad.
4. Prefiero comprar productos de negocios locales, incluso si son más caros.
5. Voto en las elecciones locales.
6. Asisto y apoyo en eventos locales.
7. Estoy orgulloso de los aspectos positivos de mi comunidad y lo comparto con otros.

8. Me comunico con mis funcionarios electos sobre asuntos de la comunidad.

Actitudes de conservación ecológica: Creencias personales sobre la importancia de la preservación del medio ambiente y el impacto de la agencia individual hacia ese fin.

A continuación, te haremos algunas preguntas acerca de ti y como te sientes. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. Totalmente en desacuerdo
2. En desacuerdo
3. Ni en desacuerdo, ni en acuerdo
4. De acuerdo
5. Totalmente de acuerdo

1. Me preocupa la cantidad de contaminación en mi comunidad.
2. Creo que los humanos tienen derecho a alterar el entorno natural de acuerdo a sus necesidades.
3. A menudo considero el impacto ambiental de las cosas que compro.
4. Creo que es importante reducir las emisiones contaminantes de los automóviles.
5. Creo que el mantenimiento de la infraestructura es importante para la conservación del medio ambiente.
6. No creo que las acciones de una sola persona puedan mejorar el medio ambiente.
7. La conservación del medio ambiente es importante para mí.
8. No creo que el cambio climático sea causado por las actividades humanas.
9. Creo que la conservación del medio ambiente debería ignorarse si se interpone en la creación de nuevos empleos.
10. Creo que la gente se preocupa demasiado por los problemas ambientales.

Orientación Social en la conservación del ambiente: El grado en que las opiniones comunales, las normas sociales y la presión social impulsan el comportamiento de conservación.

A continuación, te haremos algunas preguntas acerca de ti y como te sientes. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. Totalmente en desacuerdo
2. En desacuerdo
3. Ni en desacuerdo, ni en acuerdo
4. De acuerdo
5. Totalmente de acuerdo

1. Las personas que son importantes para mí tienden a creer que la actividad humana está dañando el medio ambiente.
2. La conservación del medio ambiente natural requiere un esfuerzo comunitario.
3. La mayoría de mis familiares y amigos no están preocupados por la conservación del medio ambiente.

4. Siento presión social para preservar el equilibrio natural.
5. Los medios de comunicación exageran la importancia de la conservación del medio ambiente.
6. Si todos lo intentaran, podríamos mejorar la conservación ambiental.

Conductas de manejo prosocial hacia peatones y ciclistas: Conductas de conducción dirigidas a la protección de peatones y ciclistas en el entorno del tráfico. (Harris et al., 2014).

A continuación, te haremos algunas preguntas acerca de ti y como te sientes. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. Totalmente en desacuerdo
2. En desacuerdo
3. Ni en desacuerdo, ni en acuerdo
4. De acuerdo
5. Totalmente de acuerdo

1. Manejo el carro (o moto) con mucho cuidado alrededor de los peatones.
2. Presto atención especial cuando me acerco a las intersecciones de calles.
3. Manejo con especial cuidado cuando estoy alrededor de ciclistas.
4. Conduzco con cuidado tomando en cuenta a peatones (por ejemplo, reducir la velocidad, moverme).
5. Conduzco en carriles designados para bicicletas cuando no veo ningún ciclista en ellos.
6. Normalmente me detengo para dejar que peatones crucen las calles.
7. Reduzco mi velocidad en zonas de construcción.
8. Seguido escribo mensajes de texto o uso mi teléfono mientras manejo.
9. Por lo general, mantengo una distancia segura entre mi vehículo y los que están frente de mí.
10. Siempre uso mis luces direccionales.

Conducción pro social hacia otros vehículos: Conductas de manejo que promuevan un entorno de tráfico seguro y armonioso entre los conductores. (Harris et al., 2014).

A continuación, te haremos algunas preguntas acerca de ti y como te sientes. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. Totalmente en desacuerdo
2. En desacuerdo
3. Ni en desacuerdo, ni en acuerdo
4. De acuerdo
5. Totalmente de acuerdo

1. Presto atención especial al dar la vuelta.
2. Presto atención al tráfico y mis alrededores mientras manejo.
3. Me paro lo suficientemente lento como para alertar a los conductores detrás de mí.

4. Conduzco con más cuidado para tomar en cuenta a los vehículos estacionados en la calle (por ejemplo, reducir la velocidad, moverme).
5. Mantengo una distancia segura cuando conduzco detrás de otros vehículos.
6. Siempre cedo cuando el derecho de paso pertenece a otros conductores.

Comportamientos de manejo seguros: Conductas generales de conducción o percepciones de conductas que fomentan un entorno de conducción seguro.

A continuación, te haremos algunas preguntas acerca de ti y como te sientes. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. Totalmente en desacuerdo
2. En desacuerdo
3. Ni en desacuerdo, ni en acuerdo
4. De acuerdo
5. Totalmente de acuerdo

1. Nunca envío mensajes de texto o uso dispositivos electrónicos mientras manejo.
2. Puedo enviar mensajes de texto o usar un dispositivo electrónico mientras conduzco de manera segura.
3. Cuando pienso que los límites de velocidad son demasiado bajos, no los obedezco.
4. Conduzco con mayor precaución cuando hay malas condiciones en la calle.
5. Siempre me detengo por completo en los altos.
6. Conduzco con mucho cuidado en condiciones cuando el clima está mal.
7. Obedezco las señales de tráfico.
8. Obedezco los límites de velocidad publicados en zonas escolares.
9. Uso mis direccionales para señalar a otros conductores mi intención de dar vuelta.

Cruze peatonal seguro: Conductas peatonales dirigidas a interacciones seguras en el entorno del tráfico.

A continuación, te haremos algunas preguntas acerca de ti y como te sientes. Por favor lee cada declaración cuidadosamente y escoge la respuesta más apropiada para ti usando la siguiente escala:

1. Totalmente en desacuerdo
2. En desacuerdo
3. Ni en desacuerdo, ni en acuerdo
4. De acuerdo
5. Totalmente de acuerdo

1. Al caminar, generalmente cruzo la calle en áreas designadas.
2. No le presto mucha atención a los conductores al cruzar la calle cuando ando a pie.
3. Seguido cruzo la calle a pie mientras escucho música.
4. Seguido cruzo la calle a pie mientras hablo o escribo mensajes de texto en mi teléfono.
5. Seguido me distraigo con otras cosas cuando cruzo la calle a pie.

6. Siempre espero cruzar la calle hasta que sea mi turno o el conductor me indique que cruce a pie.
7. No suelo usar los puentes peatonales (-)

Hago contacto visual con los conductores antes de cruzar la calle a pie.