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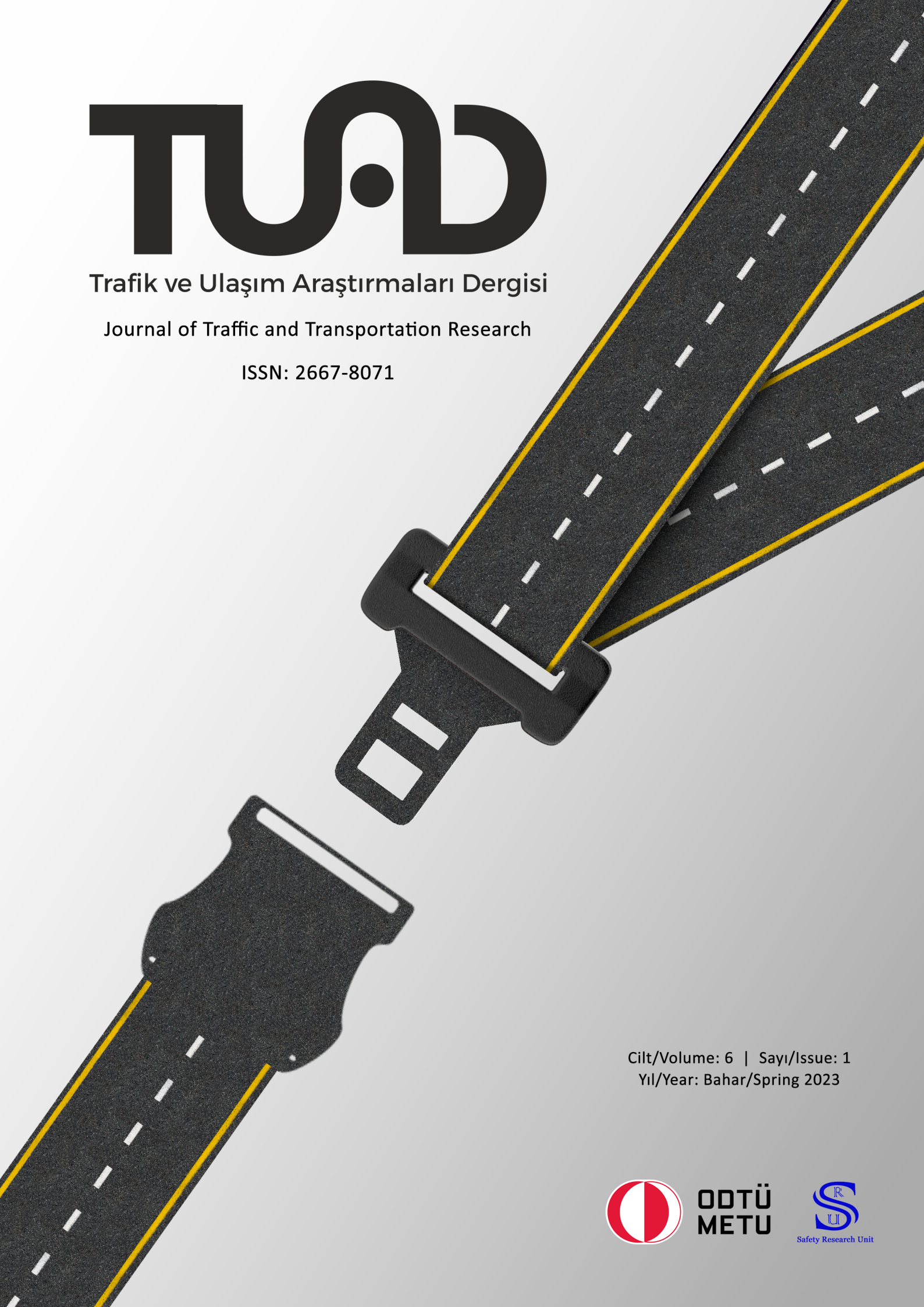

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Safety Research Unit

TRAFİK VE ULAŞIM ARAŞTIRMALARI DERGİSİ

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TUAD
Trafik ve Ulaşım Araştırmaları Dergisi

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Baş Editör'den | Editor-in-Chief's Note

Trafik ve Ulaşım Araştırmaları Dergisi'nin Değerli Okurları,

Dergimizin 6. Cildinin 1. Sayısını sizlerle paylaşmanın heyecanını ve mutluluğunu yaşıyoruz. 2023 yılı Bahar sayımız farklı uzmanlık alanlarından araştırmacıların trafik güvenliği ile ilgili makalelerinden oluşmaktadır.

Bahar sayımız kapsamında dördü araştırma, biri derleme makalesi olmak üzere beş makale yer almaktadır. Araştırma makalelerimizin ilki, Çetin ve arkadaşları tarafından yürütülmüş olan, sürücü öfke ifadesi ve sürücü davranışları odağında sorumluluğun sürücülük temelinde incelendiği bir çalışmayı içermektedir. Kırmızı tarafından hazırlanmış olan ikinci makalemiz, günümüz kentlerindeki ulaşım eşitsizliği üzerine yapılmış bir araştırmadır. Üçüncü makalemiz, Doğan ve arkadaşları tarafından hazırlanmış olan Devrekani Kavşağı örneği üzerinden köprülü kavşak sistemlerinin kazaları azaltmadaki etkisini inceleyen bir araştırma makalesidir. Gülada ve arkadaşları tarafından hazırlanan dördüncü araştırma makalemizde, kamu spotlarının nitel analizi yoluyla emniyet kemerleri kullanımın trafik güvenliğindeki rolü incelenmiştir. Bahar sayımızın son makalesi olan, Yanar tarafından hazırlanmış derleme makalemizde ise yazarımız, gelişmekte olan ülkelerdeki ara toplu taşıma sistemlerinin yükselişinin ve hızlı otobüs taşımacılığı sistemlerinin çözüm olarak değerlendirilmesinin incelendiği bir derleme çalışması yapmıştır.

Bildiğiniz gibi Şubat ayında meydana gelen ve çok sayıda vatandaşımızı kaybettiğimiz depremler sonucunda ülkece büyük üzüntüler ve zorluklar yaşadık. Depremlerin gerçekleştiği günlerden bu yana geçen süreçlerden, tüm hayat akışımızla birlikte çalışmalarımız da etkilendi. Böyle bir dönemde, farklı boyutlarda yaşadığımız tüm zorluklara rağmen 2023 Bahar sayımızın sorunsuz bir şekilde yayımlanabilmesi için sürecimize tam destek veren tüm makale yazarlarımıza, hakemlerimize, yayın kurulu üyelerimize ve editörlerimize sonsuz teşekkürlerimi sunarım.

Dördüncü cildinden itibaren TR Dizin kapsamında dizinlenmekte olan TUAD'ın yeni sayısının trafik ve ulaşım araştırmaları literatürüne ve yol güvenliği uygulamalarına anlamlı katkılarda bulunacağını umuyor; trafik ve ulaşım ortamları ile ilgili farklı disiplinlerden araştırmacıların katkılarıyla daha da zenginleşeceğini düşündüğümüz 2023 Güz sayımızda buluşana dek sağlıklı ve güzel bir dönem geçirmenizi diliyorum.

Saygılarımla.

Doç. Dr. Bahar Öz

TUAD, 2023, 6(1), 1–16

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Araştırma Makalesi

Investigating Responsibility in the Driving Context: Associations with Driving Anger Expressions and Driver Behaviors

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Abstract

The aim of this study is to explore the predicting role of responsibility (behavioral responsibility and feeling of responsibility) on driving anger expressions (verbal, personal physical, use of vehicle, and adaptive/constructive) and driver behaviors (ordinary and aggressive violations, errors, and lapses). A sample of 279 drivers (188 female and 91 male) completed an online survey which included Driver Behavior Questionnaire, Driving Anger Expression Inventory, and Feelings of Responsibility and Behavioral Responsibility Scale. Hierarchical regression analyses partially supported the expectations. Accordingly, behavioral responsibility, but not feelings of responsibility, was found as a predictor for driver behaviors. In detail, behavioral responsibility was a significant predictor for ordinary violations, errors and lapses, but not for aggressive violations. Additionally, behavioral responsibility negatively predicted verbal anger expression, feeling of responsibility negatively predicted use of the vehicle to express anger and lastly, behavioral responsibility positively predicted adaptive/constructive anger expression. Lastly, mediation analyses were conducted to investigate the indirect relationships between variables. The difference between patterns of results of the analyses with behavioral responsibility and feelings of responsibility highlights the difference between feeling and behavior, that is two concepts based on different psychological backgrounds do not necessarily lead to one another. The results were discussed in the framework of the related literature.

Keywords: driver behavior, driving anger expression, responsibility

Sorumluluğun Sürücülük Bağlamında İncelenmesi: Sürücü Öfke İfadesi ve Sürücü Davranışları

Öz

Bu çalışmanın amacı, sorumluluğun (davranışsal sorumluluk ve sorumluluk duygusu) sürücülük öfke ifadeleri (sözel, kişisel fiziksel, araç kullanımı ve uyarlanabilir/yapıcı) ve sürücü davranışları (sıradan ve saldırgan ihlaller, hatalar) üzerindeki yordayıcı rolünü araştırmaktır. 279 sürücüden oluşan bir örneklem (188 kadın ve 91 erkek), Sürücü Davranışı Anketi, Sürücü Öfke İfadesi Envanteri ve Sorumluluk Duygusu ve Davranışı Ölçeğini içeren çevrimiçi bir anketi tamamlamıştır. Hiyerarşik regresyon analizleri sonuçları araştırmanın beklentilerini kısmen desteklemektedir. Buna göre, davranışsal sorumluluğun sürücü davranışlarının bir yordayıcısı olduğu, sorumluluk duygusunun ise olmadığı bulunmuştur. Ayrıntılı olarak, davranışsal sorumluluğun, sıradan ihlaller, hatalar ve ihmaller ile ilişkili olduğu, ancak saldırgan ihlaller için ilişkili olmadığı desteklenmiştir. Bunun dışında, davranışsal sorumluluk sözel öfke ifadesini olumsuz yönde, sorumluluk duygusu öfkeyi ifade etmek için araç kullanımını yine olumsuz yönde yordamış ve son olarak davranışsal sorumluluk uyum sağlayıcı/yapıcı öfke ifadesini olumlu yönde yordamıştır. Son olarak, değişkenler arasındaki dolaylı ilişkileri test etmek için aracılık analizlerine de başvurulmuştur. Davranışsal sorumluluk ve sorumluluk duyguları ile yapılan analizlerin sonuçlarının arasındaki fark, duygu ve davranış arasındaki farkı, yani farklı psikolojik arka planlara dayanan iki kavramın mutlaka birbirine yol açmadığını vurgulamaktadır. Sonuçlar ilgili literatür çerçevesinde tartışılmıştır.

Anahtar kelimeler: sürücü davranışları, sürücü öfke ifadesi, sorumluluk

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Investigating Responsibility in the Driving Context: Associations with Driving Anger Expressions and Driver Behaviors

Just like the rest of the world, human factors are considered as a prominent contributor to traffic accidents in Turkey. One component of human factors is driver behavior which can be considered as a habitual driving style that drivers generally prefer to engage in (Elander et al., 1993). Driver behavior is affected by many factors such as beliefs (Fhaner & Hane, 1975), intentions (Chliaoutakis et al., 2000), driver's personality characteristics such as aggressiveness (Dukes et al., 2001), impulsiveness (Bıçaksız & Ozkan, 2016; Dahlen et al., 2005), demographic characteristics such as driving experience (Li et al., 2015), young age (Abdel-Aty & Abdelwahab, 2000). In the present study, we investigated the links between another individual difference variable, namely responsibility, with driver behavior after controlling for age, gender, and mileage.

Reason et al. (1990) examined driver behaviors under two different main headings which are errors and violations. Errors are not being able to practice the planned actions and consequences whereas violations are deliberate changes in actions that are known to depart from safety (Reason et al., 1990). The main difference between these two categories is based on behavioral intention. This distinction was outstanding in the sense that it is claimed there are different psychological mechanisms for violations and errors. In addition, lapses are when the intention does not match with the driver's behavior and are mostly memory-related failures (Özkan & Lajunen, 2005).

Previous literature emphasizes the relation between driver behavior and emotions mostly from the perspective of risky driving. Reichardt (2008) claimed a model that driver behavior is affected by emotions that are related to risk assessment. This finding was taken further by Hu and colleagues (2013) who argued negative emotions are associated with a higher probability of risky driver behavior. In this sense, it is not surprising that anger was found to be related to driver behavior in the way that it leads to risky driving actions such as high speed (Wickens et al., 2011) and lower lane control (Cai et al., 2007). Yagil (2001) claimed that aggression and evaluation of the driver's own violations in traffic are related. It is important to mention that this relation is formed regardless of state anger or trait anger (Deffenbacher et al., 2002). Meaning that not only aggression in traffic leads to risky driver behaviors and violations, but also more aggressive drivers do not perceive violations as dangerous as they are. Drivers think and evaluate before violating unless it becomes a habit, and if this evaluation leads to perceiving more negative consequences such that getting a ticket or disapproval by others, then drivers are less likely to violate (Parker et al., 1996). Therefore, it is possible to say that drivers' characteristics such as feeling of responsibility and behavioral responsibility can be reflected in their driver behaviors.

1.1. Responsibility

The definition of responsibility is accepting and owning any kind of outcome when making a decision (Botti & McGill, 2006). Perceived responsibility in situations may influence how people behave. This reflection of perceived responsibility on behavior was shown in various ways such as on consumer behavior (Becker-Olsen et al., 2006) and social motivation (Weiner, 1993), in addition to self-regulatory behavior (Autry, 1982).

Schlenker and colleagues' (1994) The Triangle Model of Responsibility (TMR) yields a deeper understanding of the concept by investigating perceived responsibility under three main elements. The event, as the first element refers to the action which corresponds to the driver behavior in traffic context. Prescriptions as the second element refers to rules that are referrals for the behaviors which correspond to traffic rules and regulations. The identity as the third

element refers to the characteristics of the individual which correspond to driver characteristics (e.g. age, driving experience). The model suggests that strong association between prescriptions and identity is an indicator for high perception of responsibility (DeZoort & Harrison, 2018). In other words, drivers with higher perceived responsibility are more likely to embrace the traffic rules and regulations. As a result, it can be expected that such drivers will have a lower tendency to violate the rules.

Additionally, sense of control was linked to perceived responsibility in several studies (e.g., Jörling et al., 2019; Schlenker et al., 1994; Weiner, 1993). This link of higher control and higher perceived responsibility may indicate that the drivers who have a higher sense of control over their behavior in traffic are the ones that have higher perception of responsibility as well as the ones that are less likely to error.

Perceived responsibility can be investigated through responsibility feelings of responsibility and behavioral responsibility which are correlated with one another (Conrad & Hedin, 1981). The difference between feelings of responsibility and behavioral responsibility can be generalized to any other kind of feeling-behavior difference. In other words, the feeling is not a direct reason of a specific behavior. Theory of Planned Behavior (TPB) suggested that behavior is affected by attitude, norm, perceived behavioral control and intention (Ajzen, 1985). Although feelings of responsibility and behavioral responsibility are highly correlated, it would be wrong to assume that they always coexist. It was suggested that one's perceived responsibility is associated with evaluation of the decision on an emotional level (Botti & McGill, 2006). In fact, perceptions of responsibility on a given topic leads to more self-conscious and prosocial behavior (De Groot & Steg, 2009). Therefore, drivers who perceive themselves as responsible can be expected to engage in behaviors considering others in traffic.

Furthermore, Gosling and colleagues (2006) claimed that denial of responsibility is a way to reduce dissonance such that people unconsciously perceive little or no responsibility in order to solve the conflict between thoughts and behavior. Previous research indicates that having the reluctance to take responsibility is positively correlated with anger (Arslan, 2010) and there is a significant association between experiencing anger and aggressive driving behavior (Nesbit et al., 2007). Feeling negative emotions are considered normal; however, what makes a difference is the expression of them. Since aggressive driver behavior is a way of anger expression in traffic, it is possible to claim that responsibility feelings and responsible behaviors might be related to anger expression in traffic.

1.2. Driving Anger Expression

Anger is defined not only as an emotion but also as an experience that a person undergoes when sensing a threat (Novaco, 2011) and its consequence is very likely to be aggression (Berkowitz, 1990). Having experienced the same level of anger in equal situations may lead to different expressions of anger in different people. Therefore, what is more important than the anger itself is how anger is expressed. In addition, anger expressions can be situation-specific which means daily life's anger expression can be different from anger expression in traffic (Deffenbacher et al., 2002).

People express anger in numerous ways and these can be differentiated in terms of adaptiveness. Driving Anger Expression Inventory (DAX; (Deffenbacher et al., 2002), investigated anger expression four subheadings: Verbal Aggressive Expression, Personal Physical Aggressive Expression, Use of Vehicle to Express Anger, and Adaptive/Constructive Expression. The first three of these expressions are considered maladaptive, whereas the fourth expression is adaptive. Verbal Aggressive Expression refers to expressing anger with words such as yelling and cursing. Personal Physical Aggressive Expression refers to expressing anger through using

one's own body nonverbally. For instance, hostile gestures or physical fights. Use of Vehicle to Express Anger refers to using the vehicle itself instead of verbal or personal physical expression such as cutting in front of the other driver and flashing the lights at other drivers. Adaptive/Constructive Expression refers to the driver's intention to solve the problem in expressing anger such as taking a deep breath to calm down and using distractions to distance themselves from frustrations in traffic. Although these terms are situation-based, in traffic, adaptive/constructive anger expression is considered adaptive and related to safe driver behavior, whereas expressing anger through engaging in the physical assault is considered non-adaptive and related to risky driver behavior (Deffenbacher et al., 2002). Individual differences in problem-solving methods and anger expression also show their reflections on driver behavior. The way of expressing anger in a maladaptive way was found to be correlated with risky driving (Deffenbacher et al., 2002) and sensation seeking (Dahlen et al., 2006). In short, the emotion of anger in traffic-related behavior has been an important topic for researchers because it has been thought that it leads to many undesirable yet drastic consequences such as deaths or irreversible injuries.

1.3. Aim of the Study

The aim of the study was to examine responsibility in the driving context. Specifically, we investigated the associations of feeling of responsibility and behavioral responsibility with driver behaviors and driving anger expressions. Considering the well-established links between driving anger expression and driver behaviors (Deffenbacher et al., 2002), it can be also expected that responsibility predicts driver behaviors through driving anger expression. As an exploratory analysis, we also tested the mediating role of driving anger expression in the relationship between responsibility and driver behaviors.

2. Method

2.1. Participants

The data is collected from 279 (188 females, 67%; 91 males, 33%) adult participants who have reached the age of 18 and are native Turkish speakers. All participants had driving licenses and identified themselves as active drivers. Participants had a mean age of 34 years with the range from 18 to 69 years (*SD* = 10.9). The mean annual mileage the participants had was 15867 km (range 500-200000).

2.2. Measures

2.2.1. Driver Behavior Questionnaire (DBQ).

To measure lapses, errors, and violations in the traffic, Driver Behavior Questionnaire (DBQ) were used in the study. DBQ was developed by Reason and colleagues (1990) and adapted to Turkish by Sümer and colleagues (2002) and Sümer and Özkan (2002). DBQ has 28 items that were formed of lapses (n=8), errors (n=8), aggressive violation (n=3) and ordinary violations (n=9). This scale is a 6-point Likert-type scale from 0 (Never) to 5 (Nearly All the Time) which asks how often drivers committed each behavior when driving. Higher scores indicate higher levels of violations, errors, and lapses in traffic. After deleting item 13 from the error subscale, the internal consistency coefficient (Cronbach's Alpha) of the subscales for the Driver Behavior Questionnaire was found as follows: .61 for lapses, .65 for errors, .73 for ordinary violations, and .73 for aggressive violations.

2.2.2. Responsibility Feeling and Behaviors Scale (RFBS).

Responsibility Feeling and Behaviors Scale (RFBS) was used to measure the degree to which an individual's sense of responsibility affects one's life and how it is reflected in behavior. The scale is developed by Özen (2013) for the Turkish population. There are 18 items in the scale that ask the frequency of experienced responsibility feelings in social situations and the responsible behaviors along with such feelings. Each item was rated for both feeling and behavior on a 4-point Likert-type scale from 1 (Never) to 4 (Always). Higher scores indicate higher feelings of responsibility and higher behavioral responsibility. The Cronbach's Alpha internal consistency coefficient of the feeling of responsibility subscale is .83 and the behavioral responsibility subscale is .85.

2.2.3. Driving Anger Expression Inventory (DAX).

The Driving Anger Expression Inventory (DAX) was used to measure drivers' anger expressions in traffic. This scale was developed by Deffenbacher and colleagues (2002) and adapted to Turkish by Eşiyok and colleagues (2007). In total, the scale has 49 items which includes four different subscales: Verbal Aggressive Expression (n=12), Personal Physical Aggressive Expression (n=11), Use of the Vehicle to Express Anger (n=11), and Adaptive/Constructive Expression (n=15). Drivers were asked to indicate their frequency of possible anger expressions in different situations in traffic on a 4 Point-Likert scale from 1 (Almost Never) to 5 (Almost always). Higher scores indicate higher levels of anger expression in each subscale. The Cronbach's alpha internal consistency coefficient of Verbal Aggressive Expression is .86, Personal Physical Aggressive Expression is .82, Use of the Vehicle to Express Anger is .86, and Adaptive/Constructive Expression is .89.

2.3. Procedure

Ethical approval was received from the Scientific Research and Publication Ethics Committee of Başkent University (62310886-604.99). All the data were collected through Qualtrics, an online survey website. The participants were assured of anonymity and confidentiality via informed consent form. Then, the participants answered three different scales (DBQ, RFBS, DAX) which were counterbalanced. A demographic form was given after the questionnaires. After participants answered the questions, a debriefing form was presented to give the participants detailed information about the main purpose of the study.

2.4. Data Analysis

Prior to analysis, the data were examined in terms of the major assumptions of multivariate analysis and no assumption violation was detected. Then, bivariate correlations between the study variables were calculated. After that, a series of hierarchical multiple regression analyses were carried out with each of the driving anger expression dimensions and driver behavior dimensions as the DV, behavioral responsibility and feeling of responsibility as the predictors, and age, gender, and annual mileage as the control variables. Finally, a series of mediation analyses were conducted to examine the mediating role of driving anger expression in the relationship between responsibility and driver behaviors, after controlling for age, gender and annual mileage.

3. Results

3.1. Correlations between Demographic Variables, Responsibility, Driving Anger Expression, and Driver Behaviors.

In Table 1, the correlations among study variables (i.e., age, gender, annual mileage, responsibility subscales, and driving anger expression subscales) and their means and standard deviations are presented. Accordingly, age had significant positive correlations with responsibility feeling and behavior, and negative correlations with verbal anger expression and use of the vehicle to express anger, ordinary and aggressive violations, and lapses. Being female had significant negative correlations with annual mileage, personal physical and vehicle anger expressions, ordinary violations, and errors, and a significant positive correlation with constructive anger expression. Annual mileage had significant positive correlations with personal physical anger expression and ordinary violations.

Responsibility feelings and behaviors had significant negative correlations with verbal and personal physical anger expression, and use of the vehicle to express anger, on the other hand, they both have positive correlations with constructive anger expression. Additionally, responsibility feelings and behaviors negatively correlated with ordinary and aggressive violations and lapses. Responsibility behaviors have significant negative correlations with errors, but responsibility feelings do not relate to errors.

Ordinary and aggressive violations, errors, and lapses have significant positive correlations with all of the driver's anger expressions, except constructive driving anger expression. Constructive driving anger expression is negatively correlated to the aforementioned driver behaviors. Lapses, on the other hand, was not related to constructive anger expression.

3.2. Hierarchical Regression Analysis: Predicting Driver Behaviors

Separate hierarchical regression analyses were conducted to investigate the relationship between responsibility (feeling of responsibility and behavioral responsibility) and driver behaviors after controlling for age, gender, and annual mileage. Considering the related literature, being young and male has a significant role on risky driver behaviors (Rhodes et al., 2015), thus age and gender was statistically controlled. Additionally, the statistical control of the mileage is a common practice in traffic studies, since the experience of the driver can have a great influence on the driver behaviors (Summala et al., 2014). For each subscale of the driver behavior questionnaire (ordinary and aggressive violations, lapses and errors), demographic variables as age, gender, and annual mileage were entered as control variables in the first step. In the second step, feeling of responsibility and behavioral responsibility were entered.

In the first analysis, the first model to predict **ordinary violations**, which included age, gender, and annual mileage, was statistically significant and explained 13 % of the variance (R^2_{change} = .13, $p < .001$). Age (β = -.30, SE =.00, $p < .001$) and being female (β = -.23, SE =.08, $p < .001$) were negatively related to this dimension. Annual mileage was not found as related. Model 2, which included behavioral responsibility and feeling of responsibility, significantly explained 11 % of the extra variance, (R^2_{change} = .11, $p < .001$). The only significant and negative predictor in this model was behavioral responsibility (β = -.35, SE =.15, $p < .001$). All in all, the model explained 23 % of the variances ($Adj.\ R^2.$ = .23).

In the second analysis, the first model to predict **aggressive violations**, which included age, gender, and annual mileage, was statistically significant and explained 6 % of the variance, (R^2_{change} = .06, p = .002). Age (β = -.23, SE =.00, $p < .001$) was negatively related to this dimension, while being female and annual mileage were not related. Model 2, which included

Table 1. Correlations among investigated variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13
Age (1)	1												
Gender (2)	**-.20****	1											
Annual km (3)	.12	**-.21****	1										
Responsibility: Feeling (4)	**.17****	.11	.02	1									
Responsibility: Behavior (5)	**.33****	.01	.06	**.74****	1								
DAX: Verbal (6)	**-.17****	-.01	.01	**-.15****	**-.28****	1							
DAX: Personal Physical (7)	-.03	**-.30****	**.13***	**-.15***	**-.12***	**.39****	1						
DAX: Vehicle (8)	**-.14***	**-.29****	.08	**-.27****	**-.22****	**.53****	**.68****	1					
DAX: Constructive (9)	.12	.13*	-.12	**.26****	**.31****	**-.24****	**-.27****	**-.38****	1				
Ordinary Violations (10)	**-.21****	**-.22****	**.13***	**-.31****	**-.39****	**.42****	**.46****	**.62****	**-.35****	1			
Aggressive Violations (11)	**-.22****	-.03	.09	**-.15***	**-.21****	**.61****	**.49****	**.54****	**-.30****	**.48****	1		
Errors (12)	-.02	**-.14***	.05	-.12	**-.19****	**.17****	**.14***	**.21****	**-.20****	**.42****	**.25****	1	
Lapses (13)	**-.14***	.01	-.08	**-.23****	**-.34****	**.26****	**.13***	**.23****	-.11	**.39****	**.29****	**.48****	1

Note. Gender is coded as 0= Male, 1= Female, * $p < .05$; ** $p < .01$

behavioral responsibility and feeling of responsibility was not significant. All in all, the model explained 6 % of the variance (*Adj.* R^2. = .06).

Lastly, the first model to predict **errors** was not significant. In other words, demographic variables were not related to errors. In the second model, 3% of the variances explained (R^2_{change} = .07, p < .001). The only significant and negative predictor in this model was behavioral responsibility (β = -.34, *SE* =.11, p < .001). All in all, the whole model explained 7 % of the variance (*Adj.* R^2. = .07)

The following analysis which investigates the relationship between study variables and **lapses**, revealed non-significant results for the first model. In the second model, 9% of the variance was explained by responsibility scale (R^2_{change} = .09, p < .001). In detail, behavioral responsibility was found to be negatively related to lapses (β = -.36, *SE* =.12, p < .001), while feeling responsibility was not related. All in all, the model explained 10 % of the variance (*Adj.* R^2. = .10).

3.3. Hierarchical Regression Analysis: Predicting Driving Anger Expression

Separate hierarchical regression analyses were conducted to investigate the relationship between responsibility, driving anger expression, and driver behaviors after controlling for age, gender, and annual mileage. For each subscale of the driving anger expression questionnaire (verbal aggressive expression, personal physical aggressive expression, use of vehicle to express anger, and adaptive/constructive expression), demographic variables such as age, gender, and annual mileage were entered as control variables in the first step. In the second step, feeling of responsibility and behavioral responsibility were entered.

In the first analysis, the first model to predict **verbal aggressive expression**, which included age, gender, and annual mileage, was not statistically significant. Model 2, which included behavioral responsibility and feeling of responsibility, significantly explained 7 % of the extra variance, (R^2_{change} = .07, p < .001). The only significant and negative predictor in this model was behavioral responsibility (β = -.34, *SE* =.16, p = .001). All in all, the model explained 8 % of the variances (*Adj.* R^2. = .08).

In the second analysis, the first model to predict **personal physical aggressive expression**, which included age, gender, and annual mileage, was statistically significant and explained 9 % of the variance, (R^2_{change} = .09, p < .001). Only being female was related to personal physical aggressive expression (β = .28, *SE* =.03, p < .001). Model 2, which included behavioral responsibility and feeling of responsibility was not significant. All in all, the model explained 8% of the variance (*Adj.* R^2. = .08).

In the third analysis, the first model to predict **use of vehicle to express anger** was statistically significant which included age, gender, and annual mileage, was statistically significant and explained 11 % of the variance, (R^2_{change} = .11, p < .001). Age (β = -.20, *SE* =.00, p = .002) was negatively and being female (β = .31, *SE* =.06, p < .001) was positively associated with this dimension. In the second model, 4 % of the variances explained (R^2_{change} = .04, p = .004). The only significant and negative predictor in this model was feeling of responsibility (β = -.20, *SE* =.13, p = .030). All in all, the whole model explained 14 % of the variance (*Adj.* R^2. = .14)

In the last analysis, the first model to predict **adaptive/constructive expression** which included age, gender, and annual mileage, was statistically significant and explained 4 % of the variance, (R^2_{change} = .04, p = .014). Age (β = .14, *SE* =.00, p = .028) was positively and being female (β = -.13, *SE* =.08, p = .049) was negatively associated with this dimension. In the second model, 8% of the variance was explained by responsibility scale (R^2_{change} = .08, p < .001). In detail, behavioral responsibility was found to be positively related to adaptive/constructive expression

Table 2. Results of Hierarchical Regression Analyses Examining the Associations of Responsibility with Driver Behaviors

	Ordinary Violations			**Aggressive Violations**			**Errors**			**Lapses**		
	β	*SE*	*ΔR²*	*β*	*SE*	*ΔR²*	*β*	*SE*	*ΔR²*	*β*	*SE*	*ΔR²*
Step 1			**.13****			**.06****			.03			.03
Age	**-.30****	.00		**-.23****	.00		-.03	.00		-.*15*	.00	
Gender	**-.23****	.08		-.03	.12		**-.16***	.06		-.05	.06	
Annual Mileage	.12	.00		.11	.00		.01	.00		-.08	.00	
Step 2			**.11****			**.02****			**.03***			**.09****
Feeling of Responsibility	-.00	.16		-.00	.25		.08	.14		.07	.13	
Behavioral Responsibility	**-.35****	.15		-.13	.23		**-.22***	.13		**-.36****	.12	

Note: Gender was coded as 0=men, 1=women; N = 279; *$p < .05$; **$p < .01$.

Table 3. Results of Hierarchical Regression Analyses Examining the Associations of Responsibility with Driving Anger Expression

	Verbal Aggressive Expression			**Personal Physical Aggressive Expression**			**Use of Vehicle to Express Anger**			**Adaptive/Constructive Expression**		
	β	*SE*	*ΔR²*	*β*	*SE*	*ΔR²*	*β*	*SE*	*ΔR²*	*β*	*SE*	*ΔR²*
Step 1			.03			**.09****			**.11****			**.04***
Age	**-.18****	.00		-.08	.00		**-.20****	.00		**.14***	.00	
Gender	-.03	.08		**.28****	.03		**.31****	.06		**-.13***	.08	
Annual Mileage	.03	.00		.08	.00		.03	.00		-.11	.00	
Step 2			**.07****			.01			**.04****			**.08****
Feeling of Responsibility	.11	.17		-.09	.07		**-.20***	.13		.03	.16	
Behavioral Responsibility	**-.34****	.16		-.02	.06		-.01	.12		**.28****	.15	

Note: Gender was coded as 0=men, 1=women; N = 279; *$p < .05$; **$p < .01$.

(β = .28, *SE* =.15, *p* = .003), while feeling responsibility was not significantly related. All in all, the model explained 11% of the variance (*Adj.* R^2. = .11).

3.4. Mediation Analyses

To examine the mediating role of driving anger expression in the relationship between responsibility and driver behaviors, a series of mediation models were tested via model 4 of Hayes Process Macro V.3. In these analyses, the four factors of the DAX were entered as the mediators, and either feeling of responsibility or behavioral responsibility as the IV (see Figure 1). In each analysis, age, gender and annual mileage were entered as control variables. These analyses were carried out for each of the four factors of the DBQ as the DV. Therefore, a total of eight mediation models were tested. Three of these models yielded significant total indirect effects.

First, driving anger expression significantly mediated the relationship between behavioral responsibility and ordinary violations. The bootstrapped total indirect effect was -.17 (*SE* = .09, 95 % *CI* = [-.37, -.01]). When the indirect effects of the driving anger expression dimensions were examined individually, it was found that none of them reached significance.

Second, the indirect effect of driving anger expression in the relationship between behavioral responsibility and aggressive violations was significant. The bootstrapped total indirect effect was -.43 (*SE* = .15, 95 % *CI* = [-.73, -.14]). Among the indirect effects of each driving anger expression dimension, the indirect effect of verbal aggressive expression was significant. The bootstrapped indirect effect was -.25 (*SE* = .08, 95 % *CI* = [-.41, -.11]). Behavioral responsibility was negatively associated with verbal aggressive expression (*B* = -.42, SE = .11, 95 % *CI* = [-.62, -.21]), and verbal aggressive expression in turn predicted aggressive violations positively (*B* = .62, SE = .09, 95 % *CI* = [.45, .79]).

Finally, driving anger expression significantly mediated the relationship between feeling of responsibility and ordinary violations. The bootstrapped total indirect effect was -.23 (*SE* = .11, 95 % *CI* = [-.45, -.03]). The indirect effect of none of the driving anger expression dimensions was significant.

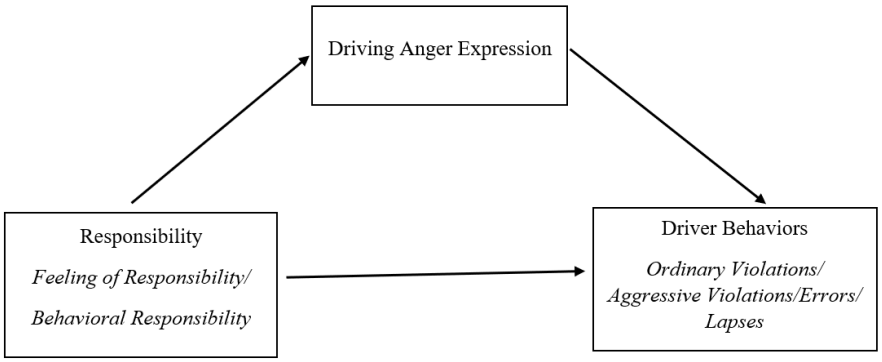

Figure 1. The conceptual framework of the mediation models tested

4. Discussion

The aim of the present study was to examine responsibility in the driving concept. More specifically, the associations of responsibility with driving anger expression and driver behaviors were tested after controlling age, gender and mileage. The results showed partially supporting evidence for the expectations regarding these relationships. In the first analysis, it was found that being young and being male were related to ordinary violations. Young driver's

tendency to commit ordinary violations is consistent with the literature that was shown in several studies (e.g., Reason et., 1990; Zhao et al., 2012). The finding related to gender is consistent with the related literature such that Golias and Karlaftis (2002) claimed females drive more safely and Kontogiannis and colleagues (2002) claimed that male drivers are more likely to violate traffic. Moreover, behavioral responsibility was associated with ordinary violations whereas feelings of responsibility was not. Taken into account the association between responsibility and prosocial behavior (De Groot & Steg, 2009), it can be claimed that responsible drivers tend to act according to the rules and violate less, because they perceive it as positive social behaviors. Also, the insignificant relationship between feelings of responsibility and ordinary violations suggests that feeling responsible is not necessarily linked to such driver behavior and action is necessary. Another possible explanation might be that responsibility might predict driver behaviors indirectly, rather than directly. We tested this alternative explanation via a series of mediation analyses in which the indirect associations of responsibility with driver behaviors through driving anger expression were tested. The results showed a significant indirect relationship between responsibility (both feeling of responsibility and behavioral responsibility) and ordinary violations through driving anger expression dimensions (combined). Therefore, these findings support the alternative explanation of an indirect relationship. It should also be noted that in both of these analyses, the total indirect effect of the four driving anger expression dimensions combined was found to be significant, and none of the individual indirect effects of each dimension of driving anger expression reached significance. As Hayes (2018) explains, the total indirect effect in a multiple parallel mediator model represents the indirect effect of the IV on DV summed across all the individual mediators, and it is possible to observe a significant total indirect effect although each of the individual indirect effects corresponding to each mediator in the model are nonsignificant. One of the reasons of this issue, according to Hayes (2018), is that if the mediators in the model are highly correlated, it might be difficult to detect their weak effects, and their effect can be strong enough to reach significance when added together. This problem of high correlations between the mediators is the case in the current study since the mediators in the models tested were four dimensions of a given construct (i.e., the four factors of the DAX scale).

Secondly, being young was found to be significantly associated with aggressive violations. Results supported that younger drivers have a higher tendency to engage in aggressive violations in traffic (Zhao et al., 2012). However, although negatively correlated, neither feeling of responsibility nor behavioral responsibility predicted aggressive violations in the regression analysis. Again, there was a possibility that responsibility might predict aggressive violations indirectly, rather than directly. The results showed a significant indirect relationship between behavioral responsibility and aggressive violations through driving anger expression dimensions (combined). Specifically, among the four dimensions if driving anger expression, the indirect effect of verbal aggressive expression between behavioral responsibility and aggressive violations was significant.

Third, being male and behavioral responsibility were related to errors. In this study, being male predicted errors. The relationship between gender and errors in the literature is controversial such that some studies found females as more likely to make errors (Reason et al., 1990), some studies found no relationship between these two factors (Bener & Crundall, 2008), and some found males as being more likely to make one subtype of errors, namely, inattention errors (Rimmö & Åberg, 1999). This suggests that to be able to understand errors, investigating different factors is necessary such as stress (Matthews et al., 1998), perceptual distraction (Storie, 1977), being more engaged by vehicle (Reason et al., 1990).

Based on the analyses, both errors and lapses were significantly predicted by behavioral responsibility indicates the role of responsible behavior in diminishing errors and lapses. Taken

into account the association between responsibility and self-conscious behavior (De Groot & Steg, 2009), it is possible to say that responsible drivers tend to be more careful and less likely to get distracted. In addition, this finding highlighted the difference of feelings of responsibility and behavioral responsibility such that feeling responsible was not related to errors and lapses, and engaging in responsible behavior was found necessary. However, although driving anger expression dimensions and errors and lapses were correlated, the mediating roles of driving anger expression between responsibility and errors and lapses were not significant. In the literature, anger expression is found to be significantly positively associated with anger as a trait (Allan & Gilbert, 2002). In addition, previous findings suggest a strong correlation between anger as a trait and driving errors (Zhang & Chan, 2016). One possible explanation for that is the cognitive load of participants when they are in the traffic. Different variables which cause cognitive load such as anxiety (Briggs et al., 2011; Shahar, 2009), stress (Kontogiannis, 2006) or anger (Demir et al., 2016) can predict errors while anger also can predict anger expression (Deffenbacher et al., 2003; Precht et al., 2017). In this study, bivariate correlation results are supporting the literature; however, further analysis can provide strong evidence for this relationship. Since this study does not control participants' cognitive load, the results may not indicate anger expression as a predictor for errors and lapses. In future studies, behavioral responsibility can be investigated to understand how it may have an impact on such behaviors. Since both errors and lapses have a high possibility to be the result of an attention shift (Stephens & Groeger, 2009), behavioral responsibility could be related to strong ability to maintain attention.

There are some limitations of the study. First, an online survey was used to collect the data. However, it is noteworthy to consider that driver behavior is a performative act. In future studies, driving stimulation might be used to obtain stronger results. Second, the self-report nature of data collection may have an effect on the reliability of the results considering participants' objectivity for the answers and issues such as socially desirable responding tendency. Finally, the majority of the participants were female drivers. Although there is not a major difference between male and female participants, this finding should be considered while generalizing the present findings.

In the present study, we investigated the associations of responsibility with driving anger expression and driver behaviors were tested. The results showed partially supporting evidence for the expectations regarding these relationships. As far as our knowledge, the present study was the first attempt to investigate the role of responsibility in driving context. Thus, we believe that it will have significant contributions to the related literature. Additionally, the practical implications of these findings might pave the way for developing intervention programs targeting responsibility in the driving context.

Ethics Committee Approval Statement

Ethics committee approval of the study was obtained from the Scientific Research and Publication Ethics Committee of Başkent University (62310886-604.99).

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Araştırma Makalesi

Transport Inequality in Today's Cities at the Intersection of Mobility and Inequality

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Abstract

One aspect of social inequality in today's cities concerns transport inequality. This simply refers to the transport advantages of the rich compared to the poor (Gebresselassie & Sanchez, 2019). The transport inequality intersects with other forms of marginalization as well, based on gender, age, disability, and ethnicity. Yet for the mobile or kinetic elite (Andreotti, Le Gallès, & Moreno-Fuentes, 2013), all places and transport means are readily available. Furthermore, transport-related mega-projects accentuate the existing social inequalities of the neoliberal city. However, urban policy makers have begun to realize the importance of transport inequality and develop inclusive policies, such as "accessibility planning" in the UK (Lucas, 2012). Urban citizens are also forming mobility justice movements to protest against the increasing transport costs, as in Latin America (Díaz Pabón & Palacio Ludeña, 2021) and France. The encompassing mobility research is largely connected to social and environmental sustainability ideals. Hence, this paper will study the relationship between mobility and inequality through a thematic analysis of approximately 100 publications that were selected with certain keywords from the results of Web of Science searches, a few books, institutional reports and other sources. This literature review shows that transport inequalities are a reflection of the capitalist system and one of the main sources of social conflict in contemporary societies. Against the solution suggestions that range from rehabilitating the system to revolution as a process in the related literature, formation of place-based solutions that take into consideration both universal and local conditions is suggested in this study.

Keywords: Social inequality; transport inequality; physical, social, technological, and political-economic dimensions of transport inequality; sustainable mobility; mobility barriers

Hareketlilik ve Eşitsizliğin Kesişiminde Günümüz Kentlerinde Ulaşım Eşitsizliği

Öz

Günümüz kentlerindeki toplumsal eşitsizliklerin bir yönünü ulaşım eşitsizliği oluşturur. Bu, basitçe, varlıklı insanların yoksullar karşısındaki ulaşım üstünlükleri anlamına gelir (Gebresselassie ve Sanchez, 2019). Ulaşım eşitsizliği, cinsiyet, yaş, engellilik ve etnik köken gibi başka ötekileştirme türleriyle de kesişir. Öte yandan, bütün yerler ve ulaşım araçları hareketli ya da kinetik seçkinlerin (Andreotti, Le Gallès ve Moreno-Fuentes, 2013) eli altındadır. Üstelik ulaşımla ilgili mega projeler neoliberal kentin var olan toplumsal eşitsizliklerini daha da belirginleştirirler. Bununla birlikte, kentsel politika yapıcıları ulaşım eşitsizliğinin önemini giderek ayırt etmeye ve İngiltere'deki "erişilebilirlik planlaması" örneğinde olduğu gibi kapsayıcı politikalar geliştirmeye başlamışlardır (Lucas, 2012). Dünya kentlerinin yurttaşları da, Latin Amerika (Díaz Pabón ve Palacio Ludeña, 2021) ve Fransa'daki gibi artan ulaşım giderlerini protesto etmek için, hareketlilik alanında adaleti hedefleyen toplumsal hareketler oluşturmaktadır. Konuyu kapsayan hareketlilik araştırmaları toplumsal ve çevresel sürdürülebilirlik hedefleriyle büyük ölçüde bağlantılıdır. Bu gerekçelerle, bu makalede hareketlilik ve eşitsizlik arasındaki ilişki belirli anahtar sözcüklerle, Web of Science arama sonuçlarından, birkaç kitaptan, kurum raporundan ve başka kaynaklardan seçilen yaklaşık 100 yayının tematik bir çözümlemesi yoluyla incelenecektir. Bu derleme makalesi ulaşım eşitsizliklerinin kapitalist düzenin bir yansıması olarak, günümüz toplumlarındaki başlıca toplumsal çatışma kaynaklarından biri olduğunu göstermektedir. Söz konusu yazındaki, düzeni iyileştirmekten, süreç olarak devrime dek uzanan çözüm önerilerine karşılık, bu çalışmada evrensel ve yerel koşulları birarada gözeten, yer odaklı çözümlerin oluşturulması önerilmektedir.

Anahtar Kelimeler: Toplumsal eşitsizlik; ulaşım eşitsizliği; ulaşım eşitsizliğinin fiziksel, toplumsal, teknolojik ve politik-ekonomik boyutları; sürdürülebilir hareketlilik; hareketlilik engelleri

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Transport Inequality in Today's Cities at the Intersection of Mobility and Inequality

Inequality is a major sociological problem with deep historical and structural roots that continues to affect the lives of millions of people around the world. It is systemic in the sense that neoliberal capitalism intensifies the inequalities between people and places in all realms of life. Inequality is defined as unequal opportunities for different individuals and societal groups ("Inequality," 2014). Hamnett (2019) defines it in terms of an uneven distribution and share of resources, such as income and wealth, and life conditions, such as health and education. Ritzer's (2007) Blackwell Encyclopedia of Sociology contains multiple entries on inequality for marriage, the city, gender and wealth. Although they are still general headings, these multiple entries indicate that inequality is indeed a broad issue that has many dimensions. In an Organisation for Economic Co-operation and Development [OECD] (2016) report about inclusive growth of cities, this multi-dimensionality of inequality is also mentioned, and some country examples of how to measure "multi-deprivation" are given for Australia, Italy and the United Kingdom.

The depth of the inequality issue also applies to the perspectives on inequality; different sociological and ideological perspectives conceive social inequality and stratification differently regarding their causes, consequences and societal benefits and harms. Most sociological research, since its beginnings in the eighteenth and nineteenth centuries, has been concerned with studying the causes and consequences of social inequality. Moreover, major sociologists, such as Bourdieu, present in their seminal work how most of these seemingly individual inequalities are socio-structural in the sense that they are transmitted from one generation to the next like an inheritance. Contemporary research on forms of social inequality mostly confirms Bourdieu's intergenerational social privilege or disadvantage thesis. For example, Hamnett (2019, p. 247) claims that "arguably most, if not all, of the forms of inequality are, in fact, manifestations of a small number of deeper, underlying inequalities".

Looking at today's globalized world, it is a stage of history where most urban societies have been living through a mobility era since the 1990s. This is explained in the social sciences literature with the concepts of "mobilities turn" and "new mobilities paradigm" that refer to a more relational and connected understanding of space. Sheller (2017) summarizes how social scientists developed these ideas to understand and interpret the on-going socio-spatial changes since the late twentieth century towards an increasingly mobile social life everywhere. This modern society of flows has not emerged out of nowhere, but was based on economic, political and technological developments, such as the developments in information and communication technology (ICT) or developments in the transport sector. Yet this emerging mobile global society is not without problems, including growing inequality that comes out as "uneven mobilities" (Sheller, 2017, p. 631) due to various historical trajectories of societies, different mobility regimes or "systems of (im)mobility" (Sheller, 2017, p. 627). According to Hamnett (2019), transport is one of those realms, where cities can have distributional inequality problems other than inequalities purely concerning economic resources. Harvey (2022), who underlines the growing social inequalities over the last 30 years and climate change and environmental degradation as two major contradictions of capitalism, provides multiple examples of mass movements from France to Chile, Ecuador, Brazil, and Tehran that were ignited by transport inequality issues.

The OECD (2016) report on inclusive cities picks up on transport issues as one aspect of increasing social inequality. The transport topic is considered under the heading of geographical mechanisms that exist behind what is called the "neighbourhood effect" (OECD, 2016, p. 84) of income inequality. A policy suggestion against socio-spatial segregation and for inclusive urban growth (OECD, 2016) is stated to be mixed neighborhoods, which can be achieved through a combination of factors from housing to transport and beyond. Another policy suggestion is developing an egalitarian transport system that enables people's access to employment and other life chances (OECD, 2016). The report shows that transport is actually one of the highest priorities—first or second—for most OECD city administrations and it is mostly financed by national administrations (OECD, 2016). There is also a special section in the report that sets out what can be done for more accessible, affordable, inclusive, and sustainable urban transport (OECD, 2016), again with country examples—Frankfurt, Bogota and Seoul—of good practices. Another OECD-International Transport Forum [ITF] (2017) report is also based on case studies of countries—the U.S., Santiago, Chile, Mexico City, Indian Cities, Bogota, Colombia and Swedish-French-Finnish cities—and quantitative analyses of data that look into the relationship between income inequality, social inclusion, and mobility.

Mobility inequality as an underlying factor of social inequality has become a major area of research in various social science disciplines, from sociology to geography and beyond. Yet the existing plethora of mobility research reminds one of the parable of the blind men and an elephant, with multiple approaches, themes, and methods, depending on where one gets hold of. In broad brush strokes, one can speak of the existence of a mobility inequality, when a certain group of people have mobility disadvantages, such as access to efficient transport on the one hand, but also, when they are forced to move when they would rather stay put or not move—exercising a right to immobility or place-making. Gebresselassie and Sanchez (2019) understand transport inequality as the advantages of the rich over the poor, who are more affected by negative transport externalities.

In a UK report on transport inequality, Gates, Gogescu, Grollman, Cooper, and Khambhaita (2019) underline three legs of the transport and inequality relationship: people's socio-spatial distribution could perhaps be considered as a departure point, distribution of opportunities as destinations, and the accessibility of transport systems in terms of cost, space-time and reliability as connection between one's departure and arrival points. The authors depict the close relationship between income, transport costs and links, employment and housing options in figures that also reveal the irony of, for example, gentrification-like side-effects of enhanced transport links in urban residential areas (Gates et al., 2019). The OECD-ITF (2017) roundtable report also warns against the land value appreciation effects of transit-led urban renewal in underdeveloped urban areas, and the displacement risk this might entail for the people who already live there. Hence, transport inequality is a complex issue that has to be handled carefully in a way that does not treat transport as a single problem area.

Furthermore, the existing mobility inequalities between people and places are deepened by global crises, such as pandemics, manmade natural disasters linked to climate change, growing fascism and decaying democracy, and country invasions and wars. Ethically and at the basic human rights level, mobility disparities are against movement and accessibility freedoms (Hidayati, Tan, & Yamu, 2021). As Hidayati et al. (2021) show in their comprehensive literature review of the subject, mobility inequality is used interchangeably

with other similar concepts, such as: mobility challenges and barriers (Cervero, 2013; Strohmeier, 2016); mobility inequity (Shirmohammadli, Louen, & Vallée, 2016); mobility injustice (Sheller, 2020); transport disadvantage (Schwanen et al., 2015); transport exclusion (Jaroš, 2017); transport accessibility (Singer, Cohen-Zada, & Martens, 2022); transport inequality (Falchetta, Noussan, & Hammad, 2021), and transport poverty (Pérez-Peña, Jiménez-García, Ruiz-Chico, & Peña-Sánchez, 2021).

Lucas (2018) defines the twin concept of transport poverty as the situation where a person has to undergo at least one of the following to satisfy her/his daily needs: unavailability of suitable transport options for her/his capabilities; inadequacy of the existing transport options; high cost of transport; excessive travel time, and unsafe transport. In another work, Lucas (2012) also depicts the relationship between transport, society, and surrounding social structures in the diagram below, which reveals the complexity of the issue.

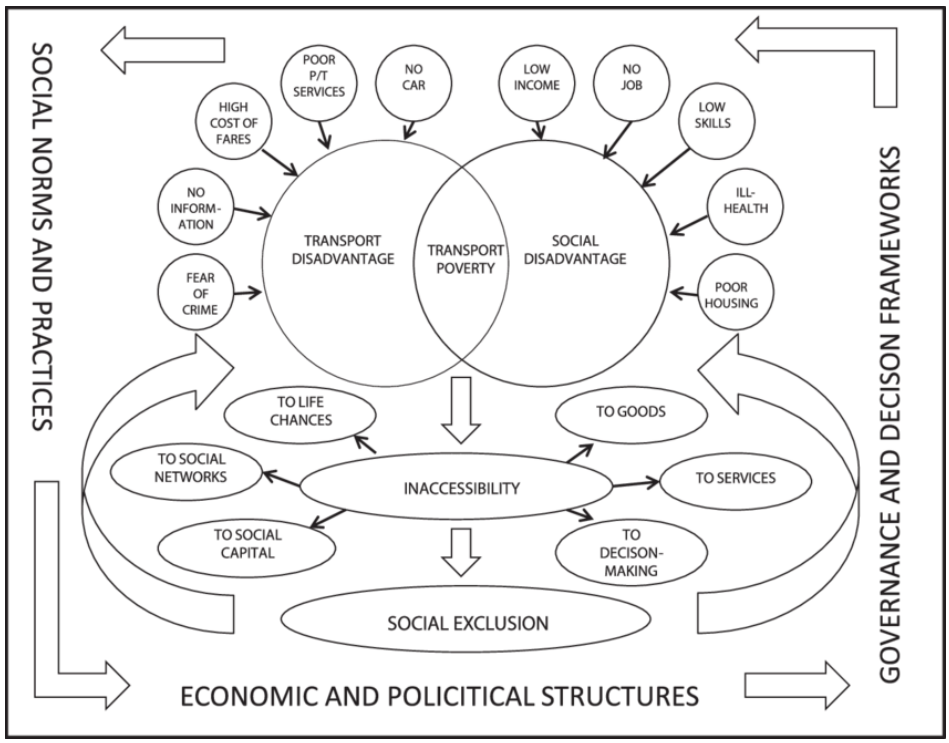

Figure 1. Karen Lucas' diagram for the link between transport and social exclusion (Lucas, 2012, p. 107)

2. Method

In this paper, the issue of transport inequality which is caused by a limited access to transport for various reasons, including supply and demand factors ("What inequality means for transport," 2018) is elaborated upon first by describing its multiple dimensions, from physical to social, economic, political, and technological. This literature review is based on a comprehensive search of the Web of Science database with the following keywords: mobility barriers, mobility disadvantage, sustainable mobility (highly cited papers only), sustainable transport (highly cited papers only), transport equity, transport inequality, transport poverty, and transportation and social exclusion. Eighty-three journal articles were selected based on their relevance, number of citations, and thematic variety for this review. In addition, a few institutional reports on transport inequality, books, book chapters and other sources were also included. Altogether approximately 100 items were included in the review (see Table 1). In Table 1, the literature items are written in chronological order and in case an item has been

used in multiple categories, it was indicated only once in the most relevant place. In addition, some items had to be relocated to different themes or subthemes after writing. The resulting detailed and analytical description of the transport inequality issue is followed by a discussion of its significance and repercussions for contemporary societies, and solution suggestions offered in the summarized literature. This paper does not require ethics committee approval because of the nature of the study as a literature review.

3. Thematic Findings of the Review

The issue of transport inequality is explained in this section in detail based on the thematic analysis of the selected literature under the categories of physical, social, technological, and political-economic dimensions.

3.1. Physical Dimensions of Transport Inequality

What is meant here by physical dimensions of transport inequality comprises anything related to either physical materials, such as transport infrastructure, or topics concerning various types of transport modes, including cars, bicycles, public transit, and even the physicality of walking, as well as resulting travel modes and behaviors. In addition, the physicality of the city is included within this subtheme; for example, how suburbs are influenced by transport inequality is a consequence of the socio-spatial organization of cities.

To start with cars, which represent motorized transport and are the target of change towards a sustainable mobility transition that is expected to be equalitarian as well, Jain and Guiver (2001) first underline the car's social embeddedness. It has been so much taken for granted as part of daily life. On the other hand, there are people, who consciously choose a life without a car (Jain & Guiver, 2001). They analyze car travel in terms of its global and local environmental and social impacts, both direct and indirect. The environmental impacts are obvious: global warming due to carbon-dioxide emissions; pressure over scarce energy sources; unequal global impacts of climate change; "temporal inequality" (Jain & Guiver, 2001, pp. 571-572), i.e. the effect on future generations; and local environmental damage. Socially, car travel directly affects people's health and communities, creates traffic problems such as noise and accidents, and deters other land uses. It also shapes the city in a car-prone way, and defines the priorities—such as speed or "time-space compression" (Jain & Guiver, 2001, p. 576)—that are reflected in car-less people as time poverty and other transport limitations accordingly. It cuts drivers' connection with the environment. Jain and Guiver (2001) also underline that individual and collective interests regarding car travel might not converge, because the individual solution to one's mobility problems does not remove the collective ones and even exacerbates them. Nonetheless, car mobility has to be questioned collectively for transport equity, and disincentives for commuting by car should be developed for sustainable urban mobility (Basu & Ferreira, 2021).

Despite all this negativity about cars, they continue to be an object of desire for many people not only for their convenience, but also for their psychological comfort. Wells and Xenias (2015, p. 116) emphasize this "cocooning" effect of a private car for its owner as a place for refuge from the crowds. Because of this continued cultural importance of a private car for people, the authors expect a time lag in people's adopting the idea of a post-automobility society. This evolving meaning of a car against the changing surrounding circumstances also becomes apparent in other personal environments, such as one's house and workplace. Wells

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Table 1. The Reviewed Literature Categorized under the Study Themes

Themes	Subthemes	Dictionary and Encyclopedia Entrie Digital Sources, and Talks (n=11)	Institutional Reports (n=3)	Books and Book Chapt (n=6)	Journal Articles and Book Reviews (n=83)
Inequality and transport inequality	Definitions	2007 Ritzer 2014 Inequality 2018 What inequality means for transport	2016 OECD 2019 Gates et a	2019 Hamnett	2012 Lucas 2018 Lucas 2019 Gebresselassie & Sanchez
	Concepts			2020 Sheller	2015 Schwanen et al. 2016 Shirmohammadliet al. 2017 Jaroš; Sheller 2021 Falchetta et al.; Hidayati et al.; Pérez-Peña et al. 2022 Singer et al.
	Comparative case		2017 OECD-IT		
Physical dimension	Cars				2001 Jain & Guiver 2015 Wells & Xenias 2021 Basu & Ferreira; Díaz Pabón & Palacio Ludeña
	Bicycles				2021 Tortosa et al. 2022 Ledsham et al.
	Public transit	2022 Aveline-Dubacl			2017 Lubitow et al.; Qamhaieh & Chakravarty 2020 Tirachini & Cats 2021 Yousefzadeh Barri et al.
Social dimension	Social class and mobility	2018 Celis et al.		2021 Işık & Pınarcıoğlu	1996 Adams 2013 Andreotti et al. 2015 Jahanshahi et al. 2019 McArthur et al.
	Age and mobility				2013 Tsai et al. 2015 Chen et al. 2016 Strohmeier 2019 Ryan et al. 2020 Portegijs et al. 2021 Fiocco et al.
	People with disabilities and mobility	2022 A brief history the disability rights movement			2007 Casas 2020 Sánchez-Ávila et al. 2021 Martin-Fuentes et al.; Schwartz et al.
	Immigrants and mobility				2017 Buhr & McGarrigle 2018 Kerzhner et al. 2021 Özkazanç
	Gender and mobil	2015 Graham-Harris			2020 Boterman; Jirón et al.; Montoya-Robledo & Escovar-Alvarez 2021 Nosal Hoy & Puławska-Obiedowska
	Pandemic, climate change mobility	2022 Tonetta & Semi			2018 Sheller 2020 Beck et al. 2022 Cirianni et al.

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Table 1 (continued). The Reviewed Literature Categorized under the Study Themes

Themes	Subthemes	Dictionary and Encyclopedia Entries, Digital Sources, and Talks (n=11)	Institutional Reports (n=3)	Books and Book Chapters (n=6)	Journal Articles and Book Reviews (n=83)
Technological dimension	Shared mobility				2017 Campbell & Brakewood 2019 Jin et al.; Tirachini & del Río 2020 Tirachini 2021 Hjorteset et al.; Turoń
	Smart mobility				2019 Groth 2020 Zhang et al. 2021 Liu et al.
	Vehicle technology e.g. autonomous vehicles (AVs)				2012 Wells 2021 Dianin et al. 2022 Harb et al.
	Urban regeneration and transport				2017 Mahieux & Mejia-Dorantes
	Change in the number of travel options in time				2013 Diaz Olvera et al.
Political-economic dimension	British examples of changing transport policy and practices	2020 Luscher			2006 Lucas 2016 Pooley 2021 Aldred et al.; Pamucar et al.
	Sustainable mobility transition			1993 Massey (?)	2000 Baeten 2008 Boschmann & Kwan 2010 Farla et al. 2015 Sheller 2021 Anastasiadou et al.
	Staying put			2018 Florida 2022 Harvey	2017 Özkazanç & Özdemir Sönmez 2019 Kębłowski et al. 2021 Allen & Farber
Outcomes and solutions	Changing behaviors	2019 How reforming fossil fuel subsidies can go wrong			2021 Acheampong et al.
	Changing attitudes	2017 Eliasson			2018 Nikitas et al.
	Technological solutions				2019 Millonig 2020 Faber & van Lierop
	Transport infrastructure				2003 Tiwari 2007 McCray & Brais 2013 Cervero 2016 Utsunomiya 2017 Pojani et al. 2021 Badji et al. 2022 Parsha & Martens; Sancho-Reinoso et al.

and Xenias (2015) claim that against the growing volatilities of the outside world, people seek comfort in their personal spaces, including the car, even if temporarily, and despite the fact that the increasing cost of oil is making it harder for people to postpone their emotional disengagement with their cars. Transport costs also trigger many protests around the world, including the Yellow Vests Movement or mobility justice movements in Latin America (Díaz Pabón & Palacio Ludeña, 2021).

Unlike cars, bicycles are a transport mode promoted for both its social and environmental benefits. However, cycling is still not at its targeted levels for most countries, including developed countries that invest heavily in cycling infrastructure in their cities. Furthermore, there are socio-spatial differences in cycling or "cycling equity" (Tortosa, Lovelace, Heinen, & Mann, 2021, p. 694) problems within individual cities as well. Hence, many researchers work on the reasons for these differences in cycling patterns in cities. One such study is Ledsham, Zhang, Farber, and Hess' (2022, pp. 1-2) study of "suburban cycling" in Toronto's suburb, Scarborough, which has little cycling infrastructure. In this article, similar to other cycling research, cycling is categorized into utilitarian and recreational cycling. One could say that the usual aim of planners and city administrations is to increase the utilitarian cycling that is for daily commuting and commercial activities to meet their sustainability goals, as cycling for commuting is a more indispensable and frequent kind of bicycle use in place of motorized transport. According to this Toronto study, the factors that increased the likelihood of utilitarian cycling were recreational cycling frequency, having a bicycle and a circle of cyclists (Ledsham et al., 2022). Therefore, recreational cycling had a positive impact on utilitarian cycling, but not vice versa. Socio-economic status also influenced people's attitude to cycling, as people with lower incomes gave more importance to the cost and theft issues as opposed to higher income groups, who cared more about the health and safety issues (Ledsham et al., 2022, p. 9 and p. 12).

Ledsham et al. (2022, p. 13) suggests that developing cycling infrastructure in the low-income areas should be backed up with "community bicycle programs" to spread utilitarian cycling to wider sections of the society and the city. Although Tortosa et al. (2021) argue the same, that cycling infrastructure is not enough to promote cycling to people, and people living in deprived areas cycle less, their findings (in England) disagree in the sense that deprived areas have more cycling infrastructure there. They explain this contradiction with the tendency of deprived areas being in the central city areas where there are more infrastructures for cycling and traffic calming measures (Tortosa et al., 2021). Both these studies show that promoting cycling among various segments of the urban population requires going beyond the provision of physical conditions, such as cycling infrastructure.

Public transit provides an in-between collective travel option with respect to the individual, but sustainable, bicycle and the unsustainable private car. It has many social benefits, including: affordability; facilitation of people's social activity, social inclusion and participation, and their access to services; and being more environmentally friendly than the individual car. On the other hand, public transit can have its own handicaps, such as creating a fiscal burden on public administrations (Aveline-Dubach, 2022); inadequacy in terms of spatial coverage, frequency and timeliness; and related lack of comfort and safety issues, especially concerning women. To these, negative notions, such as "transit dependency" (Lubitow, Rainer, & Bassett, 2017, p. 925) and "transit-captive populations" (Yousefzadeh Barri et al., 2021, p. 1), can be added.

In the U.S. context, transit dependency is defined in relation to not having a car, being young or old, and having low income (Lubitow et al., 2017). Yousefzadeh Barri et al. (2021) define transit dependent or captive populations of the disadvantaged communities in relation to choice riders, who have the socio-economic means to choose from different transport options. According to Lubitow et al. (2017, pp. 925-926), these transit-dependent populations usually have negative transit experiences, because public transport and infrastructure planning is in some ways blind to them, and centered on the needs of "the ideal user", who is an able-bodied, white, male worker with a stable income. This causes transport inequity for more vulnerable populations, including women with or without children, older people, minorities, and the homeless. Other issues concerning public transport include safety concerns for women (Jirón, Carrasco, & Rebolledo, 2020), discrimination against refugees (Özkazanç, 2021), status anxieties and stigma (Qamhaieh & Chakravarty, 2017), and health anxieties that have decreased confidence in public transit (Basu & Ferreira, 2021) and its use (Tirachini & Cats, 2020). The latter resulted in fiscal deficits in the aftermath of the COVID-19 pandemic.

3.2. Social and Technological Dimensions of Transport Inequality

When one talks about the transport disadvantaged or transport poor, one is at the same time talking about the mobile or kinetic elite (Andreotti et al., 2013) for whom all places and transport means are readily available. Hamnett (2019, p. 247) names the same category of people as "the international rich", who are attracted to global cities or "superstar cities" (Florida, 2018, p. 23), such as Hong Kong, London, and New York, with large social inequalities. For Florida (2018, p. 160), it is these cities' contradictory qualities: being creative, productive, dense in technology, having talented human capital with liberal political tendencies, and a wide public transport network, but being most fierce in economic inequality and segregation at the same time. Andreotti et al. (2013, pp. 45-47) label this social dichotomy of major metropolises in terms of transnationalism versus rootedness, as in being rooted in a place, but also argue that they can exist together, as in the "mobile rooted" social ideal type that they identify with respect to the contemporary experiences of the European upper-middle classes.

Looking at the other side of the coin, one realizes that the transport poor are usually disadvantaged in multiple ways, related to their age, gender, education, ethnicity, housing, income, physical and mental health, and transport. Hamnett (2019) underlines that these social and urban inequalities reinforce each other. This connotes a more severe poverty level than "poverty in turns" (Işık & Pınarcıoğlu, 2021) that still contains a possibility of social upward mobility for people, who hand in their life in poverty to the newly arriving immigrants at the city. Furthermore, these deep social divisions, centering on mobility, could be happening very close to each other; Adams (1996, p. 13) comments that "the mobile wealthy and the immobile poor" live very separately from each other, even if they live together in the same place. In this section, age, disability, ethnicity, gender, homelessness, and the work dynamics of transport inequality will be touched on briefly.

The literature on older people's transport inequality problem either studies the mobility barriers that older people face or searches for the possibility of technological help to overcome these barriers. These mobility barriers could be related to various things: outdoor physical barriers, emotional barriers, financial limitations, and housing and living arrangements. As older people have reduced capability of mobility, the urban physical

environment can pose them problems when they go out for various activities, just as it does for disabled people or people with small children. Chen, Matsuoka, and Tsai (2015) searched for these outdoor mobility barriers at a public housing community in Tainan in Taiwan. They designated four barriers as: "parked motor scooters, potted plants, the rubber tiles of the play areas, and a set of steps in one area of the community" (Chen et al., 2015, p. 294) and they observed an improvement in walkability in their quantitative test, where they removed these barriers hypothetically. In a similar study by Portegijs et al. (2020) in central Finland, an interactive mapping technique was used, and the elderly study participants marked on a map the destinations that facilitated their mobility in addition to the outdoor barriers that hindered it. They found that while outdoor barriers close to one's home negatively influenced the participant's physical activity more, in terms of the destinations, it was the far away ones that motivated people's physical activity more. These findings have important implications for urban design and planning for creating suitable environments that enable outside mobility for the elderly (Portegijs et al., 2020).

Ryan, Wretstrand, and Schmidt (2019) take one step further, and look through a capability lens into the differences between old people in major Swedish cities with respect to the issue of transport inequality. In their view, a person's resources, capabilities, functioning, and well-being are interconnected. They suggest that some old people are more disadvantaged then the others (Ryan et al., 2019). Hence, they emphasize the need for finer analyses that take into consideration intersectionality of factors behind transport disadvantage and differences within social groups to better inform transport equity measures. To this, other authors add other things to consider, including: financial (Fiocco et al., 2021) and emotional (Strohmeier, 2016) barriers, and older people's living arrangements (Tsai et al., 2013). Single dwellers have different mobility problems than those who live together with others. Strohmeier (2016) makes a comprehensive list of all kinds of barriers, including emotional barriers, such as safety and security, based on her data.

Mobility barriers for people with disabilities are another important transport inequality problem in urban built environments, although many improvements have been made in this field. Leading social movements can be exemplified by the Disability Rights Movement that developed back in the 1960s-1970s in the U.S. and whose demands also included equality in public transport accessibility ("A brief history of the disability rights movement," 2022). Casas' (2007) study based on the study participants' one-day travel diaries in New York's Buffalo-Niagara region underlines that accessibility for disabled people and social inclusion or exclusion is also related to factors such as: her/his age, gender, and lifecycle stage; household characteristics; and having a driver's license and a job. Her study findings reinforce the relationship between accessibility and social exclusion.

Although the issue of transport accessibility for disabled people has multiple aspects, Schwartz, Buliung, and Wilson (2021) look at it from the angle of food access for disabled adults in Toronto. They conducted mobile interviews with disabled adults to comprehend how food access could become a disabling experience (Schwartz et al., 2021). They reveal that disability does not come from a person's physical characteristics per se, but it is more about her/his socioeconomic situation and the physical environment, starting from one's own home and continuing with the conditions of the outside environment—streets, neighborhoods, supermarkets, hotels (Martin-Fuentes, Mostafa-Shaalan, & Mellinas, 2021), etc., including the transport services. In this line of research, one also sees technological approaches to finding

ways, such as by using Twitter data, to detect the disabling mobility barriers and enhancing mobility (Sánchez-Ávila, Mouriño-García, Fisteus, & Sánchez-Fernández, 2020).

Other research looks at transport inequalities arising from double or multiple disadvantages such as gender and ethnicity, and work or housing conditions and refugee status. In such a study, Kerzhner, Kaplan, and Silverman (2018) examine through in-depth interviews and focus groups Palestinian women's mobility and transport exclusion in Jerusalem. They reveal different tactics that these women have to develop against the fear-based barriers to their use of public transport. Hence, there are again emotional barriers at stake here that are built over the ethnicity and gender dynamics of Jerusalem as a contested city. Likewise, Özkazanç (2021) depicts the negative transport experiences of Syrian refugees, who are concentrated in Ankara's Altındağ district. Here again, Syrian refugees' transport experiences are impacted by combined disadvantages, related to income, gender, language, and housing, transport, and employment options, and they result in "multi-layered inaccessibility/transport deprivation" (Özkazanç, 2021, p. 11) and a lack of social integration. Buhr and McGarrigle (2017) contribute to this thread of research on migrants' urban mobility by showing that migrants, such as Guinean migrants in Lisbon, employ both mobility and place-making in their new living environments, where they also need to learn how to "do mobility". All three studies are good examples of the socio-cultural element of urban mobility.

Gender is another source of people's differential mobility, mostly because women are assigned additional care roles by society, and yet transport policies are developed either according to the needs of the male commuter or in a gender-blind manner, that is, by providing a standard service to everyone. Yet just as much as women have different transport needs than men—e.g. 25- to 29-year-old women walk and take public transport more than men, who drive more (Nosal Hoy & Puławska-Obiedowska, 2021)—there are also differences between women, depending on their age, work and health conditions, income, and care responsibilities, etc. in terms of their transport needs. However, there are common issues, such as public transport safety, that concern most women in any country. Unfortunately, women as inner-city or intercity transport passengers are more vulnerable to public assaults, including sexual harassment and violence. Özgecan Aslan was just one such victim of violence—rape and murder—while using 'dolmuş' (a type of paratransit) in south-eastern Turkey. There are numerous others who have been sexually harassed during their day or night travel in intercity buses or who have been attacked by so-called 'conservative' men because of their open and modern outfits. Yet one can also hear reciprocal cases from developed countries, where foreign men with beards or dark skin can be discriminated against on public transport.

Considering all these potential and actual threats, women try to develop everyday strategies so that they can avoid these risks in their travels as much as possible. However, Jirón et al. (2020) argue that these gendered mobility strategies are never individual, but are dependent on mediating factors, such as time, space, money, gender, age, and ethnicity. There are also continuing structural prejudices with deep patriarchal roots and immense pressures against women riding bicycles or driving cars, as in some Middle Eastern countries. There is still another kind of pejorative stigmatization towards male or female cargo bike riders in the Netherlands (Boterman, 2020). On the other hand, other countries, such as Japan and the UK, make positive discriminatory attempts, such as pink carriages on trains that are designated only for women's use to prevent sexual harassment. Yet women are divided about the benefits

of such measures that appear to be protecting women by isolating them in a vacuum (Graham-Harrison, 2015).

Gender and social class dynamics come into play in the case of transport inequality problems that are faced by working women. Montoya-Robledo and Escovar-Álvarez (2020) analyze this topic through qualitative and quantitative methods in their work on the commutes of domestic workers in Bogotá. In their analysis, which represents the issue from demand and supply sides, the authors also summarize the changes in the transport habits of these female workers over time. While they used to live in the house of their employers—like in the Mexican movie, Roma (Celis, Cuarón, & Rodriguez, 2018)—until the 1960s-80s, after that period, they began to live outside and make long daily commutes to their workplaces. Nevertheless, urban planners are reported to fail to make any accommodating changes for these women's increased commutes in the city. Regarding the impact of work on people's mobility, the shifts in the labor force are another thing to consider in developing equitable transport policies. Jahanshahi, Jin, and Williams' (2015) UK study underlines a shifting trend towards increased employment of women and part-time workers. Similarly, McArthur, Robin, and Smeds (2019, p. 433) analyze the transport strategies for London's night-time economy in terms of "the spatiotemporal dimensions of equity", and they emphasize that the night-time economy leads to its own mobility barriers for its workers that need to be tackled by transport planners.

The COVID-19 pandemic showed how much people depend on the services of essential workers on a daily basis. These workers created the exception by continuing to commute (Beck, Hensher, & Wei, 2020) during the pandemic, when other white-collar people had the chance to work from home. Pandemic mobility was limited to essential workers (Cirianni, Comi, & Luongo, 2022)—a forced mobility—and the kinetic elites—a mobility of choice—to some extent. Regarding the mobility or immobility trends of the ultra-rich, on the other hand, it is possible to see that they are taking precautions against the already happening or near future effects of climate change for which they are more responsible than the global poor. Sheller (2018) states that kinetic elites are taking control of the scarce natural resources at the global level. For example, they buy chalets in the Swiss, French and Italian Alps, where they can have access to clean water, and cool, clean air without being disturbed by the presence of others during crises like the pandemic (Tonetta & Semi, 2022) and eventually leading to alpine gentrification. Yet the Achilles' heel of this private escapism from the pandemic or climate change is these elites' continued dependency on the services of (essential) workers, who are displaced from these enriched areas, and who start to commute long distances for work.

The technologically focused work on transport (in)equality can be separated into the themes of: shared mobility, smart mobility, and vehicle technology, and particularly autonomous vehicles (AVs). There are different forms of shared mobility, including ride-hailing services such as Uber and Lyft, ride sharing, car sharing or carpooling, and bike sharing or even the traditional hitchhiking. All of these forms of mobility commons aim to combine solving people's mobility needs, with reducing the number of cars in the traffic, and thus, environmental harm, plus increasing active travel modes, such as cycling, without the obligation of ownership of a car or a bicycle. Most related research examines to what extent this system of shared mobility works as intended in different city contexts, and if it substitutes or complements other modes of travel such as public transit or cars.

Campbell and Brakewood (2017) find in their experimental study on New York that bike-sharing, based on the availability of bike-sharing infrastructure, and bus use do indeed influence each other. Tirachini and del Río (2019) find the same inverse influence of ride-hailing on public transport and taxis in Santiago de Chile. There are ambivalences then, in the expected environmental benefits of car sharing and ride-hailing, as it can actually lead to having more cars on the streets rather than less as intended (Tirachini, 2020). Moreover, the sharing riders usually belong to certain segments of city populations, including the young (Tirachini & del Río, 2019) or middle-income if not affluent groups (Hjorteset, Böcker, Røe, & Wessel, 2021), and also to certain city areas—there are, for example, fewer Uber pickups in low-income neighborhoods (Jin, Kong, & Sui, 2019)—which also makes the social transport equity benefits questionable. In that sense, however environmentally-friendly and economical the option of shared mobility might be, it still has areas for development in terms of overcoming transport-led social exclusion (Turoń, 2021).

Smart mobility, on the other hand, is more concerned with the use of smart technology, such as smartphones, in accessing transport services. Yet it has similar issues to shared mobility with respect to social exclusion. For Groth (2019), smart mobility is about a situation where information and communication technologies enable people's switching between various transport modes easily. It is therefore, associated with multimodality in people's transport behavior. However, as underlined by Groth, there are also increasing concerns about a "multimodal divide" (Groth, 2019, p. 56) between the transport-poor and others, such as younger people with higher levels of education and income who may have better access to ICTs needed for smart mobility and multiple transport options. It is a digital divide that leaves the transport poor behind. Therefore, Groth (2019, p. 68) argues that smart mobility reproduces "monooptionalities/nonoptionalities". Zhang, Zhao, and Qiao (2020) add the knowledge factor into the scene by stating that some groups, such as manual workers, women, and the elderly in Chinese cities might have less knowledge about how to use location-based services and/or they might have privacy concerns. Liu, An, Liu, Ying, and Zhao (2021) acknowledge the intensifying effect of smart mobility on existing social inequalities in China under the pandemic conditions.

Wells (2012) underlines the same concern about social equity in relation to electrical vehicles. He foresees major regional and local inequalities in terms of access to electrical vehicles, although there have been more egalitarian schemes, such as The Paris Autolib, launched in 2011. Nonetheless, Wells (2012) considers electric bicycles more sustainable and equitable than electric cars. Dianin, Ravazzoli, and Hauger (2021) analyze four scenarios of accessibility impacts of autonomous vehicles (AVs). Harb, Malik, Circella, and Walker (2022, pp. 504-505) also looked into the effects of personally owned AVs through a life simulation study, and warned against the possible rise in "zero-occupancy vehicle" or "ghost" trips, and negative influences on active travel modes and public transport.

3.3. Political-Economic Dimensions of Transport Inequality

The efficiency of transport policies and their links to urban regeneration and sustainability goals can be assessed to understand the political-economic infrastructure behind transport equity. It is not uncommon to see that governments increasingly resort to transport-led regeneration projects to upgrade areas declining due to deindustrialization and depopulation. In these projects, it is assumed that bringing transport to a remote area will increase mobility

and economic activity there, and also create positive influences (Mahieux & Mejia-Dorantes, 2017) from neighboring areas. Mahieux and Mejia-Dorantes (2017) study, through focus groups with related parties, including "the mismatched residents"—spatial and transport-wise—the mobility patterns of an old mining region, Nord-Pas-de-Calais in France. They underline the regional problems as a lack of mobility or bicycle culture, the organization of public transport, and the closure of shops and other facilities. Against these problems, the authors' suggestions contain urban regeneration policies that can improve transport and socio-economic problems together, as they are very much aware that the success of a public transport initiative depends on the availability of other simultaneous measures (Mahieux & Mejia-Dorantes, 2017).

There are also historical studies on transport, such as that of Pooley (2016), who looks at the transport history of Britain in terms of transport-related social inclusion. By studying British transport history from before the 1850s, when railway networks began to expand, until the current century of heightened mobility (Pooley, 2016), he points to the dilemma of increased mobility and social exclusion. He argues that multiplication of travel options throughout history have heightened people's expectations of fast and convenient travel, but also led to more disappointments and social exclusion, when these expectations were not so easily met. On the other hand, Diaz Olvera, Plat, and Pochet's (2013) analyses of six travel surveys and semi-structured interviews from western and central African cities indicate the opposite situation, where lack or illusion of available transport options (Diaz Olvera et al., 2013) compared with the option of being "captive walkers" (Diaz Olvera et al., 2013, p. 58) reduce especially poor people's outdoor activities, and keep social inequalities intact.

On the other hand, Lucas (2006) focuses on the current transport policies in the UK that are trying to alleviate transport accessibility and exclusion issues. She provides some numbers to explain the problem: "between 1991 and 1999, the number of households living more than a 27-min walk from a shopping centre doubled from around 40% to 90% of all households. Similarly, in 1991, approximately 72% of households lived within a 27-min walk of a doctor's surgery, whereas this had dropped to 40% by 1999" (Lucas, 2006, p. 802). She claims that the degradation in transport, local economy and physical environment creates a vicious circle for the transport vulnerable populations. These diagnoses present quite a different picture than the recently popular "15-minute city" (Luscher, 2020) plans of local governments, with an emphasis on the provision of services within short distances of people's living environments. Hence, transport plans in the UK have begun to put forth the idea of "accessibility planning" (Lucas, 2006, p. 804), which also locates transport in a wider policy context.

Because of the growing awareness of the importance of accessibility and its inclusion in the transport planning agenda in the UK, there are many studies on British examples of changing transport policy and practices. Aldred, Verlinghieri, Sharkey, Itova, and Goodman (2021) look into the equity in the implementation of London's low traffic neighborhoods that were a product of the Covid-19 pandemic. These neighborhoods are considered part of the "new active travel infrastructure" (Aldred et al., 2021, p. 1) and yet there are concerns regarding their provision in an equitable manner (Aldred et al., 2021). Although the implementation of low traffic neighborhoods (LTNs) is found to be equitable at the city and micro levels, Aldred et al. (2021) claim that it is not as equitable at the district level, where there are discrepancies in the development of such active travel infrastructure. For example, they underline that the

most car-dependent districts of London that correspond to a third of the city districts were devoid of any LTNs (Aldred et al., 2021). This case shows that even the solutions to transport inequality and sustainability problems can become part of the problem themselves, depending on their implementation.

Regarding zero-carbon city policies, such as that of London for 2050, Pamucar, Deveci, Canıtez, Paksoy, and Lukovac (2021) suggest an incremental implementation approach or "prioritization" through which these measures can be applied, first, in selected zones as a test ground. London's aim of reducing carbon emissions rests on the Climate Change Bill adopted in 2008. The more specific goal of the Mayor's Transport Strategy is to convert 80% of all trips in the city to active modes, including walking, cycling and public transport. Based on technical analysis, and considering the contextual uncertainties, the authors propose that "introducing zero emission zones, supporting the transition to low emission vehicles through adequate electrical infrastructure, and optimizing the rail efficiency" (Pamucar et al., 2021, p. 1110) are the steps to prioritize in case of London for its target of becoming a sustainable city.

Another issue that occupies transport and mobility researchers is the achievement of sustainable mobility in cities around the world. They try to decipher the limits to sustainable mobility transition (Sheller, 2015) or barriers to sustainable transport and mobility (Anastasiadou, Gavanas, Pyrgidis, & Pitsiava-Latinopoulou, 2021; Farla, Alkemade, & Suurs, 2010). Baeten (2000) even develops a critique of the sustainable transport concept itself, whereas Boschmann and Kwan (2008) look into the connection of urban transport and social sustainability. Baeten (2000) claims that the idea of sustainable transport does not resonate socially, because it maintains the asymmetric "power geometry" (Massey, 1993) between different social classes, such as the marginalized and the technocratic elite. He points to the irony of "the hegemonic sustainability discourse", which neglects the deep contestations in the planning and development of transport infrastructures that result in winners and losers between groups with different mobility interests (Baeten, 2000, p. 70). He reveals that the sustainability discourse actually hides the socio-political conflicts behind any transport decision (Baeten, 2000). For Baeten, sustainability helps to unite the irreconcilable capitalism, ecology, and sustainable transport functions along the same line. He pursues the postmodern roots of "the ecological turn of capitalism" (Baeten, 2000, p. 73), and concludes by asking, "Sustainability for whom?" and remarking that the real problem is that of transport inequality rather than sustainability.

Baeten's critique of the concept of sustainability was perhaps well to the point, as researchers have begun to add the social element into their definitions of sustainability, which is more often interpreted in a limited fashion as just environmental and economic sustainability. For example, Boschmann and Kwan (2008) review the socially sustainable urban transportation literature with the aim of understanding the link between urban transportation and social sustainability in city areas. Arguing that environmental sustainability has shadowed the equally important social and economic sustainability (Boschmann & Kwan, 2008), they carve out from the related literature the impacts of city transport on people's social inclusion or exclusion, equity and life quality, and they point to possible areas of research with respect to the issue.

Sheller (2015) places a similar emphasis on the socio-cultural environment in her case study of Philadelphia's sustainable mobility transition. She examines Philadelphia's transition to

sustainable mobility in the context of the racial characteristics of the city, and names the resulting mobility "radicalized mobilities" to point to the limits or "cultural frame" of this sustainability transition (Sheller, 2015, p. 70). These limiting urban developments are the gentrification at the city center versus the concentration of poor people in the suburbs, and their resulting transport access problems. Sheller (2015) also lays out the elements of a mobility regime: people's mobility; infrastructures of transport and communication; technology, and regional agglomerations.

Sheller (2015) then returns to the debate of "peak car", that is, the fact that there is a decline in car use among Americans, similar to that in France and other developed countries, and yet she warns against neglecting the local differences around this trend. She argues that the roots of the transport inequalities, which are not resolved with the "post-car culture" (Sheller, 2015, p. 75), but are reproduced, reside in the long-term land use patterns and racial structures of American society. Hence, she argues that the promoters of sustainable mobility should take into consideration the racial inequalities that reflect onto urban transport and space (Sheller, 2015). She gives the example of the association of the public transit system with poverty, race and ethnicity in the general American sentiment.

Farla et al. (2010) look more pragmatically at the barriers to sustainable transport transition in the Netherlands, which is considering different technological routes for this purpose. For them, these barriers are related to technology and vehicles, fuel infrastructures, and the institutional infrastructure (Farla et al., 2010). They underline that the defined transition routes towards the target of reducing gas emissions by 66% by 2035 (Farla et al., 2010) are mutually exclusive in the sense that they compete for the same resources for investment. For the first barrier regarding technology and vehicles, Farla et al. (2010) underline the foreign dependency of the Netherlands that diminishes the country's self-control. Regarding the infrastructural barriers, the irreversibility of infrastructure that requires huge investment creates a problem. The third institutional barrier concerns the lack of exchange and sharing of institutional elements between different transition routes. This hinders any possibility of cooperation against the dominant mobility regime. Therefore, the authors suggest taking up a more systemic approach to sustainable transportation transition planning.

In a similar study on barriers to sustainable urban mobility, Anastasiadou et al. (2021, p. 1) enumerate these barriers as: "political, institutional, organizational, technological, infrastructural, and socio-economic barriers as well as unforeseeable (e.g., COVID-19) conditions". These local barriers hinder the successful implementation of guidelines, such as the 2013 Sustainable Urban Mobility Plan (SUMP) in Europe. Here, the authors develop a technique to identify and prioritize these barriers for specific locations to support the task of urban policy makers in their endeavor to achieve sustainable urban mobility. They carried out a pilot study to test their tool in Thessaloniki in Greece. In this way, they tried to facilitate different cities' smooth transition to sustainable urban mobility that they consider timely, because of the pressing issues of climate change, the COVID-19 pandemic, and considering the developments of the fourth industrial revolution and digitalization. Such guidance efforts are valuable in the sense that more local solutions can be created to global transport issues that negatively affect everywhere.

4. Repercussions

Transport inequality literature is also as diverse in its suggested solutions to this issue as in its analyses. Yet a couple of common themes emerge along these lines. These solutions to the transport inequality problem could be either short term or more long term. The solutions that suggest improvements in the existing situation are an example for the former, and those that require a habitus change, such as sustainable mobility transition or giving up cars as "a protective cocoon" (Wells & Xenias, 2015, p. 107) need more time, determination, and investment.

To start with the easier ones, many authors underline the fact that poverty is suburbanized in contemporary cities, whose centers similarly undergo transitions, such as gentrification, regeneration, and commercialization, and this creates transport inequality problems for the low-income populations that increasingly live in the poorly-connected suburbs. Therefore, one quick fix is to find ways in terms of urban planning and land use for in-situ regeneration, to avoid displacing these low-income groups into suburbs (Allen & Farber, 2021). Kębłowski, Van Criekingen, and Bassens (2019) underline the significance of acknowledging people's right not to move or stay put against a notion of perpetual and unavoidable mobility.

Other researchers point to the social integration problems that result from transport inequalities due to the socio-spatial segregation of cities, where the most vulnerable groups, such as refugees, tend to occupy the peripheral areas (Özkazanç & Özdemir Sönmez, 2017; Özkazanç, 2021). Jain and Guiver (2001) similarly state that the separation of urban residents is an indirect social outcome of motorized mobility by saying that the car technology with an emphasis on speed and transport policies disconnected people from their natural and social environments without showing any respect for their senses of place.

A second type of suggestion in the literature is promoting people's use of active transport modes more than private motor vehicles in pursuit of socially and environmentally sustainable transport goals that would result in "post-automobility societies" (Wells & Xenias, 2015, p. 106). Younger generations are more open to flexible and multimodal travel options than the elderly, who grew up surrounded by an automobile habitus, although they might now have difficulty in using the car in old age. However, this tendency of the youth could be further supported by educational efforts, not only in developed countries, where the sustainable mobility transition is already under way, but also in developing country contexts, such as Abu Dhabi, that still depend to a large extent on motorized transport, because of natural, social and economic dispositions (Qamhaieh & Chakravarty, 2017).

There are also things that can be done to change the attitudes of the elderly, who are usually more environmentally sensitive anyway. In a Bristol study on the public acceptability of road pricing as an environmental mobility measure, Nikitas, Avineri, and Parkhurst (2018) propose developing pro-sociality measures to facilitate elderly people's acceptance of road pricing. This proposition is similar to that of Eliasson's (2017) regarding the fairness of "congestion pricing", for which a consumer and a citizen perspective might require quite different attitudes. In the Bristol study, Nikitas et al. (2018) state that the opinions of the elderly matter the most, as their number is increasing not only in England, but all Europe, and they are one of the populations most vulnerable to transport exclusion. That is the reason why a lot of research on transport inequality studies the topic from the perspective of the elderly, and focuses on issues such as: outdoor mobility barriers (Chen et al., 2015; Portegijs et al., 2020);

financial barriers (Fiocco et al., 2021); emotional barriers (Strohmeier, 2016); living arrangements (Tsai et al., 2013); their "capabilities in travel" (Ryan et al., 2019); and whether advanced technology, such as virtual tourism (Fiocco et al., 2021) or autonomous vehicles, can be used to ameliorate older people's reduced mobility (Faber & van Lierop, 2020; Millonig, 2019).

Yet regarding the technological solutions to transport inequality, there are still quite a number of unresolved points to consider before being able to confirm their social and environmental benefits. These technological developments could be grouped under shared mobility (bike sharing, car sharing, and ride-hailing, such as Uber, etc.), smart mobility (based on the guidance of smart phones), and other developments related to vehicle technology (prominently, autonomous cars). These kinds of technological solutions to transport inequalities are quite suited to today's zeitgeist, considering all the developments in smart technologies and ambitions towards a sustainable future. Researchers discuss the possibilities of these smart technologies, helping to overcome the mobility barriers for the elderly and other populations that have mobility impairments (Dianin et al., 2021; Harb et al., 2022). They also analyze the utility of smart phones in facilitating people's travel planning, and their benefiting from "multimodality" (Groth, 2019, p. 57) in extraordinary situations, such as the pandemic (Liu et al., 2021). Shared mobility is usually shown as a sustainable and environmentally-friendly option for transport. Yet all these expectations of technology-based advancements in transport are contingent on the availability of certain environmental standards and regulations, and target people's willingness and ability to use these technologies.

Finally, building new transport infrastructure and developing what exists could be one important measure against transport inequality. For example, local administrations could develop public transit lines to include suburban areas and thus, enhance the ability of residents of remote urban areas to access public services, such as healthcare (Badji, Badland, Rachele, & Petrie, 2021). The availability of public transport in the suburbs also creates beneficial effects in terms of increasing these people's social participation and inclusion by increasing their activity levels and social networks. Hence, Utsunomiya (2016) underlines the importance of local public transport beyond its common functional and social benefits, despite its non-profitability. However, many researchers share the opinion that bringing transport infrastructure to peripheral or poor urban areas is not enough to bring about a mobility shift. There are other structural factors, such as societal gender norms (McCray & Brais, 2007; Nosal Hoy & Puławska-Obiedowska, 2021; Parsha & Martens, 2022; Pojani, Boussauw, & Pojani, 2017; Qamhaieh & Chakravarty, 2017), that create particular forms of "gendered mobility" (Jirón et al., 2020), inter- and intra-regional inequalities (Cervero, 2013; Diaz Olvera et al., 2013; Sancho-Reinoso et al., 2022; Tiwari, 2003; Wells, 2012), and behavioral and socio-demographic factors (Acheampong, Cugurullo, Gueriau, & Dusparic, 2021) to consider in planning the right transport measures and policies for transport equity.

5. Conclusion

The capitalist system's unsustainable contradictions between growing production and profits on the one hand, and diminishing returns for the working populations in terms of wages and services on the other, are reflected in the urban transport sector just as much as in housing and other realms. The socio-structural inequalities that are created by an economic system that is

based on a principle of compound growth (Harvey, 2022) influence people's mobility in an increasingly mobile society and vice versa. This is because urban transport is not isolated from a wider urban planning and policy-making endeavor that is itself not separate from the larger political-economic system. Hence, the fields of transport and mobility have much deeper and more context-dependent aspects than being a simple matter of traveling from one place to another.

Because societies are now living in the mobility era, transport-related social problems have also gained more weight in the political field. Social movements arising from transport inequality issues are beginning to represent a significant share of the newly emerging urban social movements. Harvey (2022) points to some of them under the heading of "global unrest" in his recent book. These are urban social movements against transport inequalities that have emerged in various places, ranging from Chile to Ecuador, Paris, Tehran and São Paulo. It is interesting to see what all these recent uprisings around the world have in common: inequalities in the transport field. This is true, whether it is a student protest against the rise in the cost of subway or bus tickets, as in Chile and São Paulo, the hike in fuel prices as in the Yellow Vests Movement in Paris's suburbs or the reduction in fossil fuel subsidies in Ecuador ("How reforming fossil fuel subsidies can go wrong: A lesson from Ecuador," 2019). In the light of these, one can argue that transport inequalities come forward as a primary source of social conflict in contemporary society.

However, the fundamental solution suggestions differ depending on how one defines the problem in the first place. Is it a simple malfunction of the system, or its failure? Well-known thinkers such as Richard Florida and David Harvey take different paths in explaining these increasing social inequalities. Florida (2018) recognizes the intensity of the social inequality problem and yet argues that a more sustainable and egalitarian capitalism is still possible without giving up on the growth ideal. On the other hand, Harvey (2022) clearly states that the actual problem lies in the compound growth dependency of the capitalistic system itself, rather than a malfunctioning of its neoliberal stage. Hence, his suggested solution is a revolution rather than a reform of the current form of vulgar capitalism, but it is a revolution as a process rather than a momentary incident or event in Deleuze's sense.

More pragmatically, the issue of transport inequality requires context-specific solutions that are suitable for particular urban areas, cities, and regions. Yet at the same time, these place-specific solutions should take into consideration other socio-cultural, economic, political and environmental factors, besides transport to approach the matter. Moreover, they shouldn't lose sight of the common and universal goal of sustainability, which can be environmental, social, and economic all at the same time. Hence, it is a big challenge for transport policy makers around the world to deal with in a balanced fashion by both following good practices in such a way as to adapt them to their local contexts and creating new ones directly from their own particular circumstances. In terms of research, there is scope for more research on regional inequalities, interconnections between transport and other forms of inequality, and conflicts of interest in contested transport infrastructure projects.

Ethics Committee Approval Statement

Ethical committee approval is not required, as the study did not collect data from human or animal participants.

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Trafik ve Ulaşım Araştırmaları Dergisi

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Safety Research Unit

Araştırma Makalesi

Köprülü Kavşak Sistemlerinin Kazaları Azaltmadaki Etkisi: Devrekani Kavşağı Örneği

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Öz

Trafik kazaları, insan hayatını etkileyen büyük bir halk sağlığı sorunudur. Meydana gelen trafik kazalarının büyük çoğunluğu genellikle insan hatalarından kaynaklanmaktadır. Ancak tüm kazalar insani hatalardan kaynaklanmaz, yol durumu ve zemin durumu gibi diğer faktörler de kazalara neden olabilir. Aynı noktada sürekli olarak benzer kazaların meydana geldiği yerler, kaza kara noktası olarak adlandırılır. Bu çalışmada, Kastamonu ilinden başlayarak Niğde ilinde son bulan D765 İnebolu devlet karayolunun 2. kesim noktası 0. kilometresinde bulunan Devrekani Kavşağı mevkiinde 2010-2022 yılları arasında meydana gelen trafik kazaları incelenmiştir. Bu kavşak noktası 2019 yılından itibaren köprü kavşak halini almıştır. Öncesinde ise kontrolsüz (hemzemin) kavşak olarak çalışan sistem sebebiyle çok fazla kaza meydana gelmiştir. Devrekani kavşağı mevkiinde 2010- 2018 yılları arasında onlarca ölümlü yaralamalı kaza meydana gelmiştir. Meydana gelen kazaları engellemek amacıyla 2018 yılı içerisinde Karayolları Genel Müdürlüğü tarafından kavşak noktasının köprü kavşağa dönüştürülmesine karar verilmiştir. İnşa çalışması sırasında titizlikle alınan tedbirler sayesinde belirtilen alanda ölümlü bir kaza yaşanmaması da dikkat çekmektedir. Bu veriler sonucunda yapılan köprü kavşağın ne kadar gerekli ve önemli olduğu görülmektedir. Sonuç olarak, hemzemin kavşaklarda yapılan iyileştirme çalışmalarının olumlu faydaları olduğu tespit edilmiş ve benzer noktalarda alınabilecek önlemlerin trafik kazalarını azaltacağı sonucuna varılmıştır.

Anahtar Kelimeler: trafik kazası, kaza sebepleri, kavşak, D765 İnebolu devlet karayolu

The Effect of Bridge Junction Systems in Reducing Accidents: Devrekani Junction Example

Abstract

Traffic accidents are a major public health problem affecting human life. The vast majority of traffic accidents that occur are usually caused by human errors. However, not all accidents are caused by human error, other factors such as road condition and ground condition can also cause accidents. Places where similar accidents occur continuously at the same point are called accident black spots. In this study, traffic accidents that took place between 2010-2022 in Devrekani Junction, located at the 0^{th} kilometer of the 2^{nd} intersection points if the D765 İnebolu state highway, starting from Kastamonu and ending in Niğde province, were investigated. This junction point has become a bridge junction since 2019. Previously, too many accidents occurred due to the system operating as an uncontrolled (at-grade) intersection. Between 2010 and 2018, dozens of fatal and injury accidents occurred at Devrekani junction area. In 2018, the General Directorate of Highways decided to transform the junction point into a bridge junction in order to prevent the accidents that occurred. It is also remarkable that no fatal accident occurred at the specified location thanks to the meticulous precautions taken during the construction work. As a result of these data, it is seen how necessary and important the bridge junction is. As a result, it has been determined that the improvement works carried out at at-grade intersections have positive benefits and it has been concluded that the measures that can be taken at similar points will reduce traffic accidents.

Keywords: traffic accident, causes of accident, junction, D765 İnebolu state highway

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Köprülü Kavşak Sistemlerinin Kazaları Azaltmadaki Etkisi: Devrekani Kavşağı Örneği

Trafik kazaları, dünya üzerinde küçümsenmeyecek kadar yaralanmalara ve ölümlere sebebiyet veren kaza türüdür. Dünya Sağlık Örgütü (Word Health Organization [WHO]) verilerine göre ortalama bir yıl içerisinde bir milyon insan trafik kazası sonucu yaşamını yitirmekte, elli milyona yakın insan ise yaralanmaktadır (Word Health Organization [WHO], 2018).

Özellikle nüfus artışı ile birlikte oluşan kalabalık şehirler, bu şehirlerde tamamlanmamış veya artan nüfus hızına uygun olmayan karayolu ağı sebebiyle doğan trafik sıkışıklığı ve trafik eğitimindeki eksiklikler trafik kazalarına sebebiyet vermektedir (Doğan, 2022).

Trafik kazalarının doğurduğu zararlar tek yönlü değildir. Kazalar, birden fazla zarara neden olmaktadır. Kuşkusuz en büyük zarar kişilerin sağlığına verilmiş olsa da bunun yanı sıra toplumsal huzur, emniyet, asayiş durumu ile ekonomiye de büyük zararlar vermektedir. Ülkemizde yaşanan ekonomik kaybı değerlendirecek olursak, İçişleri Bakanı Sayın Süleyman Soylu tarafından trafik kazalarının sonuçlarının kaleme alındığı "Bir Yol Hikayesi" isimli makalede 2019 yılında trafik kazalarının ülke ekonomisine maliyeti 55 milyar TL'nin üzerinde olduğu belirtilmiştir (Soylu, 2019).

Trafik kazaları ile ilgili yapılan ulusal ve uluslararası birçok çalışmada kazaların genelde insan kaynaklı hatalardan kaynaklandığı vurgulanmıştır. İnsanların yapmış olduğu hatalardan kaynaklanan kazaların büyük çoğunluğunun aşırı hız, trafik kural ve düzenlemelerinin ihlali olduğu sonucuna varılmıştır (Touahmia, 2018).

Karayolu güvenlik sistemleri karayollarında yolcu, yaya ve sürücü olarak bulunanların can ve mal güvenliğini sağlamak, güvenli yolculuklarına devam etmeleri için uygulanan ve yolun nasıl kullanılması gerektiğini gösteren, oluşacak kazaların önüne geçilmesine veya oluşmuş bir kazanın en az zararla atlatılmasını sağlayan yapılardır (Ahıskalı, Arslan ve Sağlık, 2021).

Güvenlik sistemleri aktif, pasif, akıllı ve ışıklandırma olarak dört gruba ayrılır. Köprülü kavşaklar doğrudan bir güvenlik sistemi olmamasına rağmen kazaların önlenmesinde diğer kavşak sistemlerine göre oldukça başarılı olduğu görülmüştür. Tüm güvenlik sistemlerinin uygulanmasına rağmen kaza kara noktası olmaktan çıkarılamayan yerlerde yolun geometrik standartlarının iyileştirilmesi söz konusudur. Bu iyileştirme çalışmaları kapsamında uygun görülen hemzemin kavşaklar köprülü kavşaklara dönüştürülmektedir. Kavşağı oluşturan yol sayısına göre, yonca yaprak, trampet veya diğer kavşak türleri kullanılmaktadır. Bu tür köklü çözümler trafik kazalarını olumlu yönde etkilemekte ve o alanı kaza kara noktası olmaktan çıkarmaktadır (Ahıskalı, 2022).

Bu çalışmada, Devrekani kavşağı örneği üzerinden köprülü kavşak sisteminin trafik kazalarını azaltmadaki etkisi araştırılmıştır. D765 İnebolu devlet karayolu Kastamonu ili İnebolu ilçesinden başlayarak Niğde ilinde son bulmaktadır. D765 İnebolu Devlet Karayolu üzerinde de birden fazla kaza kara noktası vardır. D765 karayolunun 01. kesim noktasının bitiminde, 2. Kesim noktasının başlangıcında bulunan Devrekani kavşağı D765 İnebolu devlet karayolunun 37-01 Kastamonu Çatalzeytin il yolu ile kesiştiği noktadır (Doğan, 2022). Trafik yoğunluğu fazla olan bir kavşak olmasına rağmen, Şekil 1.a'da görüldüğü üzere, 2018 yılına kadar herhangi bir sinyalizasyon ve katılma ayrılma şeridi bulunmamaktadır. Bu kavşak 2019 yılından itibaren köprülü kavşak halini almıştır. Şekil 1.b'de gösterilen fotoğraf incelediğinde bu durum açıkça fark edilmektedir.

Şekil 1. Devrekani kavşağının eski (solda) ve yeni halini (sağda) gösterir şekiller

İnebolu-Kastamonu istikametinde çift yönlü trafik akışını kullanan araçların yoldaki yüksek boyuna eğimin de etkisi ile kavşak noktasına yüksek hızlarla girmesi ve ayrıca Çatalzeytin il yolu istikametinden gelerek İnebolu devlet karayolu yönüne dönmek isteyen araçların kavşağa yaklaşım ve kullanma kurallarına uymamaları sebebiyle çok fazla kaza meydana gelmektedir. 1060 metre rakıma sahip Devrekani kavşağına 1350 metre uzaklıkta Oyrak geçidi bulunmaktadır. Bu geçit; Kastamonu İnebolu karayolu üzerinde bulunan ve 1210 metre rakıma sahip bir mevkidir. Geçit ile kavşak noktası arasında oluşan rakım farkı sebebiyle maksimum bir boyuna eğim oluşmaktadır. Bu da araçların kontrolsüz hızlanmasına sebebiyet vermektedir. Sonuç olarak yüksek hızın ve diğer olumsuz faktörlerin etkisi ile kazalar kaçınılmaz hale gelmektedir. Devrekani kavşağı mevkiinde 2010-2017 yılları arasında toplam 44 ölümlü/yaralamalı kaza meydana gelmiştir. Bu kazalarda 8 kişi hayatını kaybetmiş ve 121 kişi de yaralanmıştır. Aynı zamanda, bu yıllar içerisinde meydana gelen yaralamalı ve ölümlü kazalar dışında maddi hasarlı kazaların sayısı da az değildir. Bu değerlendirmelere göre kaza kara noktası olan kavşağın, bir kaza kara noktası olmaktan çıkarası amacı ile, Karayolları Genel Müdürlüğü tarafından hemzemin kavşak noktasının köprü kavşağa dönüştürülmesi kararı verilmiştir. 2019 yılında ulaşıma açılan bu kavşaktaki kaza sonuçları, çalışmamızın ana fikrini oluşturmaktadır.

2. Yöntem

Bu çalışma, Kastamonu ili Devrekani ilçesi sınırlarında bulunan Devrekani Köprülü Kavşağının; köprülü kavşak uygulamasından öncesi ve sonrasında meydana gelen trafik kazalarına ait ayrıntılı bir analiz yapılarak, köprülü kavşağın trafik kazalarına etkisini ortaya koymak amacıyla yapılmıştır. Araştırmada kullanılan 2010 yılı Ocak ayından 2022 yılı Aralık ayına kadar meydana gelen kazalara ait veriler Jandarma Genel Komutanlığının 24.06.2021 tarihli ve E-49572419-300.99-3750003 sayılı yazısı ile Kastamonu İl Jandarma Komutanlığı Trafik Şube Müdürlüğünden temin edilmiştir.

Ayrıca veri ön işleme, sınıflandırma ve küme analizlerinin yapılması için Genel Kamu Lisansı (GNU) ile çalışan açık kaynak kodlu bir yazılım olan Waikato Environment for Knowledge Analysis (WEKA) kullanılmıştır (Weka Analysis, 2020; Witten, Frank, Hall ve Pal, 2017). Yol zemini ikili sınıflandırma analizi için Naive Bayes sınıflandırma yöntemi kullanılmıştır (Sitanggang, Tulus ve Situmorang, 2017; John ve Langley, 1995).

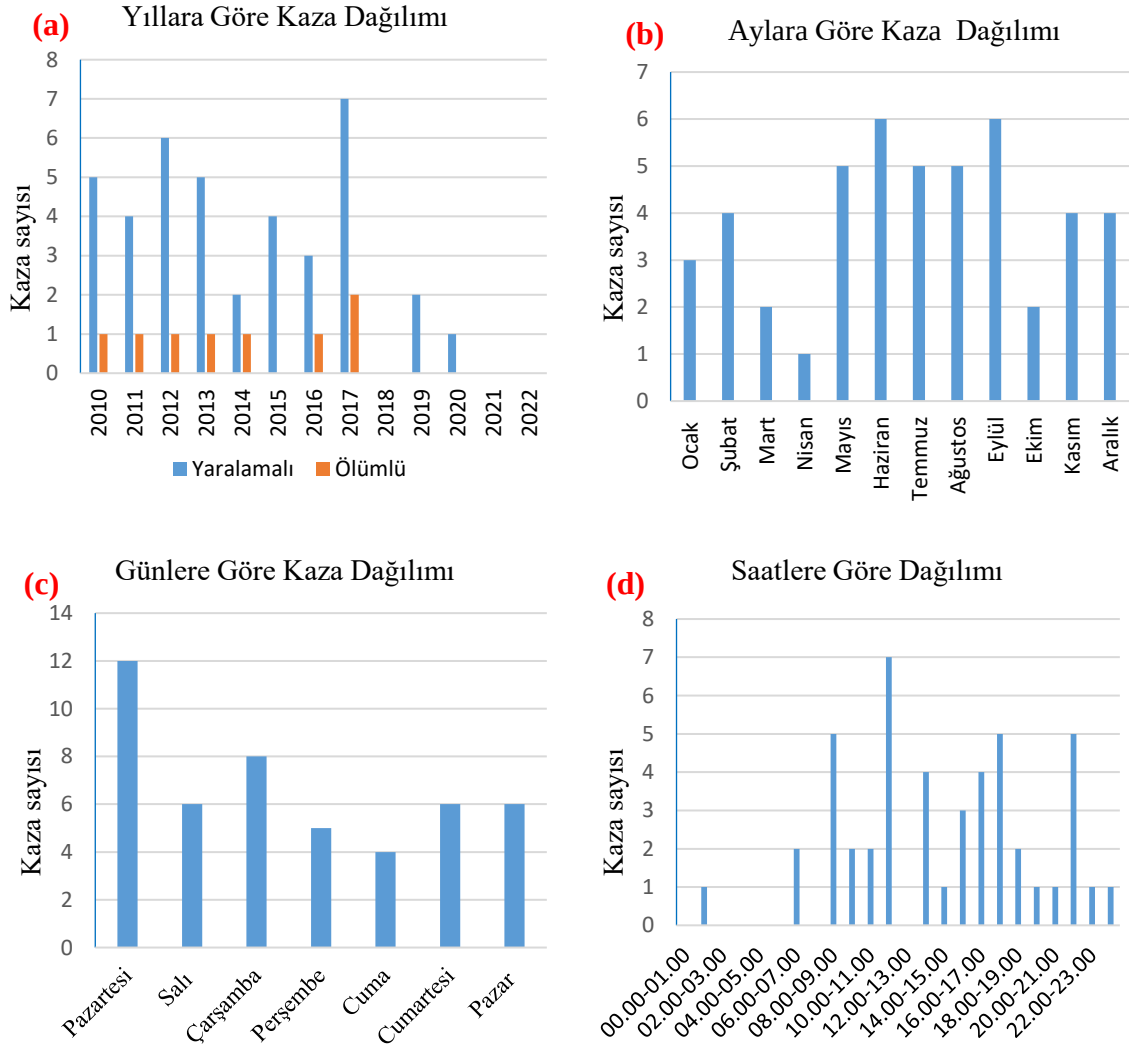
Trafik kazalarının zaman bakımından (yıl, ay, gün, saat ve gün durumuna göre), hava ve zemin durumu yönünden, kazaların oluş şekillerine göre olmak üzere trafik kaza sayısı frekans

dağılımları yapılarak analiz edilmiştir. Naive bayes ikili sınıflandırma metodu ile yol zemini-kaza şekli, yol zemini-kaza tipi, yol zemini-gün durumu ve yol zemini-araç durumlarına göre analiz edilmiştir. Ayrıca, hava durumu-yol yüzeyi-gün durumu, oluş şekli-kaza metresi-yol yüzeyi ve kaza yılı-kaza ayı-kaza metresi durumlarına ait trafik kazaların üçlü küme analizleri Weka Programı ile yapılmıştır.

3. Bulgular

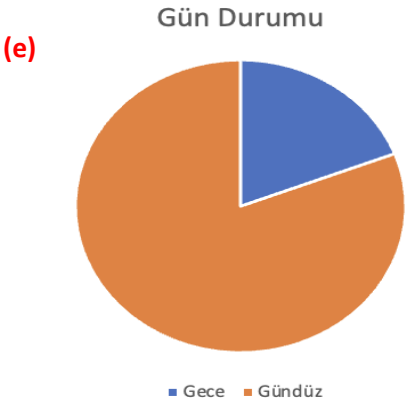
3.1. Zaman Bakımından Kazaların İncelenmesi (2012-2022)

Devrekani kavşağı ve Devrekani köprülü kavşağında 2010 yılı Ocak ayından 2022 yılı Aralık ayına kadar meydana gelen ölümlü/yaralanmalı trafik kazalarının yıllara, aylara, günlere, saatlere ve gün durumuna göre dağılımları Şekil 2'de gösterilmiştir.



Kavşak noktasını 2010 yılı itibariyle ele aldığımızda 2010 yılı ile 2017 yılları arasında 2015 yılı hariç her yıl bir ölümlü trafik kazası yaşanmış olup 2017 yılında ise iki ölümlü trafik kazası meydana gelmiştir. Kavşak noktasında 7 yılda toplam 44 yaralamalı trafik kazası meydana gelmiştir. Meydana gelen kazalara ilişkin bir görsel Şekil 3'te gösterilmiştir. Köprünün inşasına başlanan 2018 yılında kaza meydana gelmemiş olup, köprülü kavşağın kullanıma açıldığı 2019 yılı Şubat ayından 2022 yılı Ekim ayına kadar toplam 3 yaralamalı kaza meydana gelmiştir. Bu kazalardaki yaralanmalar basit tıbbi müdahale gerektiren yaralanmalardır. Bu kazalar, yeni inşa

edilen köprülü kavşağı bilmeyen ve ilk defa kullanan sürücülerin adaya çıkma şeklinde gerçekleştirdiği kazalardır. Köprülü kavşak yapılmadan önce ve yapıldıktan sonraki süreçte veriler göz önüne alındığında, köprülü kavşak olmasının halkın sağlığı açısından ne kadar önemli olduğu görülmektedir.



Şekil 2. Trafik kazalarının (a) yıl, (b) ay, (c) gün, (d) saat ve (e) gün durumuna göre dağılımları

Şekil 3. 2017 yılında meydana gelen ölümlü ve yaralamalı trafik kazasına ait şekiller

Aylara göre kaza dağılımı incelendiğinde kaza sayısında genellikle yaz aylarında artış olduğu görülmektedir. Bunun en büyük sebebi yol kullanım miktarında meydana gelen artışın kaza sayılarına da doğrudan etki etmesidir. Kastamonu'nun genel yapısı itibariyle çok fazla göç vermesi ve diğer şehirlerde yaşayan Kastamonuluların yaz aylarında memlekete gelmesi, özellikle incelememize konu olan tarih aralığında dini bayramların yaz mevsimi içerisinde olması bu artışa sebebiyet vermektedir.

En fazla kaza yaşanılan ay Haziran ve Eylül aylarıdır. En az kaza yaşanılan aylar ise Mart ve Nisan ayıdır. Kazaların aylara göre incelenmesinde bir diğer husus sürücü psikolojisi ile ilgilidir. Araç sürücüleri genellikle zor şartlar altında daha dikkatli olurken yaz mevsimi gibi yol şartlarının daha uygun olduğu dönemlerde, daha düşük konsantrasyon gerektiren zamanlarda yola dikkatini vermeyip özellikle aşırı hızlı araç kullanma ve uyarıcı levhaları dikkate almama gibi bir eğilime girmektedirler. Bu durum tatil akraba ziyaretleri gibi durumlar ile birleştiği takdirde dikkatin daha da düştüğü yaptığımız araştırma ortaya konulmuştur.

Kazaların günlere göre dağılımına baktığımızda pazartesi gününün diğer günlere nazaran daha yoğun olduğu görülmektedir. Bunun sebepleri arasında mesainin ilk günü olması ve yol ağını genellikle Kastamonu ilinin ilçeleri tarafından kullanılması, ilçelerde yaşayan vatandaşların genellikle ilde bulunan hastane ve resmi dairelere mesainin ilk günü daha yoğun gitmesi gibi nedenler sayılabilir.

Kazaların gündüz gece durumuna göre dağılımını incelediğimizde kazaların büyük bir bölümünün gündüz gerçekleştiği görülmektedir. Araç sürücüleri genellikle gece daha dikkatli ve gündüze göre daha yavaş seyahat etmeleri ile yolun kullanım sıklığının genellikle gündüz yoğun olduğu değerlendirilmektedir (Karayolları Genel Müdürlüğü, 2022).

Kazaları saatlere göre dağılımı incelendiğinde Saat 11.00-12.00, 08.00-09.00 ve 17.00-18.00 arasında yoğun olduğu belirlenmiştir. Özellikle Saat 08.00-09.00 ve 17.00-18.00 saatlerinde mesai başlangıcı ve bitişi olması sebebiyle yolun daha yoğun kullanıldığı, gece saatlerinde ise 21.00-22.00 arasında daha sık kaza meydana geldiği görülmüştür.

3.2. Kazaların Hava ve Zemin Durumuna Göre İncelenmesi

Yaralanmalara ve ölümlere neden olan trafik kazalarının, hava durumu dışında iklimi etkileyen diğer hava faktörlerinin katkısının olduğu ortaya konulmuştur. Bu faktörler arasında sulu kar, kar, buz fırtınası, sağanak yağış, sağanak gibi olayların yol yüzeyine olan etkileri araştırılmıştır (Drosu, Cofaru ve Popescu, 2020).

Yola yabancı sürücülerin yapmış olduğu kazaların incelendiği bir çalışmada, yolu bilmeyen sürücülerin özellikle yaz aylarında ve yüksek trafik yoğunluğunda artış gösterdiği tespit etmişlerdir (Intini, Bercola, Colonna, Ranieri ve Ryeng, 2018).

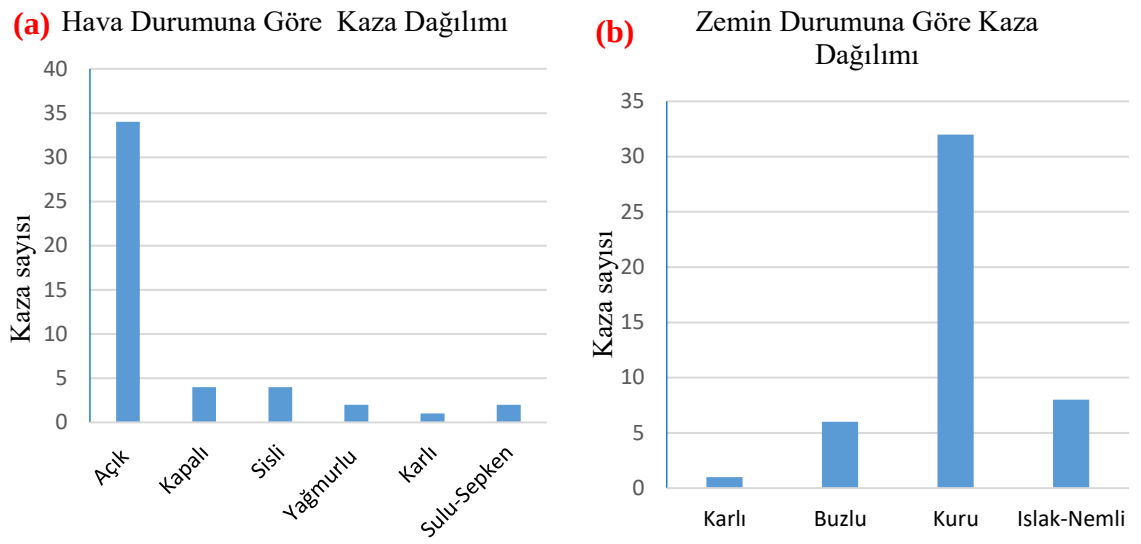
Devrekani kavşağı ve Devrekani köprülü kavşağında 2010 yılı Ocak ayından 2022 yılı Aralık ayına kadar meydana gelen ölümlü ve yaralamalı trafik kazaları hava durumu ve zemin durumuna göre dağılımları Şekil 4'te gösterilmiştir.

Yapılan incelemede kazaların daha çok havanın açık olduğu, görüş problemlerinin olmadığı zamanlarda meydana geldiği, kötü koşullarda sürücülerin daha dikkatli olduğu, hava koşullarının daha iyi seyrettiği zamanlarda ise daha özgüvenli ve tedbirsiz araç kullanmalarından kaynaklandığı sonucuna varılmıştır.

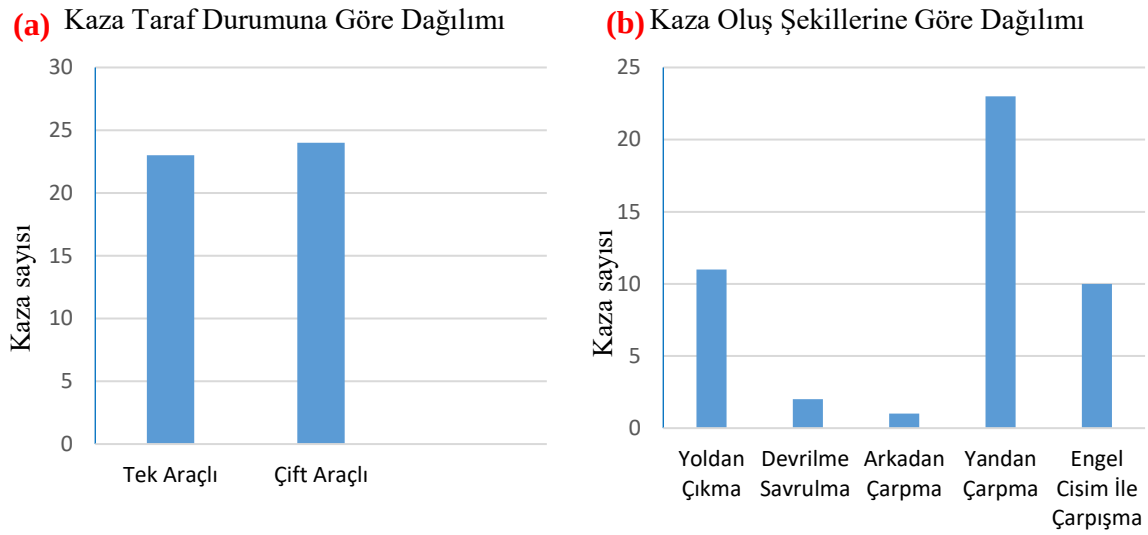
Hava durumu aynı zamanda zemin durumunu da belirleyen ana etkendir. Kış mevsiminde genellikle daha kaygan ve görüşü kısıtlayan araç kullanımı daha tehlikeli veya kazaya daha elverişli bir sürüş ortamı yaratmaktadır. Hava durumu kaza oranları ile zemin durumu kaza oranı hemen hemen benzerlik göstermektedir. Zemin olarak yolun kuru olduğu zamanlarda genellikle yolun kaza açısından bir etkisinin olmadığı değerlendirilir. Ancak incelememize konu Devrekani kavşağı bölgesinde ise yolun kuru olduğu zamanlarda sürücülerin diğer zorlu ortamlara nazaran dikkatini çok fazla yola vermemesi sebebiyle kazaların daha sık meydana geldiği görülmüştür.

3.3. Kazaların Oluş Şekillerine Göre İncelenmesi

Devrekani kavşağı ve Devrekani köprülü kavşağında 2010 yılı ile 2022 yılı ekim ayına kadar yaşanan ölümlü/yaralamalı trafik kazalarının kaza taraf durumuna göre (tek araçlı- çift araçlı) dağılımları ve trafik kazalarının oluş şekillerine göre dağılımı Şekil 5'te gösterilmiştir.



Şekil 4. Kazaların (a) hava durumuna ve (b) zemin durumuna göre dağılımları



Şekil 5. Trafik kazalarının (a) kaza taraf durumuna ve (b) kaza oluş şekillerine göre dağılımları

Meydana gelen kazalar incelendiğinde alanın kavşak noktası olması sebebiyle çift araçlı ve çok araçlı kazaların daha fazla olması beklenmektedir. Ancak Devrekani kavşağında meydana gelen kazalar incelendiğinde tek araçlı kazalarında azımsanmayacak kadar fazla olduğu görülmektedir. Bunun nedeni ise 1210 metre rakımlı Oyrak geçidinden 1060 metre rakımlı Devrekani kavşağına kısa bir mesafede inilmesi ile araçların yol koşulları sebebiyle hız yaptığı sürücülerin bu kontrolsüz hızlanmaya karşı koymadığı takdirde kavşağa yüksek hızlarda girilmektedir. Özellikle kavşağa girmeden hemen önce bulunan virajlı alan sebebiyle yapılan fren ya da direksiyon manevralarının sonucu engel cisim ile çarpışmak (yol kenarında bulunan bariyer beton blok veya kaldırıma çarpma) ve yoldan çıkma şeklinde kazalar meydana gelmektedir.

Ayrıca 37-01 Çatalzeytin yolundan kavşağa kontrolsüz giren araçlar sebebiyle manevra yapan araçların tek taraflı kaza yaptığı kazazede sürücülerin beyanlarında mevcuttur.

Kazaların oluş şekilleri incelendiğinde ise alanın kavşak olması nedeniyle iki adet birbirinden bağımsız yolu birleştirdiği için yandan çarpma şeklinde meydana gelen kazalar ağırlıktadır. Yandan çarpma olarak meydana gelen trafik kazaları en az iki aracın kazaya karışması ile meydana gelmektedir. Çalışmamıza konu İnebolu devlet karayolunda meydana gelen çift araçlı trafik kazalarının sadece bir tanesi arkadan çarpma olarak gerçekleşmiş olup geri kalan yirmi üç adet çift taraflı kaza yandan çarpma olarak gerçekleşmiştir.

Tek araç ile gerçekleşen kazaların genelinin yoldan çıkma ve engel cisim ile çarpışma şeklinde olduğu, nadiren de devrilme/savrulma olarak gerçekleştiği görülmüştür.

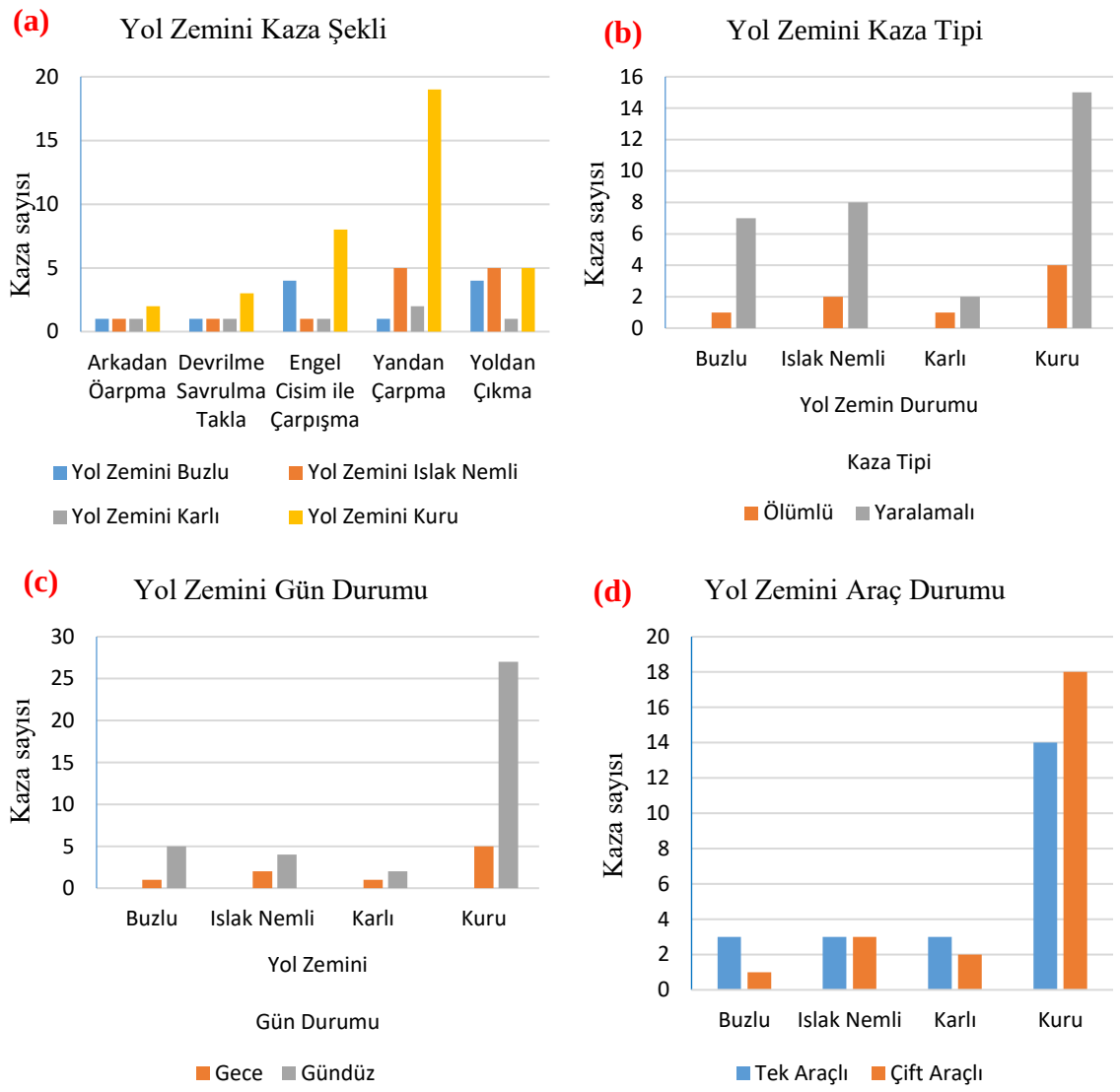
3.4. Naive Bayes Yol Zemini İkili Sınıflandırma Durumları

Naive bayes ikili sınıflandırma analizi ile Devrekani kavşağı ve Devrekani köprülü kavşağında yaşanan ölümlü ve yaralamalı trafik kazalarının; yol zemini-kaza şekli, yol zemini-kaza tipi, yol zemini-gün durumu ve yol zemini-araç durumuna ait ikili sınıflandırma grafikleri Şekil 6'da gösterilmiştir.

Elde edilen sonuçları göre kazalar, çoğunlukla sürücü hatlarından kaynaklanmıştır. Yol zemininin kuru olduğu durumlarda yandan çarpma türü kazaların daha fazladır. Ayrıca yol zemininin kuru, gün durumunun gündüz olduğu zamanlarda daha fazla kaza meydana gelmiştir.

3.5. Trafik Kazaların Üçlü Küme Analizleri

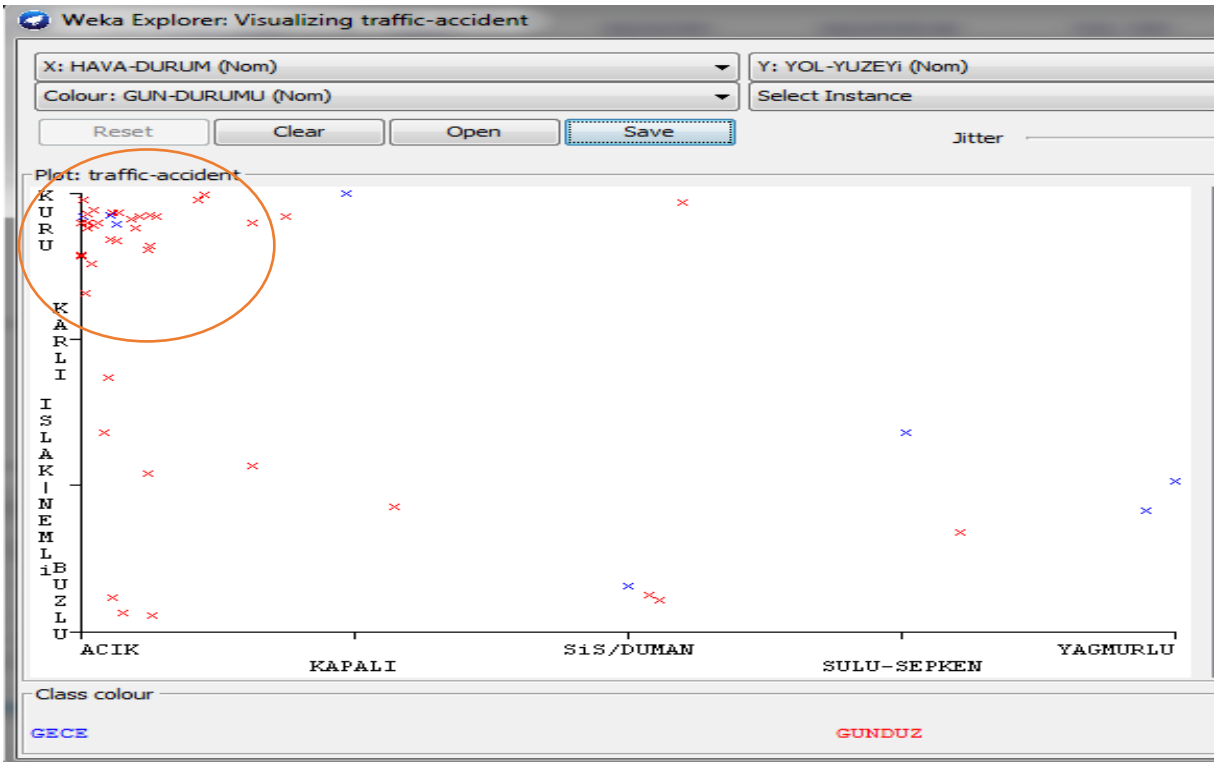
Yapmış olduğumuz çalışmanın verileri ışığında sürücülerin kaza yaptıkları anın, aslında en güvenli olduklarını düşündüğü zamanlarda meydana geldiğini, bu güvende olma düşüncesiyle de daha dikkatsiz ve kontrolsüz araç kullandıklarını değerlendirmekteyiz. Bu durum ülke geneli trafik kazaları ile karşılaştırıldığında Türkiye İstatistik Kurumu (TÜİK) (2008 ile 2017 yılları arasındaki) verilerine göre kazaların %98,97'si sürücü, yolcu veya yaya kaynaklı olduğu bildirilmiştir. İncelememize konu yol üzerinde meydana gelen kazaların %98,4 insan kaynaklı olduğu tespit edilmiştir (Türkiye İstatistik Kurumu [TÜİK], 2020). Devrekani kavşağında meydana gelen kazalara ilişkin yapılan hava durumu-yol yüzeyi-gün durumu üçlü analiz sonucunu gösterir ekran görüntüsü Şekil 7'de verilmiştir. Devrekani kavşağı alanında meydana gelen kazalar incelendiğinde açık havada, kuru yol zemininde gündüz bir kümelenme mevcut olduğu görülmüştür. Bu durum aynı zamanda trafik kolluğunca denetlendiğini düşündüğünde de geçerli olmaktadır. Elektronik denetleme sistemlerinin olduğu yollarda kaza sayısının daha az ve trafik kuralı ihlallerinin daha düşük olduğu bilinmektedir (Aydın ve Köfteci, 2020).



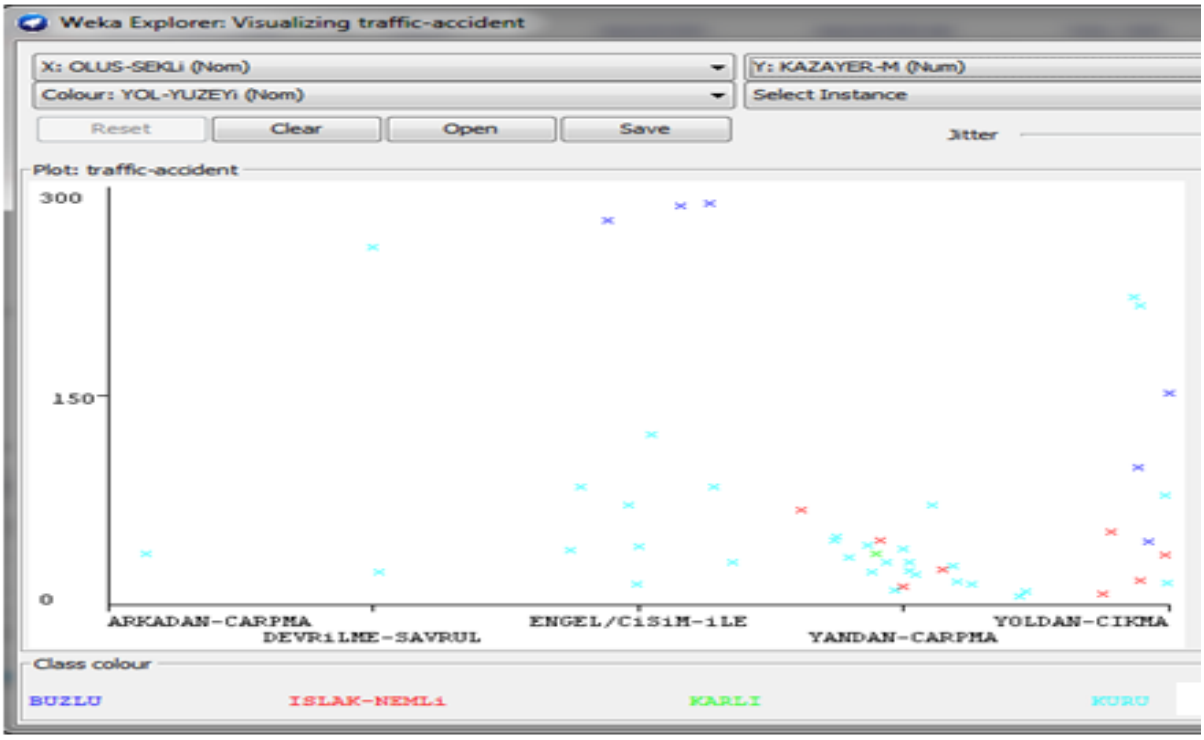
Şekil 6. Naive Bayes ikili sınıflandırma sonuçları. (a) yol zemini-kaza şekli, (b) yol zemini-kaza tipi, (c) yol zemini-gün durumu ve (d) yol zemini-araç durumu

Devrekani kavşağında meydana gelen kazalara ilişkin yapılan oluş şekli-kaza metresi-yol yüzeyi üçlü analiz sonucunu gösterir ekran görüntüsü Şekil 8'de verilmiştir. Devrekani kavşağında meydana gelen kazalar üçlü kümelenme analizi ile değerlendirildiğinde kazaların çoğunluğu kuru zeminde, kavşağın yaklaşık 50 metre civarında yandan çarpma biçiminde meydana geldiği görülmüştür. Kontrolsüz kavşak olması sebebiyle iki farklı bağımsız yolun birleştiği noktada geçiş üstünlüklerinin tam olarak bilinmemesi kavşaklara yaklaşma kurallarına uyulmaması ile kazalar meydana gelmektedir. Özellikle yukarıda kazaların zaman bakımından incelendiği bölümde saat 11.00-12.00 arasında meydana gelen kazaların tamamının aşağıda üçlü analiz içeresinde olduğu, bu duruma ana etkenin sürücülerin dikkat eksikliği ve kurallara uymamaları sebebiyet ile olduğu sonucuna varılmıştır.

Devrekani kavşağı bölgesinin köprü kavşak yerine sinyalizasyon sistemleri (trafik ışığı) ile kontrol edilmesi durumunda ışığa uymayan sürücüler yine kazalara sebep olacağı için köprülü kavşak yapımı alan için en uygun sistem olduğu değerlendirilmiştir.



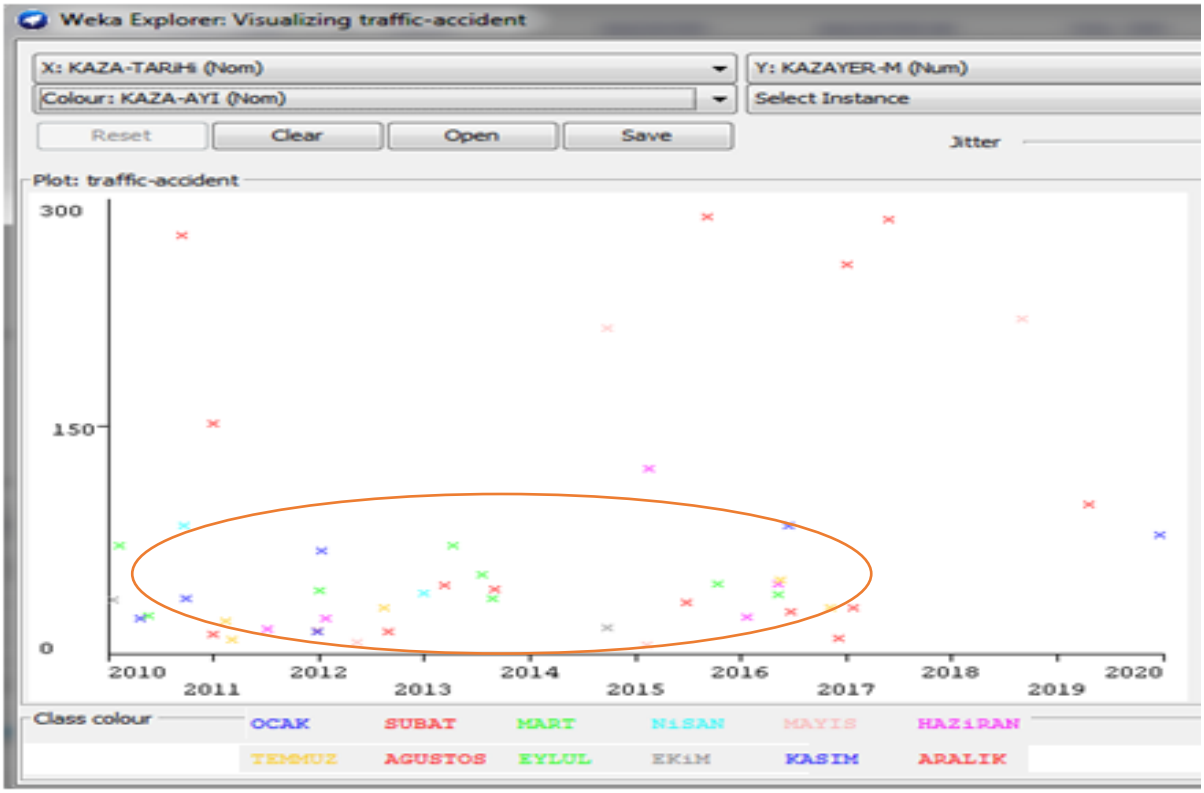
Şekil 7. Weka analiz programı ekran görüntüsü (hava durumu-yol yüzeyi-gün durumu)



Şekil 8. Weka analiz programı ekran görüntüsü (oluş şekli-kaza metresi-yol yüzeyi)

2018, 2019 ve 2020 yıllarında köprülü kavşak kullanıma açıldıktan sonra kavşak civarında çift araçlı kaza olmamış olup 2019 yılında 2, adet 2020 yılında 1 adet tek araçlı engel cisme çarpma şeklinde kaza meydana gelmiştir. İlerleyen dönemde özellikle bölge halkının köprülü kavşakta

bulunan ada sistemini öğrenmesi ve adaya çıkma şeklinde gerçekleşen kazaları önlemek için karayolları ekipleri tarafından adayı gösterir levha ve işaretlerin yerleştirilmesi ile bu kazalar da sıfıra inmiştir. Devrekani kavşağında meydana gelen kazalara ilişkin yapılan kaza yılı-kaza ayı-kaza metresi üçlü analiz sonucunu gösterir ekran görüntüsü Şekil 9'da verilmiştir.



Şekil 9. Weka analiz programı ekran görüntüsü (kaza yılı-kaza ayı-kaza metresi)

Kavşak yapıldıktan sonra yaklaşık üç yıllık süre içerisinde sadece üç kaza meydana gelmiştir. Meydana gelen kazalar ve kazaların sonuçları oldukça hafif sayılabilecek şekillerde olmuştur. Bu kazaların iki tanesine ait birleştirilmiş fotoğraf Şekil 10'da gösterilmiştir.

Şekil 10. 2019 Yılında meydana gelen iki farklı kazaya ilişkilin fotoğraflar

4. Tartışma

Trafik kazalarının büyük bir bölümü öngörülebilir olaylar olup, gerekli tedbirler alınması halinde engellenebilir durumlardır. Trafik kazaları ile mücadelede ki öncelik, kazaların oluşumunu engelleyebilen tedbirlerin alınması olmalıdır. Bu sebeple, her bir kaza noktası ayrıca incelenerek, kazaya neden olan etkenlerin ayrıntılı olarak tanımlanması ve buna yönelik alınabilecek tedbirlerin uygulanması gerekmektedir.

Atalay'a (2010) ait araştırmada, şehir dışı trafik kazaları sonucu meydana gelen ölüm ve yaralanma oranları bakımından benzer olan iller belirlenmiştir. En fazla ölüm ve yaralanma oranlarına sahip olan illerin nüfus yoğunluğu ve gelişmişlik düzeyi düşük, genelde kırsal alanlarda olduğu tespit edilmiştir. En düşük ölüm ve yaralanma oranlarının meydana geldiği illerde ise bu oranların yüksek olduğu görülmüştür. Araştırma sonucunda en fazla riske sahip olan iller; Adıyaman, Ağrı, Amasya, Bingöl, Bitlis, Çankırı, Diyarbakır, Elâzığ, Erzincan, Hakkari, Kars, Kastamonu, Kırşehir, Malatya, Muş, Siirt, Tunceli, Van, Yozgat, Karaman, Ardahan ve Kilis illeri olarak belirlenmiştir (Atalay, 2010).

Yapmış olduğumuz çalışma ile kırsal alanlarda ölüm ve yaralanma oranının yüksekliği benzerlik göstermektedir.

Namlı (2015) tarafından yapılan çalışmada şehirlerin modern anlamda gelişmesinin, ulaşım planlamasının doğruluğuna, geometrik standartların yüksek tutulmasına bağlı olduğunu belirtmiştir. Şehir içi yollardaki ilave şerit sayıları ve ana arter yolların bulunması, akışın düzenliliğini ve sürekliliğini sağlayacağını ifade etmiştir. Trafik artışı olan yerlerde ek yollar açmak mümkün olmuyorsa da bazı durumlarda köprülü kavşak yapımına gidilmesini, köprülü kavşakların kırsal kesimde son derece trafiği rahatlattığı bildirilmiştir. Ancak şehir merkezlerinde köprü kavşakların birçok sıkıntıya yol açtığını da ifade etmiştir (Namlı, 2015).

Çalışmamıza konu olan Kastamonu ilimizdeki nüfus ve araç sayılarının artışı, ana arter ve yollardaki trafik yoğunluğuna sebebiyet vermiştir. Kastamonu il merkezini ilçelere bağlayan ana yol üzerinde bulunan Devrekani kavşağının ilk projelendirme dönemine ait trafik yoğunluğunun günümüze kıyasla farklılık göstermesi, bu noktadaki kaza sayılarının artışını etkileyen en önemli faktörlerden biri olduğu görülmüştür. Alınan yerel önlemlere rağmen önlenemeyen kaza sayılarının artışını düşürmek amacı ile Devrekani ilçesi köprülü kavşağının yapılması, bu alanda meydana gelebilecek birçok kazanın önüne geçildiği sonucuna varılmıştır. Namlı'nın (2015) belirttiği gibi araştırmamızın konusu olan Devrekani ilçesinin kırsal yerleşim bölgesi olması sebebiyle benzerlik göstermektedir.

Tuncuk'a (2004) göre karayollarında meydana gelen kazaların önlenmesi için karayolu güvenlik sistemleri çalışmalarının gerekliliği önem arz etmektedir. Karayolu güvenlik sistemleri inşa edilirken, tehlikeli alanların öncelikli olduğunu belirtmiştir (Tuncuk, 2004).

Çalışmamızın konusu olan Devrekani kavşağının önceki yıllarda tehlikeli noktalar arasında yer aldığı ve yapılan güvenlik sistemleri uygulamalarına rağmen kazaların önlenememesi sonucunda köprülü kavşak yapımı ile bu noktadaki kaza oranlarının düştüğü görülmüştür. Devrekani kavşağında yapılan iyileştirme çalışması sonucu kavşak trafik kaza kara noktası olmaktan çıkmıştır. Tuncuk (2004) yaptığı çalışma çalışmamızla benzerlik göstermektedir.

5. Sonuçlar

Türkiye'de karayolu ulaşımında yapılmakta olan iyileştirme, yenileme, bakım ve onarım işlemleri yolun kalite ve güvenliğini artırmaktadır. Karayolu geometrik standartlarının ve yol sınıfının yükseltilmesi, kısa sürede kaza sayılarını düşürdüğü ve yaşanılan can kayıplarını

önlediği görülmektedir. Araştırma yaptığımız kavşak, bu konuda örnek teşkil edebilecek noktadır.

Sonuç olarak; Kastamonu ilinin Devrekani ilçesinde hemzemin kavşak olarak hizmet veren ve kaza kara noktası olan Devrekani kavşağının, köklü değişim yapılarak köprülü kavşak haline getirilmesi sonucunda kazaların neredeyse sıfıra indiği görülmüştür.

Yeniden inşa edilen bu köprülü kavşak sayesinde Kastamonu-İnebolu, İnebolu- Kastamonu istikametlerinde seyreden araçların transit geçişleri sağlanmıştır. Sürücüler, herhangi bir engel ve hız düşürücü unsura rastlamadan, kavşaktan bir başa geçiş sağlayarak proje hızına uygun ve konforlu bir yolculuk yapmaktadırlar.

Kavşak üzerinden bağlantısı gerçekleştirilen 37-01 Çatalzeytin il yolu katılma ve ayrılma şeritleri vasıtasıyla bir başka yol ile kesişmeden, sinyalizasyon sistemlerine takılmadan trafiğin akışının sürekliliği sağlanmıştır.

Özellikle il merkezi ile ilçe ve köyleri birbirine bağlayan, kırsal kesimlerde yerleşim yerleri dışında akan bu tür kavşak ve yollar çok daha hassas ve emniyetli tasarlanması gerekmektedir. Devrekani kavşağı gibi kontrolsüz kavşakları kullanan (tarım aleti kullanan) sürücülerin geçiş üstünlüğü ve yol kullanım kurallarını tam olarak bilmemeleri sebebiyle çok sayıda kaza meydana gelmiştir. Sinyalizasyon olmayan kavşaklarda geçiş üstünlüğünün uyarıcı ve bilgilendirici trafik levhaları ile verildiğine aldırmaksızın yollarına devam etmeleri kazalara davetiye çıkarmaktadır.

Trafik yoğunluğu ve taşıt çeşitliliği fazla olan bu tür kavşak noktalarının, coğrafi konum ve ekonomik koşullar el verdiği sürece, köprülü kavşak olarak düzenlenmesi doğru olacaktır. Köprülü kavşak yapımının mümkün olmadığı yerlerde ise tam kontrollü akıllı güvenlik sistemleri uygulanarak, sinyalizasyon sistemleri ile geçiş haklarının net olarak gösterildiği şekilde projelendirilmesinin uygun olacağı sonucuna varılmıştır.

Ayrıca sinyalizasyon sistemleri olan kavşaklar ile köprülü kavşakların karşılaştırmalı olarak çalışılması gerektiğini düşünmekteyiz.

Etik Kurul Onay Beyanı

İlgili çalışmada insan veya hayvan katılımcılardan veri toplanmadığı için etik kurul onayı alınmamıştır.

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Trafik ve Ulaşım Araştırmaları Dergisi

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Safety Research Unit

Araştırma Makalesi

Emniyet Kemerinin Trafik Güvenliğindeki Rolü: Kamu Spotlarının Nitel Analizi

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Öz

Trafikte emniyet kemerinin kullanımı, meydana gelebilecek trafik kazalarında ağır yaralanma riskini önemli ölçüde azaltmaktadır. Bu nedenle yasal düzenlemeler, trafikte motorlu taşıt kullanan sürücülerin emniyet kemeri takmasını zorunlu kılmıştır. Trafikte emniyet kemeri takmayan sürücülere yaptırım uygulanarak, emniyet kemeri kullanma alışkanlığı kazandırılmasına çalışılmaktadır. Bunun yanında trafikte emniyet kemeri kullanımının önemine yönelik farkındalık oluşturmak amacıyla da çeşitli kamu spotları hazırlanmaktadır. Bu kamu spotlarında yer verilen görsel ve yazılı göstergeler üzerinden trafikte sürücülerin emniyet kemeri kullanımı teşvik edilmeye çalışılmaktadır. Bu çalışmada, trafikte emniyet kemeri kullanımını teşvik etmek üzere hazırlanan kamu spotlarında ne tür mesajların verildiğinin tespit edilmesi amaçlanmıştır. Bunun için çalışmada emniyet kemeri kullanımı ve trafik güvenliği üzerine hazırlanan kamu spotlarındaki görsel ve yazılı göstergeler, trafik güvenliği bağlamında Louis Hjelmslev'in Gösterge Modeli üzerinden göstergebilim yöntemi kullanılarak analiz edilmiştir. Elde edilen bulgular, kamu spotlarında yer alan mesajların ölüm, yaralanma ve aile vurgusu üzerinden şekillendiğini ortaya koymuştur. Bu açıdan incelenen kamu spotlarında, korku çekiciliği ve hüzün çekiciliği türünde duygu çekicilikleri kullanılarak insanların trafikte emniyet kemeri kullanmasının teşvik edilmeye çalışıldığı sonucuna ulaşılmıştır.

Anahtar Kelimeler: emniyet kemeri, trafik güvenliği, kamu spotu, göstergebilim, gösterge modeli

The Role of Seat Belts in Traffic Safety: A Qualitative Analysis of Public Service Announcements

Abstract

Seat belt using in traffic significantly reduces the risk of serious injury in potential traffic accidents. For this reason, legal regulations make it mandatory for drivers who use motor vehicles in traffic to wear seat belts. Sanctions are imposed on drivers who do not wear seat belts in traffic, and efforts are made to gain the habit of using seat belts. In addition, various public service announcements are prepared in order to raise awareness about the importance of using seat belts in traffic. The use of seat belts in traffic is sought to be encouraged through the visual and written indicators in these public service announcements. In this study, it was aimed to determine what kind of messages were given in the public service announcements prepared to encourage the use of seat belts in traffic. For this purpose, visual and written indicators in public service announcements prepared on the use of seat belts and traffic safety were analyzed through Louis Hjelmslev's Sign Model using the semiotic method in the context of traffic safety. The findings highlighted that messages in public service announcements were formed through the emphasis on death, injury and family. In the public service advertisements examined in this respect, it was concluded that people were encouraged to use seat belts in traffic by using emotional appeals such as fear appeal and sadness appeal.

Keywords: seat belt, traffic safety, public service announcement, semiotics, sign model

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Emniyet Kemerinin Trafik Güvenliğindeki Rolü: Kamu Spotlarının Nitel Analizi

Emniyet kemeri kullanımı, trafik kazalarında sürücü ve yolcuların güvenliğinde önemli bir rol üstlenmektedir. Buna karşılık meydana gelen trafik kazalarının bir kısmında sürücülerin ve yolcuların emniyet kemeri kullanmadığı ortaya çıkmaktadır. Bu aşamada ülkeler, çeşitli yaptırımlar uygulayarak, trafikte emniyet kemeri kullanımını zorunlu tutmaktadır. Bunun dışında insanları, trafikte emniyet kemeri kullanımı konusunda bilinçlendirmek amacıyla da çeşitli kuruluşlar tarafından trafik güvenliği ve emniyet kemeri kullanımına ilişkin çeşitli kamu spotları hazırlanmaktadır. Kamu spotlarında trafikte emniyet kemerinin kullanımına ilişkin farkındalık oluşturulması amacıyla dikkat çekici çeşitli görsel ve yazılı göstergelerden yararlanılmaktadır. Bu kamu spotlarında çeşitli duygulara hitap edilerek, insanların trafikte emniyet kemeri kullanması teşvik edilmeye çalışılmaktadır.

Emniyet kemeri ve trafik güvenliği üzerine çeşitli akademik çalışmalar yapılmıştır. Bu çalışmalar içerisinde: Slovic, Fischhoff ve Lichtenstein (1978), kaza olasılığı ve emniyet kemeri kullanımı arasındaki ilişkiyi; Svenson, Fischhoff ve MacGregor (1985), algılanan sürüş güvenliği ve emniyet kemeri kullanımı arasındaki ilişkiyi; Preusser, Williams ve Lund (1987), New York'un emniyet kemeri kullanım yasasının genç sürücüler üzerindeki etkisini; Singh ve Thayer (1992), emniyet kemeri kullanımının sürüş davranışı üzerindeki etkisini; Begg ve Langley (2000), genç yetişkinlerde emniyet kemeri kullanımını ve buna bağlı davranışları; Steptoe ve diğerleri (2002), emniyet kemeri kullanımı, tutumlar ve mevzuattaki değişiklikleri; Williams, McCartt ve Geary (2003), lise öğrencilerinin emniyet kemeri kullanımını; Harper, Strumpf, Burris, Smith ve Lynch (2014), sosyoekonomik konuma göre zorunlu emniyet kemeri yasalarının emniyet kemeri kullanımına etkisini; Jehle, Doshi, Karagianis, Consiglio ve Jehle (2014), obezite ve emniyet kemeri kullanımını; Adams, Cotti ve Tefft (2015), farklı yasal düzenlemelerde alkollü sürücüler arasında emniyet kemeri kullanımını; Elkbuli ve diğerleri (2019), emniyet kemeri kullanımı ile travma sonuçları arasındaki ilişkiyi; Chakraborty, Singh, Savolainen ve Gates (2021), aynı aracın yolcuları arasında emniyet kemeri kullanımındaki ilişkiyi ve eğilimleri; Farooq, Ahmed ve Saeed (2021), emniyet kemeri kullanımına uyum ve karşı koyma arasındaki ilişkiyi incelemiştir.

Ulusal çalışmalar incelendiğinde; Bektaş ve Hınıs (2009), emniyet kemerine etki eden faktörleri; Porter, Lajunen, Özkan ve Will (2010), Türk sürücülerin ve çocukların emniyet kemeri kullanımını; Bilgiç, Vitoşoğlu ve Yalınız (2015), Kütahya ilindeki emniyet kemeri kullanım alışkanlıklarını; Küçük Biçer ve Özcebe (2019), Ankara'da bir devlet kurumunda iş güvencesi ve düzenli geliri olan çalışanların emniyet kemeri kullanımı konusundaki bilgi, görüş ve davranışlarını; Sümer, Gülçimen Çakan, Çakır ve Uğuz (2019), emniyet kemerlerinin insan sağlığına yönelik kaza sırasındaki olumsuz etkilerinin azaltılmasına yönelik bir sistem geliştirilmesini incelemiştir.

Emniyet kemeri ve trafik güvenliği konusunda belirli uluslar, ülkeler ve bölgeler özelinde de akademik çalışmalar yapılmıştır. Bu çalışmalarda da:

- Jonah ve Lawson (1984), Kanada zorunlu emniyet kemeri kullanım yasalarının etkinliğini;
- Lund (1986), ABD'li sürücüler arasında gönüllü emniyet kemeri kullanımını;
- Foss, Beirness ve Sprattler (1994), Minnesota'da alkollü sürücüler arasında emniyet kemeri kullanımını;
- Koushki, Ali ve Al-Saleh (1998), Kuveyt'te trafik kuralı ihlalleri ve emniyet kemeri kullanımını;

- Ichikawa, Nakahara, Okubo ve Wakai (2003), Japonya'da hamilelikte emniyet kemeri kullanımını;
- Koushki, Bustan ve Kartam (2003), Kuveyt'te emniyet kemeri kullanımının trafik kazası yaralanması ve yaralanma türü üzerindeki etkisini;
- Cunill, Gras, Planes, Oliveras ve Sullman (2004), şehir içi yollarda İspanyol sürücüler ve yolcular arasında emniyet kemeri kullanımını azaltan faktörleri;
- Bendak (2005), Suudi Arabistan'da emniyet kemeri kullanımı ve trafik kazası yaralanmalarına etkisini;
- Passmore ve Ozanne-Smith (2006), Pekin'de taksi şoförleri arasında emniyet kemeri kullanımını;
- Briggs, Lambert, Goldzweig, Levine ve Warren (2008), ABD'li lise öğrencileri arasında sürücü ve yolcu emniyet kemeri kullanımını;
- Huang, Zhang, Murphy, Shi ve Lin (2011), Çin'de sürücülerin emniyet kemeri kullanımına ilişkin tutum ve davranışlarını;
- Klair ve Arfan (2014), Pakistan'da emniyet kemeri kullanımı ve emniyet kemeri yasalarının uygulanmasını;
- Duran, Ordu ve Tekeş (2018), İstanbul Şile'de sürücü ve yolcuların emniyet kemeri kullanımını ele almıştır.

Emniyet kemeri kullanımı ve kamu spotları bağlamında benzer çalışmalar incelendiğinde ise Smith (2006), toplumsal fayda amaçlı yapılan sosyal pazarlamanın gençlerin sürüş güvenliğini teşvik etmek için kullanılmasını; Houston ve diğerleri (2010), "Rekabet Anahtardır" teması ile gençler için trafik güvenliği kampanyasını; Zambon, Hyder, Ma ve Peden (2012), Rusya özelinde "Hayat Çizgisini Bozma" kampanya sloganı altında emniyet kemeri kullanımını; Sungur (2015), Türkiye'de kurumsal sosyal sorumluluk minvalinde gerçekleşen trafik güvenliği kampanyalarını; Gülada (2018), trafik kazalarını konu alan kamu spotu reklamlarını; Kavsıracı, Demirbaş ve Tine (2021) ise karayolu trafik güvenliğini sağlamak için uygulanan sosyal kampanyalar, denetimler, idari para cezaları ve bu uygulamaların bireyler üzerindeki etkisini araştırmıştır. Ayrıca yapılan bu çalışma ile uzun vadede bir trafik kültürü oluşturmak için sürekli olarak tekrar eden sosyal kampanya ve kamu spotlarının etkili olacağı ifade edilmiştir.

Emniyet kemeri ve trafik güvenliği ilişkisi üzerine yapılan akademik çalışmalar incelendiğinde, kamu spotlarının trafik güvenliği bağlamında emniyet kemeri kullanımındaki rolü üzerine alanda önemli bir boşluk olduğu tespit edilmiştir. Çalışmada dünyanın farklı kıtalarında yer alan ülkelerdeki emniyet kemeri ve trafik güvenliği konulu kamu spotları incelenerek, konuya ilişkin literatürdeki boşluğun bir ölçüde giderilmesi amaçlanmıştır. Çalışmada trafikte emniyet kemerini kullanımını konu alan kamu spotlarında trafik güvenliği bağlamında ne tür mesajların verildiği tespit edilmeye çalışılmıştır. Bunun için çalışmada konuya ilişkin kamu spotlarındaki görsel ve yazılı göstergeler, Louis Hjelmslev'in Gösterge Modeli üzerinden analiz edilmiştir. Elde edilen bulgular ışığında aşağıdaki sorular yanıtlanmaya çalışılmıştır:

- Trafikte emniyet kemeri kullanımını teşvik eden kamu spotlarında hangi metaforlar kullanılmıştır?

- Trafikte emniyet kemeri kullanımını teşvik eden kamu spotlarında hangi duygu çekiciliklerinden yararlanılmıştır?

Çalışma, kamu spotlarının trafikte emniyet kemeri kullanımını teşvik etmedeki rolüne ışık tutması bakımından önem taşımaktadır. Bu açıdan emniyet kemeri kullanımı ve trafik güvenliği üzerine hazırlanan kamu spotlarındaki görsel ve yazılı göstergelerle ne tür mesajların verildiğinin tespit edilmesi amaçlanmıştır.

1.1. Trafik Güvenliğinde Emniyet Kemerinin Rolü

Trafikte emniyet kemerinin kullanılmaması, sürücülerin veya yolcuların hayatlarında karşılaşabilecekleri en yaygın davranışsal faktörlerden birisi olarak trafikte yaralanma riski oluşturmaktadır (Rezapur-Shahkolai, Malekpour, Tapak, Moeini ve Sadeghi-Bazargani, 2021). Trafikte araç sayısının artmasıyla birlikte trafik kazaları da her geçen gün artmakta ve emniyet kemeri kullanımı gün geçtikçe daha fazla önem kazanmaktadır. Bu doğrultuda trafik güvenliğine yönelik hazırlanan kamu spotlarıyla emniyet kemerinin rolü bireylere benimsetilmeye çalışılmaktadır.

Trafik güvenliği kampanyaları, karayolu güvenliğinin teşviki ve bireylerin yolda emniyet kemeri takmaları açısından önemli stratejilerdir. Hazırlanan kamu spotları ile hem trafik kazaları hem de emniyet kemeri kullanımı sayesinde yaralanma ve ölüm gibi riskler azalmaktadır (Zabihi, Davoodi ve Nordfjærn, 2019).

Ülkeler arasındaki kültürel farklılıklardan dolayı trafik güvenliğine bakış açıları da farklı olabilmektedir. Örneğin İsveç, Birleşik Krallık, Hollanda gibi ülkelerde emniyet kemeri kullanım oranları çok yüksektir. Bunun ana sebeplerinden birisi emniyet kemerinin bu ülkelerde hem ön hem de arka koltukta oturan yolcular için zorunlu olmasından kaynaklanmaktadır. Amerika Birleşik Devletleri gibi farklı eyalet yapılanması olan yerlerde ise ortak bir uygulama veya zorunluluk olmadığı için hem ön hem de arka koltuklarda emniyet kemeri kullanım oranları belirtilen ülkelere nazaran daha düşüktür (Luoma ve Sivak, 2014). Bu kapsamda trafik güvenliği ile ilgili genel bir uygulamanın olmadığı ve trafikte emniyet kemerine verilen önemin de ülkeler nezdinde farklılaştığı görülmektedir.

1.2. Emniyet Kemerinin Kullanımına İlişkin Yapılan Çalışmalar

Emniyet kemeri kullanımı, araç kazalarında yaralanma şiddetini ve ölüm oranlarını azaltarak trafik güvenliğinde önemli bir rol oynamaktadır. Bununla birlikte İran'da yapılan bir çalışmada emniyet kemerinin çoğunlukla erkekler tarafından ve %52,4 oranla kullanıldığı bulgusuna ulaşılmıştır (Tavafian, Aghamolaei, Gregory ve Madani, 2011). Türkiye'de ise emniyet kemeri takma oranının %25 gibi bir seviyeyle düşük olduğu tespit edilmiş ve kadınların erkeklere nazaran emniyet kemeri kullanmaya daha duyarlı olduğu görülmüştür (Şimşekoğlu ve Lajunen, 2008). Türkiye'de yapılan farklı bir çalışmada önceki çalışmalara ek olarak anonim bir gözlem çalışması yapılmıştır. Bulgular incelendiğinde Afyon ilinden katılımcıların %39'u ve Ankara ilinden ise katılımcıların %45'i emniyet kemeri kullandığını belirtmiştir. Ancak bu oranlar üzerinden Afyon'daki katılımcıların sadece %47'sinin ve Ankara'da ise %70'inin emniyet kemerini gerçekten taktığı gözlenmiştir. Ayrıca erkeklerin kadın sürücülere nazaran daha az emniyet kemeri kullanma eğiliminde oldukları görülmüştür (Özkan, Puvanachandra, Lajunen, Hoe ve Hyder, 2012). Van ilinde yapılan farklı bir çalışmada ise katılımcıların %66'sının emniyet kemerinin hayati bir önem taşımadığını düşünmeleri dikkat çekicidir (Şehribanoğlu, 2019). Ayrıca Türkiye'de oruç zamanı olan Ramazan ayında emniyet kemeri kullanım oranının daha da azaldığı ve korna çalma davranışının da arttığı tespit edilmiştir (Yıldırım-Yenier, Lajunen ve Özkan, 2016). Nijerya'da yapılan bir çalışmada Türkiye'ye benzer olarak kadınların emniyet kemeri kullanım oranlarının erkeklere göre daha yüksek olduğu ve emniyet

kemeri kullanımının ülkede artırılması için trafik yasaları konusunda bireylerin duyarlılık kazanmasının gerektiği önerilmiştir (Ipingbemi, 2012). Katar'da yapılan bir çalışmada bireylerin %59'unun ehliyetsiz araç kullandıkları ve %47'sinin sürücü veya yolcu olarak emniyet kemeri kullanmadığı tespit edilmiştir (Shaaban ve Hassan, 2017). Güney Kore'de yapılan bir çalışmada ise hükümetin uygulamış olduğu güvenlik politikalarına rağmen (emniyet kemeri yasası, hız sınırlayıcı montajı gibi) kaza, ölüm ve yaralanma sayısının azalmasında istatistiksel olarak kalıcı ve anlamlı bir etkinin olmadığı görülmüştür (Kim, Myeong ve Kweon, 2006). Dolayısıyla emniyet kemerinin kullanımına yönelik yapılan çalışmalarda da kültürel farklılıklardan ötürü duyarlılıkların ülkeler bazında farklılaştığı görülmektedir. Ancak emniyet kemerinin kullanımı herkes için önem arz eden bir durum olduğundan, farklı ülkelerin bakış açıları ile kamu spotlarında da benzer bir durum olup olmadığı, ülkelerin hangi konularda kendi vatandaşlarına duyarlılık kazandırmaya çalıştığı gibi hususların bilinmesi çalışma açısından önem arz etmektedir.

2. Yöntem

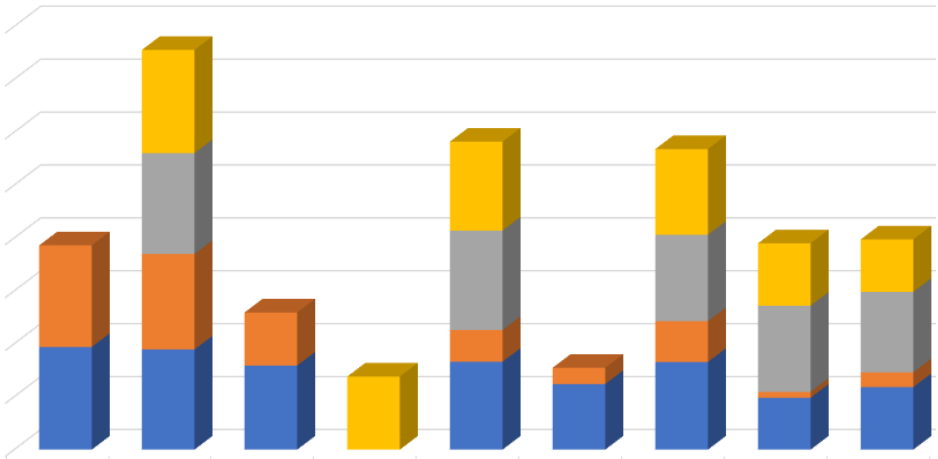
Çalışmada trafikte emniyet kemerinin kullanımını teşvik etmek amacıyla hazırlanan kamu spotları, dünya genelinden çeşitli reklamların yer aldığı "Adeevee" adlı siteden elde edilmiştir. Adeevee sitesine alternatif olarak "AdForum" ve "Ads of the World" gibi siteler de bulunmaktadır. Dünyanın pek çok farklı ülkesinden reklam kampanyalarına yer veren bu sitelerin içerikleri birbirlerine benzer olduğu için "Adeevee" sitesinin diğerlerine nazaran daha yakın tarihlerde ortaya çıkması örneklemin seçilmesinde etkili olmuştur.

Adeevee sitesinde "emniyet kemeri" başlığında yapılan arama sonucu çıkan 1214 çalışma içerisinden trafikte emniyet kemeri kullanımını teşvik etmek amacıyla hazırlanan Avustralya, Birleşik Krallık, Brezilya, Endonezya, Güney Kore, İtalya, Macaristan, Meksika ve Şili'den toplam 11 kamu spotuna ulaşılmış (Adeevee, 2022a; Adeevee, 2022b) ve bu kamu spotları trafik güvenliği bağlamında analiz edilmiştir.

Araştırmada ele alınan ülkelerin kamu spotu bulguları sunulmadan önce ilgili ülkelerin emniyet kemeri kullanım oranları istatistiksel olarak incelendiğinde, tüm yolcular bağlamında en yüksek kullanım oranına sahip ülkenin Birleşik Krallık olduğu görülmektedir. Ön koltuk ve arka koltukta emniyet kemeri kullanımı ayrı ayrı ele alındığında ise Avustralya'nın öne çıktığı görülmektedir. Yalnızca sürücüler bağlamında da Birleşik Krallık ve Güney Kore'nin daha duyarlı olduğu görülmektedir. Bununla birlikte, arka koltuklarda emniyet kemeri kullanımının Meksika'da oldukça düşük olması dikkat çekmektedir. Meksika'yı izleyen Şile, İtalya, Güney Kore ve Macaristan'da da arka koltuklarda emniyet kemeri kullanım oranının düşük olduğu gözlenmektedir. Ayrıca istatistiksel olarak en az veriye sahip ülke olarak görülen Endonezya ile ilgili sadece tüm yolcular bazında emniyet kemeri kullanım oranlarının kayıt altına alındığı görülmektedir (Şekil 1).

Görsel ve yazılı göstergeler üzerinden mesajların ne şekilde oluşturulduğunun kapsamlı bir şekilde açıklanabilmesi için araştırmada ele alınan ülkelerdeki kamu spotları, anlatımın tözü, anlatımın biçimi, içeriğin tözü ve içeriğin biçiminden meydana gelen Louis Hjelmslev'in Modeli (1969) bağlamında göstergebilimsel yöntemle incelenmiştir. Göstergebilimsel yöntem belirli bir düzen içerisinde nitel olarak anlamların çözümlenmesini içermektedir. Göstergebilimsel yöntemin ön plana çıkan isimlerinden bazıları incelendiğinde; görüntüsel gösterge, belirti ve sembole odaklanan Charles Sanders Peirce; düz anlam, yan anlam, metafor, metonim ve inşa edilen mite odaklanan Roland Barthes ile gösteren ve gösterilene odaklanan Ferdinand de Saussure yaptıkları çalışmalarla alanın oluşmasına katkı sağlamış ve yöntemi farklı yönlerle şekillendiren diğer araştırmacıları da etkilemişlerdir. Bu kapsamda Louis Hjelmslev de Saussure'un temel felsefi izleri doğrultusunda kendi dilbilimsel ilkelerini

geliştirerek Kopenhag Dilbilim Okulu'nun açılmasına öncülük etmiş ve göstergeleri bütünüyle ortaya koyan sade bir yapı ortaya koymuştur.



	Avustralya	Birleşik Krallık	Brezilya	Endonezya	Güney Kore	İtalya	Macaristan	Meksika	Şili
Tüm Yolcular		97,5%		69,0%	84,0%		81,0%	58,9%	49,6%
Yalnızca Sürücüler		95,3%			94,0%		81,7%	81,4%	76,0%
Arka Koltuk	96,0%	90,3%	50,2%		30,0%	15,4%	38,5%	5,6%	14,0%
Ön Koltuk	97,0%	94,6%	79,4%		83,0%	61,9%	82,8%	49,0%	59,0%

Şekil 1. Emniyet Kemeri Takma Oranları (Dünya Sağlık Örgütü, 2017a)

Hjelmslev'in Gösterge Modeli'nde (1969) yer alan anlatımın tözü, göstergeleri; anlatımın biçimi, mesaj oluşum sürecinde göstergelerin bir araya getirilmesini; içeriğin tözü, göstergelerin anlamlarını ve içeriğin biçimi de göstergeler üzerinden verilen mesajı/mesajları açıklamaktadır. Ayrıca içerik-biçim ve anlatım-biçim arasında bir ayrım yapılmaktadır. Aynı şekilde içerik-töz ve anlatım-töz arasında da bir ayrım bulunmaktadır (Ten Wolde ve Keizer, 2016).

Trafikte emniyet kemeri kullanımını konu alan kamu spotları, sırasıyla anlatımın tözü, anlatımın biçimi, içeriğin tözü ve içeriğin biçimi üzerinden analiz edilmiştir.

3. Bulgular ve Analiz

Çalışmanın bu kısmında emniyet kemeri kullanımını teşvik etmek amacıyla hazırlanan 11 kamu spotu, trafik güvenliği boyutunda Louis Hjelmslev'in Gösterge Modeli üzerinden incelenmiş ve ulaşılan bulgular paylaşılmıştır.

3.1. Kemer Bağla - Macaristan Kamu Spotu

Macaristan'da Leo Burnett Reklam Ajansı tarafından hazırlanan birinci kamu spotu, 2004 yılında yayınlanmıştır. Kamu spotunda "Kemer bağla" (Buckle up) yazısı yer almaktadır.

Anlatımın tözünde kamu spotunda insanlar ve kırık çerçeve ön plana çıkarılmaktadır. Anlatımın biçiminde kamu spotunda bir kadın ve iki çocuğun bir koltukta oturduğu fotoğrafının olduğu kırık bir çerçeve ve çerçevenin önünde cam kırıkları bulunmaktadır. İçeriğin tözünde kamu spotundaki yazılı göstergeler üzerinden kırık çerçevenin trafik kazasını temsil ettiği ortaya çıkmaktadır. Kırık çerçeve ise ölüm metaforu olarak ön plana çıkarılmaktadır. Kırık camlar, meydana gelen trafik kazasının sinekdoşu olarak kullanılmaktadır. Kırık çerçevedeki fotoğrafta yer alan bir koltuğun boş olması üzerinden de trafik kazası sonucunda bir kişinin hayatını kaybettiği aktarılmaktadır. Diğer yandan kırık

çerçevede yer alan bir kadın ve iki çocuk ise trafik kazasında hayatını kaybeden kişinin yakınları (tahmini eşi ve çocukları) olarak sunulmaktadır. İçeriğin biçiminde kamu spotunda ölüm metaforundan ve hüzün çekiciliğinden yararlanılarak, bir ailenin bütünlüğünün sağlanmasında emniyet kemerinin rolüne vurgu yapılmaya çalışılmaktadır.

Görsel 1. Kemer Bağla - Macaristan Kamu Spotu (Leo Burnett Reklam Ajansı, 2004)

3.2. Araç Kullanılmadığında Kemerin Takılması- Endonezya Kamu Spotu

Endonezya'da Fortune Indonesia Reklam Ajansı tarafından hazırlanan ikinci kamu spotu, 2004 yılında yayınlanmıştır. Kamu spotunda "Araç kullanılmadığında kemerin takılması" (Wearing belt when not driving) yazısı yer almaktadır.

Anlatımın tözünde kamu spotunda insan, ceset torbası ve kemer ön plana çıkarılmaktadır. Anlatımın biçiminde kamu spotunda sedyede ceset torbası içerisinde hayatını kaybetmiş bir insana yer verilmektedir. İçeriğin tözünde kamu spotundaki yazılı göstergeler üzerinden ceset torbasındaki kişinin trafik kazası sonucu hayatını kaybeden bir kişi olduğu ortaya çıkmaktadır. Yine kamu spotundaki yazılı göstergeler üzerinden sedyedeki kemerle araçtaki emniyet kemerine atıfta bulunulmakta ve hayatını kaybeden kişinin emniyet kemeri takmadığı için trafik kazası sonucunda hayatını kaybettiği algısı oluşturulmaktadır. Kamu spotundaki kemer, kurtarıcı, ceset torbası da ölüm metaforu olarak kullanılmaktadır. İçeriğin biçiminde kamu spotunda kurtarıcı metaforundan ve korku çekiciliğinden yararlanılarak, emniyet kemerinin insanların hayatta kalmasındaki rolüne atıf yapılmaktadır.

Görsel 2. Araç Kullanılmadığında Kemerin Takılması - Endonezya Kamu Spotu (Fortune Indonesia Reklam Ajansı, 2004)

3.3. Çok Geç - Güney Kore Kamu Spotu

Güney Kore'de Cheil Worldwide Reklam Ajansı tarafından hazırlanan üçüncü kamu spotu, 2004 yılında yayınlanmıştır. Kamu spotunda "Emniyet kemerinizi takmak için artık çok geç" (Too late to fasten your safety belt) yazısı yer almaktadır.

Görsel 3. Çok Geç - Güney Kore Kamu Spotu (Cheil Worldwide Reklam Ajansı, 2004)

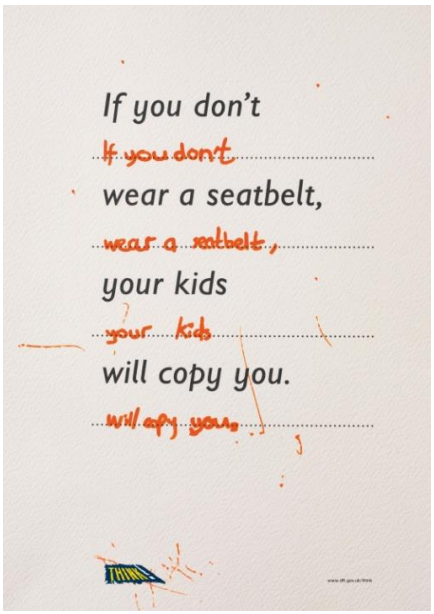
Anlatımın tözünde kamu spotunda insan şeklinde çizgi ve tekerlek izleri ön plana çıkarılmaktadır. Anlatımın biçiminde kamu spotunda yolda tekerlek izlerine ve insan şeklinde beyaz bir çizgiye yer verilmektedir. İçeriğin tözünde kamu spotunda yer alan beyaz çizgi, ölümle sonuçlanan bir olayda cesedin yerinin belirtilmesi amacıyla çizilen beyaz çizgi olarak kullanılmaktadır. Kamu spotundaki tekerlek izleri, trafik kazası metaforu olarak kullanılmakta ve emniyet kemeri şeklinde sunularak trafikte emniyet kemeri kullanımına atıfta bulunulmaktadır. İnsan şeklindeki beyaz çizgi, ölüm, tehlike ve trafik kazası metaforları olarak kullanılmaktadır. Tekerlek izleri de meydana gelen trafik kazasının metonimi olarak ön plana çıkmaktadır. Kamu spotunda insan şeklindeki beyaz çizginin, fren izlerinin üstünde olmasıyla ve fren izlerinin emniyet kemerine benzetilmesiyle, bir trafik kazasının meydana geldiği ve meydana gelen trafik kazasında da kişinin emniyet kemeri takmadığı için hayatını kaybettiği aktarılmaktadır. İçeriğin biçiminde kamu spotunda ölüm, tehlike ve trafik kazası metaforundan ve korku çekiciliğinden yararlanılarak, emniyet kemerinin trafik kazasında insanların yaşama tutunmasındaki önemine vurgu yapılmaktadır.

3.4. Çocuklarınız Sizi Örnek Alacaktır - Birleşik Krallık Kamu Spotu

Birleşik Krallık'ta Leo Burnett Reklam Ajansı tarafından hazırlanan dördüncü kamu spotu, 2007 yılında yayınlanmıştır. "Emniyet kemeri takmazsanız, çocuklarınız sizi örnek alacaktır" (If you don't wear a seatbelt, your kids will copy you) yazısı yer almaktadır.

Anlatımın tözünde kamu spotunda yazılar ve yazıların kopyası ön plana çıkarılmaktadır. Anlatımın biçiminde kamu spotunda bir kâğıdın üzerinde yazılara ve yazıların altında da yazıların kopyalanmış haline yer verilmektedir. İçeriğin tözünde kamu spotundaki yazılı göstergelerden kamu spotundaki yazıların yetişkin bir kişi tarafından yazıldığı, yazıların kopyalarının ise yazıları yazan yetişkin kişinin çocuğu tarafından yazıldığı ortaya çıkmaktadır. Kamu spotundaki yazıların kopya edilmesi üzerinden bireyin trafikte emniyet kemeri takmaması davranışının çocuğu tarafından da yapılabileceği aktarılmaktadır. Kemer, güvenlik ve koruma metaforu olarak ön plana çıkarılmaktadır. Çocukların yazısının turuncu kırmızı olmasıyla, kana vurgu yapıldığı ileri sürülebilmektedir. Bu şekilde yazıların korku metaforu şeklinde sunulduğu belirtilebilmektedir. Yazı çizgisinin de benzetme metaforu olarak

aktarıldığı söylenebilmektedir. İçeriğin biçiminde kamu spotunda güvenlik ve koruma metaforundan ve korku çekiciliğinden yararlanılarak, emniyet kemeri kullanılmasıyla gelecek nesillere örnek olunmasının önemine vurgu yapılmaktadır.



Görsel 4. Çocuklarınız Sizi Örnek Alacaktır - Birleşik Krallık Kamu Spotu (Leo Burnett Reklam Ajansı, 2007)

3.5. Çözümün Bir Parçası Olun - İtalya Kamu Spotu

İtalya'da Fabrica Reklam Ajansı tarafından hazırlanan beşinci kamu spotu, 2007 yılında yayınlanmıştır. Kamu spotunda "Emniyet kemerinizi takmak için artık çok geç. Emniyet kemeri takmak araçtan fırlama ve ciddi veya ölümcül yaralanma riskini %40-65 oranında azaltır. Çözümün bir parçası olun: Emniyet kemeri takın" (Too late to fasten your seat-belt Wearing a seat-belt reduces the risk of being ejected from a vehicle and suffering serious or fatal injury by between 40%-65%. Be part of the solution: wear a seat-belt) yazısı yer almaktadır.

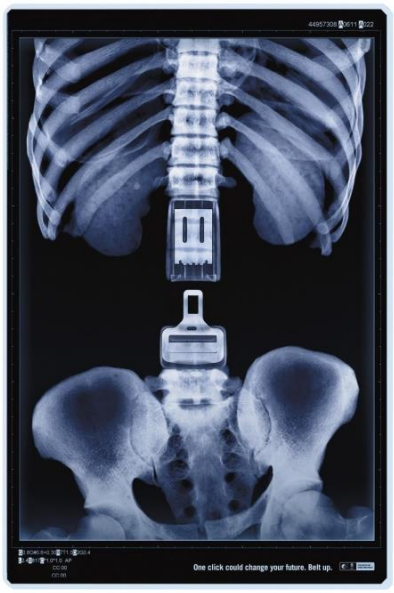
Görsel 5. Çözümün Bir Parçası Olun - İtalya Kamu Spotu (Fabrica Reklam Ajansı, 2007)

Anlatımın tözünde kamu spotunda insan ve emniyet kemeri şeklinde yol çizgisi ön plana çıkarılmaktadır. Anlatımın biçiminde kamu spotunda yolda sırt üstü yatmakta olan bir kişiye ve yatmakta olan kişinin üstünde de emniyet kemeri şeklinde beyaz bir çizgiye yer verilmektedir. İçeriğin tözünde kamu spotundaki yazılı göstergelerden, yolda sırt üstü yatmakta olan kişinin trafik kazası sonucu hayatını kaybeden bir kişi olduğu ortaya çıkmaktadır. Emniyet kemeri şeklindeki beyaz yol çizgisinin yerde yatan kişinin üzerinden geçmesiyle, yerde yatan kişinin emniyet kemeri takmadığına ve bu yüzden öldüğüne ya da yaralandığına yönelik algı meydana getirilmektedir. Kamu spotunda emniyet kemeri şeklindeki beyaz yol çizgisi, ölüm metaforu olarak kullanılmaktadır. İçeriğin biçiminde kamu spotunda ölüm metaforundan ve korku çekiciliğinden yararlanılarak, trafikte emniyet kemeri takmama ve ölüm arasında ilişki ön plana çıkarılmaktadır.

3.6. Tek Bir Tıklama - Avustralya Kamu Spotu

Avustralya'da Marketforce Reklam Ajansı tarafından hazırlanan altıncı kamu spotu, 2008 yılında yayınlanmıştır. Kamu spotunda "Tek bir tıklama geleceğinizi değiştirebilir. Kemeri bağlayın" (One click could change your future. Belt up) yazısı yer almaktadır.

Anlatımın tözünde kamu spotunda röntgende kemikler ve emniyet kemeri ön plana çıkarılmaktadır. Anlatımın biçiminde kamu spotunda bir insanın iskeletinin bir bölümünün yer aldığı bir röntgene yer verilmektedir. Kamu spotunda röntgendeki bel kemiği bölgesi, güvenlik metaforu olarak kullanılmakta ve takılı olmayan bir emniyet kemerine benzetilmektedir. İçeriğin tözünde kamu spotundaki yazılı göstergelerden röntgendeki bel kemiğinin açık bir emniyet kemeri şeklinde yansıtılmasıyla, trafikte emniyet kemeri kullanımının trafik kazası sırasında bel kemiği kırılmasının önüne geçilebileceği aktarılmaktadır. Röntgen görselinde vücudun ikiye ayrılmasıyla araçta emniyet kemeri takmayan sürücünün ya da yolcunun trafik kazası sırasında yaralanması (ya da ölmesi) anlatılmaktadır. Röntgen, yaralanma metaforu olarak kullanılmaktadır. İçeriğin biçiminde kamu spotunda yaralanma metaforundan ve korku çekiciliğinden yararlanılarak, emniyet kemeri kullanmama ve trafik kazasında yaralanma riski arasında ilişki kurulmaktadır.



Görsel 6. Tek Bir Tıklama - Avustralya Kamu Spotu (Marketforce Reklam Ajansı, 2008)

3.7. Sevdiğiniz Kişiden Ayrılmayın - Brezilya Kamu Spotu

Brezilya'da Mota Comunicação Reklam Ajansı tarafından hazırlanan yedinci kamu spotu, 2012 yılında yayınlanmıştır. Kamu spotunda "Sevdiğiniz kişiden ayrılmayın. Emniyet kemerinizi her zaman takın" (Do not be apart from who you love. Always wear your seatbelt) yazısı yer almaktadır.

Anlatımın tözünde kamu spotunda insanlar ve emniyet kemeri ön plana çıkarılmaktadır. Anlatımın biçiminde kamu spotunda büyük bir emniyet kemerine, emniyet kemerinin bir tarafında elini açmış yetişkin bir erkeğe ve emniyet kemerinin diğer tarafında ise ellerini açmış ağlamakta olan bir çocuğa yer verilmektedir. İçeriğin tözünde kamu spotunda emniyet kemerinin açık bir şekilde sunulmasıyla, trafikte emniyet kemerinin takılmamasına vurgu yapılmaktadır. Kamu spotunda emniyet kemerinin bir tarafında elini açmış yetişkin erkek trafikte emniyet kemerini takmayan kişiyi, emniyet kemerinin diğer tarafında ise ellerini açmış ağlamakta olan çocuk ise trafikte emniyet kemeri takmayan kişinin yakınını (tahminen oğlunu) temsil etmektedir. Kamu spotunda yetişkin kişinin ve çocuğun ayrı taraflarda sunulmasıyla emniyet kemeri takmayan kişinin hayatını kaybettiğine ve hayatını kaybeden kişinin yakınının da onun ölümüne üzüldüğüne atıf yapılmaktadır. İnsanların havada sunulmasıyla trafik kazası sırasında emniyet kemeri takmayan kişilerin araçtan fırlayabileceğine yönelik de algı oluşturulmaktadır. Kemer devasa sunularak da trafik kazasında kemerin insanların araçtan dışarı fırlamasını önleyebilecek bir etkisinin olabildiğine vurgu yapıldığı ileri sürülebilmektedir. Kamu spotunda kemer, güvenlik metaforu olarak kullanılmaktadır. İçeriğin biçiminde kamu spotunda trafik kazasında emniyet kemeri takmayarak hayatını kaybeden kişiye ve hayatını kaybeden kişinin yakınına vurgu yapılarak, hüzün duygusu ön plana çıkarılmaktadır. Kamu spotunda hüzün çekiciliği ile birlikte aynı zamanda ölüme göndermede bulunulması üzerinden de korku çekiciliği kullanılmaktadır. Bu şekilde kamu spotunda güvenlik metaforundan ve hüzün ve korku çekiciliklerinden yararlanılarak, trafikte emniyet kemeri kullanımının insanların kendi ve yakınlarının hayatı için önemine vurgu yapılmaktadır.

Görsel 7. Sevdiğiniz Kişiden Ayrılmayın - Brezilya Kamu Spotu (Mota Comunicação Reklam Ajansı, 2012)

3.8. Risk Almayın - Şili Kamu Spotu

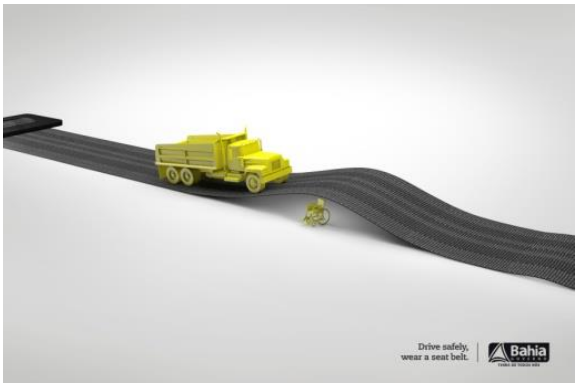
Şili'de McCann Reklam Ajansı tarafından hazırlanan sekizinci kamu spotu, 2014 yılında yayınlanmıştır. Kamu spotunda "Risk almayın. Her zaman emniyet kemeri takın" (Don't take risks. Always wear a seatbelt) yazısı yer almaktadır.

Görsel 8. Risk Almayın - Şili Kamu Spotu (McCann Reklam Ajansı, 2014)

Anlatımın tözünde kamu spotunda mancınıklar ön plana çıkarılmaktadır. Anlatımın biçiminde kamu spotunda bir arabanın koltukları şeklinde sıralanmış beş mancınığa yer verilmektedir. Mancınık, tehlike metaforu olarak kullanılmaktadır. İçeriğin tözünde kamu spotundaki yazılı göstergelerden arabanın içerisindeki beş koltuğun, beş mancınığa benzetilerek metalepsis (anlatımda bir kavramın bir özelliğinin ya da özelliklerinin başka kavrama atfedilmesi) bir anlatımdan yararlanıldığı ortaya çıkmaktadır. Kamu spotunda trafik kazasında beş koltukta bulunan kişilerin bir mancınığın içerisindeymiş gibi savrulabileceği aktarılmaktadır. İçeriğin biçiminde kamu spotunda tehlike metaforundan ve korku çekiciliğinden yararlanılarak, emniyet kemerinin trafik kazasında insanların araçtan savrulmasını önlemedeki rolüne vurgu yapılmaktadır.

3.9. Güvenli Sürün - Brezilya Kamu Spotu

Brezilya Leiaute Reklam Ajansı tarafından hazırlanan dokuzuncu kamu spotu, 2014 yılında yayınlanmıştır. Kamu spotunda "Güvenli sürün, emniyet kemeri takın" (Drive safely, wear a seat belt) yazısı yer almaktadır.



Görsel 9. Güvenli Sürün - Brezilya Kamu Spotu (Leiaute Reklam Ajansı, 2014)

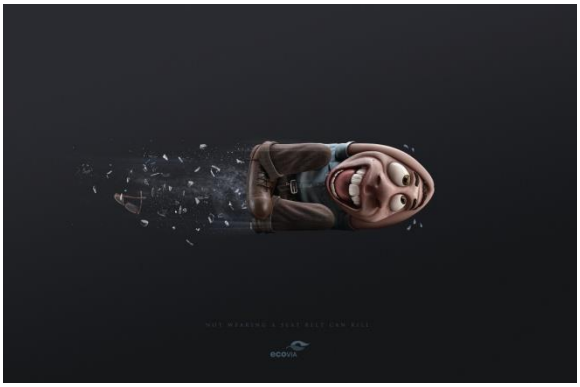
Anlatımın tözünde kamu spotunda kamyon, tekerlekli sandalye ve emniyet kemeri ön plana çıkarılmaktadır. Anlatımın biçiminde kamu spotunda emniyet kemeri şeklinde bir yola, yolun üstünde bir kamyona ve kamyonun altında da tekerlekli sandalyeye yer verilmektedir. İçeriğin tözünde kamu spotunda yolun emniyet kemeri şeklinde sunulmasıyla trafikte emniyet kemeri

kullanımının önemine vurgu yapılmaktadır. Kamu spotundaki emniyet kemerinin üstündeki kamyon, trafikte seyir halindeki bir taşıta, emniyet kemerinin altındaki tekerlekli sandalye ise kamyon sürücüsünün seyir halinde emniyet kemeri kullanmadığında meydana gelebilecek bir trafik kazasında sakat kalabileceğine atıf yapmaktadır. Bu aşamada kamu spotundaki tekerlekli sandalye sakatlanma metaforu olarak ön plana çıkarılmaktadır. Tekerlekli sandalyenin emniyet kemerinin altında bulunmasıyla sürücüleri, sakatlıkla sonuçlanabilecek trafik kazalarından emniyet kemerinin koruyabileceği aktarılmaktadır. İçeriğin biçiminde kamu spotunda sakatlanma metaforundan ve korku çekiciliğinden yararlanılarak, trafikte emniyet kemeri kullanmama ve sakatlanma arasında ilişki kurulmaktadır.

3.10. Emniyet Kemeri Takmamak Öldürebilir - Brezilya Kamu Spotu

Brezilya'da Terremoto Reklam Ajansı tarafından hazırlanan onuncu kamu spotu, 2015 yılında yayınlanmıştır. Kamu spotunda "Emniyet kemeri takmamak öldürebilir" (Not wearing seat belt can kill) yazısı yer almaktadır.

Anlatımın tözünde kamu spotunda insan ve cam kırıkları ön plana çıkarılmaktadır. Kamu spotunda siyah arka plan korkuyu yansıtmaktadır. Anlatımın biçiminde kamu spotunda arkasında kırık camlar bulunan ve bir mermiye benzetilen bir erkeğe yer verilmektedir. Erkeğin yüz ifadesinden korku ortaya koyulmaktadır. İçeriğin tözünde kamu spotundaki yazılı göstergelerden trafik kazasında emniyet kemeri takılı olmayan bir kişinin camdan fırladığı aktarılmaktadır. Cam kırıkları da meydana gelen trafik kazasının sinekdoşları olarak kullanılmaktadır. Kamu spotunda camdan fırlayan kişinin mermi şeklinde sunulmasıyla metalepsis bir anlatımdan yararlanılmakta ve trafik kazasında emniyet kemeri takmayan bir kişinin bir mermi gibi camdan fırlayabileceği aktarılmaktadır. Burada merminin hızı ve çarpma etkisi ön plana çıkmaktadır. Cam kırıkları, trafik kazası metaforu olarak kullanılmaktadır. İçeriğin biçiminde kamu spotunda trafik kazası metaforundan ve korku çekiciliğinden yararlanılarak, trafikte emniyet kemeri kullanmama ve araçtan fırlama arasında ilişki kurulmaktadır.



Görsel 10. Emniyet Kemeri Takmamak Öldürebilir - Brezilya Kamu Spotu (Terremoto Reklam Ajansı, 2015)

3.11. Tüm Emniyet Kemerleri Hayat Kurtarır - Meksika Kamu Spotu

Meksika'da Leo Burnett Reklam Ajansı tarafından hazırlanan on birinci kamu spotu, 2015 yılında yayınlanmıştır. Kamu spotunda "Tüm emniyet kemerleri hayat kurtarır. Arka koltuktaki emniyet kemerlerinin kullanılması, ölümlü kazalarda %75'e varan oranda zayiatı azaltmaktadır" (All seat belts save lives. Using back seat belts reduce casualties in fatal accidents up to 75%) yazısı yer almaktadır.

Görsel 11. Tüm Emniyet Kemerleri Hayat Kurtarır - Meksika Kamu Spotu (Leo Burnett Reklam Ajansı, 2015)

Anlatımın tözünde kamu spotunda insanlar ve araba ön plana çıkarılmaktadır. Anlatımın biçiminde kamu spotunda ön koltukları arka tarafta, arka koltukları da ön tarafta sunulan bir arabaya yer verilmektedir. Kamu spotunda arabanın ön tarafında iki çocuk, arka tarafında ise arabayı kullanan bir kadın bulunmaktadır. Burada çocuklar, sevgi metaforu olarak kullanılmaktadır. İçeriğin tözünde kamu spotunda yazılı göstergelerden arabanın arka koltuğunda oturanların emniyet kemeri kullanımına vurgu yapılmaktadır. Kamu spotunda arabanın arka koltuğunda oturan kişilerin, trafikte arabanın ön tarafında sunulmasıyla arka koltukta emniyet kemeri takmayan kişilerin meydana gelen bir trafik kazasında ön tarafta emniyet kemeri takmayan kişiler gibi tehlike altında olabileceği aktarılmaktadır. Ön planda çocuklara yer verilmesiyle arka koltukta emniyet kemeri takılmadığında trafik kazasında çocukların yaralanabileceği ya da hayatını kaybedebileceği anlatılmaktadır. Sürücü koltuğunda da bir kadına yer verilmesiyle kamu spotunda annelere yönelik mesaj verildiği söylenebilmektedir. Bu şekilde çocuklar üzerinden sürücünün evlat sevgisine hitap edildiği çıkarımında bulunulabilmektedir. İçeriğin biçiminde kamu spotunda sevgi metaforundan ve korku çekiciliğinden yararlanılarak, emniyet kemerinin aracın ön koltuklarında oturan kişilerin olduğu kadar arka koltuğunda oturan kişilerin de güvenliği için önemli olduğu vurgulanmaktadır.

4. Tartışma

Çalışmada incelenen kamu spotlarının bazılarında benzer, bazılarında ise farklı içeriklerin kullanıldığı tespit edilmiştir. Trafikte emniyet kemerinin kullanımını teşvik eden kamu spotlarında çoğunlukla ölüm metaforundan yararlanılarak, trafikte emniyet kemeri kullanmama ve ölüm arasında bağ kurulmaya çalışılmıştır. Çalışmadaki kamu spotlarının önemli bir bölümünde korku çekiciliği, bir kısmında da hüzün çekiciliğinden yararlanılarak insanların emniyet kemeri kullanmasının teşvik edildiği ortaya çıkmıştır. Kamu spotlarında ölüm ve sakatlanma vurguları üzerinden korku çekiciliğinden yararlanırken, emniyet kemeri takmayan kişilerin yakınları üzerinden de hüzün çekiciliğinden yararlanıldığı saptanmıştır. Ayrıca çalışmada incelenen kamu spotlarında trafikte emniyet kemeri kullanımının trafik kazalarındaki yaralanma ve ölüm riskini azaltmadaki rolüne ilişkin sınırlı istatistiki bilgiye yer verildiği tespit edilmiştir. Yine incelenen kamu spotlarında sınırlı sayıda metalepsis anlatıma yer verildiği saptanmıştır. Metalepsis anlatımla araştırmada verilen mancınık ve mermi örneklerinin özellikleri üzerinden asıl kavram olarak emniyet kemerinin önemine ulaşılmaya çalışılmıştır.

Çalışmada incelenen ülkeler istatistiksel olarak karşılaştırıldığında emniyet kemeri kullanımı ile ilgili yasal boşlukların Meksika'da olduğu gözlenmiştir (Dünya Sağlık Örgütü, 2017b). Ayrıca Meksika özelinde arka koltuklarda emniyet kemeri kullanımı konusunda da insanların

daha fazla bilinçlenmeye ihtiyacının bulunduğu görülmektedir. Örneğin Meksika'da dört yaşından büyük çocuklarda emniyet kemeri ile çocuk koltuğu kullanımı neredeyse yok denecek kadar azdır. Bu durum özellikle sürücü haricindeki yolcular için de kamuoyunun bilinçlendirilmesi gerektiğini göstermektedir (Cervantes-Trejo ve Leenen, 2015). Dolayısıyla yapılan çalışmada da Meksika'nın araçta bulunan tüm emniyet kemerlerinin hayat kurtardığına yönelik kamu spotuna odaklanarak faaliyet yürütmesi önem arz etmektedir.

İlerleyen çalışmalarda farklı ülkelerle birlikte Türkiye özelinde de çalışmaların yapılması önerilmektedir. Çünkü Türkiye ve diğer benzer orta gelire sahip ülkelerde emniyet kemerinin kullanımının yüksek gelirli ülkelere nazaran daha düşük olduğu görülmektedir. Bu durum karayolu trafik yaralanmalarının artmasına sebep olmaktadır. Emniyet kemeri kullanımına yönelik eğitim kampanyaları Kanada ve ABD gibi yüksek gelirli ülkelerde başarıyla uygulanmıştır. Dolayısıyla emniyet kemeri takılmasına yönelik eğitim kampanyalarının Türkiye'de özellikle 14-17 gibi en genç yaş kategorisindeki kişilere yönelik yapılması ile bu bireyler büyüdüklerinde bilinçli bir nesil yetiştirilebilecektir (Milder, Gupta, Özkan, Hoe ve Lajunen, 2013). Ancak bireylerin emniyet kemerini kullanımı ile ilgili "bana bir şey olmaz" düşüncesi sebebiyle oluşan deneyim eksikliği yapılan kampanyaları da etkileyebilmekte ve bireylerde davranış değişikliği oluşturmada zorluklar yaşanmasına sebebiyet verebilmektedir (Bayraktaroğlu ve İlter, 2007). Bu kapsamda kamu spotlarının insanların deneyimleyerek görebileceği emniyet kemeri simülasyon araçları gibi örnek uygulamalarla desteklenmesi trafik güvenliği konusundaki farkındalığı daha çok yükseltecektir.

Genel olarak değerlendirildiğinde kamu spotlarında farklı içerikler üzerinden insanların trafikte emniyet kemeri kullanımının teşvik edildiği sonucuna ulaşılmıştır. Kamu spotlarında trafikte emniyet kemeri takmanın teşvik edilmesinde ölüm ve sakatlanma vurgusu üzerinden korku çekiciliği kullanılmasının etkili bir yöntem olacağı ileri sürülebilmektedir. Nitekim günümüzde pek çok sağlık konulu kamu spotunda insanların istenilen yönde ikna edilmesinde korku çekiciliğinden yararlanılmaktadır. Benzer şekilde trafikte emniyet kemeri kullanmadığı için yaralanan ya da hayatını kaybeden kişilerin yakınlarının ön plana çıkarılarak hüzün çekiciliğinden yararlanılmasının da başarılı bir ikna yöntemi olduğu belirtilebilmektedir. Örneğin Becan'ın (2021) yapmış olduğu bir çalışmada, hüzün içerikli reklamlara karşı insanların olumlu bir tutum sergilediği ortaya koyulmuştur. Günümüzde çeşitli bağımlılık karşıtı kamu spotlarında da hüzün çekiciliği üzerinden insanların belli alışkanlarının önüne geçilmeye çalışılmaktadır.

Çalışmada trafikte emniyet kemeri kullanımının teşvik edilmesine yönelik kamu spotlarına ilişkin birtakım öneriler sunulmaktadır. Kamu spotlarında hüzün çekiliği boyutunda trafikte emniyet kemeri kullanmayan bireylerin başlarına gelebilecek olası olumsuz durumlardan sonra çocuklarının veya ebeveynlerinin üzüntüsünün ön plana çıkarılması önerilmektedir. Ayrıca konuya ilişkin kamu spotlarında korku çekiciliği bağlamında ölümün dışında doğrudan kalıcı sakatlanmaya maruz kalmış bir bireyin görseline yer verilebilir. Diğer yandan kamu spotlarında trafikte emniyet kemeri kullanımına yönelik farkındalık oluşturmak amacıyla doğrudan ölümü yansıtan, tabut ve mezar taşı gibi metaforlardan yararlanılabilir. Son olarak trafikte emniyet kemerinin önemine vurgu yapmak için kamu spotlarında mancınık ve mermi dışında farklı metalepsis anlatımlardan yararlanılması da önerilmektedir.

Çalışmada kamu spotlarının içerikleri incelenerek trafikte emniyet kemeri kullanımının teşvik edilmesinde ortak metaforlar ve duygu çekiciliklerinin neler olduğu açıklanmaya çalışılmıştır. Buna karşılık çalışmadaki bulgular, trafikte emniyet kemerinin kullanımını teşvik eden kamu spotlarının insanlar üzerinde ne gibi bir etki oluşturduğunu ortaya koyamamaktadır. Bu açıdan gelecek çalışmaların trafikte emniyet kemeri kullanımını teşvik eden kamu spotlarının

insanların düşünce, tutum ve davranışları üzerindeki etkisini yansıtan saha araştırmalarına yönelmesi önerilmektedir.

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Derleme Makalesi

An Examination of the Rise of Informal Public Transport Systems in Developing Countries and the Critiques About Bus Rapid Transit Systems as a Desired Solution

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Abstract

This article provides a review of the general characteristics of Informal Public Transport (IPT) systems, the reasons behind the increasing use of these systems in developing countries, and the evaluation of Bus Rapid Transit Systems (BRTS) as an alternative solution to IPTs. IPTs, whose use has increased significantly in many countries where Formal Public Transport is insufficient, are different in their service, operation, finance, monitoring and labour features. These systems' usage has increased in developing countries for many economic, social and political reasons such as low income, rapid population growth, increase in demand, urban macroform, job opportunities and more flexible routes. However, besides the positive effects of these systems, there are many adverse effects. It is challenging to transfer the public transport schemes made in developed countries directly to these countries, and understanding the reasons in detail allows to offer the right solution. Nevertheless, BRTS, which are segregated busways, is seen as a solution in many countries, and there are many agreeing and disagreeing arguments for this idea in the literature. Although there are examples where these systems improve public transport systems, there are many examples where they do not contribute to the solution. As a result, it has been reached that the diversity of the reasons for the increase in the use of IPT systems is high, and BRTS can be an alternative, producing spatially, economically, environmentally and politically appropriate solutions according to the local characteristics of the countries can be more beneficial than a single solution.

Keywords: bus rapid transit systems, developing countries, informal public transport

Gelişmekte Olan Ülkelerde Ara Toplu Taşıma Sistemlerinin Yükselişinin ve Hızlı Otobüs Taşımacılığı Sistemlerinin Çözüm Olarak Değerlendirilmesinin İncelenmesi

Öz

Bu makale, Ara Toplu Toplu Taşıma (Informal Public Transport - IPT) sistemlerinin genel özelliklerini, bu sistemlerin gelişmekte olan ülkelerde artan kullanımının arkasındaki nedenleri ve IPT'lere alternatif bir çözüm olarak Hızlı Otobüs Taşımacılığı Sistemlerinin (Bus Rapid Transit Systems - BRTS) değerlendirilmesini sunmaktadır. Resmi toplu taşımacılık sistemlerinin yetersiz olduğu birçok ülkede kullanımı önemli ölçüde artan IPT'ler hizmet, işletme, finans, izleme ve işçilik özellikleri bakımından farklılık göstermektedir. Bu sistemlerin kullanımı gelişmekte olan ülkelerde düşük gelir, hızlı nüfus artışı, ulaşımda talep artışı, kentsel makroform, iş olanakları ve daha esnek güzergahlar gibi birçok ekonomik, sosyal ve politik nedenlerle artmıştır. Ancak bu sistemlerin olumlu etkilerinin yanı sıra birçok olumsuz etkisi de bulunmaktadır. Gelişmiş ülkelerde yapılan toplu taşıma programlarının doğrudan bu ülkelere aktarılması zordur ve gelişmekte olan ülkelerde güncel durumdaki IPT kullanımının nedenlerinin ayrıntılı olarak anlaşılması doğru çözümün sunulmasını sağlayabilecektir. Ayrılmış otobüs yolları olan BRTS birçok ülkede ulaşım kaynaklı problemlere çözüm olarak görülmektedir ancak literatürde bu çözüme yönelik olumlu ve olumsuz eleştiriler yer almaktadır. Bu sistemlerin toplu taşıma sistemlerini iyileştirdiği örnekler olsa da çözüme katkı sağlamadığı pek çok örnek bulunmaktadır. Sonuç olarak, IPT sistemlerinin kullanımının artmasının nedenlerinin çeşitliliğinin yüksek olduğu ve tek bir çözüme bağlı kalmaktansa bölgenin yerel özelliklerine göre mekansal, ekonomik, çevresel ve politik olarak uygun çözümler üretilmesi gerektiği sonucuna ulaşılmıştır.

Anahtar Kelimeler: ara toplu taşıma sistemleri, gelişmekte olan ülkeler, hızlı otobüs taşımacılığı sistemleri

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An Examination of the Rise of Informal Public Transport Systems in Developing Countries and the Critiques About Bus Rapid Transit Systems as a Desired Solution

The need to reduce the rising use of motor vehicles with transportation plans and improve sustainable transportation modes to meet the increases in mobility is growing worldwide (Black, 2018). Transportation problems, especially in developing countries, should be evaluated based on the adequacy of public transport (PT) services. Formal Public Transport (FPT), which requires high-level organization and government regulation, and Informal Public Transport (IPT), which has informality in services, have importance in this direction (Kumar, Zimmerman, and Arroyo-Arroyo, 2021). However, the two systems have many differences, as can be seen in Table 1. Although the provision of PT is the duty of the government, resources and capacity are insufficient for PT systems in developing countries (Kumar, Singh, Ghate, Pal, and Wilson, 2016). For this reason, decreases in FPT and increases in IPT are observed, and it should be questioned whether this causes a degradation in transport systems or is the reason for this (Kumar et al., 2021). In many developing countries, Bus Rapid Transit Systems (BRTS) are seen as the desired solution to PT problems, and investments are made in this direction by utilizing the examples of implementations in the world (Wood, 2014). For this reason, it is necessary to examine the reasons for existence, characteristics, and effects of IPT in detail and to examine whether BRTS will be a definitive solution to PT problems and negative consequences. In this study, the basic features of IPT systems will be examined, the reasons for their widespread use in developing countries will be evaluated, and a critical discussion will be presented on seeing BRTS as the desired solution.

2. Methodology

In this paper, relevant publications are first analysed to understand IPT and BRTS systems better. In addition, understanding the characteristics of these systems in developing countries is added to the research content. Various databases, especially Web of Science and Scopus, are used to access these publications. Related keywords are defined as public transport, informal public transport, FPT, IPT, developing countries, bus rapid transit systems, and BRTS. These keywords are used in different combinations to find common articles. Where relevant, the searches were extended by adding the necessary country names. In addition to electronic databases, official website publications of developing countries are also analysed. Although many studies from the literature are evaluated, 40 of them are found suitable for evaluation within the article. The reason for this is the neglect of studies that do not mention the findings on the reasons for the emergence, effects and results of IPT and BRTS systems in developed countries.

3. Informal Public Transport (IPT)

With the rapidly increasing urbanization and mobility in developing countries, PT services have become unable to meet the needs (Behal, Kumar, and Tiwari, 2020). Because highly regulated FPTs have to comply with all government rules (in terms of schedule, routes, stops, operations, fares), they are costly for these countries (Kumar et al., 2021). Therefore, small-scale operators have started the IPT system without government support to meet this demand. This system, also known as Intermediate Public Transport and Paratransit, includes privately operated PT modes such as rickshaws, mini-buses and taxis (Kumar et al., 2016). These modes are called by different names in different countries such as Combis, TroTro, Matatu, Chapa (Figure 1) but have the same similar features (Behrens, Saddier, Pickup, and Durant, 2021). These modes generally consist of small, ageing, low-performance motor vehicles (Cervero, 2000).

Table 1. ***Dimensions of FPT and IPT (Cervero, 2000)***

Dimension	**Formal**	**Informal**
Economic Standing	Middle and Upper Class	Lower Class, Poor
Political Influence	Strong, Empowered	Weak
Legitimacy	Legal, Regulated	Illegal, Unregulated
Society and Culture	Modern	Traditional
Internal Organization	Orderly, Vertically Integrated	Less Structured, Horizontally Integrated
Assets and Capitalization	Intensive	Minimal
Financing and Credit Access	Commercial Banks	Family and Loan Sharks
Technology	High Tech	Low tech
Skill Levels	Knowledge−Based, Cognitive	Labor−Based, Adaptive
Legal Status	Registered	Unregistered
Supply		
Service Structure	Fixed Route, Standardized	Variable Route, Adaptive
Delivery	Line−Haul, Trunk−Line	Distribution, Feeder
Scheduling	Fixed Timetable	Market Driven, Adaptive
Reliability	Reasonably Dependable	Inconsistent
Vehicle Type	Large	Small to Medium
Ownership	Public and Private	Private
Market Perspective	Monopolist	Entrepreneurial
Labor	Semi−Skilled	Semi−to−Non−Skilled
Organization	Bureaucracy	Route Associations
Demand & Price		
Market Focus	Mixed	Niche
Main Trip Purposes	Work, School Shp,	Mode Access
Trip Distances	Medium to Long	Short to Medium
Customer Relations	Impersonal	Interpersonal
Socio − Demographics	Low to Moderate Income	Low Income
Fare Structures	Fixed, Uniform	Variable, Differentiated

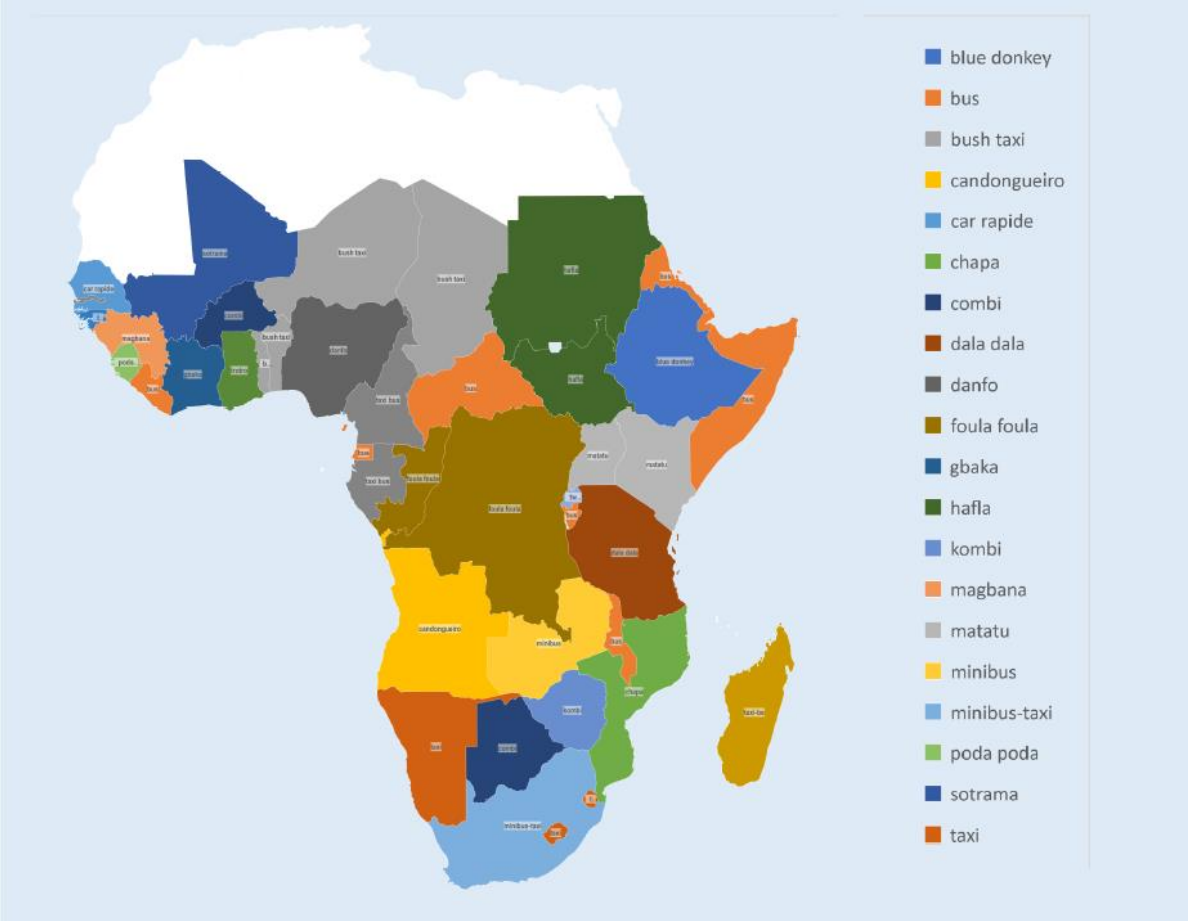

Figure 1. Common IPTs in African cities (Behrens et al., 2021)

It is possible to evaluate the IPT sector with its service features, operation system and financial aspects (Kumar et al., 2021). IPT services are provided whenever the operators want, and they depart from the terminals when sufficient capacity is reached for the operator or with a fixed service frequency (Kumar et al., 2016). They can stop to pick up or drop off passengers wherever they want without having formal stops. They can change the route and do not have a regular schedule (Cervero, 1998b). Remarkably, IPT modes are accessible and adjustable by different groups (Vuchic, 2007). For example, while small vehicles can serve areas with low passenger volume, taxis provide more personalized service, and rickshaws provide this service to different segments of society. Pricing generally focuses on profit maximization as IPTs are served by private individuals and operators (Shimazaki & Rahman, 1995). Also, sometimes the fare of IPT modes can be higher because they provide high-frequency service, and it is decided in three ways as fixed, metered and negotiated (Shimazaki & Rahman, 1995). Besides, IPTs are politically weak, under-represented officially, and the system of operators and drivers is maintained by associations or unions (Cervero, 2000). Management is generally carried out according to the net-cost model operation system (Cervero, 2000). In addition, situations such as excessive passenger intake, use of old vehicles, and low use of clean fuels are encountered in these vehicles for profit (Kumar et al., 2016). All these general features of IPT modes are summarized in Figure 2.

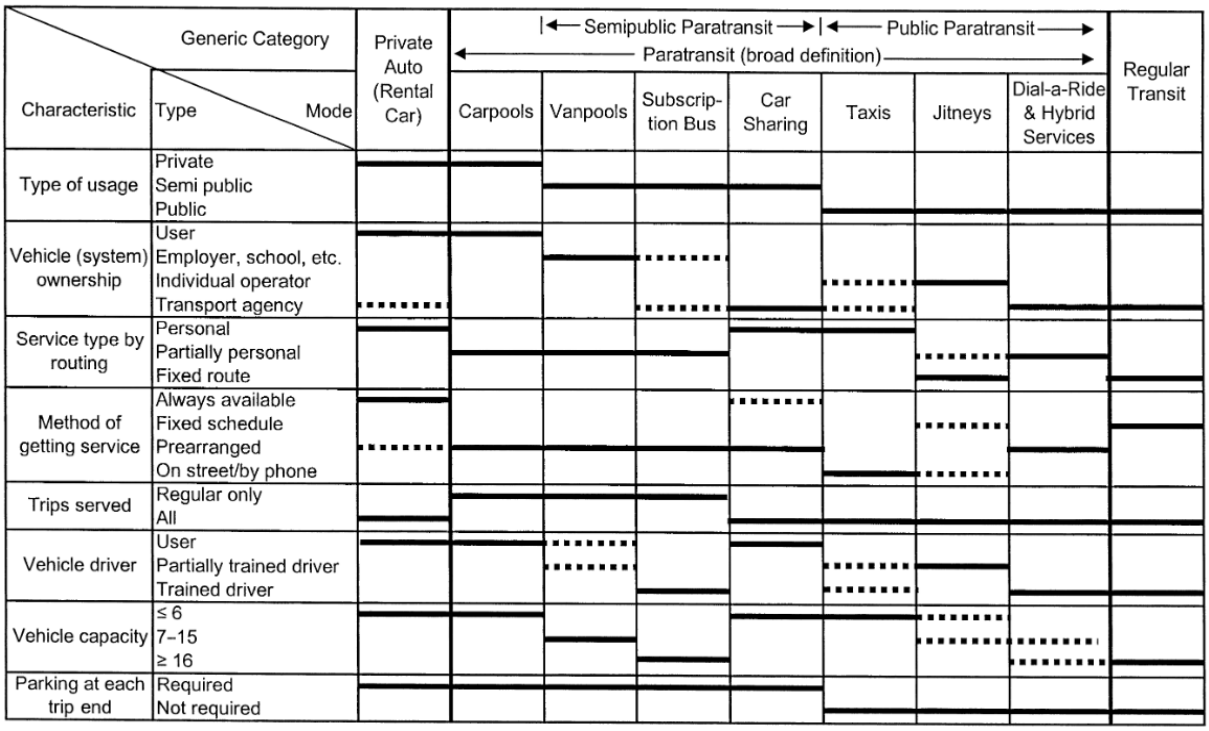

Figure 2. Basic features of IPT (Vuchic, 2007)

IPT has examples in many parts of the world. For example, when IPTs in five regions in India were examined, Tata Magics, Mahindra Gios, Chakdas, Kadukas, minibuses, motorized and bicycle rickshaws drew attention, and it was observed that they played an essential role in meeting the transportation needs of the population (Kumar et al., 2016) (Figure 3). For example, it has been seen that the manoeuvring feature of the bicycle rickshaw provides the flexibility of movement in narrow and busy streets, and IPTs are more common in urban areas. However, it has also been observed that the lack of local follow-up regarding compliance with the legislation and the violation of transportation conditions (such as carrying capacity, route, license) are common. When PUJs and tricycles in the Philippines are examined, it has been observed that their use has become a habit in society, and they only prefer FPT for long-distance journeys (Guillen, Ishida, and Okamoto, 2013). It was observed that the developments in FPT could not change this habit. Although in some countries, decisions were made entirely independent of the formal administration, for example, the routes of Daladas minibuses in Dar-Es-Salaam were fixed by the Surface and Marine Transport Regulatory Authority, or the fare and route of the Dolmuş were fixed by the municipalities in Türkiye (IUT India, 2014).

IPT systems also have adverse effects due to traffic congestion, air and noise pollution and negative contributions to traffic safety (Cervero, 2000). The first effect is that they increase traffic congestion during rush hour by providing irregular scheduling and service (Dumba, 2017). Another effect is that competition between drivers for passengers increase accident rates (Özbilen, 2016). For example, in Ankara (Türkiye), 54% of urban traffic accidents are caused by Dolmuşs (Shimazaki & Rahman, 1995). Also, the preference of high demand routes due to competition causes low demand routes to be entirely out of service (Cervero, 2000). Another impact is the safety problem caused by the drivers not having the necessary training and supervision and inadequacy and disrepair of the vehicles. For example, only half of the paratransit operators in Mexico are legally licensed (Cervero, 1998a). In addition, since the regulatory institutions are weak, there is no way for passengers to report their opinions about the service (Özbilen, 2016). Finally, their pricing cannot be integrated into transit systems (Adam Smith Institute, 1989).

Figure 3. IPT modes in India (Kumar et al., 2016)

In conclusion, IPT systems have emerged as a result of a need in many countries, and their importance has gradually increased. These systems have both positive and negative effects on these cities. It is necessary to understand why these systems are important in developing countries and make appropriate developments accordingly to solve their negative effects. For this reason, in the continuation of the study, the factors that make IPT widespread in developed countries will be examined.

4. Factors Contributing to the Rise of IPT in Developing Countries

IPT is the most common form of transportation in the world's poorest countries, especially for low-income people, and over the years, many factors have driven IPT to become widespread (Cervero & Golub, 2007). These are FPTs' inability to meet demand, rapid population growth, unplanned urban settlements, urban sprawl, increase in travel distances, inadequate transportation infrastructure, ease of adaptation of IPTs, and job opportunities for people (Kumar et al., 2021).

The most important reason for the rise of IPT is the inability of FPT services to meet the market demand (Cervero & Golub, 2007). In areas where FPT systems are irregular, unreliable, or non-existent, IPT has started to provide requisite service, especially for workers (IUT India, 2014). For this reason, IPT systems that emerged to fill these gaps and ensure that unserved regions receive service were valued and evaluated as gap fillers (Cervero, 2000). For example, in Mexico, the usage rate of minibuses and Pesero taxis, which emerged due to the decrease in the capacity of the formal bus systems and the less service area of the Metro-rail system outside the city centre, increased by 40% in 10 years (Wirth, 1997). Although there are still many security problems due to cartels today, their use is high because people do not have other alternatives to reach their jobs and they provide the link between metro stations and settlements. Also, due to insufficient municipal budgets in a significant part of Africa, transportation planning has been inadequate, and IPTs have become the only reliable service (Cervero & Golub, 2007). For this reason, people in South Africa have volunteered to pay individual fares for door-to-door services (IUT India, 2014).

The second reason is rapid population growth that occurs when transportation systems are inadequate (Dumba, 2017). For example, in Sub-Saharan Africa, the population of big cities is increasing by 4% annually (CFR, 2007). Also, it is seen that the already overpopulated population will be much higher in the coming years, and approximately 72% of the urban population lives in slum conditions (CFR, 2007). It is not unexpected that the mode these people can afford is IPT. However, income has started to rise with the increasing population, which has led to an increase in individual vehicle use (Kumar et al., 2021). The inadequacy of transport infrastructure and services in developing countries also reinforced the effects of this situation. For example, individual car ownership in Ghana has increased significantly over the years, as seen in Figure 4 (Obeng-Odoom, 2010). However, as Obeng-Odoom (2010) mentioned, traffic congestion has become an urgent problem because road infrastructure has become unable to handle this demand, and therefore IPT has gained importance. Also, less than 15% of the urban land is reserved for streets in Sub-Saharan African cities and cannot meet the demands of the growing population (Kumar et al., 2021).

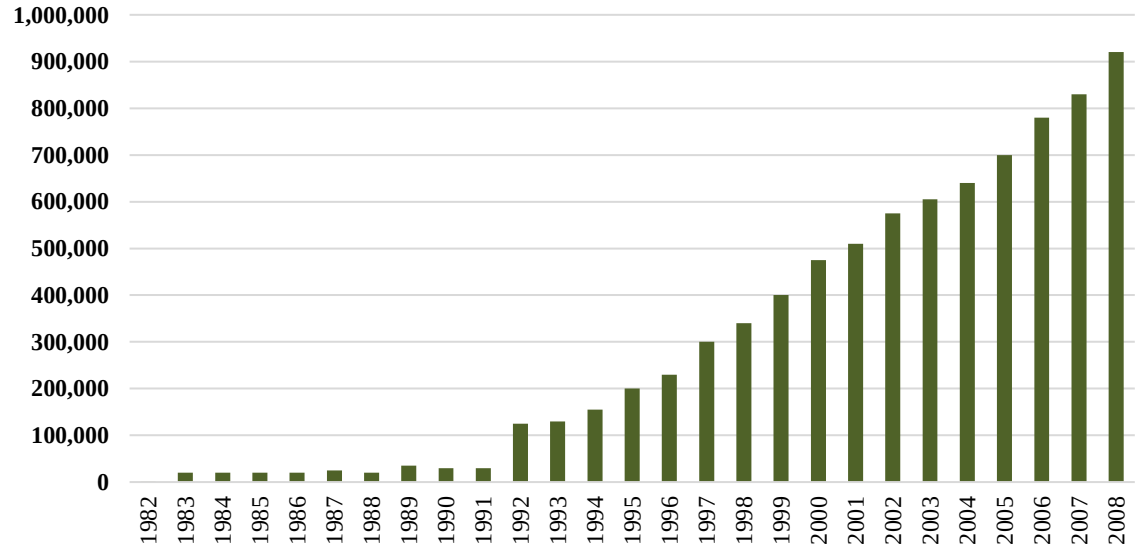

Figure 4. Change in individual car ownership in Ghana (Obeng-Odoom, 2010)

Holistic planning of land-use and transportation is one of the cornerstones of creating a sustainable city plan. For this reason, unplanned urban sprawl causes an inadequate PT system due to the spread of settlements to the city periphery and their inadequate relationship with the transportation network (Trubka, Newman, and Bilsborough, 2010). As Daisa et al. (2013) mentioned, cost-effective use of existing infrastructure that can be provided with infill settlements is not provided with urban sprawl. On the contrary, with urban sprawl, the density of the journeys decreases, the trip distances get longer, and therefore it becomes complicated for developing countries financially and politically to create a fixed route and system for PT. For example, in Sub-Saharan African cities, individual traffic flow has many-to-many travel due to homogeneous urban structure and low densities (Kumar et al., 2021). For this reason, IPT has started to gain importance in cities that do not have high-demand corridors where transportation systems will be concentrated. As another example, migrations from rural to urban in Ankara (Türkiye) in the mid-1950s affected the urban form, and the slums located in the urban fringe started the rising period of Dolmuş (Özbilen, 2016) (Figure 5).

In addition, IPT systems have operational flexibility that can efficiently adapt to the existing transport network and individuals' daily needs (Behrens et al., 2021). In IPT systems, standard routes and pricing can be changed easily and not monitored (Kumar et al., 2021). In addition, working hours are longer than FPTs (Cervero, 2000). As in India, the use of these services has increased due to the flexibility of services and pricing and the speed of adapting to changing demands (Kumar et al., 2016). For example, in Jaipur, managers work on the routes to ensure driver compatibility, and instant adjustments can be made according to the situation (Kumar et al., 2016). Other advantages of small vehicles in these cities are they can be more frequent and manoeuvrable, and individuals feel more private and safer (Cervero, 1998b). Especially in peak hours, the demands have increased due to the physical advantage. Another reason is that it can be relatively cheaper in some cases due to competition (Adam Smith Institute, 1989). For example, in Dar-es-Salaam, it has been observed that 70% of families with an informal economy prefer informal modes (Joseph et al., 2020). This is because fares depend on the individual decisions of the driver. Apart from the station, taking passengers by stopping everywhere in a competitive environment has also increased the preferability as it makes it easier for people to access the mode of transportation (Kumar et al., 2016). Also, as Behrens et al. (2021) mentioned, real-time route deviations provided more door-to-door service to passengers.

IPT systems have also been valued in creating job opportunities for low-skilled people, as most of the drivers are people who migrate from rural areas to cities (Cervero & Golub, 2007). It has been seen as an important employment area to use the idle labour force, and it has been evaluated as a source of income and a resource that can reduce poverty (Behrens et al., 2021). For example, in the Philippines, the role of IPT is quite significant in the transportation sector of approximately two million people work (Guillen et al., 2013). About 19,000 drivers work in the IPT sector in Nairobi, and it is among the most prominent informal economy sectors (Khayesi & Nafukho, 2016). Emerging business areas with IPT such as the maintenance, local vehicle production, and assemblage have also increased the demand (Cervero, 2000). For example, Sub-Saharan Africans are generally young, have little education and cannot get formal jobs, while IPT supports them as it does not have any criteria (Kumar et al., 2021)

In summary, many economic, social, and political reasons have led to the spread of IPTs in developing countries. This spread can be summarized as the inability to manage the decisions taken in line with the needs of the society by the government because of insufficient resources. In general, Bus Rapid Transit Systems (BRTS) are considered a desirable solution for solving transportation problems in developing countries.

Time Period / Topic	Urban Macroform Transformation	Modes of Transportation in the City	Important Incidents Affected Transportation			Issues of Transportation	
1920s	Densely crowded citadel town	Walking, Horsecarts, Private Car, Suburban Train	Small size settlements dominated by pedestrian trips because of topographical thresholds	Preparation of Lörcher Plan and Jansen Plan enabling a planned development		Sharp increase in the number of automobiles as a result of the establishment of the Republic	
1930s	Expansion of Old City towards south and east	Walking, Private Car, Taxi, Suburban Train, Kaptı-Kaçtı, Public Bus	Rapid increase in the motorized transportation demand	Introduction of municipality (public) bus operations		Lack of transportation service through the old city center in the first half	
1940s	Quaquaversal Expansion of old city and the beginning of unauthorized housing	Walking, Private Car, Taxi, Suburban Train, Public Bus, KaptıKaçtı, Taxi Dolmuş, Trolleybus	International transaction difficulties because of budget constraints during Second World War	Fire in the municipality bus garage		Lack of spare parts of the vehicles because of WW II	Insufficiency of Public Bus Fleet in Meeting Demand
1950s	Rapid Authorized / Unauthorized Residential Development of the City	Walking, Private Car, Taxi, Suburban Train, Taxi Dolmuş, Trolleybus, Minibus, Dolmuş	Leibrand's report on inefficient transportation network	Reorganization of public bus operations	Yücel-Uybadin plan transportation proposals	Inefficiency of radially operating bus operations of EGO	The beginning of the private entrepreneurship dominance in urban transport
1960s	Highway based development of urban macroform	Walking, Private Car, Taxi, Suburban Train, Taxi Dolmuş, Trolleybus, Minibus-Dolmuş, Station-Dolmuş	Establishment of minibus and automobile production factories	Reorganization of dolmuş operations and emergence of a new type of dolmuş	Restriction in the number of taxi and dolmuş vehicles	Rapid increase in the number of motorized vehicles	Decrease in the share of publicly operated public transport vehicles

Figure 5. Relation between urban macroform and IPTS in Ankara (Özbilen, 2016)

5. Arguments on Bus Rapid Transit Systems (BRTS)

Bus Rapid Transit Systems (BRTS) is a bus-based transit system with segregated busways, formal management, fixed stations, and routes (Wright & Hook, 2007). Nowadays, there are BRTS in 177 cities, carrying around 33 million people daily (BRT Data, 2021). One of its important features is that it can be up to 20 times cheaper than light rail transit systems and up to 100 times cheaper than metro systems (Wright & Hook, 2007). Alternative PT methods which are effective and inexpensive are sought in developing and developed countries, and BRTS investments are considered valuable (Hensher & Golob, 2008). BRTS is preferred over rail systems with higher user capacity and operating costs, in case of the city has a sufficient road network in medium to high-density regions where infrastructure is insufficient (Ibarra-Rojas, Delgado, Giesen, and Muñoz, 2015). However, there are also opposing opinions regarding seeing BRTS as the desired solution for traffic congestion and low-quality PT in developing countries. These counter-views includes institutional barriers, political and technical inadequacy, the opposition of existing systems, insufficient financing, and spatial inequality in developing countries (Lindau, Hidalgo, and de Almeida Lobo, 2014).

In many studies on BRTS, it has been stated that it may positively affect developing countries. One of the ways to avoid traffic congestion is to prevent sharing road capacity with cars, and although light and heavy rail systems meet this, BRTS is a less costly method (Basso, Feres and Silva, 2019). It is also considered that it provides rapid, high quality and safe PT, increases passenger volume, and supports PT-oriented development by providing sufficient capacity to the community (Deng & Nelson, 2011). In addition, there are many examples that BRT studies are generally effective in reducing traffic pressure with affordable costs, and travel time savings can reach 35% (Levinson, Zimmerman, Clinger, and Gast, 2003). When the BRTS recommended for Kampala (Uganda) is evaluated, it is calculated that the average travel time can be reduced by up to 50% (Vermeiren et al., 2015). In another example, Mexico City, after BRTS, it was observed that people's exposure to traffic-induced air pollution was considerably reduced, and they were seen as safer (Wöhrnschimmel et al., 2008). In summary, BRTSs are considered necessary for developing countries due to their low infrastructure expense, capability to operate without subvention, their ability to be implemented in a short time (1-3 years), and their easier and scalable adaptation to city structures (Wright & Hook, 2007).

When the opposing arguments are examined, first, as Kumar et al. (2021) mentioned, the PT market and operating system of each city differ, and the types of services should be shaped correspondingly. In addition, there are different components and development stages of BRTS development, and if this order is operated incorrectly, the effectiveness of the investment decreases. For example, in Mexico City, in addition to the benefits, Metrobus' "fostering" policy was found more complex, costly, slowing system development, politically compelling and unsustainable, contrary to expectations (Flores-Dewey & Zegras, 2012). In this direction, it is not guaranteed that the effects of BRT investment made in another developed country will provide the same results by policy tourism in developing countries (Wood, 2014). For example, Sub-Saharan African cities have a lower infrastructure and less financial adequacy than Latin American cities, so it is difficult for projects to operate with the same system (Kumar et al., 2021). As mentioned above, since there is no systematic PT management in developing countries where IPT systems are common, it will be challenging to switch to the regulated and controlled system, which is the requirement of the BRT system (Lindau et al., 2014).

Secondly, issues such as government support, finance, infrastructure needs, political and technical competence are crucial for the success of BRTS. As Pickrell (1992) mentioned, decision-makers can realize transit projects that they cannot afford politically and economically by underestimating the costs of these systems. One reason for this is, for example, the lack of

up-to-date data on urban characteristics, livelihoods, population, and mobility characteristics of many African cities (Vermeiren et al., 2015). Also, few developing countries prioritize urban transport policies (Lindau et al., 2014). In this direction, the design and implementation stages can be challenging as there is no experience, political framework, and financial management in these projects, which require significant investments in these countries. For example, in Lagos, Nigeria, queues began to form at the BRT bus stops, as in Figure 6, which was stated to be due to the slowness in the ticketing process (The Guardian, 2017). The person travelling by car may be stuck in traffic, while the person who wants to use the PT may be late due to the queue in this system (Basso et al., 2019). However, as Adebambo and Adebayo (2009) examined, although it did not end PT problems, it increased passenger satisfaction and provided the integration of different modes in Lagos. In addition, the safety of pedestrian crossings should also be considered when separating bus lanes that will allow buses to go faster on main urban arteries. However, it raises concerns about the quality of PT as there is no priority road safety inspection in developing countries (Lindau et al., 2014). This situation is an example of the results of the construction of the system without holistic evaluation.

Figure 6. BRT queues in Lagos (The Guardian, 2017)

As mentioned above, one of the reasons for the widespread use of IPT systems in developed countries is urban sprawl. So, although the single corridor development serves certain parts of the city, it has difficulties providing full communication between the areas where the population using PT live or work (Kumar et al., 2021). For example, in Lima (Peru), which became dependent on the use of IPT with the deterioration of PT quality and city macroform in the 20th century, 18 districts are connected by a 26 km BRT lane (Jauregui-Fung et al., 2019). However, it contributes to solving the congestion in the north-south corridor and reducing travel times, while IPT in the rest of the city (Mototaxis) addiction continued (Figure 7). Even after BRT and the metro system, the demand for IPT modes has been 30 times higher than the demand for FPT modes. As explained by Jauregui-Fung et al. (2019), the problem here is that the PT system is managed without being integrated, having autonomous regulatory authority, and not fully serving the city's urban structure. In other words, the existence of BRTS solely was not enough to solve PT problems in Lima.

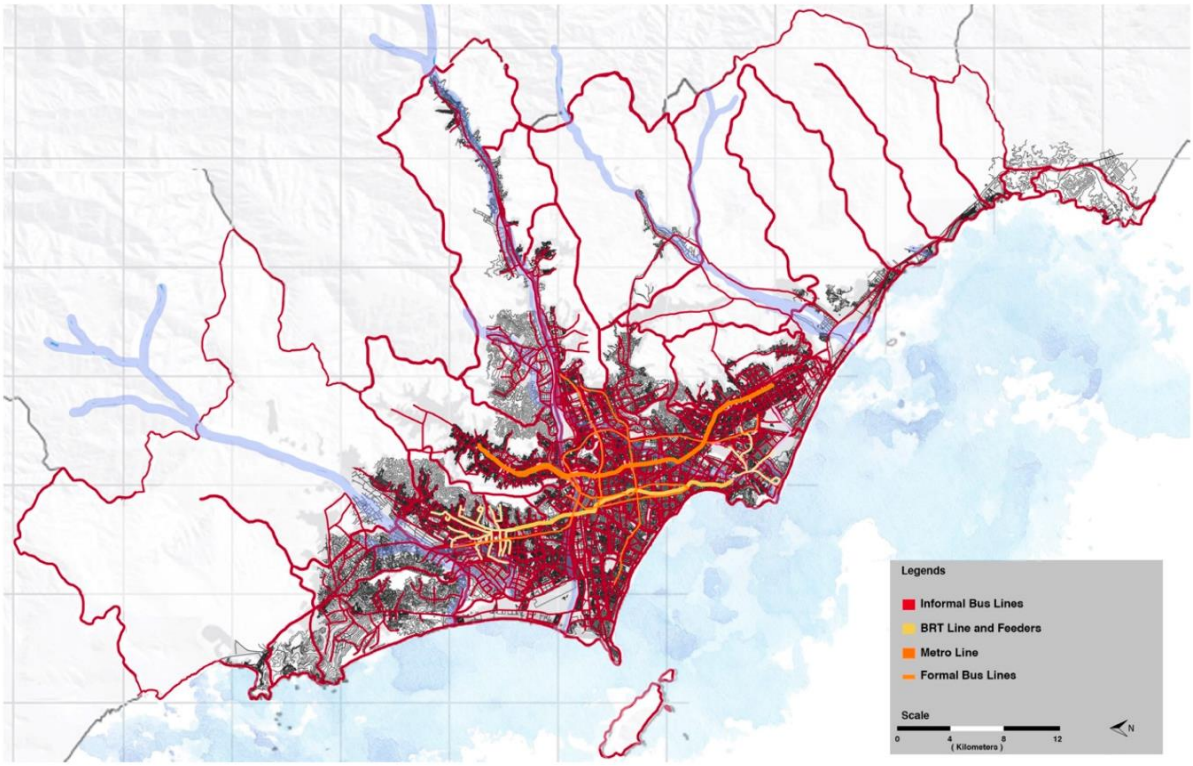

Figure 2. IPT and BRT lines in Lima (Jauregui-Fung et al., 2019)

Another concern is the social impact of these investments. Due to high urban inequalities in developing countries, the impact of investments for segments of society can be different (Vermeiren et al., 2015). It is thought that changes in property values resulting from BRTS may support social segregation observed in developing countries (Deng & Nelson, 2011). For example, walking spatial accessibility to the BRTS in Cali (Colombia) was calculated relatively high for middle-income groups but limited for highest and lowest income groups (Delmelle & Casas, 2012). Also, for Kampala (Uganda), four groups (extremely poor, poor, middle income and rich) were interviewed to understand the effects of BRTS designed to mitigate the negative impact of minibuses and low-income groups were observed to be vulnerable to physical exclusion from BRT (Vermeiren et al., 2015). In addition, the dedicated line required by the BRT system can challenge the existing inadequate transportation infrastructure, and people who do not use PT may perceive the development of a dedicated line as an intervention in their rights (Kumar et al., 2021).

As a result, there is no single truth for the improvement of PT systems, projects should be prepared by determining the dynamics of each city accurately. In short, PT systems need to be improved by considering the financial, legal, institutional political situation of the cities, PT market, capacity, the socio-economic structure of the society, the people working in these systems and future concerns (Kumar et al., 2021).

5. Conclusion

PT systems are one of the primary modes for managing increasing mobility in developing countries. Therefore, IPT modes, consisting of flexible and small vehicles created in line with the needs and operated informally, are the most common PT types. Although IPTs have not the most comfortable mode for passengers in developing countries, they can be the only option that people have, provide employment and adaptable service to places where FPT cannot serve

(Kumar et al., 2016). For this reason, considering cities' economic and political conditions, rapid transformation is complex, and positive effects can be increased with regulations, follow-up systems and measures to improve functioning and service. In this direction, improvement in regulatory authority and proper infrastructure facilities, provision of social benefits to drivers, economic support required for the maintenance of vehicles, production of alternatives for the fuel types used in IPT vehicles, and formulation of systems that will ensure the safety and information of passengers should be provided for the reformation of IPTs (IUT India, 2014). Also, there are many positive and negative approaches to BRTS seen as a solution to PT problems. Although it reduces travel times and seems cheaper, it is thought that directly copying these systems, the compatibility of operating costs, unique macroforms and social structures may be problematic. BRTS will be successful when stakeholders are aligned, capacity to meet the complexity of projects is achieved, the adequate institutional framework is established, technical, legal, and economic capacities are increased, and adequate funding is provided (Lindau et al., 2014). In addition, policy and institutional reforms on vehicle purchasing, transit regulations, urban design are required in developing countries to implement BRTS (Adebambo & Adebayo, 2009).

As a solution recommendation in Türkiye, instead of copying BRTS applications directly, it is necessary to ensure the integration of IPT and FPT systems and to make arrangements following contemporary applications. It is necessary to adopt practices that will not deprive any segment of society using the Minibus-Dolmus system by analysing them. As mentioned above, the spatial distribution of the service of IPTs in Türkiye is spread over wide areas, it provides job opportunities for many people, and it is used extensively at the points where FPT is lacking. Replacing this system directly with another system will not work in Türkiye either. For this reason, issues such as making service improvements, ensuring the inclusion of IPTs in the transit systems, providing driver training and monitoring systems, defining their relations with FPTs in more detail, and replacing these systems with rail systems, where possible, should be addressed instead of replacing the system completely.

In summary, in developing countries, designing solutions following local conditions and constraints should be the primary consideration and causes of PT problems should be determined correctly. It is necessary to improve the FPTs and IPTs, which are evaluated with sufficient data infrastructure, and ensure that the projects are operated, managed, and monitored correctly by providing equal opportunities to everyone in terms of local, sustainable, and spatial, economic, and environmental aspects.

Ethics Committee Approval Statement

Ethical approval is not applicable, because this article does not contain any studies with human or animal subjects.

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