TUAD, 2025, 8(1), 15–31

Trafik ve Ulaşım Araştırmaları Dergisi

Dergi Ana Sayfa: http://dergipark.org.tr/tuad

Safety Research Unit

Araştırma Makalesi | Research Article

Caught in the Middle: Examining Pedestrian and Driver Responses to Aggressive Driving

Yeşim Üzümcüoğlu[1*], Merve Yaşar[1]

[1] Department of Psychology, TOBB University of Economics and Technology, Ankara, Türkiye.

Abstract

This study investigates the dual roles of individuals as pedestrians and drivers, focusing on their perceptions and attitudes toward aggressive driver behaviors and other traffic-related interactions. By applying Role Theory, the research highlights how societal expectations and role conflicts shape these attitudes, providing a deeper understanding of the psychological and behavioral challenges associated with navigating dual roles. Using a qualitative approach, semi-structured interviews were conducted with 20 participants (10 males and 10 females) to explore their experiences in traffic. Thematic analysis revealed two main themes: Pedestrian Behaviors and Driver Behaviors. Pedestrian behaviors were categorized into Predictable Movement Patterns and Unpredictable Movement Patterns, reflecting the ways pedestrians' actions influence traffic dynamics and safety. Driver behaviors included both positive actions (e.g., Adhering to Rules, Respecting Pedestrian Rights) and negative actions (e.g., Aggressive Driving, Violating Pedestrian Rights). These findings underscore the complexity of pedestrian-driver interactions and emphasize the importance of Role Theory in developing strategies to foster safer and more cooperative traffic environments through targeted educational and policy-based interventions.

Anahtar Kelimeler: *pedestrians, driver anger, anger expression, attitude, road safety, role theory*

Arada Kalmak: Yaya ve Sürücülerin Agresif Sürüşe Tepkilerinin İncelenmesi

Öz

Bu çalışma, bireylerin trafikte hem yaya hem de sürücü olarak üstlendikleri çift rolleri incelemektedir. Bu roller bağlamında agresif sürüş davranışları ve trafikle ilgili diğer etkileşimlere yönelik algı ve tutumlarını araştırmaktadır. Rol Teorisi çerçevesinde, toplumsal beklentilerin ve rol çatışmalarının söz konusu tutumları nasıl şekillendirdiği derinlemesine ele alınmaktadır. Ayrıca, bireylerin bu ikili rol arasında yaşadığı psikolojik ve davranışsal zorluklara dair kapsamlı bir inceleme yapılması amaçlanmıştır. Toplamda 10 kadın ve 10 erkek katılımcıyla gerçekleştirilen görüşmeler aracılığıyla nitel araştırma yöntemi uygulanmıştır. Katılımcıların trafikle ilgili deneyimleri tematik analiz yöntemiyle incelenmiştir. Analiz sonucunda iki ana tema belirlenmiştir: Yaya Davranışları ve Sürücü Davranışları. Yaya davranışları, trafik akışı ve güvenliği etkileyen öngörülebilir ve öngörülemez hareket örüntüleri olmak üzere iki alt kategoriye ayrılmıştır. Sürücü davranışları ise olumlu davranışlar (örneğin, kurallara uyma, yayalara öncelik verme) ve olumsuz davranışlar (örneğin, agresif sürüş, yaya haklarını ihlal etme) şeklinde sınıflandırılmıştır. Elde edilen bulgular, yaya ve sürücü rollerinin dinamiklerini ve etkileşimlerinin karmaşıklığını ortaya koymaktadır. Bu bağlamda sonuçlar, daha güvenli ve iş birliğine dayalı trafik ortamlarının oluşturulmasında Rol Teorisi'nin sağlayabileceği katkılara ve buna yönelik eğitimsel ve politika odaklı müdahalelerin gerekliliğine dikkat çekmektedir.

Keywords: *yayalar, sürücü öfkesi, öfke ifadesi, tutum, yol güvenliği, rol teorisi*

[*] *İletişim / Contact: Yeşim Üzümcüoğlu, Department of Psychology, TOBB University of Economics and Technology, Ankara, Turkey. E-Posta / E-mail:* yesimuzumcuoglu@gmail.com.

Gönderildiği tarihi / Date submitted: 22.03.2025, Kabul edildiği tarih / Date accepted: 16.04.2025

Alıntı / Citation: Üzümcüoğlu, Y. & Yaşar, M. (2025). Caught in the middle: Examining pedestrian and driver responses to aggressive driving. *Trafik ve Ulaşım Araştırmaları Dergisi, 8*(1), 15–31. https://doi.org/10.38002/tuad.1663166

Caught in the Middle: Examining Pedestrian and Driver Responses to Aggressive Driving

1. Introduction

Traffic environments are complex spaces where individuals frequently assume dual roles: as pedestrians and as drivers. These roles might present contrasting experiences. Pedestrians often navigate traffic with vulnerability. They lack the physical protection offered by vehicles and have limited control over the actions of drivers and surrounding traffic conditions. This leaves them more exposed to risks, especially in high-speed or poorly lit environments. Drivers, on the other hand, benefit from the physical protection of their vehicles and a greater sense of control over their movement. However, this control can sometimes create a false sense of security, potentially reducing their awareness of pedestrians' vulnerability (Hobday & Knight, 2010). Understanding these differing perspectives is essential for fostering empathy and improving safety dynamics between these groups.

This study examines the impact of dual roles on attitudes toward aggressive driver behaviors, with a specific focus on urban environments. Ensuring pedestrian safety, recognized as a critical aspect of global traffic management, is essential for developing safer and more inclusive traffic systems (World Health Organization [WHO], 2023). With pedestrians accounting for a significant proportion of road fatalities, particularly in urban areas, understanding their attitudes toward driver aggression is vital for creating safer and more inclusive traffic environments. Moreover, the interactions between pedestrians and drivers are often shaped by situational and environmental factors, such as traffic density, road infrastructure, and cultural norms. These factors not only influence pedestrian attitudes but also play a crucial role in determining the likelihood of conflicts and near-misses in urban traffic systems (Liu et al., 2022; Saeipour et al., 2023; Sheykhfard & Haghighi, 2018). This study builds on existing research to explore these dynamics, aiming to inform targeted interventions and policy recommendations.

Pedestrians in developing countries face heightened risks due to inadequate infrastructure and limited protective regulations (WHO, 2023). In Turkey, pedestrians account for 23.3% of traffic fatalities, emphasizing their vulnerability (Turkish Statistical Institute [TÜİK], 2023). Based on data from the Turkish Statistical Institute, drivers are identified as the primary cause of accidents (86.8%), with pedestrians as the second main cause (9.5%). However, when the fatality rates among road user groups are examined, pedestrians account for 23.3% of road traffic fatalities (TÜİK, 2023). Combining global and local data provides a nuanced understanding of pedestrian vulnerability, informing strategies tailored to different socioeconomic and infrastructural contexts.

1.1. The Vulnerability of Pedestrians in Traffic Environments

Pedestrians are considered a vulnerable road user group since they do not have protective equipment like vehicles do, making them more susceptible to injuries in the event of a traffic accident. The absence of physical barriers (e.g., airbags), which causes direct exposure to potential hazards, indicates the need for increased attention and safety measures for pedestrians in road safety (WHO, 2023). The risk of being injured in an accident is significantly influenced by the speed of the vehicle; however, this risk is particularly heightened for pedestrians due to their vulnerability (Rosén et al., 2010). These findings highlight the critical importance of understanding factors that contribute to pedestrian vulnerability, particularly in the context of driver behaviors.

Aggressive driver behaviors, such as speeding and failing to yield at crosswalks, exacerbate pedestrians' vulnerability by increasing physical risks and influencing their crossing behaviors (Liu et al., 2022). These interactions often create a heightened sense of vulnerability among pedestrians, leading to stress and fear in traffic environments. For instance, such behaviors significantly influence pedestrians' willingness to engage in safe crossing practices and their overall traffic behavior (Saeipour et al., 2023). This underscores the need to examine driver aggression from a pedestrian’s perspective to address these challenges effectively.

1.2. Anger and Its Role in Traffic Interactions

Anger is a fundamental emotion frequently experienced in traffic settings, particularly by drivers, and it plays a critical role in shaping interactions between road users. Aggressive behaviors driven by anger, such as verbal aggression, tailgating, or failing to yield, can escalate into dangerous situations, especially for vulnerable road users like pedestrians (Deffenbacher et al., 2002; Cinnamon et al., 2011).

These behaviors not only create immediate physical risks but also influence pedestrian stress and decision-making in traffic environments. This section examines the emotional and behavioral impacts of anger on pedestrians and highlights the dynamics of dual roles in traffic interactions.

1.2.1. Aggressive Driver Behaviors.

Aggressive driving behaviors, such as failing to yield or speeding near crosswalks, significantly contribute to pedestrian fatalities and stress (Cinnamon et al., 2011). These behaviors create immediate risks and influence pedestrian decision-making under stress, such as hesitation to cross roads or engaging in risky maneuvers. Deffenbacher et al. (2002) categorized anger expression into four distinct types, each with unique implications for pedestrian safety. Verbal aggressive expression, such as shouting, cursing, or honking, heightens pedestrians' stress and fear. Physical aggressive expression, which involves gestures or throwing objects, further escalates traffic tensions. Vehicle-related aggression, including tailgating, reckless driving, or speeding, directly endangers pedestrians' physical safety (Cinnamon et al., 2011). In contrast, constructive expressions of anger involve redirecting anger into calming strategies, such as deep breathing or adapting driving behaviors to minimize harm.

Understanding these types provides critical insights into how aggression manifests in traffic and impacts pedestrian well-being. For example, verbal aggression can cause immediate psychological distress, while vehicle-related aggression might lead to avoidance behaviors or long-term anxiety. Effective interventions must address these diverse manifestations to reduce the risks associated with driver anger.

1.2.2. Pedestrian Responses to Aggressive Driver Behaviors: Perceptions and Emotional Impacts.

Pedestrians frequently experience stress, fear, and frustration as a result of aggressive driver behaviors. These behaviors create immediate risks and influence pedestrian decision-making under stress, such as hesitation to cross roads or engaging in risky maneuvers (Cinnamon et al., 2011; Liu et al., 2022). High traffic densities often exacerbate this effect, as pedestrians perceive safety in numbers and assume that drivers are more likely to yield to groups rather than individuals, leading to group-based risk-taking behaviors (Liu et al., 2022; Salamati et al., 2013).

The absence of protective barriers makes pedestrians particularly vulnerable, amplifying their emotional and psychological reactions to driver aggression (WHO, 2023). While marked crosswalks can provide pedestrians with a sense of security, they may also create a false sense of safety, causing pedestrians to take riskier crossing decisions (Pfortmueller et al., 2014). Furthermore, infrastructural factors such as poorly designed crossings or absence of traffic calming measures may lead to heightened pedestrian stress and avoidance behaviors (Schroeder & Rouphail, 2011; Sheykhfard et al., 2022).

Cultural factors also influence pedestrian responses to aggressive driver behavior. In certain cultural contexts, pedestrians may adopt confrontational strategies when threatened, whereas in others, they exhibit avoidance behaviors to minimize risk and conflict (Sheykhfard & Haghighi, 2018). Examining these diverse responses highlights the need for context-specific interventions, such as targeted infrastructure improvements and educational campaigns, to mitigate pedestrian stress and promote safer traffic interactions. Understanding these diverse influences—ranging from psychological stress and group behaviors to cultural norms and infrastructure—provides a holistic framework for addressing pedestrian safety in shared road environments (Cloutier et al., 2017; Sheykhfard et al., 2022; Schroeder & Rouphail, 2011).

1.3. Dual Role of Road Users

Attitudes are key precursors to anger-related behaviors in traffic contexts (Ambak et al., 2017; Youssef et al., 2023). Negative attitudes among pedestrians toward other road users are linked to higher rates of aggressive violations and transgressions, as well as reduced attentiveness (Serin et al., 2018). Similarly, drivers' negative attitudes toward pedestrians contribute to escalating conflicts and decreased mutual trust, perpetuating a cycle of aggression (Febres et al., 2021; Serin et al., 2018). Although driver behaviors are the primary cause of road traffic accidents, pedestrians also play a crucial role in road safety outcomes (WHO, 2023).

Research on pedestrian behaviors has focused primarily on specific contexts, such as unsignalized and signalized crosswalks (Ren et al., 2011; Yang et al., 2022), and the impact of distractions like mobile phone use (Schwebel et al., 2012; Zhou et al., 2019). These behaviors increase accident risks, particularly for pedestrians, whose vulnerability amplifies the

severity of injuries compared to drivers (Rosén et al., 2010; Zhou et al., 2019). However, exploration of pedestrians' perceptions of drivers' undesirable behaviors remains limited (Nordfjærn et al., 2011). Individuals alternating between pedestrian and driver roles provide valuable insights into these interactions, offering a nuanced perspective on both pedestrian vulnerabilities and driver behaviors (Gibson et al., 2018).

Role Theory offers a foundational framework for understanding how individuals navigate multiple social roles. It posits that people adopt specific behaviors, attitudes, and responsibilities based on the roles they occupy, with each role governed by societal expectations, norms, and responsibilities (Stryker & Burke, 2000). For dual-role road users, alternating between pedestrian and driver roles can lead to significant tension, as the behavioral expectations and responsibilities of these roles often conflict (Nordfjærn et al., 2011). This theoretical lens provides a valuable basis for analyzing the psychological and behavioral challenges faced by individuals managing these dual roles in traffic contexts.

Previous research suggests that pedestrians often perceive drivers' behaviors as threatening and unpredictable, which can contribute to heightened risk perceptions and defensive actions in traffic environments (Nordfjærn et al., 2011; Serin et al., 2018). Conversely, drivers often express frustration with pedestrians' perceived inattentiveness, which they interpret as violations of shared traffic norms (Febres et al., 2021; Nordfjærn et al., 2011).

Role Theory highlights how these mutual frustrations stem from conflicting role expectations: pedestrians expect protection and caution from drivers, while drivers expect attentiveness and compliance with traffic norms from pedestrians (Febres et al., 2021; Nordfjærn et al., 2011). This reciprocal nature of frustrations underscores the need to address role-related dynamics in traffic safety strategies. By applying Role Theory, the study emphasizes the importance of fostering mutual empathy and awareness between road users. Educational interventions, such as driver-pedestrian awareness campaigns or virtual reality simulations, can promote shared responsibilities, mitigate role-related tensions, and create safer, more cooperative traffic environments (Nigam et al., 2021; Schuring et al., 2023).

1.4. Research Gap and Aim of the Study

This study addresses a critical and underexplored gap in traffic safety research: the dual perspectives of individuals who alternate between being pedestrians and drivers. While prior studies have treated pedestrians and drivers as distinct entities, few have examined how these dual roles interact to shape attitudes toward aggressive driving behaviors and road safety outcomes. This research is the first of its kind to integrate Role Theory as a framework for understanding how societal expectations, role conflicts, and role perceptions influence individuals' behaviors and attitudes in shared traffic environments.

By revealing the dynamic tensions between pedestrians' sense of vulnerability and drivers' perceived control, this study provides novel insights into the psychological and behavioral contradictions inherent in these roles. For example, individuals may empathize with drivers' frustrations when navigating traffic but simultaneously demand heightened caution and protection as pedestrians. The findings not only advance current understanding of road user interactions but also offer a foundation for targeted interventions, such as educational programs and policies, aimed at fostering mutual empathy, reducing role-related conflicts, and promoting safer, more cooperative traffic environments.

2. Method

2.1. Participants

The study included 20 participants (10 males, 10 females) aged between 18 and 43 years (M = 23.8, SD = 5.27). Female participants reported an average age of 24 years (SD = 6.60), whereas the average age for male participants was 23 years (SD = 3.80). All participants held a valid driving license, a deliberate criterion to ensure that they could reflect on their experiences from both perspectives: as pedestrians and as drivers. Participants' daily pedestrian activity durations varied across genders, as summarized in Table 1. On average, participants spent 86.25 minutes daily (SD = 61.28) navigating traffic as pedestrians. Female participants reported slightly longer durations (M = 90, SD = 78.31) compared to males (M = 82.5, SD = 41.98).

As shown in Figure 1, time categories for pedestrian activities revealed notable gender-based differences. Women most frequently reported walking during "Morning Only" and displayed greater variability, as

evidenced by their responses in the "It depends" category. In contrast, men reported more structured patterns, predominantly walking during "Noon Only" and "Afternoon Only". Combined categories, such as "Morning + Afternoon" and "Afternoon + Evening", showed similar participation across both genders.

Table 1. Characteristics of participants

ID	Age	Gender	Minutes spent as pedestrian	Time Category	Interview method
1	21	Woman	20	Morning, Noon, Afternoon, Evening	Face to face
2	22	Man	90	Morning, Afternoon	Online
3	22	Man	90	Night	Face to face
4	21	Woman	30	Noon	Face to face
5	23	Woman	180	It depends*	Face to face
6	22	Woman	60	Morning, Evening	Face to face
7	22	Woman	20	Morning	Face to face
8	22	Man	30	Noon, Afternoon, Evening	Face to face
9	22	Woman	180	Morning, Evening	Face to face
10	21	Man	120	Morning	Online
11	18	Man	120	Noon	Online
12	21	Man	15	Afternoon, Evening	Face to face
13	22	Man	120	Noon, Evening	Online
14	30	Man	120	Morning	Face to face
15	29	Man	90	It depends*	Online
16	26	Man	30	Noon, Afternoon	Online
17	23	Woman	30	Noon, Afternoon, Night	Online
18	24	Woman	180	It depends*	Online
19	43	Woman	20	It depends*	Online
20	23	Woman	180	Morning, Afternoon, Evening	Face to face

*The participant's responses did not indicate specific time intervals, suggesting that their time spent as a pedestrian in traffic varies.

The sample size of 20 participants was chosen based on achieving data saturation, ensuring a thorough exploration of recurring themes while maintaining diversity in participant responses. Previous research supports the sufficiency of small, homogenous samples in qualitative studies, particularly when participants share common characteristics (Young & Casey, 2018; Vasileiou et al., 2018). In this study, the dual roles of participants as pedestrians and drivers provided a focused yet diverse sample, facilitating rich, in-depth insights into their traffic experiences.

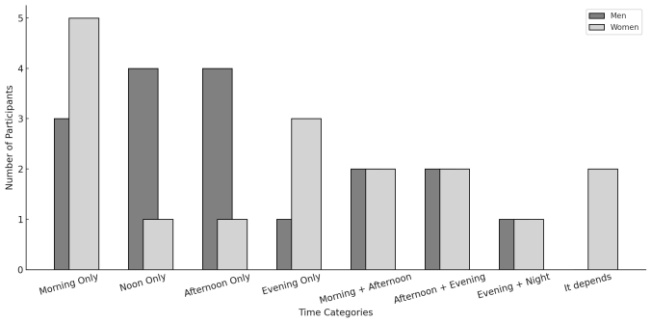

Figure 1. Gender-Wise Distribution of Participants Across Time Categories.

2.2. Instruments

Data were collected using a demographic information form and semi-structured interviews. The demographic form included questions on participants' age, gender, and time spent navigating traffic as pedestrians and drivers. The interview guide consisted of 15 open-ended questions, which were developed and adapted from well-established scales to ensure reliability and relevance to the research objectives. Specifically, questions were drawn from the Driver Anger Scale (Deffenbacher et al., 2002), which explores participants' emotional responses to traffic interactions, the Driver Behavior Questionnaire (Reason et al., 1990), designed to identify patterns of risky and aggressive driving behaviors, and the Pedestrian Behavior Questionnaire (Serin et al., 2018), which focuses on pedestrian behaviors, particularly in shared traffic environments.

The semi-structured format allowed participants to provide detailed responses about their perceptions, emotions, and experiences as both pedestrians and drivers, encouraging them to reflect on their dual roles. Prior to the main data collection phase, pilot testing was conducted to ensure that the questions were clear, relevant, and aligned with the study's objectives. Based on the feedback from the pilot phase, minor refinements were made to improve the clarity and flow of the interview guide. The full list of questions is as follows: 1) What is your perspective on aggressive driver behaviors as pedestrians?; 2) What situations in traffic cause you stress as a

pedestrian?; 3) How do you cope with stressful situations in traffic as a pedestrian?; 4) What driver behaviors make you angry as a pedestrian?; 5) What aggressive driver behaviors have you encountered as a pedestrian?; 6) What driver behaviors make you feel comfortable when you are in traffic as a pedestrian?; 7) What aggressive driver behaviors do you exhibit towards pedestrians when you are a driver?; 8) How do the difficulties you face in traffic as a pedestrian affect your daily life outside of traffic?; 9) In your opinion, what driver behaviors would make your life easier in traffic as a pedestrian?; 10) How do you think aggressive drivers can manage their anger in traffic?; 11) Do you observe any changes in your behavior as a pedestrian in situations where you are angry in traffic?; 12) How do you control your behavior as a pedestrian when you are angry in traffic?; 13) What kind of influence do you think you have on driver behavior as a pedestrian in traffic?; 14) Do you think you exhibit behaviors as a pedestrian in traffic that provoke drivers' anger?; 15) Which pedestrian behaviors do you think can anger drivers in traffic?

2.3. Procedure

Ethical approval for the research was obtained from the TOBB ETU Human Research Ethics Committee. Snowball sampling was used to recruit participants, focusing on individuals with regular pedestrian activity in traffic. Individual interviews were conducted in quiet settings, either in-person or online, depending on participants' preferences. Each interview lasted an average of 30–40 minutes and was conducted solely by the first author. Audio recordings were obtained from participants who provided consent, while detailed notes were taken during interviews with those who did not agree to be recorded. Participants were informed about the study and provided consent by completing the consent form.

2.4. Data Analysis

The interview data were analyzed using thematic analysis, following Braun and Clarke's (2006) six-phase framework. The process involved familiarization with the data, initial coding, theme identification, and iterative refinement. Transcripts were carefully reviewed, and initial codes were generated inductively to capture recurring patterns. These codes were subsequently organized into overarching themes and subthemes, which were refined to ensure internal consistency and coherence. To enhance the reliability of the analysis, coding discrepancies were addressed through collaborative discussions among the research team until consensus was reached. Rather than focusing on statistical measures such as inter-rater reliability, a reflexive and dialogic approach was employed to ensure credibility of the analysis. A semantic-level strategy guided the analysis, prioritizing participants' explicit narratives and avoiding interpretive assumptions. The resulting themes captured the emotional and behavioral dynamics of participants' dual roles, highlighting their unique experiences as both pedestrians and drivers.

3. Results

This section presents the results of the thematic analysis, highlighting the behavioral and emotional dynamics of participants in their dual roles as pedestrians and drivers. Two primary themes, 'Pedestrian Behaviors' and 'Driver Behaviors,' were identified, each encompassing multiple subthemes and categories that reflect the complexities of traffic interactions. Table 2 provides a comprehensive overview of the themes, subthemes, and categories that emerged from the analysis.

3.1. Pedestrian Behaviors

This theme captures the participants' reflections on their own behaviors as pedestrians, highlighting actions that either align with or deviate from traffic safety norms. Two subthemes were identified: "Safety-Conscious Pedestrian Behaviors" and "Behavioral Risks in Pedestrians."

3.1.1. Safety-Conscious Pedestrian Behaviors

Participants emphasized the importance of adopting safe behaviors as pedestrians, which contribute to their own safety as well as overall traffic safety. These behaviors were grouped into two categories:

3.1.1.1. Adhering to Traffic Signals.

Participants described following traffic lights and waiting for the green pedestrian signal as critical behaviors that minimize risks for both pedestrians and drivers. Such compliance ensures predictable traffic patterns and fosters mutual respect on the road. These behaviors were not only perceived as essential for personal safety but also as a form of accountability in shared spaces.

"Pedestrians who do not suddenly dart into traffic while paying attention to traffic lights." (P3, M, 22)

"These days, there are so many pedestrians, especially young people, who use headphones or look at their phones. I can't count how many times I've avoided the risk of an accident because they don't hear the sound of the horn or assume they have the right to step onto the road just because they're pedestrians." (P14, M, 30)

Table 2. Themes, subthemes and categories

Theme	Subtheme	Category
Pedestrian Behaviors	Safety-Conscious Pedestrian Behaviors	Adhering to Traffic Signals
		Optimal Use of Infrastructure
	Behavioral Risks in Pedestrians	Disregard for Traffic Rules
		Unpredictable Movement Patterns
Driver Behaviors	Driver Awareness and Consideration	Compliance with Safety Norms Demonstrating Respect for Pedestrians Pedestrian-Centered Driving
	Driver Aggression and Rule Violations	Expressions of Frustration
		Neglecting Pedestrian Rights
		General Rule-Breaking

3.1.1.2. Optimal Use of Infrastructure.

Proper use of pedestrian-specific infrastructure, such as sidewalks and crosswalks, was highlighted as a key practice for maintaining safety. Participants emphasized that avoiding abrupt movements into traffic, crossing streets while observing traffic signals, walking at a moderate pace, and utilizing sidewalks significantly reduce conflicts with vehicles. These actions also demonstrate awareness of shared road responsibilities, helping to create a more orderly traffic environment.

"The improper use of sidewalks designed for people with disabilities by pedestrians can also cause various problems. Additionally, the government's failure to address damaged sidewalks or delayed interventions also leads to issues." (P4, F, 21)

While safety-conscious pedestrian behaviors contribute to reducing conflicts and fostering mutual respect in traffic, participants also highlighted the prevalence of risky behaviors that undermine these positive outcomes and escalate tensions between pedestrians and drivers.

3.1.2. Behavioral Risks in Pedestrians

Risky pedestrian behaviors were identified as those that increase the likelihood of accidents or provoke aggressive reactions from drivers. These were further divided into two categories:

3.1.2.1. Disregard for Traffic Rules.

Participants frequently noted that behaviors such as ignoring red lights, jaywalking, or crossing streets in undesignated areas lead to unsafe situations. Such actions not only put pedestrians at risk but also frustrate drivers, potentially escalating aggressive driving behaviors. The lack of rule adherence was perceived as a major contributor to traffic tensions.

"Pedestrians who fail to heed traffic lights, suddenly dart into traffic, and violate the rules." (P17, F, 23)

"Implementing necessary sanctions for pedestrians as much as for drivers regarding the disregard of traffic rules could be a solution to prevent conflicts. In my opinion, pedestrians are not subjected to sufficient sanctions; at least, this is what I can say based on my own experiences." (P20, F, 23)

3.1.2.2. Unpredictable Movement Patterns.

Sudden and erratic pedestrian movements, such as stepping into traffic without looking or abruptly changing direction, were identified as significant safety risks. Participants pointed out that these actions often catch drivers off guard, leaving little time to react appropriately. Such behaviors were frequently linked to increased accidents and heightened driver frustration.

"Making sudden or unpredictable movements." (P5, F, 23)

"Both pedestrians and drivers being distracted by their phones in traffic often leads to sudden movements. For instance, when I was driving, there was a time when someone didn't see me on the road because they were looking at their phone, which caused me to suddenly swerve left and almost have an

accident. That's why I think this is a very risky behavior." (P7, F, 22)

While risky pedestrian behaviors increase the likelihood of accidents, participants emphasized that driver behaviors, including both positive and negative actions, play an equally critical role in shaping traffic dynamics.

3.2. Driver Behaviors

This theme focuses on participants' perceptions of driver behaviors that either facilitate or hinder pedestrian safety. Two subthemes were identified: "Driver Awareness and Consideration" and "Driver Aggression and Rule Violations."

3.2.1. Driver Awareness and Consideration

Participants highlighted positive driver behaviors that supported pedestrian safety, categorized as follows:

3.2.1.1. Compliance with Safety Norms.

Adhering to speed limits, yielding to pedestrians at crosswalks, and respecting pedestrian signals were frequently mentioned as crucial behaviors. These actions were praised for reducing traffic conflicts and enhancing mutual trust between pedestrians and drivers. Participants appreciated drivers who consistently followed these rules, viewing them as key contributors to safer road environments.

"Drivers who obey traffic rules, do not violate pedestrian rights, are respectful, and can empathize." (P12, M, 21)

"Honestly, seeing people shouting and yelling in traffic makes me lose the desire to use public transportation, so I usually try to use the subway. Being in traffic completely stresses me out." (P1, F, 21)

3.2.1.2. Demonstrating Respect for Pedestrians.

Beyond rule compliance, participants valued behaviors that showed genuine consideration for pedestrians, such as slowing down near crosswalks or signaling to pedestrians with hand gestures. Such actions were perceived as respectful and indicative of a driver's empathy and awareness of pedestrian needs.

"Gentle hand and head gestures towards pedestrians were the most appreciated driver behaviors." (P20, F, 23)

"Sometimes there are pedestrians wearing headphones, so they obviously don't hear the horn, and I gesture with my hand. Usually, they nod apologetically. Honestly, I use this gesture too because I liked it when drivers did the same for me when I was a pedestrian." (P16, M, 26)

3.2.1.3. Pedestrian-Centered Driving.

Drivers who actively adapt their behaviors to prioritize pedestrian safety were highlighted as role models. Participants viewed these drivers as thoughtful and considerate, often citing their ability to empathize with the pedestrian perspective. This approach was seen as critical in fostering a cooperative traffic environment.

"I sometimes remember situations when I myself was a pedestrian, and that's why I try to approach pedestrians with more understanding." (P1, F, 21)

"I usually drive, but I didn't have a car when I was a student. So, when I see students or young people walking, I remember my own youth and the challenges I faced on the roads, and I always give way to them. Sometimes, I even help hitchhikers and give them a ride to where they're going." (P19, F, 43)

Although participants appreciated drivers who demonstrated awareness and consideration for pedestrian safety, they also frequently cited aggressive and rule-violating behaviors that undermine these positive interactions and escalate risks for pedestrians.

3.2.2. Driver Aggression and Rule Violations

Participants frequently cited aggressive or careless driver behaviors. These were categorized as follows:

3.2.2.1. Expressions of Frustration.

Behaviors such as honking excessively, shouting, or making offensive gestures were identified as common expressions of driver anger. Participants noted that these actions created stress and discomfort, undermining the sense of safety for pedestrians.

"Drivers who disregard traffic rules, ignore pedestrians, and drive aggressively." (P7, F, 22)

"I believe there is significantly more prejudice and norms directed at women in traffic, whether they are drivers or pedestrians, and I can say this clearly based on my own experiences. I can say that I get yelled at more often when they see that I am a woman." (P9, F, 22)

While expressions of frustration by drivers contribute to an environment of stress and discomfort for pedestrians, neglecting pedestrian rights further exacerbates these tensions, reflecting a broader disregard for road safety norms.

3.2.2.2. Neglecting Pedestrian Rights.

Examples included failing to yield at crosswalks, speeding in rainy conditions, or splashing pedestrians with water. Such actions were described as inconsiderate and indicative of a disregard for pedestrian safety.

"Drivers who speed in rainy weather and splash water on pedestrians show no consideration for others." (P5, F, 23)

"I think drivers feel like being inside a car, like having something protective around them, gives them the right to treat pedestrians badly or ignore them. For example, I don't think people riding motorcycles do the same or even can. Why? Because they don't have anything to protect them from outside contact!" (P14, M, 30)

3.2.2.3. General Rule-Breaking.

Ignoring traffic signs, failing to use turn signals, or excessive speeding were frequently mentioned as hazardous driver behaviors. Participants described these actions as both frustrating and dangerous, emphasizing the uncertainty they created for pedestrians.

"It stresses me out when drivers fail to use turn signals, as I can't predict their next move." (P3, M, 22)

"I definitely think the reason for not following these rules is the lack of enforcement. I know many people who don't follow the rules, saying things like 'no one's watching anyway' or 'nothing will happen to me.' Especially late at night, they don't even pay attention to traffic lights or anything." (P15, M, 29)

These findings provide valuable insights into the behavioral and emotional dynamics of pedestrian-driver interactions, emphasizing the need for targeted interventions to address role conflicts and foster mutual respect in shared traffic environments.

4. Discussion

This study provides critical insights into the interplay between pedestrian vulnerability and driver aggression, highlighting the complex dynamics shaped by individuals' dual roles in traffic. The findings emphasize the significant impact of both pedestrian and driver behaviors on road safety. Participants identified a range of safe and risky behaviors among pedestrians, as well as positive and negative behaviors among drivers, underscoring the reciprocal nature of traffic interactions. The findings from this study offer a nuanced understanding of the interplay between pedestrian vulnerability and driver aggression, which are further explored through the lens of Role Theory.

Role Theory provides a valuable framework for analyzing the societal and situational expectations that govern individual behaviors in traffic contexts. The tension observed in participants' dual roles as pedestrians and drivers reflects the core premise of Role Theory—societal expectations often conflict with situational demands. For instance, pedestrians perceive themselves as vulnerable and deserving of caution from drivers, while drivers often assert authority and control, sometimes at the expense of pedestrian safety. This dichotomy, shaped by role perceptions and societal norms, underscores the complexities of traffic interactions.

Anger emerged as a key emotional factor influencing driver behaviors, often expressed through verbal aggression and the use of vehicles to intimidate. Conversely, pedestrians predominantly reported experiencing stress, employing various coping strategies such as listening to music, practicing breathing exercises, and cognitive reappraisal. These differing emotional responses reflect the inherent power dynamics in traffic, where drivers may feel more empowered to express anger while pedestrians navigate their vulnerability. These findings align with

cultural insights from prior studies, suggesting that societal norms and infrastructural challenges exacerbate these emotional disparities (Pradhan & Bhattacharya, 2020; Feng et al., 2020).

The dual-role perspective revealed internal conflicts in attitudes and behaviors, with individuals sometimes justifying aggressive driving actions while expecting caution and respect as pedestrians. This tension illustrates the bidirectional nature of traffic dynamics and the need for targeted interventions that address these contradictions. For example, educational programs that emphasize empathy-building and mutual responsibility could bridge the gap between these conflicting roles, fostering a safer traffic environment. Additionally, considering cultural and contextual factors, such as the prioritization of pedestrian rights in certain societies (Ma et al., 2023; Royko, 2024), can enhance the design of policies and awareness campaigns aimed at reducing aggressive behaviors.

4.1. Dual Roles of Pedestrians and Drivers: Insights Through the Lens of Role Theory

Role Theory provides a critical lens for understanding the complex dynamics of pedestrian and driver interactions, particularly in dual-role users. The results highlight significant role conflicts, shaped by societal expectations and role perceptions, as individuals navigate between these roles. For example, participants reported adherence to traffic rules and demonstrating safety-conscious behaviors as pedestrians, but often justified aggressive driving actions under the pretext of maintaining traffic efficiency. This aligns with the concept of role conflict, where expectations tied to one role (e.g., pedestrian vulnerability) clash with those of another (e.g., driver control and efficiency) (Khan et al., 2014; Nordfjærn et al., 2011; Ma et al., 2023).

Role expectancy, or societal assumptions about appropriate behaviors, further influences these interactions. As pedestrians, participants emphasized the need for drivers to prioritize their safety, reflecting broader societal norms of pedestrian rights. Conversely, as drivers, participants justified behaviors like honking or tailgating, often attributing them to situational demands, such as time constraints or dense traffic conditions. These findings underscore the tension between societal norms and individual behaviors, which is central to Role Theory's premise that social roles are governed by both expectations and situational realities (Nordfjærn et al., 2011; Ma et al., 2023).

Role perception, the way individuals internalize their responsibilities within each role, also emerged as a key theme. Dual-role users often perceived themselves as entitled to protection and caution from drivers as pedestrians, yet felt empowered to assert control as drivers. For instance, participants admitted to expressing frustration at jaywalking pedestrians when driving, despite recognizing their own tendency to cross streets unpredictably as pedestrians. These dual perspectives highlight the fluidity of role perception and its influence on both attitudes and behaviors in traffic contexts (Gibson et al., 2018; Persoskie et al., 2019).

By applying Role Theory, this study provides deeper insights into how dual-role users navigate the conflicting demands of vulnerability and control in traffic environments. The findings emphasize that role conflicts are not just individual struggles but also reflective of broader cultural and structural contexts, such as societal attitudes toward traffic norms and the design of urban infrastructure (Feng et al., 2020; Ma et al., 2023). Addressing these dynamics through educational interventions that emphasize empathy-building and mutual responsibility can foster safer and more cooperative traffic interactions. Additionally, targeted policy measures, such as enhanced pedestrian infrastructure, stricter enforcement of traffic laws, and culturally sensitive public awareness campaigns, can help align societal expectations with individual behaviors. These findings underscore the importance of fostering empathy between road users by encouraging reflection on their behaviors from both roles. Educational campaigns that address role conflicts and promote mutual understanding are essential for mitigating tensions and improving traffic dynamics.

4.2. Expressions of Anger in Traffic Contexts

Anger is a dominant emotion in traffic, often shaping interactions between drivers and pedestrians. Participants in this study identified verbal aggression, such as shouting and using offensive language, as well as physical aggression, including honking excessively or making threatening gestures. These

behaviors align with Deffenbacher et al.'s (2002) framework for categorizing anger expressions, which include verbal aggression, physical aggression, vehicle use, and adaptive expressions. Tailgating and sudden braking were commonly mentioned as examples of using vehicles as tools for intimidation, highlighting the physical embodiment of anger in traffic contexts (Holman & Popușoi, 2018).

The situational factors influencing anger expressions were evident, with congestion, delays, and perceived violations of road norms frequently cited as triggers. Previous studies, such as those by Feng et al. (2020) and Pradhan and Bhattacharya (2020), support these findings, demonstrating how environmental stressors in traffic amplify frustration and lead to aggressive behaviors. Participants also noted the normalization of certain aggressive behaviors, such as honking, which is often seen as an acceptable means of communication in Turkish traffic culture (Ersan et al., 2020).

Despite the prevalence of aggression, some participants demonstrated awareness of their anger and employed adaptive coping strategies, such as cognitive reappraisal or taking deep breaths. These findings align with Thompson et al.'s (2012) work on the effectiveness of adaptive coping mechanisms in reducing stress and anger in traffic environments. Educational interventions focusing on anger management and emotional regulation, particularly for professional drivers who spend extended hours in high-stress traffic conditions, are essential to mitigating these behaviors (Shehab & Alkandari, 2021; Kalašová, 2022).

The patterns of anger expression observed in this study underscore the necessity of addressing both individual and systemic factors. Incorporating anger management training into driver education programs and promoting public awareness campaigns that challenge cultural norms around aggression could foster more harmonious interactions on the road. This dual approach—targeting both personal behaviors and societal attitudes—has the potential to significantly improve road safety.

4.3. Cultural and Contextual Insights

Cultural and contextual factors significantly shape traffic behaviors, particularly in societies like Turkey, where unique infrastructural and societal challenges converge. Participants frequently noted the normalization of aggressive driving behaviors, such as honking and speeding, reflecting broader cultural norms that tolerate such actions. This is consistent with findings by Şimşekoğlu (2015) and Ersan et al. (2019), who emphasize the role of societal attitudes in shaping traffic dynamics.

Infrastructure plays a critical role in shaping pedestrian-driver interactions. Participants highlighted issues such as poorly marked crosswalks, limited pedestrian bridges, and narrow sidewalks as contributors to conflict-prone scenarios. Ersan et al. (2020) found that infrastructural improvements, including dedicated pedestrian zones and clearer road markings, significantly reduce tensions and foster safer traffic environments. Moreover, limited enforcement of traffic laws exacerbates these challenges, as drivers may feel emboldened to disregard pedestrian rights, particularly in urban areas with high traffic density (Holman & Popușoi, 2018; Ma et al., 2023).

The cultural context also influences perceptions of hierarchy in traffic. Participants described a tendency for drivers of larger or more expensive vehicles to exhibit dominance, often ignoring traffic regulations at the expense of pedestrians. Such behaviors highlight the need for educational campaigns that promote equality and mutual respect among all road users (Royko, 2024). Studies have shown that culturally tailored interventions, such as public awareness campaigns emphasizing positive driver behaviors, can effectively reduce aggressive driving tendencies (Feng et al., 2020; Duperrex et al., 2002).

Situational factors, such as weather conditions and traffic density, further exacerbate these challenges. Participants frequently cited slippery roads and high-speed traffic as barriers to positive driver behaviors, aligning with findings by Chu (2024) on the impact of environmental factors on traffic dynamics. Similarly, Pradhan and Bhattacharya (2020) emphasize the importance of considering situational realities in the design of traffic interventions and policies.

These findings highlight the interplay between cultural norms, infrastructural realities, and

situational factors in shaping traffic behaviors. By addressing these dimensions through culturally sensitive interventions, including educational programs, policy reforms, and infrastructural upgrades, it is possible to foster a safer and more cooperative traffic environment.

4.4. Stress and Coping Mechanisms in Traffic

Traffic environments are inherently dynamic and often pose significant stress, particularly for vulnerable road users such as pedestrians. This study identified driver behaviors, including excessive honking, vehicles speeding too close to pedestrians, and verbal confrontations, as prominent stressors. In line with prior research, environmental factors such as poor visibility (Stoker et al., 2015) and inadequate pedestrian infrastructure (Ersan et al., 2019) further compounded these challenges, creating a heightened sense of vulnerability in urban traffic settings.

Participants described various coping mechanisms employed to manage these stressors. Common strategies included listening to relaxing music, practicing breathing exercises, and reframing stressful situations using cognitive reappraisal. These adaptive methods align with findings that cognitive strategies can effectively mitigate stress in dynamic environments (Gross & John, 2003; Jo et al., 2019). However, certain coping strategies, such as using music to reduce stress, carry potential risks, as prior research has shown their tendency to distract pedestrians from traffic dynamics (Thoma et al., 2013; Thompson et al., 2012).

The dual roles of participants as both pedestrians and drivers also influenced their stress management approaches. As pedestrians, participants often adopted avoidance behaviors, such as stepping back from crosswalks or avoiding eye contact with aggressive drivers, reflecting findings in studies on defensive pedestrian behaviors (Pradhan & Bhattacharya, 2020). As drivers, they reflected on their own pedestrian experiences, fostering empathy and encouraging more considerate driving practices. This interplay underscores the reciprocal nature of pedestrian-driver interactions, where experiences in one role inform behaviors in the other (Ma et al., 2023).

Addressing stress in traffic contexts requires a dual approach. Educational initiatives should emphasize adaptive stress management techniques for both pedestrians and drivers, fostering mutual understanding and resilience. These findings support the value of culturally tailored interventions, as highlighted in Ersan et al. (2020), to address local traffic dynamics effectively. Simultaneously, infrastructure improvements, such as enhanced lighting and pedestrian-friendly urban designs, are essential for reducing external stressors. By integrating these strategies, traffic systems can become safer and more accommodating for all road users (Feng et al., 2020).

4.5. Vulnerability and Power Dynamics in Traffic

The study highlights the contrasting emotional responses of drivers and pedestrians, with anger being predominantly expressed by drivers and stress by pedestrians. This emotional divergence appears to reflect the inherent power dynamics in traffic. Drivers, protected by the physical shielding of their vehicles, often feel a sense of empowerment, which may embolden them to express anger through verbal aggression, honking, or intimidating maneuvers. In contrast, pedestrians, acutely aware of their physical vulnerability, frequently adopt passive or evasive responses to driver aggression. These findings align with previous research emphasizing the vulnerability of pedestrians in shared traffic environments (Ersan et al., 2019; Stoker et al., 2015).

The study's participants described their heightened awareness of these dynamics during their roles as pedestrians, noting how driver behaviors, such as speeding or failing to yield, intensified their sense of insecurity. Similarly, as drivers, participants recognized their capacity to influence pedestrian behavior through actions that either increased or alleviated stress. This dual perspective underscores the importance of addressing these power imbalances to foster safer and more empathetic traffic interactions (Feng et al., 2020).

Despite technological advancements, such as automated vehicles and intelligent transport systems (ITS), the human factor remains critical in traffic safety. Participants noted that while technology can reduce some risks, it cannot substitute the mutual understanding and cooperative behaviors essential for

managing complex traffic scenarios. Studies suggest that technology should be seen as a complement to, rather than a replacement for, human-centered safety strategies, ensuring that all road users feel secure and respected in shared environments (Ma et al., 2023; Kalašová, 2022).

The differing emotional responses and power dynamics observed in this study highlight the need for targeted interventions. Educational campaigns that emphasize the vulnerabilities of both pedestrians and drivers can help shift perceptions and reduce conflicts. Similarly, infrastructural changes, such as traffic calming measures and pedestrian-friendly designs, can help balance these dynamics by promoting shared responsibility and mutual respect on the roads (Ersan et al., 2020; Pradhan & Bhattacharya, 2020). Integrating these strategies into traffic policies will help create environments where both pedestrians and drivers can navigate safely and cooperatively.

4.6. Limitations and Future Directions

This study provides valuable insights into the dynamics of pedestrian and driver behaviors, particularly through the lens of dual-role users. However, several limitations must be addressed to refine our understanding and guide future research efforts. First, while the study offers a qualitative exploration of dual roles, it does not systematically examine demographic factors such as gender and age. Prior research indicates that these variables significantly shape road user behaviors. For instance, gender differences have been observed in traffic violations, with men typically engaging in riskier behaviors, while women are more likely to adhere to safety norms (Özkan & Lajunen, 2005; Öztürk & Öz, 2021). Similarly, age-related variations highlight that younger drivers often exhibit more aggression and impulsivity, while older drivers tend to prioritize caution (Dula & Ballard, 2003). Future research could incorporate these variables to uncover additional layers of behavioral complexity.

Cultural context is another critical dimension requiring further exploration. While this study primarily focuses on the Turkish context, cross-cultural studies could shed light on how different regulatory frameworks, cultural norms, and societal attitudes influence road user interactions (Péle et al., 2017). For instance, countries with stringent pedestrian rights regulations may experience fewer conflicts, whereas in other contexts, informal negotiation between pedestrians and drivers might dominate traffic interactions. Understanding these cultural variations could help develop globally adaptable interventions and region-specific traffic policies.

Moreover, the qualitative nature of this study poses limitations in generalizability. While rich, in-depth narratives were captured, the findings represent a specific sample and context. To build upon these insights, future research could develop new, culturally sensitive scales to assess the dynamics of dual-role road users. Existing instruments, such as the Driver Anger Scale (Deffenbacher et al., 2002), provide valuable frameworks but may not fully capture the nuances of pedestrian vulnerability or the dual-role dynamics explored here. Validating these scales across diverse cultural and demographic contexts would enhance their applicability.

Another avenue for future research is comparative studies. Comparing individuals who identify solely as pedestrians or drivers with dual-role participants could provide deeper insights into how role-specific experiences shape attitudes and behaviors. Such comparisons could also highlight discrepancies in the perception of vulnerability and power dynamics, offering actionable insights for targeted interventions.

Lastly, the study underscores the critical role of perceived vulnerability in shaping traffic interactions. Exploring how vulnerability influences road user behavior could lead to interventions that foster greater empathy and cooperation. For instance, educational programs emphasizing shared responsibilities and the reciprocal nature of road use could address tensions and promote safer interactions. Additionally, investigating how emerging technologies, such as automated vehicles and intelligent transport systems, impact these dynamics would provide a forward-looking perspective on traffic safety.

In summary, while this study lays a foundation for understanding dual-role road users, addressing these limitations through future research will enhance the

depth and breadth of our knowledge. By integrating demographic, cultural, and technological dimensions, future studies can contribute to the development of inclusive, sustainable, and contextually relevant traffic systems.

Ethics Committee Approval Statement

Ethical approval for the research was obtained from the TOBB ETU Human Research Ethics Committee (No: E-27393295-100-52781).

References

Ambak, K., Shamsudini, S., Daniel, B. D., & Ghani, A. R. A. (2017). Driver anger scale (DAS) among car drivers: How serious are they?. M*ATEC Web of Conferences*, *103*, 08001. https://doi.org/10.1051/matecconf/201710308001

Cinnamon, J., Schuurman, N., & Hameed, S. M. (2011). Pedestrian injury and humanbehaviour: Observing road-rule violations at high-incident intersections. *PLOS ONE*,*6*(11), e21063. https://doi.org/10.1371/journal.pone.0021063

Cloutier, M., Lachapelle, U., d'Amours-Ouellet, A., Bergeron, J., Lord, S., & Torres, J. (2017). "Outta my way!" Individual and environmental correlates of interactions between pedestrians and vehicles during street crossings. *Accident Analysis & Prevention*, *104*, 36–45. https://doi.org/10.1016/j.aap.2017.04.015

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

Dula, C. S., & Ballard, M. E. (2003). Development and evaluation of a measure of dangerous, aggressive, negative emotional, and risky driving 1. *Journal of Applied SocialPsychology*, *33*(2), 263-282. https://doi.org/10.1111/j.1559-1816.2003.tb01896.x

Duperrex, O., Bunn, F., & Roberts, I. (2002). Safety education of pedestrians for injury prevention: A systematic review of randomised controlled trials. *BMJ*, *324*(7346), 1129-1129. https://doi.org/10.1136/bmj.324.7346.1129

Febres, J., Saldaña, M., Herrera, S., & Herrero, S. (2021). Pedestrians' injury severity intraffic accidents in Spain: A pedestrian actions approach. *Sustainability*, *13*(11), 6439.https://doi.org/10.3390/su13116439

Feng, C., Duan, A., Qiu, J., Su, S., Guo, W., Yin, Z., … Zhao, H. (2019). Investigation of head injuries suffered by pedestrians in traffic accidents via videos. *International Journal of Crashworthiness*, *25*(6), 680–688. https://doi.org/10.1080/13588265.2019.1633817

Feng, Z., Ji, N., Luo, Y., Sze, N., Tian, J., & Zhao, C. (2020). Exploring the influencing factors of public traffic safety awareness in China. *Cognition, Technology & Work*, *23*(4), 731-742. https://doi.org/10.1007/s10111-020-00655-8

Gibson, L., Creamer, M., Breland, A., Giachello, A., Kaufman, A., Kong, G., … & Halpern Felsher, B. (2018). Measuring perceptions related to e-cigarettes: Important principles and next steps to enhance study validity. *Addictive Behaviors, 79*, 219–225. https://doi.org/10.1016/j.addbeh.2017.11.017

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, *85*(2), 348. https://doi.org/10.1037/0022-3514.85.2.348

Hobday, M., & Knight, S. (2010). Motor vehicle collisions involving adult pedestrians in Thekwini in 2007. *International Journal of Injury Control and Safety Promotion*, *17*(1), 61–68. https://doi.org/10.1080/17457300903524870

Holman, A., & Popușoi, S. (2018). Ethical predispositions to violate or obey traffic rules and the mediating role of driving styles. *The Journal of Psychology*, *152*(5), 257-275. https://doi.org/10.1080/00223980.2018.1447433

Jo, H., Song, C., & Miyazaki, Y. (2019). Physiological benefits of viewing nature: systematic review of indoor experiments. *International Journal of EnvironmentalResearch and Public Health*, *16*(23), 4739. https://doi.org/10.3390/ijerph16234739

Kalašová, A. (2022). The interaction between a driver and intelligent transport systems. *Acta Polytechnica CTU Proceedings, 39,* 16-22. https://doi.org/10.14311/app.2022.39.0016

Khan, S., Khalifah, Z., Munir, Y., Islam, T., Nazır, T., & Khan, H. (2015). Driving behaviours, traffic risk and road safety: Comparative study between Malaysia and Singapore. *International Journal of Injury Control and Safety Promotion, 22*(4), 359– 367. https://doi.org/10.1080/17457300.2014.925938

Liu, Y., Alsaleh, R., & Sayed, T. (2022). Modeling pedestrian temporal violations at signalized crosswalks: A random intercept parametric survival model. *Transportation Research Record, 2676*(6), 707–720. https://doi.org/10.1177/03611981221076119

Ma, X., Liu, Y., & Guo, Y. (2023). Research on the conflict between pedestrians and right-turning vehicles at signal intersections based on psychological level. *International Journal of Scientific Advances, 4*(3). https://doi.org/10.51542/ijscia.v4i3.18

Nordfjærn, T., Jørgensen, S., & Rundmo, T. (2011). A cross-cultural comparison of road traffic risk perceptions, attitudes towards traffic safety and driver behaviour. *Journal of Risk Research, 14*(6), 657–684. https://doi.org/10.1080/13669877.2010.547259

Özkan, T. & Lajunen, T. (2005). Why are there sex differences in risky driving? The relationship between sex and gender-role on aggressive driving, traffic offences, and accident involvement among young turkish drivers. *Aggressive Behavior, 31(*6), 547-558. https://doi.org/10.1002/ab.20062

Öztürk, İ., & Öz, B. (2021). Investigating young male and female road users' behavior as pedestrians and drivers. *Studies in Psychology, 41*(2), 581–614. http://dx.doi.org/10.26650/SP2020-0045

Péle, M., Bellut, C., Debergue, É., Gauvin, C., Jeanneret, A., Leclere, T., … & Sueur, C. (2017). Cultural influence of social information use in pedestrian road-crossing behaviours. *Royal Society Open Science, 4*(2), 160739. https://doi.org/10.1098/rsos.160739

Persoskie, A., O'Brien, E., & Poonai, K. (2019). Perceived relative harm of using e-cigarettes predicts future product switching among US adult cigarette and e-cigarette dual users. *Addiction, 114*(12), 2197–2205. https://doi.org/10.1111/add.14730

Pfortmueller, C., Marti, M., Kunz, M., Lindner, G., & Exadaktylos, A. (2014). Injury severity and mortality of adult zebra crosswalk and non-zebra crosswalk road crossing accidents: A cross-sectional analysis. *PLoS ONE, 9*(3), e90835. https://doi.org/10.1371/journal.pone.0090835

Pradhan, V., & Bhattacharya, S. (2020). Benchmarking model for culture of urban traffic-safety management in India: Interpretive structural modeling framework. *International Journal of Innovation Science, 13*(1), 34-52. https://doi.org/10.1108/ijis-09-2020-0168

Reason, J., Manstead, A., Stradling, S., Baxter, J., & Campbell, K. (1990). Errors and violations on the roads: a real distinction?. *Ergonomics, 33*(10-11), 1315-1332. https://10.1080/00140139008925335

Ren, G., Zhou, Z., Wang, W., Zhang, Y., & Wang, W. (2011). Crossing behaviors of pedestrians at signalized intersections: Observational study and survey in China. *Transportation Research Record: Journal of the Transportation Research Board, 2264*(1), 65-73. https://doi.org/10.3141/2264-08

Rosén, E., Källhammer, J.E., Eriksson, D., Nentwich, M., Fredriksson, R., Smith, K. (2010). Pedestrian injury mitigation by autonomous braking. *Accident Analysis & Prevention, 42*(6), 1949-57. https://doi.org/10.1016/j.aap.2010.05.018.

Royko, Y. (2024). Provision of a rational control mode at pedestrian crosswalk. *MATEC Web of Conferences, 390,* 03011. https://doi.org/10.1051/matecconf/202439003011

Saeipour, P., Sarbakhsh, P., Salemi, S., & Bakhtari Aghdam, F. (2023). A fuzzy clustering approach to identify pedestrians' traffic behavior patterns. *Journal of Research in Health Sciences, 23*(3), e00592. https://doi.org/10.34172/jrhs.2023.127

Salamati, K., Schroeder, B. J., Geruschat, D. R., & Rouphail, N. M. (2013). Event-based modeling of driver yielding behavior to pedestrians at two-lane roundabout approaches. *Transportation Research Record, 2389*, 1–11. https://doi.org/10.3141/2389-01

Schroeder, B. J., & Rouphail, N. M. (2011). Event-based modeling of driver yielding behavior at unsignalized crosswalks. *Journal of Transportation Engineering, 137*(7), 455–465. https://doi.org/10.1061/(ASCE)TE.1943-5436.0000225

Schwebel, D. C., Stavrinos, D., Byington, K. W., Davis, T. J., O'Neal, E., & Jong, D. d. (2012). Distraction and pedestrian safety: How talking on the phone, texting, and listening to music impact crossing the street. *Accident Analysis & Prevention, 45*, 266-271. https://doi.org/10.1016/j.aap.2011.07.011

Serin, G., Öz, C., Öz, B., & Lajunen, T. (2018). Türkiye'de yaya tutumları ve yaya davranışları arasındaki ilişkinin incelenmesi. *Trafik ve Ulaşım Araştırmaları Dergisi*, *1*(1), 54–68. https://dergipark.org.tr/en/pub/tuad/issue/36875/420890

Shehab, M., & Alkandari, D. (2021). Drivers' tendencies to engage in aberrant driving behaviors that violate traffic regulations in Kuwait. *Transport Problems, 16*(1), 19-28. https://doi.org/10.21307/tp-2021-002

Sheykhfard, A., & Haghighi, F. (2018). Behavioral analysis of vehicle-pedestrian interactions in Iran. *Scientia Iranica*, *25*(4), 1968–1976. https://doi.org/10.24200/sci.2017.4201

Sheykhfard, A., Haghighi, F., Bakhtiari, S., & Pariota, L. (2022). Safety margin evaluation of pedestrian crossing through critical thresholds of surrogate measures of safety: Area with zebra crossing versus area without zebra crossing. *Transportation Research Record: Journal of the Transportation Research Board, 2677*(1), 396–408. https://doi.org/10.1177/03611981221099510

Stoker, P., Garfinkel-Castro, A., Khayesi, M., Odero, W., Mwangi, M. N., Peden, M., … & Ewing, R. (2015). Pedestrian safety and the built environment. *Journal of Planning Literature, 30*(4), 377-392. https://doi.org/10.1177/0885412215595438

Stryker, S., & Burke, P. J. (2000). The past, present, and future of an identity theory. *Social Psychology Quarterly, 63*(4), 284–297. https://doi.org/10.2307/2695840

Şimşekoğlu, Ö. (2015). 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

Thoma, M. V., Marca, R. L., Brönnimann, R., Finkel, L., Ehlert, U., & Nater, U. M. (2013). The effect of music on the human stress response. *PLoS ONE, 8*(8), e70156. https://doi.org/10.1371/journal.pone.0070156

Thompson, L., Rivara, F., Ayyagari, R., & Ebel, B. (2012). Impact of social and technological distraction on pedestrian crossing behaviour: An observational study. *Injury Prevention, 19*(4), 232-237. https://doi.org/10.1136/injuryprev-2012-040601

TÜİK (2023). *Karayolu Trafik Kaza İstatistikleri [Road Traffic Accident Statistics], 2022* (May 2023). https://data.tuik.gov.tr/Bulten/Index?p=Karayolu-Trafik-Kaza- Istatistikleri-2022-49513

Vasileiou, K., Barnett, J., Thorpe, S. J., & Young, T. (2018). Characterising and justifying sample size sufficiency in interview-based studies: Systematic analysis of qualitative health research over a 15-year period. *BMC Medical Research Methodology, 18*(1), 148. https://doi.org/10.1186/s12874-018-0594-7

Yang, Y., Wang, Y., Easa, S. M., & Zheng, X. (2022). Analyzing pedestrian behavior at unsignalized crosswalks from the drivers' perspective: A qualitative study. *Applied Sciences, 12*(8), 4017. https://doi.org/10.3390/app12084017

Young, D., & Casey, E. A. (2018). An examination of the sufficiency of small qualitative samples. *Social Work Research, 42*(1), 57–64. https://doi.org/10.1093/swr/svy026

Youssef, D. Salameh, P., Abou-Abbas, L., & Salmi, L. (2023). Driving anger dimensions and their relationship with aberrant driver behavior in Lebanon: Results from a national self- reported survey. *Plos One, 18*(3), e0283293. https://doi.org/10.1371/journal.pone.0283293

World Health Organization (2023). *Global status report on road safety 2023.* https://www.who.int/publications/i/item/9789240086517

Zhou, Z., Liu, S., Wen-xin, X., Pu, Z., Zhang, S., & Zhou, Y. (2019). Impacts of mobile phone distractions on pedestrian crossing behavior at signalized intersections: An observational study in China. *Advances in Mechanical Engineering*, *11*(4), 168781401984183. https://doi.org/10.1177/1687814019841838