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# Determinants of risky driving behavior: a narrative review

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## Abstract

Road traffic crashes (RTCs) account for great mortality and morbidity rates worldwide, resulting in substantial global burden. Factors contributing to RTC generally fall into three categories: environmental, vehicle, and human, with the human factor being by far the leading determinant. Obtaining an in-depth exploration of driving behavior and factors underpinning risky driving could be of particular importance to facilitate the establishment of effective policies.

The present article provides insight to different aspects of risky driving behavior, at micro and macro levels, from individual attitudes, and psychological factors like personality, temperament, mood and emotions, to socioeconomic context, social norms, cultural backgrounds, level of law enforcement, and internalization of legality in the society.

Risky driving behavior is a multidimensional issue and any effort to design and establish modification policies should be based on a comprehensive understanding of its determinants in different aspects.

**Keywords**: Road traffic crash (RTC), Car crash injury, Driving behavior, Psychological distress, Risky behavior, RTC determinants.

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## Introduction

All over the world, about 1.2 million people are killed and 20 to 50 million more are injured or disabled annually due to road traffic crashes (RTCs) (1). The losses account for 2.1% of global mortality and 23% of deaths due to injury. This tragedy, the so called "war on roads" (2), imposes substantial psychological distress and economic costs both in micro and macro scales. RTC is a contributor to the global burden of disease with a trend that is estimated to be rising, moving from the tenth rank in 2002 to the eighth by 2020 (3). The problem is receiving an increasing attention by goverments, non-governmental organizations, and academics indicated by the growing number o f published studies in this field (4). This has resulted in a decrease in the rate of injuries in developed and a few developing countries, as well (5,6).

Road traffic injury is a multidimensional issue and apart from fundamental factors like population density and structure, motorization and vehicle population, urbanization rate, road infrastructures and general safety measures, there are a myriad of other factors influencing it (4,7). Moreover, fatalities due to RTC additionally depend on the accessibility and quality of medical care in pre-hospital and hospital levels, including the availability of emergency service, timely initiation of primary survey and rapid resuscitation, appropriate transport methods, adequate equipment, as well as clinical capability of the destination hospitals or trauma centers (8).

With respect to RTCs, contributing fac-

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tors generally fall into three categories: environmental (e.g. undivided, curved, or inclined and accident-prone roads; lighting, weather conditions and visibility of objects), vehicle (e.g. security equipment, safety maintenance), and human factor (driver's mental and physical capacity, driving style, violations and errors) (9). Causes can be exclusively human, a combination of human and environmental or human and vehicle, or an interplay of all three factors (10). It is unclear that what exact proportion of RTCs can be attributed to each factor. However, human factor appears to be by far the leading determinant (7, 11-14). In addition, it is worthwhile to pay particular attention to this factor since tremendous favorable effects on road safety can be achieved by simple behavioral modifications (4).

It is acknowledged that driving is a social activity. Obtaining an in-depth exploration of driving behavior and factors underpinning it at an individual level and in the social context could be of particular importance and can facilitate the establishment of effective policies. Consistent with this need, the present article seeks to provide insight to psycho-social determinants of driving behavior. Here and in what follows, we aim to explore associated factors in this domain.

### *Risky Driving Behavior*

Driving behavior is the connecting chain that links the human to different outcomes. Table 1 demonstrates some common examples of aberrant driving behavior. A few of the mentioned behaviors might just be considered as discourteousness (e.g. not to comply with parking disciplines). However, a great majority of them, namely dangerous driving or risky driving behaviors (RDB), obviously endanger or at least have the potential to put the driver and/or other people in danger (15). In other words, some patterns of driving behavior including but not limited to legal infringements like speeding, tailgating, improper passing and lane-usage, right-of-way violations, illegal turns, and control signal violations that place drivers at risk for morbidity and mortality are considered as RDBs (16). These behaviors can be either deliberate i.e. violations, or unintentional i.e. errors and distractions.

### *Violations*

Some intentional RDBs result from negative emotional motivations like bad mood, anger, or aggression (17, 18). Male drivers often show more aggressive violations than females (19). Aggression might be initiated as a result of perceived discomfort caused by others. For instance, if a vehicle fails to move promptly when the traffic light turns green, the driver in the back whose passage

Table 1. common examples of aberrant driving behavior

| |
|---|
| • Running stop signals |
| • Blocking intersections |
| • Failing to yield right-of-way; Failure to stop for pedestrians; forcing someone to give way |
| • Weaving in/out of traffic |
| • Taking two lanes |
| • Speeding > 8 Km/h above the limit |
| • Tailgating; Chasing other vehicles |
| • Failure to use signals; Changing lanes without signaling |
| • Improper passing and lane changing; Passing on the shoulder; Overtake on the right side |
| • Blocking other vehicles; Preventing others from passing, changing lanes, or merging into traffic |
| • Changing speed erratically; Intentionally braking suddenly; Cutting in front of other drivers |
| • Making threats or communicate insults through words and/or gestures (obscene gestures or profanity); Sustained horn-honking or flashing headlights * |
| • Driving through a yellow light that is turning red |
| • Taking up more than one parking space |
| • Pulling into a parking space someone else is waiting for |
| • Double parking |

* flashing high beams is a normal and polite method used to signal the intention to overtake in some jurisdictions

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is blocked may show an aggressive behavior like sustained horn-honking or insulting with words (15). Conversely, an aggressive behavior can be provoked in response to the aggression of the counterpart. It is shown that public attitude towards retaliation is less negative than in relation to the initiation of aggression (20). However, not all drivers respond actively with risky behaviors or offensive actions such as profanity or indecent gesturing; a number of them refrain from immediate reaction, but experience negative emotions like anger, discontent or frustration that further affect their driving behavior (15).

Certain psychological traits like sensation seeking personality (10, 21-27), choleric temper (10), and competitive personality are associated with risky driving behavior. Moreover, conduct disorder (13), antisocial personality disorder (28), adult attention deficit hyperactivity disorder (ADHD) (13, 29) characterized by impulsivity, impatience and lack of perseverance, and also mood disorders such as depression can lead to aberrant driving (30). In severe cases of major depression, dangerous driving and involvement in RTCs might in fact be a "disguised suicidal attempt" (31).

Some other intentional violations, often referred to as "ordinary violations", are not related to emotions. Rather, they are committed for the sake of convenience or gaining advantage (20). Examples of this type of violation include running a red light or forcing others to give way when a driver is in a hurry and under time pressure, ignoring a no entry sign to create a shortcut to the destination, and exceeding speed limits as a driver believes that the assigned limits are not appropriate for the setting and driving at the supposed speed would be too slow. In a study by Moradi et al, prevalence of speeding was examined in different sections of a rural road with three groups of posted speed limits: less than 50 km/h, 50 to100km/h and more than 100 km/h. Drivers were far more likely to pass the speed limit in areas with the lowest posted limits (32).

With respect to exploring the motivations behind conscious decision of violating behavior, the theory of planned behavior has been proposed. According to this theory, intention which is the immediate predictor of behavior is determined by three distinct factors: attitude, subjective norm, and perceived behavioral control (20).

Attitude pertains to how favorable or unfavorable a person feels about performing a behavior and about its consequences. The more positive one's attitude toward a specific behavior is, the more likely he/she would intend to perform it. In a recent study on knowledge, attitude and self-reported practice (KAP) of the Iranian drivers, it has been shown that among the three factors, attitude plays the key role in predicting the rate of RTC. In other words, it is not just the knowledge and standard education but how such education is registered as an attitude that transforms what has been learned into action. (33).

Subjective norm is the perceived pressure from others to perform a behavior or refrain from it. It reflects whether others (peers, parents, spouses, or general people in the society) approve a specific behavior and/or perform it themselves. This component can be extended considering the effect of role models, personal/moral norms, religious beliefs and self-identity. For instance, behavior can change when important others are physically present as a passenger. This occurs probably due to a desire to be seen by them to have a positive impression, or as an attempt to be a good role model for their children if they are accompanying. Another example could be that people may try to drive safer in order not to put their loved ones in danger (34).

Perceived behavioral control refers to the degree to which one feels that performing a certain behavior is up to their will and under their control. It could be influenced by excessive optimism or overestimation of one's ability (35).

### *Errors and Distractions*

Unintentional risky behavior can result

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from failure to accomplish the desired consequence of a planned action (19), for instance due to inexperience, unawareness or underestimation of the risk, distraction by outside or inside stimuli and disturbance at any stage of the consecutive process of attention, perception, analysis and reaction. Using cell phone (12, 36), reading billboards, eating, drinking, adjusting car stereo, and checking one's own appearance can all be distracting (15). Both novice and experienced drivers are prone to lapses of attention, but inexperienced drivers are more susceptible and more likely to fail to recover (37).

Driver's physical and mental ability also play important role. Poor eyesight can have a deleterious effect on object recognition. Cognition and memory impairment, increased mental work load due to negative emotions like anger, anxiety or depression, fatigue (10) and sleep deprivation (37) either quantitatively due to lifestyle and occupational demands or qualitatively due to conditions like sleep apnea, use of psychotropic or sedative drugs and drink-driving (3, 38) all contribute to an impairment in driving capacity and result in risky driving (39).

### *Demographics*

Well-established prototype of RTC victims are young men (3, 40). People aged 15-44 years account for around 59% of global road traffic mortality. Moreover, 77% of all victims are male (41). It is shown that young males are more prone to excessive speeding influenced by peer pressure (42). In general, male gender is associated with more RDB (17, 24) as either emotional or ordinary violation. However, females are specifically more prone to errors (19). This could root the notion of a public gender-oriented attitude toward driving behavior, with men typically complaining of women's driving incompetence and women blaming men for aggressive driving (14).

Studies show that both age and driving experience can independently influence crash involvement (37, 43). Drivers with more years of driving experience make fewer errors than novice drivers (19). Furthermore, in a study by Bachoo et al, drivers older than 25 years old reported a more negative attitude toward violations than the younger participants (24).

Risk of road traffic injury is higher in never married people than married individuals (44), and in those with a body mass index (BMI) of under 25$^{th}$ or over 75$^{th}$ percentile (45).

### *Law Enforcement*

Governance and level of law enforcement can also influence the driving behavior (46). Poor enforcement of traffic regulations due to limitation of the resources, administrative problems, or corruption can lead to reduced incentive of respect to the rules (4, 47). Continuous high level of enforcement needs to be sustained over generations before loyalty to the values of law and legality becomes internalized in a society and turns to a spontaneous behavior and a social norm (14, 48).

### *Socioeconomic Status*

Socioeconomic level can be roughly indicated by educational level, occupational status and neighborhood income (45). Low socioeconomic status is associated with higher risk of road traffic injury (45, 49-51) and mortality (52, 53). There is a bidirectional relationship between poverty and road traffic injuries (4). Low and middle-income countries bear more than 90% of global road deaths, though these countries share only nearly half of the world's vehicles. Similarly, within more affluent countries, deprived people are more likely to be involved in RTCs than those from higher socioeconomic backgrounds. Rate of car ownership and choice of transport mode, older vehicles, poor maintenance and inability to afford regular services or add extra safety features are among factors that contribute to different injury rates in the deprived socioeconomic groups (54). On the other hand, given that a great majority of

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victims are men in their productive period of life, loss of the main source of income draws many families into poverty (55), and the cost of prolonged medical treatments and disability care puts additional financial burden on families of the survivors (41), adversely affecting their quality of life (56).

There is a gap in the literature in terms of a comprehensive exploration of the effect of individual income in shaping driving behavior. A study of Danish people showed that higher income is associated with higher driving speed, which can be explained by decreased "real cost" of speed-related fines for rich drivers. It is also postulated that drivers constantly face a trade-off between obeying the rules and thus decreasing expenditure due to accidents and fines, and violating the rules to gain more time that can be utilized to earn more money (4). In addition, owning an expensive car may be considered as a symbol of prestige and lead to a sense of superiority and autonomy in these drivers, as if they "own the roads" (14), resulting in behaviors such as failure to yield right-of-way.

### *Socio-cultural complexity of driving behavior - Iran as an example*

Iran has one of the highest rates of RTC and related fatalities in the world (6). In a study by Banakar and Nasrolahi Fard (14), cultural and legal dimensions of Iranian driving behavior were analyzed using open and semi-structured interviews to explore driving habits and experiences of RTC among residents of two major cities in Iran. The interviewees agreed on "lack of culture of driving", "discrimination in law enforcement", and "excessive individualism" as the main underlying problems.

Driving culture or namely "injunctive norm" of driving pertains to the desirable and prescribed driving behavior that people of a society think should be considered by all members as a responsibility based on mutual expectations. Compared with this is the so called "descriptive norm" that represents what is routinely done by people. There is often a gap between what people think should be done and what they actually do. Therefore, laws are introduced and enforced to reduce this gap and keep the society in order. However, a comparable gap exists between the expected law enforcement and the enforcement in practice.

The problem might root in Iran's long history of arbitrary governments that has not allowed the establishment of a consistent legal structure and shaped skepticism and individualism among people, which results in lack of incentive to observe the rules (14).

Moreover, there is something behind the driving behavior in Iran that distinguishes it from face to face interactions: drivers perceive themselves as anonymous individuals with unexposed or disguised identities, and others as strangers or "abstract entities toward which they have no responsibility" (14). As mentioned before, considerable effort is required over generations to change this view.

## Conclusion

Risky driving behavior is a multidimensional issue with a wide range of factors influencing it. Determinants of driving behavior include gender, age, driving experience, driver's physical and mental abilities and psychological factors like personality type, temperament, mood, and emotions, distraction by outside or inside stimuli, socioeconomic context and the individual income, socio-cultural backgrounds, level of governance and law enforcement as well as internalization of legality and fidelity to the values of law in the society.

The motivation behind an intentional risky driving behavior is determined by the attitude toward the behavior, subjective norm, and perceived control over one's behavior. Driver's attitude translates the knowledge into action and is one of the key factors contributing to driving behavior.

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