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Association Between Academic Stress, Academic Self-Efficacy, And Psychological Well-Being Among University Students During Research Project

By

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RELATIONSHIP BETWEEN DRIVING FATIGUE, DANGEROUS TRAFFIC VIOLATIONS AND DRIVER BEHAVIOR AMONG YOUNG DRIVERS.

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CERTIFICATE OF APPROVAL

It is certified that the Research Thesis titled "relationship between driving fatigue, dangerous traffic violations and driver behavior among young drivers" carried out by Maryam Khalid, Reg. No. BSP201001, under the supervision of Dr. Sabahat Haqqani, Capital University of Science & Technology, Islamabad, is fully adequate, in scope and in quality, as a Research Thesis for the degree of BS Psychology.

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First of all I would like to thanks Allah Alimghty who made the completion of my thesis possible. This work is dedicated to all those who navigate the intricate paths of knowledge, seeking to unravel the mysteries of the world. To the relentless pursuit of understanding, to the tireless curiosity that propels us forward, and to the passion that fuels our endeavors. This dedication extends to the unsung heroes behind every discovery, the mentors who light the way, and the resilient spirits that triumph in the face of challenges. May this dedication echo the collective heartbeat of those dedicated to the pursuit of wisdom and the relentless journey toward a brighter, more enlightened future.

DECLARATION

I solemnly declare that the work presented in this thesis titled " Validating The Relationship Between Driving Fatigue, Dangerous Traffic Voilation And Driver Behavior For Developing Intervention For Traffic Congestion On Campus" is my original contribution and has not been submitted elsewhere for any academic purpose. All sources consulted or referred to in the preparation of this work have been properly acknowledged and cited. I further affirm that all assistance received in the preparation of this thesis and sources of financial support, if any, have been duly acknowledged. This document is an authentic representation of my own efforts and endeavors in academic pursuit.

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Contents

List of tables

ABSTRACT

The aim of this study was to identify the behaviors of the road user of the campus that are causing traffic congestion to improvise the traffic condition. The study utilized two instruments to measure the variables of interest, namely Fatigue severity scale (FSS) and Driver Behavior Questionnaire (DBQ). Other than that a survey is formed on the basis of parallel observation at different off times of University. Observations was conducted to gather data on dangerous violations, reckless driving, role of guards on campus and overtaking behavior, while surveys was also captureing subjective experiences related to driving fatigue. The study was a co-relational study using convenient sampling. For this purpose we had population from CUST as a convenient sampling. The data was analyzed through SPSS on which descriptive statistics was done.

Keywords: Dangerous violations, reckless behavior, traffic congestions

Chapter 1

In this chapter, the introduction of the study and the theoretical frame work will be discussed. The definition of variables and the importance of the study in the past and in the present will be the discussed.

1.1 INTRODUCTION

In an era of fast urbanization and increased automotive traffic, efficient management of transportation networks on university campuses is a vital concern. This thesis dives into the creation of a behavioral insight intervention aiming not only at improving traffic management but also at reducing driving tiredness and reducing hazardous infractions on campus. As vehicle congestion and safety concerns remain widespread challenges, this project seeks to investigate creative ways anchored in behavioral psychology to modernize traffic management paradigms within educational institutions. This study aims to provide nuanced insights and practical solutions to encourage safer, more efficient, and accommodating driving conditions inside university settings through a comprehensive analysis.

Traffic congestion, driving fatigue, and dangerous violations are major issues faced by road users in Pakistan like rest of the world and also this is the leading cause of the deaths in the whole world.In a recent reports of world health organization (WHO), approximately 1.3 million people die each year as a result of road traffic crashes and the main cause of death in children and young adults is road accident according to World Health Organization (WHO, 2022). Moreover, traffic congestion and driving fatigue have a significant impact on productivity, economic growth, and quality of life (Khan, 2019).

Most investigations agree that one of the rising issues in Pakistan like rest of the world is the aggressive growth of traffic in the cities. This traffic may include busses, vans, cars, motorcycle and many mores. There are many other issues arising with this; are accidents, road congestion, wastage of time and more.In the research of world health organization (WHO), the total number of deaths in Pakistan in the year of 2013 is 25,781(WHO, 2018).Many of these above mentioned traffic issues are mainly caused due to human behavior. These issues can only be solved by changing the behavioral practices of human beings. To understand this issue this study will keep the underlying factors in focus. It has seen that fatigue is one of the factors that is playing major role in this issue.

Fatigue is a serious issue; it can decrease efficiency of the person and lead to higher chances of accident risks(Dorrian,2007). This study focuses that fatigue is the reason for impaired alertness. This fatigue can be caused due to workload or maybe sleeplessness.Studies tells us that both workload and fatigue impair performance.Fan,& Smith, A. P. (2017).The other factor that plays a vital role in traffic related issues is dangerous driving violation that will be discussed in detail.

Dangerous driving violation may include aggressive driving, breaking traffic laws, rash driving and wrong overtaking. Aggressive driving is recognized as a dangerous phenomenon with adverse effects on road safety (Dahlen et al., 2012, Paleti et al., 2010,Sârbescu, &Maricuţoiu, 2019).These types of drivers causes many damages to other road users either intentionally or unintentionally and there are two types of aggression that is shown in the road users; the first one is verbal which include abusing and the second one is cutting in front on other users (Sârbescu, &Maricuţoiu, 2019).

This study is targeting the peak problematic hours of our sample; that is the off time when the whole institute just wants to just reach home as early as they can because they are tired psychically and mentally exhausted. The traffic issues are caused due to the behavioral issues of our road users so in order to reduce these issues or eliminate them from the society the study will work on the behavior of the road users.

In the next part, there are some evidences from the literature review that will support this thesis topic and variables. It can be clearly seen through the literature review that this study has a vital role in the betterment of the society and in altering the behaviors of the society.

1.2 Literature review:

This section will review the variables of the study in the light of the present literature. A comprehensive review of the recent studies on drivers fatigue, dangerous violations and risky driving behaviors will provide a better insight in causing road conjunction and road related issues. Firstly, this study will discuss about the impact of fatigue on the behavior and attention span of the driver.

1.2.1 Driver's Fatigue

Fatigue is the most common issue which plays vital role in the road accident. This fatigue is maybe due to long drive or either due to other chores of the life but this fatigue can cause dangerous road accidents either fatal or not. In the research of (Walker, & Trick2018); they concluded that people frequently associate distracted driving with some sort of physical or obvious secondary task, such as texting or holding a phone conversation, but the current study shows that even in the absence of external distraction, driving performance can change over time as the driver experiences increased difficulty focusing (mind-wandering).

Fatigue has emerged as a significant and direct contributor to traffic accidents, warranting increased attention and understanding of its underlying factors. It is widely recognized that fatigue often arises due to prolonged periods of driving, particularly in monotonous road conditions and adverse weather, as well as being influenced by individual driver characteristics. A study conducted by Meletis and Barker (2004) highlighted the association between subjective weariness and deteriorated performance following extended engagement in cognitively demanding tasks, further underscoring the detrimental impact of fatigue on road safety (Meletis, & Barker, 2004).

The role of fatigue in traffic accidents cannot be underestimated, as it impairs various aspects of driver performance. Sleepiness, a prominent manifestation of fatigue, compromises alertness and attentiveness, leading to delayed reaction times and impaired judgment. Prolonged driving sessions without adequate rest increase the likelihood of microsleep episodes, brief involuntary lapses in attention, which can have devastating consequences on the road. Furthermore, monotonous road conditions, such as long stretches of highway with minimal stimuli, can exacerbate the effects of fatigue by lulling drivers into a state of reduced vigilance and diminished cognitive engagement.

Notably, the impact of fatigue on driver performance extends beyond physical fatigue and encompasses cognitive fatigue as well. Engaging in cognitively challenging tasks for prolonged periods without sufficient breaks or rest can deplete mental resources and impair cognitive functioning. This cognitive fatigue manifests as decreased concentration, reduced information processing speed, and impaired decision-making abilities. In the context of driving, these cognitive deficits can impede the driver's ability to assess and respond to changing road conditions and unexpected events promptly (Meletis, & Barker, 2004).

Moreover, the subjective experience of weariness associated with fatigue is a significant indicator of the potential risks it poses. Subjective weariness reflects the driver's perception of their own level of fatigue and is closely tied to performance decrements. When individuals subjectively report feeling tired or fatigued, their ability to sustain optimal performance diminishes. This subjective weariness serves as a warning sign, indicating the need for rest and recovery to prevent further deterioration in driving performance and mitigate the risk of accidents (Meletis, & Barker, 2004).

To address the multifaceted issue of fatigue-related traffic accidents, it is essential to adopt comprehensive strategies. These strategies can include public awareness campaigns that educate drivers about the importance of recognizing and managing fatigue, promoting healthy sleep habits, and encouraging regular breaks during long drives. Employers can also play a crucial role by implementing fatigue management programs for employees engaged in transportation-related occupations. These programs may include scheduling practices that prioritize rest, providing access to rest areas or accommodations, and implementing fatigue monitoring systems that alert drivers when their performance may be compromised.

Additionally, advancements in technology have paved the way for innovative solutions to mitigate fatigue-related accidents. For instance, the development of driver-assistance systems that monitor driver fatigue indicators, such as eye movements and steering patterns, can provide real-time feedback and alert drivers when signs of fatigue are detected. These systems can serve as valuable tools in enhancing driver safety and reducing the risks associated with fatigue-related impairments.

Fatigue is a pervasive issue that affects individuals in various aspects of their lives, and its impact cannot be underestimated. While it is commonly known that fatigue can have serious safety implications for drivers, there are numerous other areas where its detrimental effects become apparent. In fact, research conducted by Al-Mekhlafi, Isha, and Naji (2020) has highlighted the profound consequences of fatigue on driver safety, demonstrating that it can significantly reduce a driver's ability to respond quickly and efficiently in a manner that is both environmentally friendly and conducive to avoiding accidents (Al-Mekhlafi, Isha, &Naji, 2020).

Beyond its implications for driving, fatigue can also have a far-reaching influence on a person's overall well-being and performance in different domains. When an individual is plagued by fatigue, their cognitive functioning, decision-making abilities, and motor skills can all be severely compromised. This can lead to suboptimal performance in academic or professional settings, hindering productivity and negatively impacting the quality of work produced. Moreover, fatigue can affect one's interpersonal relationships, as it can lead to irritability, reduced patience, and decreased engagement in social activities.

Furthermore, the physiological consequences of fatigue should not be overlooked. Prolonged fatigue can weaken the immune system, making individuals more susceptible to illnesses and infections. It can also contribute to the development of chronic conditions such as cardiovascular diseases, diabetes, and obesity. In addition, research suggests that fatigue can disrupt the body's hormonal balance, leading to hormonal imbalances that may further exacerbate health problems.

In today's fast-paced society, the prevalence of fatigue is on the rise due to factors such as demanding work schedules, long commutes, excessive screen time, and poor sleep habits. As a result, it is crucial to recognize the importance of addressing and mitigating fatigue's impact on individuals' lives. Implementing strategies such as promoting healthy sleep hygiene, encouraging regular exercise, and incorporating stress management techniques can all contribute to reducing fatigue levels and enhancing overall well-being.

Fatigue exerts a wide-ranging and diverse effect on the psychomotor functioning of individuals, leading to numerous consequences that extend beyond just increased reaction time. The impact of fatigue on drivers, in particular, has been extensively studied; shedding light on the significant risks it poses to road safety. A study published in the Journal of Critical Reviews conducted by (Al-Mekhlafi, Isha, &Naji, 2020) delved into the sources of vehicle distraction, including complex tools, and its implications for a driver's ability to recognize and respond effectively, especially in unanticipated situations.

The detrimental effects of fatigue on psychomotor functioning cannot be underestimated. When individuals experience fatigue, their cognitive processes, including attention, perception, and decision-making, becomes compromised. This compromised cognitive state manifests in a range of negative outcomes, such as delayed response times, reduced accuracy in assessing and interpreting the environment, and impaired judgment in critical situations. Consequently, the ability to effectively recognize and respond to unexpected events on the road becomes significantly hampered.

In the context of driver safety, the study conducted by (Al-Mekhlafi, Isha, &Naji, 2020) highlighted the impact of fatigue on a driver's ability to handle complex tools and manage distractions. Complex tools, such as advanced infotainment systems or navigation devices, can further burden a fatigued driver, diverting their attention and compromising their cognitive resources. This diversion of attention coupled with the diminished capacity to process information accurately and promptly, can have serious implications for driver safety, particularly when confronted with unforeseen circumstances on the road.

Moreover, the consequences of fatigue-induced psychomotor impairment extend beyond the immediate driving environment. Fatigue can also compromise an individual's ability to engage in other activities that require precision, coordination, and quick reactions, such as operating machinery, participating in sports, or even performing routine tasks at home or in the workplace. This impaired psychomotor functioning can not only increase the likelihood of accidents and errors but also impact overall productivity, performance, and quality of life.

Understanding the multifaceted impact of fatigue on psychomotor functioning is crucial for developing effective strategies to mitigate its adverse effects. Employing measures that address the underlying causes of fatigue, such as ensuring sufficient rest and sleep, managing workloads and schedules, and adopting stress-reducing techniques, can play a significant role in preventing and managing fatigue-related impairments. Additionally, promoting awareness about the dangers of fatigue and providing education on the importance of regular breaks, healthy lifestyle habits, and the risks of operating vehicles or machinery while fatigued can contribute to fostering a safer and more responsible approach to psychomotor tasks.

1.2.2 Dangerous driving violations

The study of dangerous driving violations encompasses a broad range of behaviors and actions on the road that pose a significant risk to both drivers and pedestrians. These violations, including speeding, reckless driving, driving under the influence, and distracted driving, have been a subject of extensive research and analysis within the literature.

Understanding the underlying causes, consequences, and potential interventions associated with dangerous driving violations is of paramount importance in promoting road safety and reducing the alarming rates of accidents and fatalities. This literature review aims to examine and synthesize the existing body of research on dangerous driving violations, shedding light on key findings, theoretical frameworks, and areas for further investigation in this critical field. By exploring the multidimensional aspects of dangerous driving violations, this review seeks to contribute to the development of evidence-based strategies and interventions to mitigate their impact and create safer road environments for all.

Emotions play a significant role in influencing human behavior, and this holds true even when it comes to behaviors exhibited behind the wheel. Aggressive driving, characterized by behaviors such as tailgating, speeding, sudden lane changes, and verbal or physical confrontations, is a widespread issue on roads worldwide. Researchers have been exploring various factors that contribute to aggressive driving, and one prominent factor that has been extensively studied is the individual's emotional state.

A study conducted by Khawar, Khan, (2020) delved into the relationship between emotional states and the propensity to behave aggressively while driving. Their research suggested that a person's emotional state is likely to be a key determinant in their likelihood to engage in aggressive driving behaviors. Understanding this connection is crucial for developing effective strategies to mitigate aggressive driving and promote road safety (Khawar, Khan, 2020).

Emotions are complex psychological experiences that can range from positive (e.g., joy, happiness) to negative (e.g., anger, frustration). When individuals experience negative emotions, such as anger or frustration, their ability to regulate their behavior may be compromised, leading to a higher likelihood of engaging in aggressive acts. The feeling of being threatened, provoked, or disrespected on the road can trigger these negative emotions, further fueling aggressive driving behaviors.

Furthermore, certain emotional states can impair cognitive functioning, decision-making processes, and impulse control, making it more challenging for individuals to manage their behavior behind the wheel. For instance, high levels of stress or anxiety can lead to a heightened state of arousal, making drivers more prone to aggressive responses to perceived threats or frustrations on the road.

It is worth noting that the relationship between emotions and aggressive driving is bidirectional. Aggressive driving can also elicit negative emotions in other road users, creating a vicious cycle of aggression. When one driver exhibits aggressive behavior, such as cutting off another driver or using offensive gestures, the recipient of such behavior may experience anger or fear, which can, in turn, influence their emotional state and behavior.

In addition to individual emotional states, situational factors also interact with emotions to influence aggressive driving behavior. Environmental conditions, traffic congestion, time pressure, and interactions with other road users can all impact a driver's emotional state and subsequently affect their propensity for aggression.

Understanding the link between emotions and aggressive driving is essential for developing interventions and educational programs aimed at reducing aggressive behavior on the roads. Techniques such as anger management strategies, stress reduction techniques, and fostering empathy among drivers can be valuable tools in curbing aggressive driving tendencies. Additionally, promoting awareness about the impact of emotions on driving behavior through public campaigns and driver education programs can contribute to a safer and more harmonious road environment.

In the field of transportation and traffic management, the accurate and timely detection of traffic incidents is of paramount importance for maintaining road safety and minimizing the negative impact on traffic flow. In this regard, researchers have been exploring innovative approaches to improve incident detection methods. One such approach is the hybrid observer approach, which combines multiple techniques to estimate traffic incidents. A study conducted by Muhammad, Sameer, Sheikh, et al. (2020) focused on enhancing automatic incident detection (AID) using a lane-changing speed mechanism in the highway traffic environment (Muhammad, Sameer. Sheikh, 2020).

The primary objective of the research was to develop an effective system that could detect traffic incidents with high precision and efficiency. Traditional incident detection systems often rely on fixed thresholds or specific event triggers, which may result in false alarms or missed incidents. By integrating the lane-changing speed mechanism into the AID system, the researchers aimed to overcome these limitations and improve incident detection accuracy.

The lane-changing speed mechanism utilized in this study takes advantage of the fact that during traffic incidents, such as accidents or breakdowns, vehicles tend to change lanes abruptly or slow down significantly. By monitoring the speed of lane changes and comparing it to the average traffic speed, the system can identify anomalous behavior that may indicate the presence of an incident.

The hybrid observer approach employed in this research combines multiple data sources and algorithms to estimate traffic incidents accurately. It integrates real-time traffic flow data, vehicle trajectory information, and video surveillance footage to gather comprehensive and reliable information about the traffic conditions. This multi-dimensional data fusion allows for a more robust incident detection system that can adapt to different types of incidents and varying traffic scenarios.

Furthermore, the study incorporated machine learning techniques to improve the system's performance over time. By training the system on historical incident data, the researchers were able to enhance its ability to recognize patterns and identify subtle changes in traffic behavior that may indicate the occurrence of an incident. This adaptive learning approach increases the system's accuracy and reduces false alarms, making it more reliable for real-world application.

The implications of this research are significant for both traffic management authorities and road users. Accurate and timely incident detection can facilitate swift response from emergency services and traffic control centers, allowing them to take appropriate measures to mitigate the impact of incidents on traffic flow and ensure the safety of road users. By providing early warnings and reducing response time, this hybrid observer approach has the potential to save lives and minimize the disruption caused by traffic incidents.

Aggressive driving has garnered recognition as a hazardous phenomenon that poses significant risks to road safety (Dahlen, 2012; Paleti, 2010). It encompasses various driving behaviors that are intended to cause harm, either physically or psychologically, to other road users (Dula,& Geller, 2003; Ellison-Potter, 2001). These behaviors can manifest in different ways, including verbal aggression (such as yelling or cursing at another driver or pedestrian), physical aggression (such as making obscene gestures), and using the vehicle as a means of aggressive expression (such as attempting to cut in front of another driver) (Deffenbacher, Lynch, Oetting, &Swaim, 2002).

Numerous studies have explored the associations between aggressive driving and traffic accidents (Chliaoutakis, 2002; Dahlen, 2012; Sârbescu, 2012). However, it is important to note that the relationships observed in these studies are not as consistent as those found between driving errors or violations and accidents. Nonetheless, there is a growing body of evidence suggesting a significant connection between aggressive driving behaviors and an increased likelihood of being involved in a traffic accident.

Aggressive driving behaviors contribute to a more hostile and unsafe driving environment. The act of aggressively tailgating, abruptly changing lanes, or engaging in hostile interactions with other road users creates a heightened level of risk on the road. Such behaviors not only increase the chances of collisions and near-misses but also escalate the potential for road rage incidents and escalate conflicts among drivers.

The implications of aggressive driving extend beyond the immediate risks of accidents. It also has negative consequences on individuals' mental well-being, as both the aggressor and the recipient of aggressive behavior can experience heightened stress, anxiety, and frustration. This emotional turmoil can impair drivers' cognitive functioning, decision-making abilities, and overall driving performance, further contributing to unsafe road conditions.

Efforts to address aggressive driving and promote road safety have included educational campaigns, law enforcement interventions, and targeted interventions aimed at raising awareness about the consequences of aggressive driving behaviors. By emphasizing the importance of empathy, patience, and respectful behavior on the road, these initiatives seek to foster a more harmonious and cooperative driving environment.

1.2.3 Driver’s behavior

In today's transportation networks, reducing congestion and enhancing overall traffic management are vital goals. A crucial component in accomplishing these objectives is the thorough investigation of driver conduct in many traffic scenarios. This research is critical for both maximizing traffic flow and lowering the number of traffic accidents because it provides a sophisticated knowledge of how driver behavior affects crash risk.

Bärgman (2016) did a research that explores the complexities of collecting data on driving behavior and offers four different methods. These methods are important because they are diverse and because they have all worked together to simplify the complicated world of driver behavior. Every technique used in the research provides distinct insights that, when combined, can greatly improve our comprehension of the complex dynamics found in traffic settings.

The first strategy is using cutting-edge technology, including cameras and sensors installed in cars, to track and record driver behavior in real time. This technological method offers a detailed view of driving behavior, picking up on subtleties that conventional methods could miss. Researchers may learn a great deal about driver decision-making, response times, and interactions with the car environment by examining this data.

The use of surveys and questionnaires is a further strategy that the study looked into. Self-reported data about driving behaviors, encounters, and attitudes is requested from participants. Despite being subjective, these answers might provide insightful qualitative information to support quantitative results from other approaches. This method sheds light on the motives and mental processes that drive activities on the road and offers a view into the perceptual and psychological components of driver behavior.

An additional source of information about driving behavior is observational research. Researchers methodically record and examine driver behavior in actual traffic situations, frequently using techniques for video analysis or skilled observers. Naturalistic data may be gathered using this technique, which captures the impulsive reactions of drivers to different stimuli. An objective perspective on driver behavior is provided by observational research, which is a useful contrast to self-reported data and technology monitoring.

The research concludes with a method that simulates driving conditions in controlled surroundings. Through the use of driving simulators, which replicate real-world traffic situations, researchers may watch and examine driver behavior in a secure environment. With the use of this technique, variables may be changed to examine particular facets of driver reaction, which advances our knowledge of the underlying causes of particular actions (Bärgman, (2016)).

Behavioral insight intervention is deemed necessary in traffic management owing to its ability to modify driver behavior and increase road safety. Traditional approaches to traffic management have frequently centered on engineering solutions, such as widening roads or installing traffic lights. While these interventions are unquestionably vital, they may not be adequate to address the complex and dynamic character of human behavior on the road. Behavioral insight intervention supplements these engineering techniques by addressing the human aspect and the underlying issues that determine driver behavior.

Estimating and anticipating traffic conditions over time is a critical competence for advanced driver assistance systems and self-driving cars. When longer prediction horizons are required, such as in decision making or motion planning, the uncertainty caused by inadequate environment perception and stochastic scenario evolution over time cannot be ignored without compromising robustness and safety (Gindele et al. (2015)).

1.3 Theoretical background

Fatigue and risky violations are major problems in traffic management because they have a considerable influence on road safety and can result in accidents, injuries, and fatalities. Traditional efforts to dealing with these concerns have mostly concentrated on enforcement and regulatory measures. However, behavioral economics theory provides vital insights into understanding human decision-making processes and behavior, as well as creative techniques to minimize tiredness and harmful breaches through the notion of nudging.

Behavioral economics, as a multidisciplinary discipline, examines how individuals make decisions in real-world circumstances by combining ideas from psychology, economics, and social sciences. It questions the conventional economic assumption of rational decision-making and recognizes that humans frequently display systematic biases, heuristics, and cognitive limits that impact their choices. Applying similar concepts to traffic management, behavioral economics implies that minor adjustments in the environment and decision-making context might encourage individuals towards safer behaviors without restricting their options or imposing stringent mandates.

One of the core ideas of behavioral economics is choice architecture, which emphasizes the design of the decision-making environment to impact behavior. Choice architecture can be used to limit the possibility of hazardous violations in the situation of weariness.

Default choices, another behavioral economics principle, take advantage of people's tendency to remain with the default option when making decisions. By applying this idea to serious infractions, traffic management may provide default settings that encourage safe driving behaviors. Setting default speed restrictions to lower numbers, for example, nudges drivers to comply with safer speeds automatically, minimizing the possibility of harmful infractions such as speeding.

Social norms, which regulate people's behavior based on what they consider to be acceptable, are critical in preventing harmful infractions. Behavioral economics emphasizes the need of emphasizing prevalent social norms in order to encourage compliance with traffic laws. Displaying signs, messaging, or campaigns that express the societal disapproval of harmful infractions, such as texting while driving or driving under the influence, can instill a feeling of accountability in drivers and discourage such behavior.

Individuals are more sensitive to losses than profits, according to loss aversion, a basic notion in behavioral economics. In traffic management, using loss aversion to prevent risky offences can assist. Emphasizing the possible negative effects of violations, such as accidents, injuries, or penalties, can induce loss aversion and discourage hazardous behavior. Displaying visuals or information relating to accidents or the personal consequences of infractions, for example, might urge drivers to priorities safety and avoid harmful violations.

Feedback and rewards are crucial in changing behavior. Providing timely feedback on drivers' driving behaviors can raise awareness and encourage self-regulation. According to behavioral economics theory, people routinely make illogical decisions that are influenced by a range of biases, heuristics, and contextual factors. Nudge interventions can help individuals make better decisions by changing the context or framing of the choice without restricting their alternatives or imposing duties.

1.4 Rationale

The foundation for this thesis topic isto promote safer, greener, and more effective transportation systems, behavior modification is crucial in the domain of traffic management. Concerns about road safety: Fatigue and hazardous violations continue to be chronic issues in traffic management, leading to a considerable number of accidents, injuries, and fatalities (WHO, 2022).Addressing these challenges is critical to ensuring road users' safety and improving overall road safety. It is critical to investigate creative techniques that might successfully minimize tiredness and reduce harmful infractions in order to create safer road settings.

Improving traffic management and minimizing driver weariness and risky infractions have far-reaching societal benefits. Improving road safety not only prevents accidents and injuries, but also lowers the economic and social costs of traffic accidents. The study can help to the overall well-being and quality of life of people, communities, and society as a whole by advocating safer driving behaviors.

Improved transportation efficiency: Traffic congestion caused by accidents and dangerous infractions can impede the movement of goods and services, resulting in transportation and logistics inefficiencies. Traffic flow may be improved by lowering accidents and minimizing harmful infractions using nudging tactics, resulting in smoother transportation operations, less congestion, and increased productivity in supply chains. This can have a favorable economic impact by allowing for more punctual delivery, lowering fuel usage, and optimizing transportation costs.

1.5 Objective

Following are the objectives of the study

- To identify the problematic behaviors of the drivers to solve road congestion.
- To explore the relationship between driving fatigue and dangerour traffic voilations.
- To explore the relationship between driving fatigue and driver behavior.

1.6 Hypotheses

Following are the hypotheses of the study

- There is an association between driving fatigue and driving practices.
- There is an association between driving fatigue and dangerous traffic violation.
- There is an association between driving fatigue and situational driver behavior.

Chapter 2

2.METHOD

In this section the methodology of the study will be discussing in detail including the scales to be used during the study.

2.1 Research design

This study will be conducted in three phased. In phase one survey will be conducted to gather information for intervention development in accordance with local context. In phase two interventions will be developed in Urdu and English language. In last phase a field experiment will be conducted for testing the efficacy and feasibility of the intervention.

2.2 Ethical Consideration

This study will take approval from department of psychology before conducting the research. Furthermore, informed consent will be taken for every participant before collecting data. Students will be not forced to participate in the study. Every participant has a right to withdraw from the study anytime they want. The data will be used for research purpose only and shall be kept confidential. We shall explain to the students the study's objectives and the fact that it is purely educational.

2.3Study data collection

The collection of the data in this studyis:

1) By survey

2.3.1 Survey formation

A survey is formed to identify the in-depth reasons of the traffic congestion on the campus and dangerous violation of the drivers; for this purpose parallel observations are done at different off times of the university. On the basis of observations the survey is formed and the survey targets five different aspects that were being noticed during the observation. The survey subscales are traffic congestion, driver behavior, type of violations, role of guards and parking challenges.

2.4Sample and sampling strategy

Convenient sampling will be used and sample size is 275 participants.

2.5Inclusion criteria

Participant of age 18 years and above are included and there is no gender restriction. The participant must be the student of the university.

2.6Exclusion criteria

Individual with diagnosed mental or physical illness that hinders their ability to participate in the study will be excluded.

2.7Instruments

2.7.1 Fatigue Severity Scale (FSS)

The FSS is a widely used self-report measure of the severity of fatigue, and the original version of the scale was developed by Krupp et al. (1989). The scale consists of 9 items, and participants rate the extent to which they agree or disagree with each item on a 7-point Likert scale. Among the one-dimensional measures that have been created to evaluate tiredness, the FSS is the one that is most commonly utilized. The FSS has a passably strong association with the Visual Analog Scale, suggesting that it is a valuable instrument for determining the degree of exhaustion. The fatigue severity scale's Cronbach's alpha was 0.89. The least score of the scale was 9 and the highest score was 63 (9 being very low fatigued and 63 being extremely fatigued).

2.7.2 Driver Behaviors questionnaire (DBQ)

The original questionnaire was developed by Reason et.al in 1990 but with the passage of time different researchers have modified them according to their studies. In this study the version that is being used is “new addition to DBQ: positive driver behavior scale” that is modified by Turker et.al in 2005. The reliability of the test-retest was 0.61 for the entire scale, 0.76 for violations, and 0.50 for mistakes. The scoring of the subscales is by adding the total score and then adding up all the sub scales for the total score of the scale.

2.9 Demographics sheet

The demographic sheet of the study include question about age, gender, valid driving license, daily driving time, weekly driving time and do the bring vehicle on campus of the participant. The demographics consist of open and close ended questions.

2.10Procedure

The study started with the observations in the parking of the campus, at different places and in alternatives off time slots. On the basis of that observation a survey is made and that survey is filled by the participants of our research along with the two scales that are being used in this study. A total 275 number of participants took part in this study and they were of both genders. It was make sure that all the participants are the students of university and they bring their vehicles on campus.

2.11 Proposed data analysis procedures

Quantitative analysis was used for the study. Data was analyzed using Software Package dor Social Sciences-20 (SPSS-20). There is no missing value in the data.

Descriptive analysis were used to calculate the distributions of the data. Normality testing is done by using Kolmogorov-Smirnov (K-S). Reliabilities of the scales were also calculated by computing cronbach's alpha. Spearmen and pearson were done to check the corelation of the variables.

Chapter 3

This section disscus the result of the findings and the discussion of the tables are included in it.

Results

This chapter explains the results of the study. The study aimed to assess the association between driver fatigue, driver behavior and dangerous voilations by the drivers on the campus. Discriptive and bivariate infrential statistics were used for the analysis of data.

Sample characteristics

Data was collected from 275 drivers. Driver were of both male and female gender took part in the study. Following table explains the demographics of the participants.

Table 1

Frequencies (f) and percentage(%) for demographic characteristics (N=275)

Variables and categories		***f*(%)**
Age in years		
	18	2 (0.7)
	19	18 (6.5)
	20	49 (71.8)
	21	60 (21.8)
	22	35 (12.7)
	23	53 (19.3)
	24	15 (5.5)
	25	18 (6.5)
	26	14 (5.1)

Variables and categories	*f*(%)
27	4 (1.5)
28	7 (2.5)
Gender of participant	
male	208 (75.6)
female	67 (24.4)
Do they have licence	
yes	176 (64)
No	99 (36)
Weekly driving hours	
10	31 (11.3)
12	4 (1.5)
15	33 (12)
18	8 (2.9)
20	49 (17.8)
22	8 (2.9)
24	10 (3.6)
25	74 (26.9)
28	8 (2.9)

Variables and categories	*f*(%)

30	12 (4.4)
35	14 (5.1)
60	6 (2.2)
65	18 (6.5)
Time to reach home (mints)	
5	22 (8)
10	27 (9.8)
12	10 (3.6)
15	51 (18.5)
20	46 (16.7)
25	61 (22.2)
30	6 (2.2)
40	24 (8.7)
45	8 (2.9)
50	14 (5.1)
55 and more	6 (2.2)

Data was collected from the drivers of Capital University of Science and Technology (N=275, 100%) out of this (N=208,75.6) were the male participants and (N=67,24.4) were female participants. The minimum age is 18 and maximum age is 28 and the mean of age is 22.13 and median is 22.0 . The standard deviation of the age od participants is 2.175.The skewness of age of participants is 0.716 and kurtosis is 0.061. The Kolmogorov-Smirnov (K-S) test ditribution of age of participant is normal because its value is 0.167 ($p<0.001$).

The weekly driving hours, it is evident that the majority of participants (26.9%) reported driving for 25 hours per week, followed by 17.8% who drove for 20 hours. Notably, 11.3% of participants reported driving for 10 hours weekly. The distribution of driving hours reflects a diverse range, with varying frequencies across different time intervals.

Regarding the time taken to reach home, the data show a varied distribution with different time intervals. A significant proportion of participants (22.2%) reported taking 25 minutes to reach home, followed by 18.5% taking 15 minutes. The distribution indicates diverse commuting times, ranging from 5 to 55 minutes. These findings provide an understanding of the participants' commuting patterns and the variability in the time they allocate for this activity.

Moving on to the descriptive statistics, the analysis of participant age reveals a mean of 22.13 years, with a range from 18 to 28 years. The skewness of 0.716 suggests a slightly right-skewed distribution, indicating a slight concentration of younger participants. The kurtosis of 0.061 indicates a relatively normal distribution with moderate peakness.

Examining the gender distribution, the mean of 1.24 suggests a predominantly male sample with a standard deviation of 0.430. The skewness of 1.201 indicates a positively skewed distribution, reflecting a higher frequency of male participants. The kurtosis of -0.562 indicates a distribution with lighter tails compared to a normal distribution.

The analysis of whether participants possess a driving license shows a mean of 1.36, suggesting that, on average, participants have a driving license. The skewness of 0.587 indicates a slightly positively skewed distribution. The kurtosis of -1.668 suggests a distribution with lighter tails compared to a normal distribution, indicating a less extreme distribution of participants with and without driving licenses.

Moving to the weekly driving hours variable, the mean of 1.24 indicates that, on average, participants drive 20 hours or less per week. The skewness of 2.170 indicates a highly positively skewed distribution, reflecting a concentration of participants with lower weekly driving hours. The kurtosis of 3.740 suggests heavy tails in the distribution, indicating a high frequency of extreme values.

Analyzing the time taken to go home, the mean of 1.87 indicates an average duration of 20 minutes or less. The skewness of 0.861 implies a somewhat positive skewed distribution, implying a concentration of people with lower commute durations. The kurtosis of 0.512 suggests that the distribution has a modest peak.

Reliabilities of scales in term of Cronbach's alpha (a):

Table 2

Cronbach's alpha Reliability (a) of survey, mean, mediam, standard deviation, cronbach's alpha, skewness and kurtosis (N=275).

Scale	N	M	SD	*a*	Skewness	Kurtosis
Survey	275	19.28	3.396	0.543	0.219	-0.019

Note: N=number of items, M=mean, SD= Standard deviation, (a) = Cronbach's alpha.

Table 2 provides critical information about the survey, which was conducted to a cohort of 275 research participants. This survey sought to collect data on a specific variable, and the statistics produced provide insights into both the central tendency and distribution features of the replies. Let delve into the details to gain a comprehensive understanding.

The mean of the survey results, represented as 19.28, serves as a focal point for the averag**e** value stated by participants**.** The standard deviation, calculated as 3.396, provides useful information regarding the dispersion or spread of survey results. A larger standard deviation indicates greater diversity in replies, implying that participants' opinions or perceptions of the questioned variable span a wider range. In contrast, a smaller standard deviation suggests a more uniform collection of responses.

Cronbach's alpha, which measures internal consistency dependability, is recorded at 0.543. This result indicates a modest level of dependability for the survey instrument. While not as high as desired, it does show some consistency in assessing the construct of interest.

Skewness (0.219) gives information on the symmetry of the survey score distribution. A skewness near to zero indicates relative symmetry, but the high skewness here shows a little rightward tail in the distribution.

Kurtosis, represented as -0.019, examines the form of the distribution. A number around 0 suggests that the distribution is comparable to a normal curve. Negative kurtosis in this context indicates that the distribution is somewhat less peaked than a normal distribution.

Table 3

Cronbach's alpha Reliability (a) of Fatigue Sverity Scale (FSS), mean, mediam, standard deviation, cronbach's alpha, skewness and kurtosis (N=275).

Scale	N	M	SD	*a*	Skewness	Kurtosis
Fatigue Sverity Sacle	275	34.16	7.86	0.849	-0.480	-0.016

Note: N=number of items, M=mean, SD= Standard deviation, (a) = Cronbach's alpha.

Table 3 contains key information regarding the study's sample as well as the Fatigue Severity Scale (FSS) score characteristics. The statistics show that 275 people were included in the analysis. The weariness intensity Scale is a widely used measure for determining the intensity of weariness experienced by individuals. The participants' mean FSS score is 34.16, indicating a focal point around which individual scores cluster.

The standard deviation (SD) of the FSS scores is 7.86. This measure of variability describes the spread or dispersion of scores around the mean. A larger standard deviation implies more variation in the participants' tiredness severity assessments, whereas a lower value indicates better consistency.

Cronbach's alpha is a measure of internal consistency dependability, and 0.849 indicates a good level of reliability for the FSS in this investigation. This suggests that the questions on the Fatigue Severity Scale reliably measure the construct of interest (fatigue severity) among individuals.

The skewness value of -0.480 indicates the symmetry of the FSS score distribution. A skewness number near to zero implies a reasonably symmetrical distribution, whereas a negative skewness indicates a minor leftward skew. This suggests that some people may experience less severe weariness than the norm. Kurtosis, with a value of -0.016, provides information about the distribution's shape and whether the scores have heavy tails or are more concentrated around the mean. A number around 0 indicates a normal distribution. In this case, negative kurtosis means that the distribution is somewhat less peaked than a normal distribution. This suggests that FSS scores may have fewer extreme values or outliers.

Table4

Cronbach's alpha Reliability (a) of Driver Behavior Quetionnaire (DBQ), mean, mediam, standard deviation, cronbach's alpha, skewness and kurtosis (N=275).

Scale	N	M	SD	*a*	Skewness	Kurtosis
DBQ 1	275	24.52	6.25	0.718	1.89	9.62
DBQ 2	275	15.6	4.81	0.35	2.58	13.36
DBQ 3	275	59.08	15.34	0.89	-1.14	1.073
DBQ 4	275	90.37	23.89	0.83	-0.426	0.18
DBQ 5	275	35.17	11.21	0.82	-0.18	-0.48

Note: N=number of items, M=mean, SD= Standard deviation, (a) = Cronbach's alpha.

Table 4 shows that (N= 275) participants took part in the Driver Behaviour Questionnaire (DBQ) while the mean of the DBQ 1 is 24.52 while standard deviation is 6.25 having Cronbach's alpha value of 0.718 with skewness of 1.89 and kurtosis of 9.62. The mean of the DBQ 2 is 15.6 while standard deviation is 4.81 having Cronbach's alpha value of 0.35 with skewness of 2.58 and kurtosis of 13.36. The mean of the DBQ 3 is 59.08 while standard deviation is 15.34 having Cronbach's alpha value of 0.89 with skewness of -1.14 and kurtosis of 0.18. The mean of the DBQ 4 is 90.37 while standard deviation is 23.89 having Cronbach's alpha value of 0.83 with skewness of -0.426 and kurtosis of 0.18. The mean of the DBQ 5 is 35.17 while standard deviation is 11.21 having Cronbach's alpha value of 0.82 with skewness of -0.18 and kurtosis of -0.48.

Normality of data

Table 5

Normality of survey, mean, mediam, standard deviation, Kolmogorov- Smirnov, *skewness and kurtosis (N=275).*

Scale	N	M	SD	Kolmogorov-Smirnov	Skewness	Kurtosis
Survey	275	19.28	3.396	0.108	0.219	-0.019

Note: N=number of items, M=mean, SD= Standard deviation.

Table 5 encapsulates pivotal details pertaining to the survey conducted among a cohort of 275 participants. This survey aimed to capture insights into a particular variable, and the statistics presented offer a nuanced understanding of both the central tendency and the distribution characteristics of the gathered responses. The mean of the survey responses, positioned at 19.28, serves as a crucial reference point, embodying the average value reported by participants. This central measure provides a focal point around which individual responses gravitate. The standard deviation, computed as 3.396, offers valuable insights into the variability or spread of the survey scores. A higher standard deviation suggests a broader range of responses, signifying diverse opinions or perceptions on the surveyed variable. Conversely, a lower standard deviation implies a more homogenous set of responses, indicating a convergence in participants' views.

Cognizant of reliability, the Kolmogorov-Smirnov statistic is reported as 0.108, shedding light on the distribution's adherence to normality. A smaller value suggests a distribution closer to normal, and in this case, 0.108 indicates a relatively normal distribution. The skewness of 0.219 provides insights into the symmetry of the distribution, with a positive skewness hinting at a rightward tail.

This implies that some participants may have reported values on the surveyed variable higher than the mean, contributing to a mild asymmetry in the distribution. The kurtosis of -0.019 delves into the shape of the distribution, and the negative value indicates a slight flattening of the distribution compared to a normal curve. This suggests that the survey responses may lack extreme values or outliers, contributing to a distribution that is less peaked than the normal distribution.

Table 6

Normality of Fatigue Sverity Scale (FSS), mean, mediam, standard deviation, cronbach's alpha, skewness and kurtosis (N=275).

Scale	N	M	SD	Kolmogorov-Smirnov	Skewness	Kurtosis
Fatigue Sverity Sacle	275	34.16	7.86	0.077	-0.480	-0.016

Note: N=number of items, M=mean, SD= Standard deviation.

Table 6 furnishes comprehensive insights into the Fatigue Severity Scale (FSS) responses from a cohort of 275 participants. The FSS, a widely utilized tool for assessing the severity of fatigue, produced a mean score of 34.16, signifying the central tendency around which individual scores tend to cluster. This mean value provides a crucial reference point for gauging the average level of fatigue reported by participants. The accompanying standard deviation of 7.86 offers valuable information about the dispersion or spread of FSS scores. A higher standard deviation indicates greater variability among participants' fatigue severity scores, suggesting a diverse range of responses. Conversely, a lower standard deviation would imply a more consistent set of responses, indicative of convergence in participants' reported levels of fatigue.

Considering the Kolmogorov-Smirnov statistic, which stands at 0.077, it serves as an indicator of the distribution's adherence to normality. A smaller value suggests a distribution closer to normal, and in this instance, 0.077 indicates a relatively normal distribution of FSS scores. The skewness of -0.480 provides insights into the symmetry of the distribution, with a negative skewness indicating a slight leftward tail. This suggests that some participants may have reported lower fatigue severity values than the mean, contributing to a mild asymmetry in the distribution. The kurtosis value of -0.016 delves into the shape of the distribution, and the negative sign indicates a distribution slightly less peaked than a normal curve. This implies that the FSS scores may lack extreme values or outliers, contributing to a distribution that is more flattened compared to the normal distribution.

Table 7

Normality of Driver Behavior Quetionnaire (DBQ), mean, mediam, standard deviation, cronbach's alpha, skewness and kurtosis (N=275).

Scale	N	M	SD	Kolmogorov-Smirnov	Skewness	Kurtosis
DBQ 1	275	24.52	6.25	0.118	1.89	9.62
DBQ 2	275	15.6	4.81	0.179	2.58	13.36
DBQ 3	275	59.08	15.34	0.219	-1.14	1.073
DBQ 4	275	90.37	23.89	0.126	-0.426	0.18
DBQ 5	275	35.17	11.21	0.082	-0.18	-0.48

Note: N=number of items, M=mean, SD= Standard deviation.

Table 7 provides an expansive overview of the Driver Behavior Questionnaire (DBQ) responses from a cohort of 275 participants, shedding light on various dimensions of driving behavior. Each dimension, represented by DBQ 1 through DBQ 5, offers distinct insights into participants' self-reported behavior. For DBQ 1, the mean score of 24.52 indicates the central tendency around which responses cluster, with a standard deviation of 6.25 revealing the extent of variability in reported scores. The Kolmogorov-Smirnov value of 0.118 suggests a distribution somewhat close to normal, while the skewness of 1.89 indicates a rightward tail, potentially reflecting a tendency for some participants to report higher values than the mean. The substantial kurtosis of 9.62 suggests a distribution with a pronounced peak and heavy tails.

Moving to DBQ 2, a mean of 15.6 and a standard deviation of 4.81 depict a different facet of driving behavior. The Kolmogorov-Smirnov value of 0.179 hints at a distribution relatively close to normal, while the skewness of 2.58 signifies a pronounced rightward skew, indicating that a subset of participants reported significantly higher values than the mean. The kurtosis of 13.36 further underscores the heavy-tailed nature of the distribution.

For DBQ 3, with a mean of 59.08 and a standard deviation of 15.34, the Kolmogorov-Smirnov value of 0.219 suggests a distribution that leans toward normality. The negative skewness of -1.14 indicates a leftward tail, implying that some participants reported lower values than the mean. The kurtosis of 1.073 suggests a distribution that is less peaked than a normal curve.

Moving on to DBQ 4, the mean of 90.37 and standard deviation of 23.89 signify a higher level of reported behavior. The Kolmogorov-Smirnov value of 0.216 suggests a distribution that is not far from normal. The negative skewness of -0.426 suggests a slight leftward tail, while the kurtosis of 0.18 indicates a distribution with a modest peak.

Finally, for DBQ 5, with a mean of 35.17 and a standard deviation of 11.21, the Kolmogorov-Smirnov value of 0.082 suggests a distribution relatively close to normal. The skewness of -0.18

indicates a mild leftward skew, suggesting some participants reported lower values than the mean, while the kurtosis of -0.48 implies a distribution less peaked than a normal curve.

Hypothesis #1

There is an association between driving fatigue and driving practices.

Table 8

Association between driving fatigue and driving practices as measured by Fatigue Severity Scale(FSS) and Survey (N=275).

		sum of fatigue sverity scale	survey total
sum of fatigue sverity scale	Pearson Correlation	1	.151*
	Sig. (2-tailed)		.012
	N	275	275
survey total	Pearson Correlation	.151*	1
	Sig. (2-tailed)	.012	
	N	275	275

**. Correlation is significant at the 0.05 level (2-tailed).*

The correlation table 9 shows valuable insights into the relationship between two key variables: the sum of the Fatigue Severity Scale (FSS) scores and the total scores derived from the survey. Employing the Pearson correlation coefficient, this statistical analysis quantifies both the strength and direction of the linear association between these variables, providing researchers with a quantitative measure of their interdependence.

The obtained correlation coefficient of 0.151 denotes a positive correlation between the sum of FSS scores and survey total scores. A positive correlation implies that as one variable increases, the other tends to increase as well. In the context of this study, it suggests that higher levels of reported fatigue severity, as indicated by FSS scores, are associated with elevated total scores in the survey. However, the strength of this correlation is deemed relatively weak, given that the coefficient is closer to zero. This signifies that the linear relationship between these variables is not particularly robust or pronounced.

The statistical significance of the correlation is denoted by the p-value, which is reported as 0.012. The p-value signifies the probability of observing such a correlation by chance, assuming no genuine association exists in the broader population. In this instance, the p-value being less than 0.05 indicates that the correlation is statistically significant at the conventional 0.05 level. This implies that the likelihood of obtaining this correlation purely by random chance is sufficiently low, bolstering the confidence in the meaningfulness of the observed association.

Hypothesis #2

There is an association between driving fatigue and dangerous traffic violation.

Table 9

Association between driving fatigue and dangerous traffic violation as measured by Fatigue Severity Scale(FSS) and Driver Behavior Questionnaire (N=275).

			sum of fatigue sverity scale	DBQ subscale 1
Spearman's rho	sum of fatigue sverity scale	Correlation Coefficient	1.000	.261**
		Sig. (2-tailed)	.	.000
		N	275	275
	DBQ subscale 1	Correlation Coefficient	.261**	1.000
		Sig. (2-tailed)	.000	.
		N	275	275

***. Correlation is significant at the 0.01 level (2-tailed).*

The correlation analysis in the provided table illuminates the intricate relationship between two pivotal variables: the sum of the Fatigue Severity Scale (FSS) scores and the scores derived from Driver Behavior Questionnaire (DBQ) Subscale 1. Spearman's rho correlation coefficient serves as the analytical tool of choice, offering insights into the strength and direction of the monotonic association between these variables.

The reported Spearman's rho correlation coefficient of 0.261 unfolds a noteworthy positive correlation between the sum of FSS scores and DBQ Subscale 1 scores. This positive correlation signifies that as one variable experiences an increase, the other tends to follow suit. In practical terms, higher levels of self-reported fatigue severity, as indicated by elevated FSS scores, are correspondingly associated with increased scores on DBQ Subscale 1.

The statistical significance of this correlation is underscored by the p-value of 0.000, rendering it significant at the 0.01 level (2-tailed). This low p-value implies a minimal likelihood of observing such a correlation purely by chance, assuming no inherent association between fatigue severity and DBQ Subscale 1 scores within the broader population.

While the correlation strength of 0.261 is considered moderate, it elucidates a consistent and discernible trend in the interdependence of these variables. Although not reaching the magnitude of a strong correlation, the moderate correlation coefficient reinforces the reliability of the observed association.

The implications of this correlation extend to the understanding that, in the context of this study, heightened levels of reported fatigue severity align with increased scores on DBQ Subscale 1, indicating a potential influence of fatigue on certain aspects of driving behavior assessed by the specific subscale.

Hypothesis #3

There is an association between driving fatigue and situational driver behavior.

Table 10

Association between driving fatigue and situational driver behavior as measured by Fatigue Severity Scale(FSS) and Driver Behavior Questionnaire (N=275)

			sum of fatigue sverity scale	DBQ subscale 5
Spearman's rho	sum of fatigue sverity scale	Correlation Coefficient	1.000	.047
		Sig. (2-tailed)	.	.440
		N	275	275
	DBQ subscale 5	Correlation Coefficient	.047	1.000
		Sig. (2-tailed)	.440	.
		N	275	275

The correlation analysis encapsulated in the provided table serves as a valuable lens through which researchers can scrutinize the dynamic interplay between the sum of Fatigue Severity Scale (FSS) scores and the scores derived from Driver Behavior Questionnaire (DBQ) Subscale 5. Spearman's rho correlation coefficient, chosen for its suitability in capturing monotonic relationships, is employed to discern the strength and direction of this association.

The reported Spearman's rho correlation coefficient of 0.047 unfolds a narrative of a very weak positive correlation between the sum of FSS scores and DBQ Subscale 5 scores. This minuscule coefficient implies that, while there is a slight tendency for both variables to increase together, the association is marginal at best. The correlation lacks statistical significance, as indicated by the p-value of 0.440, surpassing the conventional threshold of 0.05. This implies that there exists a noteworthy probability of observing such a correlation purely by chance, suggesting that the observed association may not be a genuine reflection of the broader population.

With a correlation coefficient of 0.047, the strength of the correlation is deemed minimal. This signifies that there is little to no discernible trend in the relationship between self-reported fatigue severity, as gauged by the FSS scores, and the specific driving behavior encapsulated by DBQ Subscale 5. The lack of statistical significance further underscores the importance of exercising caution when drawing meaningful conclusions about any potential link between fatigue severity and the specific driving behaviors assessed by this particular subscale.

Discussion

1. **Reliability of scales:**

The survey conducted among 275 research participants aimed to gather data on a specific variable. The mean survey result of 19.28 served as the average value reported by participants, and the standard deviation of 3.396 indicated the dispersion or spread of the responses. A larger standard deviation suggested greater diversity in opinions, while a smaller standard deviation indicated a more uniform set of responses. The Cronbach's alpha of 0.543 reflected a modest level of dependability for the survey instrument, and skewness (0.219) revealed a slight rightward tail in the distribution. Kurtosis of -0.019 indicated that the distribution was somewhat less peaked than a normal distribution.

The Fatigue Severity Scale (FSS) analysis involved 275 participants, with a mean FSS score of 34.16. The standard deviation of 7.86 represented variability, and a Cronbach's alpha of 0.849 indicated good reliability for the FSS. Skewness of -0.480 suggested a minor leftward skew in the distribution, indicating that some participants experienced less severe fatigue than the norm. Kurtosis of -0.016 indicated a distribution somewhat less peaked than normal, suggesting fewer extreme values or outliers.

The Driver Behaviour Questionnaire (DBQ) was analyzed for various subscales. For DBQ 1, the mean was 24.52, standard deviation 6.25, Cronbach’s alpha 0.718, skewness 1.89, and kurtosis 9.62. For DBQ 2, the mean was 15.6, standard deviation 4.81, Cronbach’s alpha 0.35, skewness 2.58, and kurtosis 13.36. For DBQ 3, the mean was 59.08, standard deviation 15.34, Cronbach’s alpha 0.89, skewness -1.14, and kurtosis 0.18. For DBQ 4, the mean was 90.37, standard deviation 23.89, Cronbach's alpha 0.83, skewness -0.426, and kurtosis 0.18. For DBQ 5, the mean was 35.17, standard deviation 11.21, Cronbach's alpha 0.82, skewness -0.18, and kurtosis -0.48.

2. Demogrphics

The data collected from drivers at Capital University of Science and Technology (N=275) provides comprehensive insights into the demographic characteristics, driving habits, and commuting patterns of the participants. Out of the total participants, 75.6% were male (N=208), and 24.4% were female (N=67). The age of participants ranged from 18 to 28 years, with a mean age of 22.13 and a median of 22.0. The standard deviation of participants' ages is 2.175, indicating a relatively moderate degree of variability. The skewness of 0.716 suggests a slightly right-skewed distribution, indicating a slight concentration of younger participants, while the kurtosis of 0.061 indicates a relatively normal distribution with moderate peakness. The Kolmogorov-Smirnov test, with a value of 0.167 ($p<0.001$), indicates that the distribution of participants' ages is normal.

Moving on to driving habits, the data reveals that the majority of participants (26.9%) reported driving for 25 hours per week, followed by 17.8% who drove for 20 hours. Additionally, 11.3% of participants reported driving for 10 hours weekly. This distribution reflects a diverse range of driving hours, demonstrating varying frequencies across different time intervals.

Regarding the time taken to reach home, the data exhibit a varied distribution with different time intervals. A notable proportion of participants (22.2%) reported taking 25 minutes to reach home, followed by 18.5% taking 15 minutes. The distribution indicates diverse commuting times, ranging from 5 to 55 minutes, providing valuable insights into participants' commuting patterns and the variability in the time they allocate for this activity.

Descriptive statistics further elaborate on the characteristics of the participants. The analysis of participant age, with a mean of 22.13 years and a range from 18 to 28 years, provides a comprehensive overview of the age distribution. The skewness of 0.716 suggests a slight concentration of younger participants, while the kurtosis of 0.061 indicates a distribution with moderate peakness.

Examining the gender distribution, the mean of 1.24 suggests a predominantly male sample, as participants were coded as 1 for male and 2 for female. The skewness of 1.201 indicates a positively skewed distribution, reflecting a higher frequency of male participants. The kurtosis of -0.562 indicates a distribution with lighter tails compared to a normal distribution.

The analysis of whether participants possess a driving license shows a mean of 1.36, suggesting that, on average, participants have a driving license. The skewness of 0.587 indicates a slightly positively skewed distribution, while the kurtosis of -1.668 suggests lighter tails compared to a normal distribution, indicating a less extreme distribution of participants with and without driving licenses.

Moving to the weekly driving hours variable, the mean of 1.24 indicates that, on average, participants drive 20 hours or less per week. The skewness of 2.170 indicates a highly positively skewed distribution, reflecting a concentration of participants with lower weekly driving hours. The kurtosis of 3.740 suggests heavy tails in the distribution, indicating a high frequency of extreme values.

Analyzing the time taken to go home, the mean of 1.87 indicates an average duration of 20 minutes or less. The skewness of 0.861 implies a somewhat positively skewed distribution, indicating a concentration of people with lower commute durations. The kurtosis of 0.512 suggests that the distribution has a modest peak.

3. Association between driving fatigue and driving practices

Fatigue is a significant issue for the transportation sector since it may impact operational safety (Desmond et al., 2009; Dorrian et al., 2011). The correlation table (Table 9) presents a meaningful exploration of the association between the sum of Fatigue Severity Scale (FSS) scores and the total scores derived from the survey. Utilizing the Pearson correlation coefficient, this statistical analysis provides researchers with a quantitative measure of the linear relationship between these variables, shedding light on their interdependence.

The obtained correlation coefficient of 0.151 suggests a positive correlation between the sum of FSS scores and survey total scores. This implies that, within the context of the study, as reported fatigue severity increases (indicated by higher FSS scores), there is a tendency for the total scores in the survey to elevate as well. However, the strength of this correlation is characterized as relatively weak, as the coefficient is closer to zero. This suggests that the linear relationship between the two variables is not highly pronounced or robust.

In accordance with statistical convention, the p-value associated with the correlation coefficient is crucial for determining its significance. The reported p-value of 0.012 is less than the conventional threshold of 0.05, signifying statistical significance at the 0.05 level. This indicates a low probability of observing such a correlation purely by random chance, assuming no genuine association exists in the broader population.

In the literature, the strength of the correlation coefficient aligns with the notion that the relationship between fatigue severity and the surveyed variables is not overwhelmingly strong.

This finding resonates with studies that have explored the complex interplay between fatigue and various health or psychological factors. While the positive correlation suggests a coherent trend, it emphasizes the importance of considering other potential contributing factors that may influence the relationship. A study conducted by Meletis and Barker (2004) highlighted the association between subjective weariness and deteriorated performance following extended engagement in cognitively demanding tasks, further underscoring the detrimental impact of fatigue on road safety (Meletis, & Barker, 2004).

4. There is an association between driving fatigue and dangerous traffic violation

The correlation analysis presented in the table provides a nuanced exploration of the relationship between the sum of Fatigue Severity Scale (FSS) scores and scores derived from Driver Behavior Questionnaire (DBQ) Subscale 1. Spearman's rho correlation coefficient is particularly suitable for capturing the monotonic association between these variables, offering insights into both the strength and direction of their relationship.

The reported Spearman's rho correlation coefficient of 0.261 unveils a notable positive correlation between the sum of FSS scores and DBQ Subscale 1 scores. This implies that as participants report higher levels of fatigue severity (as indicated by elevated FSS scores), there is a corresponding tendency for increased scores on DBQ Subscale 1, reflecting certain aspects of driving behavior. This positive correlation suggests that individuals experiencing heightened fatigue severity may exhibit specific patterns of behavior as captured by the questions in DBQ Subscale 1.

The statistical significance of this correlation is emphasized by the p-value of 0.000, indicating significance at the 0.01 level (2-tailed). The low p-value underscores the minimal likelihood of observing such a correlation purely by chance, assuming no inherent association between fatigue severity and DBQ Subscale 1 scores within the broader population. This strengthens the confidence in the meaningfulness of the observed association.

While the correlation strength of 0.261 is categorized as moderate, it signifies a consistent and discernible trend in the interdependence of these variables. Although not reaching the magnitude of a strong correlation, the moderate coefficient implies a reliable and replicable association between self-reported fatigue severity and driving behavior as assessed by DBQ Subscale 1.

The implications of this correlation extend to the understanding that heightened levels of reported fatigue severity are aligned with increased scores on DBQ Subscale 1. This suggests a potential influence of fatigue on certain aspects of driving behavior encapsulated by the specific questions in Subscale 1. Researchers may delve deeper into the specific behaviors assessed by DBQ Subscale 1 to uncover insights into how fatigue might manifest in driving patterns, providing valuable information for interventions or strategies aimed at improving road safety in populations experiencing fatigue. Further research could explore causation, moderating factors, and the broader impact of fatigue on diverse aspects of driving behavior. A study conducted by Khawar, Khan, (2020) delved into the relationship between emotional states and the propensity to behave aggressively while driving.

5. There is an association between driving fatigue and situational driver behavior

The correlation analysis presented in the provided table offers valuable insights into the relationship between the sum of Fatigue Severity Scale (FSS) scores and scores derived from Driver Behavior Questionnaire (DBQ) Subscale 5. Spearman's rho correlation coefficient is employed for its ability to capture monotonic relationships, providing a means to discern the strength and direction of this association.

The reported Spearman's rho correlation coefficient of 0.047 suggests a very weak positive correlation between the sum of FSS scores and DBQ Subscale 5 scores. This minute coefficient implies that, while there is a slight tendency for both variables to increase together, the association is marginal at best. In practical terms, the correlation suggests that as participants report higher levels of fatigue severity (indicated by FSS scores), there is a subtle tendency for increased scores on DBQ Subscale 5, reflecting specific aspects of driving behavior.

However, the correlation lacks statistical significance, as indicated by the p-value of 0.440, surpassing the conventional threshold of 0.05. This implies that there exists a noteworthy probability of observing such a correlation purely by chance. The lack of statistical significance raises caution, suggesting that the observed association may not be a genuine reflection of the broader population. This underscores the importance of interpreting the results with prudence and considering potential confounding factors or alternative explanations for the observed correlation.

With a correlation coefficient of 0.047, the strength of the correlation is deemed minimal (Gindele, et al. (2015)).This signifies that there is little to no discernible trend in the relationship between self-reported fatigue severity, as gauged by FSS scores, and the specific driving behavior encapsulated by DBQ Subscale 5. The lack of statistical significance further underscores the importance of exercising caution when drawing meaningful conclusions about any potential link between fatigue severity and the specific driving behaviors assessed by this particular subscale.

Conclusion

The survey with 275 participants aimed to understand how people feel about driving. The average response was 19.28, showing what most people think. If the number is higher, it means people had different opinions. The survey tried to be dependable, but it got a 0.543 score, which is okay but not great. If the number was closer to 1, it would be better.

For fatigue, which is feeling tired, the average score was 34.16 out of 100. This is where most people's tiredness levels met. If the number is higher, it means some people were more tired. The survey tried its best to be reliable, and it got a good score of 0.849. It means the questions about tiredness were good.

People also answered questions about their driving habits. Some drove more hours in a week than others. The number 25 was common, with 26.9% of people saying they drove this much. The survey also asked how long it took for people to get home. Most said it took them 25 minutes. Others had different times.

The survey collected information about people's age, gender, and if they had a driving license. Most people were around 22 years old. More guys took part in the survey than girls. Most people had a driving license.

Researchers looked at how the tiredness level (from the survey) connects with how people drive. They found a small connection, but it's not super strong. It means if someone feels more tired, they might drive a bit differently, but it's not a big change. This connection was important, and it was for real, not just by chance.

Then, they checked if being more tired connects with doing dangerous things while driving. It does connect a bit more here, showing that feeling more tired might make people do more risky things on the road.

Lastly, they checked if being more tired connects with how people drive in certain situations. Here, the connection was tiny and not really for sure. So, feeling more tired might not really change how people drive in different situations.

Limitations and recommendations

The acknowledging the challenge of low generalizability due to the focus on a small population from a specific area, future studies should aim for diverse and representative samples. Expanding the participant pool to include a broader range of demographics, locations, and traffic scenarios would provide more comprehensive insights into driving behaviors and fatigue across different settings.

The interventions based solely on the observation and survey of traffic within a university may have limited external validity. To address this, researchers can incorporate a more varied and inclusive set of interventions, considering factors beyond university traffic patterns. Collaborating with local traffic authorities, implementing interventions in diverse traffic environments, and incorporating real-world scenarios can contribute to a more robust understanding of the impact of interventions on driving behavior.

The time duration of the study is noted as a limitation. Future research should consider extending the study duration to capture potential variations and trends over a more extended period. Longitudinal studies provide a more comprehensive view of changes in driving behaviors and fatigue patterns, allowing for a deeper understanding of trends and potential influencing factors.

The study focuses specifically on the traffic of Capital University of Science and Technology (CUST), caution is needed when generalizing findings to other university populations. Future research should include multiple universities or educational institutions to assess the generalizability of results across diverse academic settings. This approach would contribute to the development of more universally applicable insights into the relationship between driving behaviors and fatigue among university populations.

Implications

The study unfolds several meaningful implications that can significantly impact driving behaviors and traffic management systems. One noteworthy implication is the potential effectiveness of promoting safe and responsible driving as a societal standard. Embracing this as a nudge intervention could serve as a powerful catalyst for fostering a culture of responsible driving behavior. Encouraging individuals to perceive safe driving as a societal norm might contribute to a positive shift in attitudes and behaviors on the road.

Another valuable implication revolves around the alteration of default settings in traffic management systems. This subtle yet influential nudge intervention has the potential to shape driving behaviors by modifying default options. By strategically adjusting these settings, authorities can guide individuals towards safer and more responsible choices, leveraging the power of defaults to influence behavior positively. The study also underscores the effectiveness of nudge interventions in highlighting desired behaviors and simplifying their adoption. By making these behaviors more appealing and straightforward, interventions can enhance adherence to traffic laws and norms. This implies that interventions focusing on clarity and attractiveness may have a more substantial impact on encouraging desired behaviors among drivers. Additionally, the findings suggest that nudge interventions can play a pivotal role in making safe driving practices more desirable and rewarding. Creating a positive association with responsible behaviors through incentives and rewards may contribute to sustainable changes in traffic management behaviors. This implies that interventions designed to make safe driving both attractive and personally rewarding could lead to long-lasting positive outcomes.

Moreover, the study emphasizes the importance of providing drivers with pertinent and helpful information, feedback, and alternatives as part of nudge interventions. Improving the user experience by offering valuable insights and choices can contribute to a more informed and responsible driving community. By enhancing communication and guidance, these interventions can positively impact the decision-making processes of drivers and other road users.

3. References

Abdu, R., Shinar, D., &Meiran, N. (2012).Situational (state) anger and driving.*Transportation Research Part F: Traffic Psychology and Behaviour*, *15*(5), 575-580. https://doi.org/10.1016/j.trf.2012.05.007

Al-Mekhlafi, A. B. A., Isha, A. S. N., &Naji, G. M. A. (2020). The relationship between fatigue and driving performance: A review and directions for future research. *J. Crit. Rev*, *7*(14), 134-141

Al-Mekhlafi, A. B. A., Isha, A. S. N., &Naji, G. M. A. (2020). The relationship between fatigue and driving performance: A review and directions for future research. *J. Crit. Rev*, *7*(14), 134-141

Bärgman, J. (2016). *Methods for analysis of naturalistic driving data in driver behavior research*. Chalmers Tekniska Hogskola (Sweden)

Chliaoutakis, J. E., Demakakos, P., Tzamalouka, G., Bakou, V., Koumaki, M., &Darviri, C. (2002). Aggressive behavior while driving as predictor of self-reported car crashes. *Journal of Safety Research*, *33*(4), 431-443. https://doi.org/10.1016/S0022-4375(02)00053-1

Dahlen, E. R., Edwards, B. D., Tubré, T., Zyphur, M. J., & Warren, C. R. (2012).Taking a look behind the wheel: An investigation into the personality predictors of aggressive driving.*Accident Analysis & Prevention*, *45*, 1-9. https://doi.org/10.1016/j.aap.2011.11.012

De Winter, J., &Dodou, D. (2010). The Driver Behaviour Questionnaire as a predictor of accidents: A meta-analysis. *Journal of Safety Research*, *41*(6), 463-470. https://doi.org/10.1016/j.jsr.2010.10.007

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

Desmond, P. A., & Matthews, G. (2009). Individual differences in stress and fatigue in two field studies of driving. *Transportation Research Part F: Traffic Psychology and Behaviour*, *12*(4), 265-276

Dorrian, J., Roach, G. D., Fletcher, A., & Dawson, D. (2007). Simulated train driving: fatigue, self-awareness and cognitive disengagement. *Applied ergonomics*, *38*(2), 155-166

Dula, C. S., & Geller, E. (2003). Risky, aggressive, or emotional driving: Addressing the need for consistent communication in research. *Journal of Safety Research*, *34*(5), 559-566. https://doi.org/10.1016/j.jsr.2003.03.004

Dorrian, J., Roach, G. D., Fletcher, A., & Dawson, D. (2007). Simulated train driving: Fatigue, self-awareness and cognitive disengagement. *Applied Ergonomics*, *38*(2), 155-166. https://doi.org/10.1016/j.apergo.2006.03.006

Fan, J., & Smith, A. P. (2017).The impact of workload and fatigue on performance. In *Human Mental Workload: Models and Applications: First International Symposium, H-WORKLOAD 2017, Dublin, Ireland, June 28-30, 2017, Revised Selected Papers 1* (pp. 90-105). Springer International Publishing

Gindele, T., Brechtel, S., & Dillmann, R. (2015). Learning driver behavior models from traffic observations for decision making and planning. IEEE Intelligent Transportation Systems Magazine, 7(1), 69-79.

Hallsworth, M., Snijders, V., Burd, H., Prestt, J., Judah, G., Huf, S., & Halpern, D. (2016).Applying behavioral insights: simple ways to improve health outcomes. *World Innovation Summit for Health, Doha, Qatar, 29–30 November*

Khawar, Khan. et al., (2020). Evaluating the Nature of Distractive Driving Factors towards Road Traffic Accident.https://pdfs.semanticscholar.org/

Lajunen, T. (2001). Personality and accident liability: Are extraversion, neuroticism and psychoticism related to traffic and occupational fatalities? *Personality and Individual Differences*, *31*(8), 1365-1373. https://doi.org/10.1016/S0191-8869(00)00230-0

Miles, D. E., & Johnson, G. L. (2003). Aggressive driving behaviors: Are there psychological and attitudinal predictors? *Transportation Research Part F: Traffic Psychology and Behaviour*, *6*(2), 147-161. https://doi.org/10.1016/S1369-8478(03)00022-6

Muhammad, Sameer. Sheikh.et al., 2020. An Improved Automatic Traffic Incident Detection Technique Using a Vehicle to Infrastructure Communication.https://downloads.hindawi.com/

Rakauskas, M. E., Ward, N. J., &Gerberich, S. G. (2009).Identification of differences between rural and urban safety cultures.*Accident Analysis & Prevention*, *41*(5), 931-937. https://doi.org/10.1016/j.aap.2009.05.008

Reisch, L. A., &Sunstein, C. R. 2016. Do Europeans like nudge?.https://www.cambridge.org/

Richer, I., & Bergeron, J. (2012).Differentiating risky and aggressive driving: Further support of the internal validity of the Dula Dangerous Driving Index.*Accident Analysis & Prevention*, *45*, 620-627. https://doi.org/10.1016/j.aap.2011.09.014

Sârbescu, P. (2012). Aggressive driving in Romania: Psychometric properties of the Driving Anger Expression Inventory. *Transportation Research Part F: Traffic Psychology and Behaviour*, *15*(5), 556-564. https://doi.org/10.1016/j.trf.2012.05.009

Sârbescu, P., &Maricuţoiu, L. (2019). Are you a “bad driver” all the time? Insights from a weekly diary study on personality and dangerous driving behavior. *Journal of Research in Personality*, *80*, 30-37. https://doi.org/10.1016/j.jrp.2019.04.003

Sullman, M. J., & 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

Wells-Parker, E., Ceminsky, J., Hallberg, V., Snow, R. W., Dunaway, G., Guiling, S., Williams, M., & Anderson, B. (2002). An exploratory study of the relationship between road rage and crash experience in a representative sample of US drivers. *Accident Analysis & Prevention*, *34*(3), 271-278. https://doi.org/10.1016/S0001-4575(01)00021-5

World Health Organization (WHO) (2020).World Health Organization (WHO).https://www.who.int/

World Health Organization (WHO) (2022).World Health Organization (WHO). https://www.who.int/

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August 7, 2023

TO WHOM IT MAY CONCERN

Capital University of Science and Technology (CUST) is a federally chartered university. The university is authorized by the Federal Government to award degrees at Bachelor's, Master's and Doctorate level for a wide variety of programs.

Ms. Maryam Khalid, registration number **BSP201001** is a bona fide student in BS Psychology program at this University from Spring 2020 till date. In partial fulfillment of the degree, she is conducting research on "Development and feasibility testing of behavioral insight intervention: a study on improving traffic management and reducing driving fatigue and dangerous violations on a university campus". In this continuation, the student is required to collect data from your institute.

Considering the forgoing, kindly allow the student to collect the requisite data from your institute. Your cooperation in this regard will be highly appreciated.

Please feel free to contact undersigned, if you have any query in this regard.

Best Wishes,

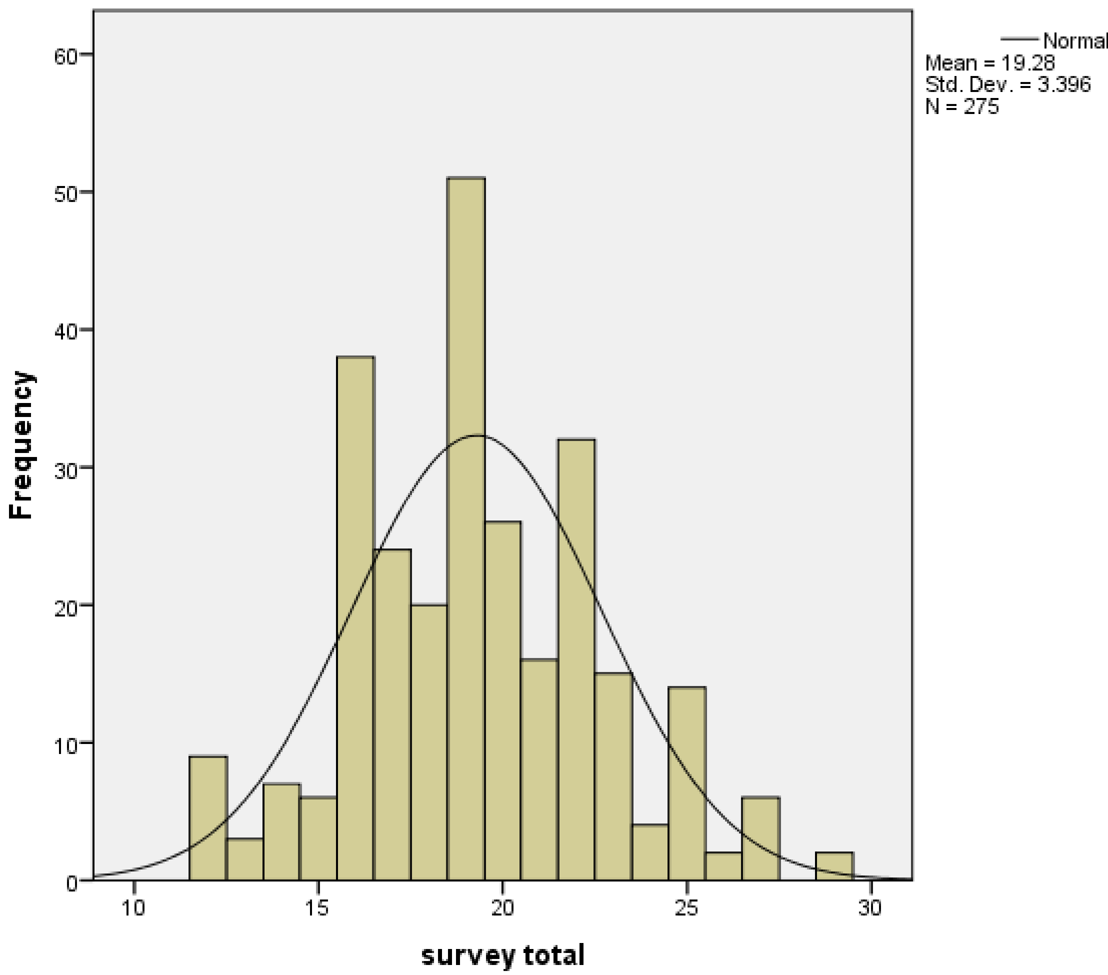
Dr. Sabahat Haqqani
Head, Department of Psychology
Ph No. 111-555-666 Ext: 178
sabahat.haqqani@cust.edu.pk

Appendix I

Histograms

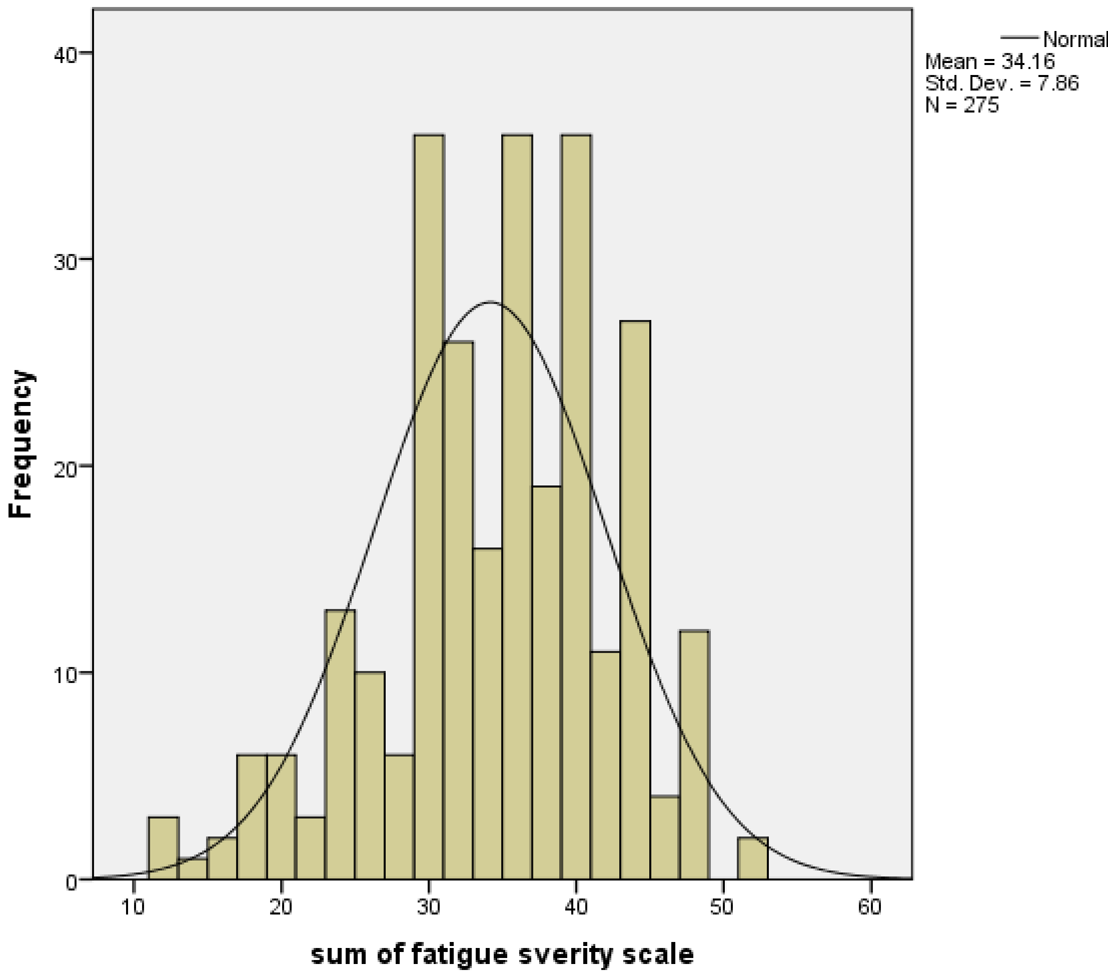
Histogram of Survey questionnaire

Distribution of survey questionnaire (N=275)



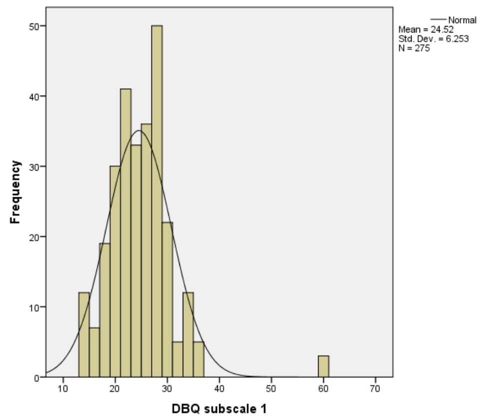
Histogram of Fatigue Sverity Scale (FSS)

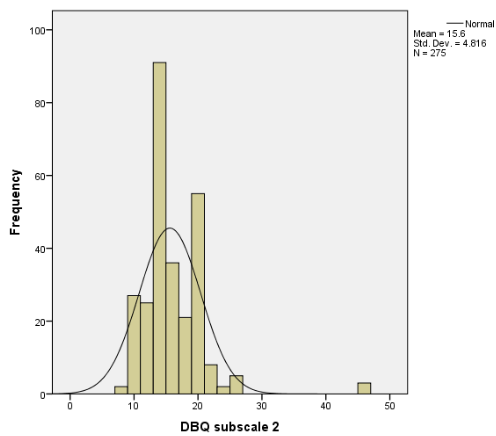
Distribution of Fatigue Sverity Scale

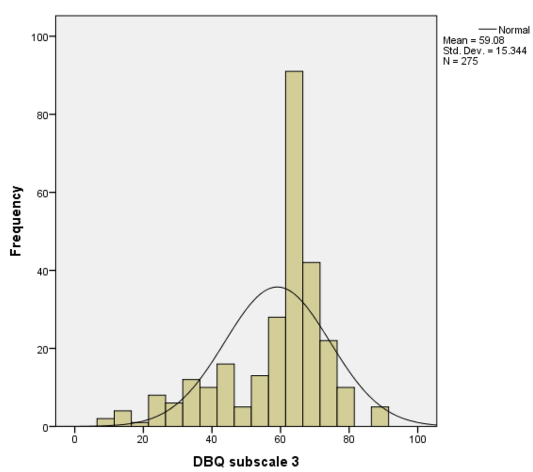


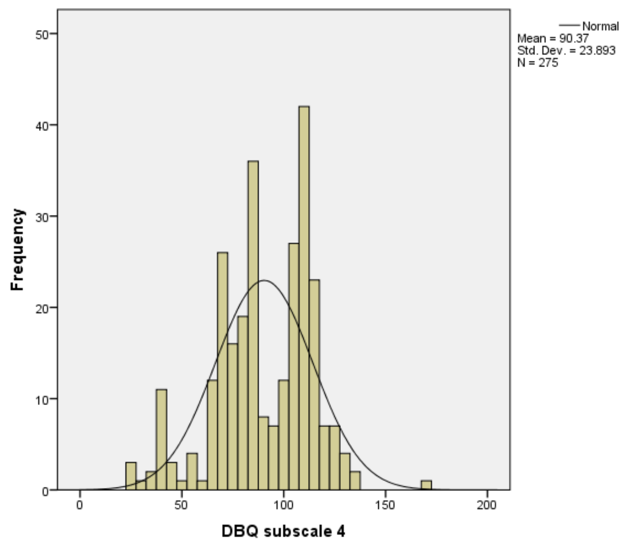
Histogram of Driver Behavior Questionnaire

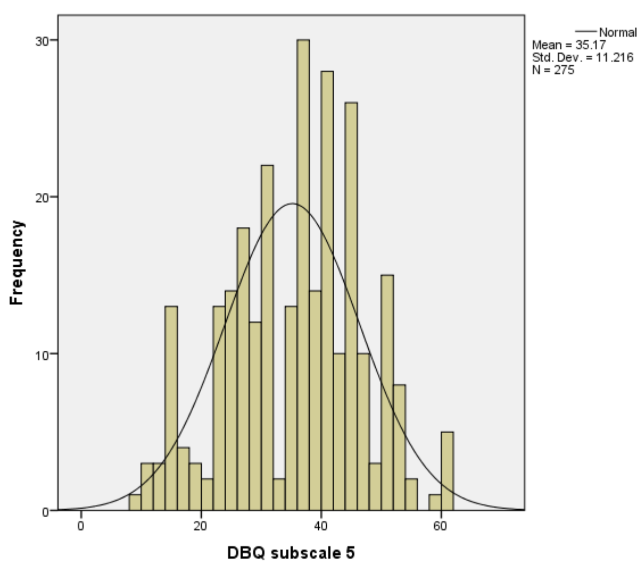
Distribution of driver behavior questionnaire








Normal
Mean = 90.37
Std. Dev. = 23.893
N = 275
Frequency
DBQ subscale 4
0
10
20
30
40
50
0
50
100
150
200


Normal
Mean = 35.17
Std. Dev. = 11.216
N = 275
Frequency
DBQ subscale 5
0
10
20
30
0
20
40
60

Appendix II

Survey Questtionnaire

Inform concent

Demographic sheet

Please tick the appropriate answer.

Traffic Congestion 1. Have you observed instances of drivers breaking into lanes to bypass traffic?	Yes		No		
2. Do you believe that barriers separating inbound and outbound lanes affect traffic flow positively or negatively?	Positively		Negatively		No impact
Driver Behavior 1. Have you encountered aggressive driving behaviors, such as aggressive lane changes or over speeding on the campus roads?	Frequently	Often	Some time		Never
2. Do you feel that drivers on campus often exhibit impulsive actions due to the urgency to exit the campus?	Yes		No		
3. It is very hard for me to wait in the lane after spending the whole day in the university (1 being very difficult and 5 very easy).	Frequently	Often	Sometime	Rarely	Never
Types of Violations 1. Which traffic violations have you noticed most frequently on campus? (Select all that apply)	Lane-breaking		Abrupt lane changes		
Other (please specify)					
Role of Guards: 1. Have you interacted with campus guards who manage traffic?	Yes		No		
2. How would you rate the effectiveness of campus guards in handling traffic issues on a scale of 1 to 5 (1 being very ineffective and 5 being highly effective)?	Frequently	Often	Sometimes	Rarely	Never
Parking Challenges: 1. Have you experienced issues related to improper parking, especially by specific company vans on campus?	Yes		No		
2. Do you feel frustrated when others park wrong in the exit lane and make the exit lane congested?	Frequently	Often	Sometimes	Rarely	Never
3. How often do vehicles encroach upon pedestrian lanes, causing inconvenience to pedestrians?	Frequently	Occasionally	Rarely	Never	

Consent Form

This study is carried out as a bachelor's thesis by Maryam Khalid under supervision of Dr. Sabahat Haqqani from the Psychology Department at Capital University of Science and Technology, Islamabad. This determine relationship between fatigue of drivers with risky driving behavior. The data will be kept confidential and privacy will be maintained. The data collected will be used for research purpose only. Participation in this study is entirely voluntary. You may withdraw anytime point and it will not incur any penalty on the part of the participant. Your participation will be highly appreciated. Please carefully read each instruction and ensure that information is understood. You may ask the researcher in case you have further query. Please confirm that you want to participate in this study by providing your consent below.

You can contact on given email address in case of any queries,

Email: hod.psy@cust.edu.pk

Signature

Demographic sheet

Name:
Age:
Sex:
Driving license: Yes/ No
Weekly driving hours: ________________
How much time it takes you to reach home: _________________________.
Please describe do you drive in university on regular basis? Y/N

Appendix III

Fatigue Sverity scale (FSS)

Please tick the appropriate answer.

1. My motivation is lower when I am fatigued.	Strongly disagree	Slightly disagree	disagree	Neutral	agree	Slightly agree	Strongly agree
2. Exercise brings on my fatigue.	Strongly disagree	Slightly disagree	disagree	Neutral	agree	Slightly agree	Strongly agree
3. I am easily fatigued.	Strongly disagree	Slightly disagree	disagree	Neutral	agree	Slightly agree	Strongly agree
4. Fatigue interferes with my physical functioning.	Strongly disagree	Slightly disagree	disagree	Neutral	agree	Slightly agree	Strongly agree
5. Fatigue causes frequent problems for me.	Strongly disagree	Slightly disagree	disagree	Neutral	agree	Slightly agree	Strongly agree
6. My fatigue prevents sustained physical functioning.	Strongly disagree	Slightly disagree	disagree	Neutral	agree	Slightly agree	Strongly agree
7. Fatigue interferes with carrying out certain duties and responsibilities.	Strongly disagree	Slightly disagree	disagree	Neutral	agree	Slightly agree	Strongly agree
8. Fatigue is among my most disabling symptoms.	Strongly disagree	Slightly disagree	disagree	Neutral	agree	Slightly agree	Strongly agree
9. Fatigue interferes with my work, family, or social life.	Strongly disagree	Slightly disagree	disagree	Neutral	agree	Slightly agree	Strongly agree

Please mark an "X" on the number line which describes your global fatigue with 0 being worst

and 10 being normal.

0	1	2	3	4	5	6	7	8	9	10

Appendix IV

Driver Behavior Questionnaire

Please tick the appropriate answer.

1. How frequent do you drive?	Almost every day	A few days a week	A few days a month	A few times a year	Never
2. What type of driving do you usually do?	Short distance travel (50km-200km round trip)	Middle distance travel (201km-500km round trip)		Long distance travel (>500km round trip)	
3. How frequent do you drive on the highway?	Almost every day	A few days a week	A few days a month	A few times a year	Never
4. How frequent do you drive in the city or town?	Almost every day	A few days a week	A few days a month	A few times a year	Never
5. How frequent do you drive in the outskirt or rural area?	Almost every day	A few days a week	A few days a month	A few times a year	Never
6. Do you practice speeding while driving?	Never	Rarely	Occasionally	Often	Always
7. How frequent do you speed on the highway?	Never	Rarely	Occasionally	Often	Always
8. How frequent do you speed in the city or town?	Never	Rarely	Occasionally	Often	Always
9. How frequent do you speed in the outskirt or rural area?	Never	Rarely	Occasionally	Often	Always

10. What is/are the reason(s) of you speeding? (you may tick more than one options)

It is fun.

Driving fast keeps me awake.

Running late for work/ interviews/ fetch kids from school/ etc.

I am very familiar with the road.

I wasn't aware of the speed limit of the location.

I wasn't aware of the speed I'm travelling in.

The road designs encourage speeding.

When I am feeling stressed.

My car is built to speed.

In order to keep up with surrounding traffic.

When I am on a long journey.

When under pressure from another driver following close behind me.

When driving on quiet roads with little or no traffic.

When another driver flashes their headlights or sounds their horn behind me.

When I was overtaken by another vehicle.

When I am listening to certain types of music in the car.

I feel the urge to show-off or assert myself.

The passengers are encouraging me to drive faster.

I seldom get caught for speeding.

Please tick (√) or fill in your answers in the space provided.

1. As a driver, have you been caught for any traffic violations? How frequent you were caught?	Yes	Rarely	Occasionally	Often	Always	Never
2. What is/ are the traffic offences you have violated?						
3. As a driver, have you been caught for speeding? How frequent you were caught for speeding?	Yes	Rarely	Occasionally	Often	Always	Never
4. As a driver, how many road accidents have you involved in (including minor & injury free road accidents)?						
5. As a driver, how many road accidents due to speeding have you involved in (including minor & injury free road accidents)?						

Please rate from 1 to 10 for the following questions

1. In your opinion, rate the following reasons to the high rate of road accidents.										
(i) Driver- related factors	1	2	3	4	5	6	7	8	9	10
(ii) Vehicle- related factors	1	2	3	4	5	6	7	8	9	10
(iii) Environmental factors (road design and infrastructure-related factors, weather, time of day, presence of passengers/ pedestrians, animal crossings etc)	1	2	3	4	5	6	7	8	9	10
2. In your opinion, rate the following driving behaviors which attributed to the high rate of road accidents.										
(i) Speeding	1	2	3	4	5	6	7	8	9	10

(ii) Aggressive- driving	1	2	3	4	5	6	7	8	9	10
(iii) Mobile phone usage	1	2	3	4	5	6	7	8	9	10
(iv) Drug and drink driving	1	2	3	4	5	6	7	8	9	10
(v) Fatigue driving	1	2	3	4	5	6	7	8	9	10
(vi) Stress or workload driving	1	2	3	4	5	6	7	8	9	10

Please rate from 1 to 10, which best describe you.

1. In general, I drive faster than other drivers.	1	2	3	4	5	6	7	8	9	10
2. Whenever my friends are with me in the car, I tend to drive faster.	1	2	3	4	5	6	7	8	9	10
3. Whenever my family is with me in the car, I tend to drive safer.	1	2	3	4	5	6	7	8	9	10
4. I get a real thrill out of driving fast.	1	2	3	4	5	6	7	8	9	10
5. Traffic violations does not necessarily lead to road accident, so it is worthwhile taking risks on the road.	1	2	3	4	5	6	7	8	9	10
6. When driving on an unfamiliar road, I tend to drive slower.	1	2	3	4	5	6	7	8	9	10
7. My heart beats harder/ faster whenever I speed.	1	2	3	4	5	6	7	8	9	10
8. Driving is stressful, unless necessary I do not drive.	1	2	3	4	5	6	7	8	9	10
9. I get impatient during the rush hour.	1	2	3	4	5	6	7	8	9	10
10. In a traffic jam, I think of ways to get through the traffic faster.	1	2	3	4	5	6	7	8	9	10
11. In a traffic jam, when the lane next to me starts to move, I try to move into that lane as soon as possible.	1	2	3	4	5	6	7	8	9	10
12. I drive through traffic lights that have just turned red.	1	2	3	4	5	6	7	8	9	10
13. I accelerate harder when the traffic lights turned yellow.	1	2	3	4	5	6	7	8	9	10
14. I enjoy cornering at high speed.	1	2	3	4	5	6	7	8	9	10
15. “Who cares about speed limit? I drive my way”	1	2	3	4	5	6	7	8	9	10

Please rate from 1 to 10 for the following questions.

Situation A1: It is raining heavily at night and you are driving at 90km/h in a rural area without street lamps. Suddenly, a cow crosses the road 5m away from you. How likely that you will involve in an accident?	1	2	3	4	5	6	7	8	9	10
Situation A2: It is raining heavily at night and you are driving at 45km/h in a rural area without street lamps. Suddenly, a cow crosses the road 5m away from you. How likely that you will involve in an accident?	1	2	3	4	5	6	7	8	9	10

Situation B1: You are going to be late for work in the city and hence you speed up to 90km/h on a 50km/h road. You are 5m away and the traffic light turn red and a pedestrian starts crossing the road without noticing you. How likely that you are to hit the pedestrian?	1	2	3	4	5	6	7	8	9	10
Situation B2: You are going to be late for work in the city but you abide to the speed limit of 50km/h. You are 5m away and the traffic light turn red and a pedestrian starts crossing the road without noticing you. How likely that you are to hit the pedestrian?	1	2	3	4	5	6	7	8	9	10
Situation C1: It is a clear blue sky and therefore you confidently drive at 160km/h on the highway. Suddenly your rear tyre burst. How likely that you will lose control of your car and lead to road accidents?	1	2	3	4	5	6	7	8	9	10
Situation C2: It is a clear blue sky and therefore you confidently drive at 100km/h on the highway. Suddenly your rear tyre burst. How likely that you will lose control of your car and lead to road accidents?	1	2	3	4	5	6	7	8	9	10