

The Effect of Gender on Violations and Errors in Risky Driving Behaviour Among Car Drivers: A Systematic Literature Review

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Abstract

Risky driving behaviour significantly contributes to traffic accidents, with gender long recognized as an influencing internal factor. However, findings on gender's role in driving behaviour are inconsistent. This systematic review explores gender's influence on two risky driving categories, violations and errors, while considering cultural context and research methodologies. Following PRISMA guidelines, an initial search yielded 110 articles. After title screening, 62 remained, with subsequent abstract review narrowing the selection to a final 21 scientific articles published between 2015 and 2025, primarily from ScienceDirect. Results indicate that men tend to commit more offences, while women commit more errors, particularly in WEIRD countries. Furthermore, the utilized research designs influenced the generalizability of the findings. This study emphasizes the significance of cross-cultural approaches and appropriate design in gender-based traffic safety research, highlighting the need for targeted interventions.

Keywords: culture, errors, gender, research methods, risky driving behaviour, violations

Abstrak

Perilaku mengemudi berisiko secara signifikan berkontribusi terhadap kecelakaan lalu lintas, dengan gender yang telah lama diakui sebagai faktor internal yang memengaruhi. Namun, temuan tentang peran gender dalam perilaku mengemudi tidak konsisten. Tinjauan sistematis ini mengeksplorasi pengaruh gender pada dua kategori mengemudi berisiko, pelanggaran dan kesalahan, sambil mempertimbangkan konteks budaya dan metodologi penelitian. Mengikuti pedoman PRISMA, pencarian awal menghasilkan 110 artikel. Setelah penyaringan judul, 62 tetap ada, dengan tinjauan abstrak berikutnya mempersempit pilihan menjadi 21 artikel ilmiah terakhir yang diterbitkan antara 2015 dan 2025, terutama dari ScienceDirect. Hasil menunjukkan bahwa pria cenderung melakukan lebih banyak pelanggaran, sementara wanita melakukan lebih banyak kesalahan, terutama di negara-negara WEIRD. Selain itu, desain penelitian yang digunakan memengaruhi generalisasi temuan. Studi ini menekankan pentingnya pendekatan lintas budaya dan desain yang tepat dalam penelitian keselamatan lalu lintas berbasis gender, menyoroti perlunya intervensi yang ditargetkan.

Kata kunci: budaya, kesalahan, jenis kelamin, metode penelitian, perilaku mengemudi berisiko, pelanggaran

Article info

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INTRODUCTION

Traffic accidents remain a significant global issue that has not yet been fully resolved. World Health Organization (2023) states that injuries resulting from road traffic crashes are the leading cause of death for children and young adults aged 5 to 29 years. Annually, approximately 1.19 million people die due to road accidents. One of the primary factors contributing to these accidents is risky driving behaviour, defined as driver actions that increase the likelihood of a crash (Möller et al., 2021).

Risky driving behaviour can be defined as any conduct deviating from road safety standards, intentional or unintentional (Rundmo & Iversen, 2004). This behaviour can be classified into two main categories: violations and errors. Violations are deliberate actions that contravene traffic rules, such as speeding, running red lights, or aggressive driving. Conversely, errors refer to unintentional actions resulting from a lack of knowledge, inattention, or inaccurate decision-making, such as misjudging distances or forgetting to use turn signals (Precht et al., 2017).

Among various modes of transportation and road user types, this study focuses explicitly on car drivers due to several considerations. First, private cars are one of the most common modes of transport used across all ages and genders in many countries. Second, car driving behaviour involves unique dynamics and specific interactions with road infrastructure and other road users, distinguishing it from riding motorcycles or other modes. Third, although accident statistics in Indonesia indicate that motorcycles account for a higher proportion of accidents (Tempo, 2022), Morency et al. (2018) showed that compared to city buses, car journeys have a higher injury rate not only for drivers and passengers but also for pedestrians and cyclists sharing the same traffic lanes. Hence, it highlights the broad public safety implications of understanding car driver behaviour.

Risky driving behaviour is influenced by various factors, both internal (originating from the individual) and external (originating from the environment). Internal factors include demographic and psychological characteristics of drivers, such as gender, age, driving experience, personality, attitudes, and risk perception. On the other hand, external factors include the physical road environment, weather conditions, traffic density, the presence of law enforcement officers, and vehicle conditions.

Gender is one of the internal factors extensively studied concerning risky driving behaviour. Statistically, men are known to sustain injuries from traffic accidents more frequently than women, as demonstrated by a decade-long national data analysis in Australia (Soltani et al., 2025). Nevertheless, findings from previous studies show inconsistent results. Some research indicates differences in risky driving behaviour between men and women. Male drivers tend to exhibit higher levels of risk-taking and lower risk perception than female drivers (Jing et al., 2023). That phenomenon is often associated with biological and social predispositions that shape driving behaviour patterns.

Meanwhile, other studies have found that women exhibit more errors while driving, whereas men more frequently commit violations (Rowe et al., 2013). Still, other research has found no significant differences between male and female drivers regarding risky driving behaviour (Baran et al., 2024). These divergent findings necessitate further investigation into what influences the inconsistency in the relationship between gender and risky driving behaviour. Researchers suspect this inconsistency is influenced by two main factors: culture and research methodology.

The results of the literature review conducted by the researchers indicate that gender differences in risky driving behaviour are often more prominent in WEIRD



(Western, Educated, Industrialized, Rich, and Democratic) countries than in non-WEIRD countries. Socio-cultural factors such as gender norms, levels of emancipation, and social expectations for male and female drivers can influence risky driving behaviour. A study conducted by Nævestad et al. (2022) showed that drivers in Greece, a country with a lower road safety level compared to Norway and Israel, prioritize individual freedom to take risks in driving. Furthermore, national culture, in general, has also been proven to have a significant influence on risky driving behaviour tendencies (Berghe, 2025). Another study conducted in five countries, Estonia, Greece, Kosovo, Russia, and Turkey, showed significant differences in violation and error behaviours based on their respective cultural contexts (Ersan et al., 2020). Hence, it further reinforces the importance of considering cultural background in understanding the relationship between gender and risky driving behaviour.

In addition to cultural factors, research methodology also contributes to the diverse results. Differences in research design (experimental and non-experimental) can lead to data variability. Experimental studies allow for control over extraneous variables, while observational or survey studies tend to be more open to external influences (Thompson & Panacek, 2007). Sample characteristics such as age and driver experience, which vary, can also influence the results because younger drivers tend to be more impulsive, while older drivers are often more cautious.

These conflicting findings underscore the need for a systematic review of the existing literature. Therefore, this study aims to systematically review the literature discussing gender differences in risky driving behaviour, specifically across two main dimensions: violations and errors. Beyond exploring common emerging patterns, this study also aims to identify conceptual and methodological gaps in previous research and understand how cultural context and research methodology influence these findings.

Utilizing a systematic approach guided by PRISMA, this study reviews articles from 2015 to 2025, focusing on car drivers and addressing the central question regarding the relationship between gender and risky driving behaviour. The results of this study are expected to provide a deeper understanding of risky behaviour patterns based on gender, which is crucial for developing more targeted traffic safety and gender-sensitive driver education programs, as well as more effective accident prevention interventions in various cultural contexts.

METHOD

This study adopted a rigorous Systematic Literature Review (SLR) approach to examine scientific findings related to gender differences in risky driving behaviour, specifically focusing on the two main dimensions: violations and errors. This review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, encompassing a systematic search, article selection, data extraction, and synthesis of relevant literature.

Search Strategy

Literature was exclusively gathered from the ScienceDirect database, selected for its comprehensive collection of indexed and relevant scholarly journals in psychology, driver behaviour, and traffic safety. The search strategy utilized a combination of keywords with Boolean operators as follows: (“gender differences” OR “sex differences”) AND (“risky driving” OR “driving behaviour”) AND (“violations” OR “errors”) AND (“car drivers” OR “automobile drivers”). The search was limited to



articles published between 2015 and 2025 to ensure the relevance and currency of the analyzed studies.

Inclusion and Exclusion Criteria

A selection process was conducted based on the following established inclusion and exclusion criteria to ensure that only relevant articles meeting methodological standards were analyzed in this study.

1. Inclusion Criteria

- a. Empirical studies presenting data disaggregated by gender
- b. Focus on car drivers (not other vehicle types)
- c. Analyze risky driving behaviour in the dimensions of violations and/or errors
- d. Written in English

2. Exclusion Criteria

- a. Non-empirical articles (opinions, narrative reviews, or editorials without data)
- b. Technical studies on vehicles that do not discuss driver behaviour
- c. Articles that do not disaggregate data by gender

Article Selection Process

The article selection process was carried out in several stages, which are documented in the PRISMA Flow Diagram (Figure 1). First, all articles identified from the initial search strategy (110 articles) underwent title screening. This stage resulted in 62 remaining articles. Subsequently, abstract screening was performed, yielding 21 potentially relevant articles. Finally, a full-text review was conducted on these 21 articles to ensure full compliance with the inclusion criteria. The entire screening and selection process at each stage was conducted independently by two reviewers (Almira Rahma Safira and Dewi Maulina). Any disagreements during the article selection process were resolved through discussion until a consensus was reached.

Data Extraction

From the 21 articles that passed the final selection, relevant data were extracted using a standardized form. The information extracted included: (a) Authors and Publication Year; (b) Study Design (questionnaire (non-experimental) and experimental); (c) Sample Characteristics (number of participants, age range, gender distribution); (d) Country/Cultural Context; (e) Definition and Measurement of Risky Driving Behavior (violations and/or errors); and (f) Key Findings related to gender differences in risky driving behaviour. The data extraction process was performed by Almira Rahma Safira and verified by Dewi Maulina to ensure accuracy.

Methodological Quality and Risk of Bias Assessment

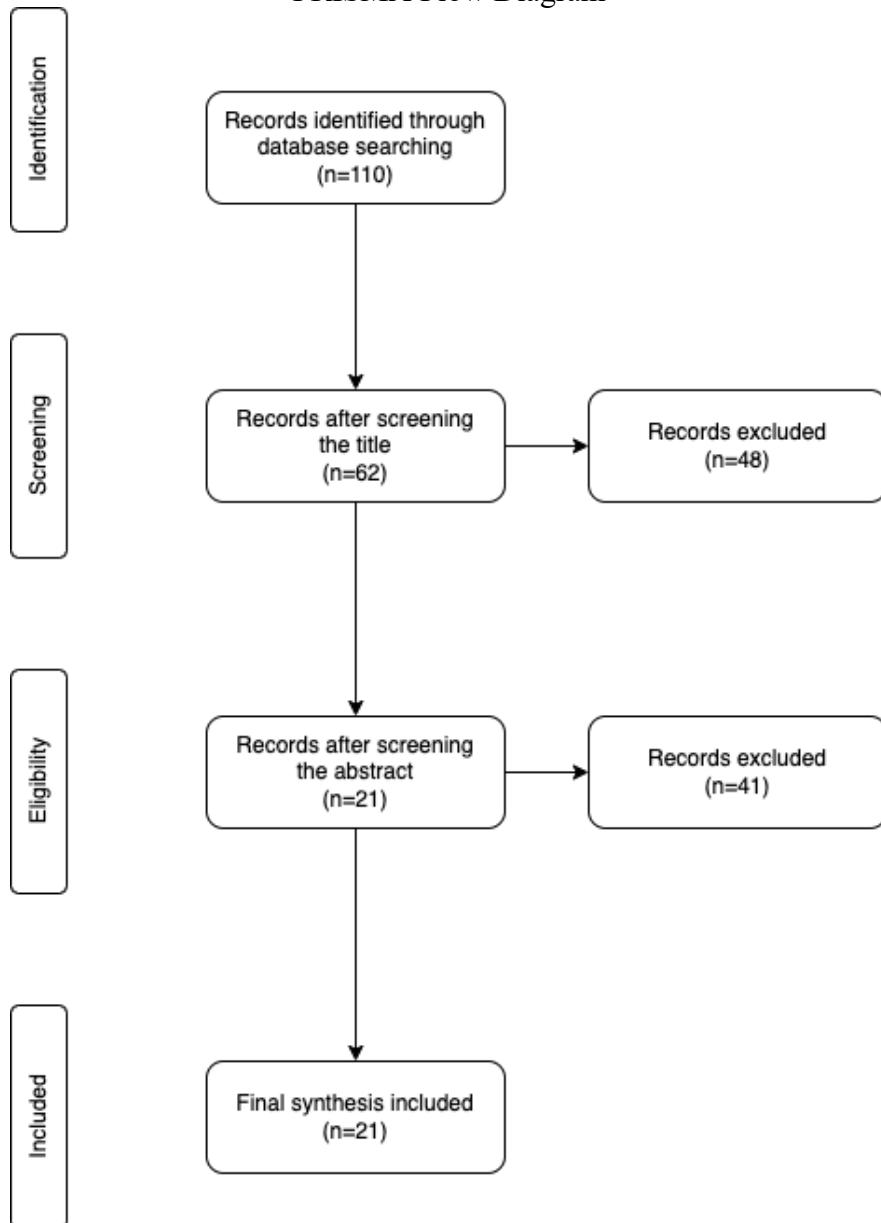
To ensure the relevance and foundational quality of the included studies, articles were exclusively retrieved from reputable peer-reviewed journals indexed in ScienceDirect. This selection criterion aimed to leverage the inherent quality control provided by the rigorous peer-review process of these academic publications, thereby ensuring a baseline level of methodological rigour and scientific validity for all synthesized evidence.



Data Synthesis

The findings from the extracted and quality-assessed articles will be synthesized narratively. Data will be grouped and analyzed based on key emerging themes related to the relationship between gender, violations, and errors. The analysis will also consider the influence of cultural context (particularly differences between WEIRD and non-WEIRD countries) and research design (non-experimental and experimental) on the reported findings. This synthesis identifies consistent patterns, explains inconsistencies, and highlights future research gaps.

Graph 1.
PRISMA Flow Diagram



RESULT AND DISCUSSION

Characteristics of Included Studies

Twenty-one articles met the predefined inclusion and exclusion criteria and were included in this systematic review, as detailed in the PRISMA Flow Diagram (Figure 1). The characteristics of these included studies are summarized in Table 1, which provides an overview of the findings on risky driving behaviour, including the name of the author(s) and year, country, cultural classification (WEIRD and Non-WEIRD), research design (non-experimental & experimental), gender findings, and behaviour categories (violations & errors).

Table 1.
Summary of Risky Driving Behavior Findings

No	Author(s) (Year)	Country	Cultural Classification	Research Design	Gender Findings	Behaviour Categories
1.	Alhomoud et al. (2022)	Saudi Arabia	Non-WEIRD	Non- Experimental	Males are more frequently involved in accidents and commit violations	Violations
2.	Tao et al. (2017)	China	Non-WEIRD	Non- Experimental	Females commit more errors	Violations & Errors
3.	Baran et al. (2024)	Poland	WEIRD	Non- Experimental	No significant differences	Violations
4.	Scott-Parker et al. (2015)	Australia	WEIRD	Non- Experimental	Males exhibit higher psychosocial driving motivation and more frequently commit violations such as speeding	Violations (speeding)
5.	Varet et al. (2023)	France	WEIRD	Experimental	Females more positively evaluate compliance	Violations
6.	Nicolleau et al. (2022)	France	WEIRD	Non- Experimental	Males have firmer entity beliefs and commit violations	Violations
7.	Sahu et al. (2022)	India	Non-WEIRD	Non- Experimental	Gender influences Risky Self-willed Violation (RSV)	Violations & Errors
8.	Cullen et al. (2021)	Australia	WEIRD	Non- Experimental	Accident risk in males remains high despite increased experience	Contextual Violations



No	Author(s) (Year)	Country	Cultural Classification	Research Design	Gender Findings	Behaviour Categories
9.	Sahu et al. (2025)	India	Non-WEIRD	Non-Experimental	Males and females show equivalent deviant behaviour (Red Light Violations) under certain conditions	Violations
10.	Dotse & Rowe (2021)	Ghana	Non-WEIRD	Non-Experimental	Males more frequently commit violations, while females commit more errors	Violations & Errors
11.	Rabelo-da-Ponte et al. (2021)	Brazil	Non-WEIRD	Non-Experimental	Females are dominant in the CELL (Careful and Low-Likelihood) cluster, which is classified as low-risk	Violations
12.	Nègre & Delhomme (2017)	France	WEIRD	Non-Experimental	Males commit more violations (speed anger), while females are more environmentally conscious	Violations
13.	Li et al. (2016)	China	Non-WEIRD	Non-Experimental	Gender differences were found in competitive driving tendencies	Violations (Aggressive)
14.	Palat et al. (2017)	France	WEIRD	Non-Experimental	Males more frequently disregard warnings	Violations
15.	Lardelli-Claret et al. (2024)	Spain	WEIRD	Non-Experimental	Females drive more safely but are more susceptible to serious injuries in accidents	Errors
16.	Yeh et al. (2015)	Taiwan	Non-WEIRD	Non-Experimental	Age, education, and mileage factors influence speeding violations in female taxi drivers	Violations



No	Author(s) (Year)	Country	Cultural Classification	Research Design	Gender Findings	Behaviour Categories
17.	Moè et al. (2015)	Italy	WEIRD	Experimental	Females commit more errors in driving simulations when stereotype threat is present	Errors
18.	Deniz et al. (2021)	Australia	WEIRD	Non-Experimental	Implicit differences in gender and age strategies	Errors
19.	Schrauth (2024)	Germany	WEIRD	Non-Experimental	Males are at higher risk of Driving Under the Influence (DUI) of alcohol	Violations (DUI)
20.	Wagner & Sanchez (2017)	Brazil	Non-WEIRD	Non-Experimental	Females are less likely to commit violations compared to males, who are at higher risk of DUI	Violations (DUI)
21.	Peng et al. (2019)	China	Non-WEIRD	Non-Experimental	Males are more often perpetrators in road rage cases due to aggressive behaviour, while females generally become victims in such incidents	Violations (Aggressive)



Findings on Gender Differences in Risky Driving Behavior Across Cultural Contexts and Methodologies

Studies conducted in WEIRD (Western, Educated, Industrialized, Rich, and Democratic) countries, including Australia (Cullen et al., 2021; Scott-Parker et al., 2015), France (Nicolleau et al., 2022; Varet et al., 2023; Nègre & Delhomme, 2017; Palat et al., 2017), Spain (Lardelli-Claret et al., 2024), Italy (Moè et al., 2015), and Germany (Schrauth, 2024), generally report consistent patterns, which is male drivers more frequently engage in violations, such as speeding, red light running, and aggression behaviour, while female drivers are reported to be more cautious or more often involved in errors, such as lapses and miscalculation of distance.

In contrast, studies from non-WEIRD countries, such as India (Sahu et al., 2022; Sahu et al., 2025), Ghana (Dotse & Rowe, 2021), Saudi Arabia (Alhomoud et al., 2022), China (Li et al., 2016; Tao et al., 2017; Peng et al., 2019), Brazil (Wagner & Sanchez, 2017; Rabelo-da-Ponte et al., 2021), and Taiwan (Yeh et al., 2015), show more varied findings. In some instances, behavioural differences between male and female drivers appear to diminish or become non-significant when controlled for factors such as driving experience, education, or driving intensity (Sahu et al., 2025).

Furthermore, the research methodology appears to influence the reported findings. Studies employing experimental designs (Moè et al., 2015; Varet et al., 2023) highlight specific psychological mechanisms related to gender in driving contexts, often indicating that situational factors, such as stereotype activation, can influence performance. Conversely, survey-based and self-report studies (non-experimental) tend to yield more varied findings, which may reflect their sensitivity to participant subjectivity or contextual differences.

Patterns in Risky Driving Behavior Categories: Violations and Errors

Most studies in this review utilized classification approaches for risky driving behaviour, often based on the Driver Behavior Questionnaire (DBQ). This approach typically distinguishes three main categories of risky driving behaviour such as ordinary violations (speeding, running red lights, and failing to give way), aggressive violations (verbal aggression and using the vehicle to intimidate other drivers), and errors (unintentional mistakes such as lapses, misjudging distances, or poor decision-making) (Scott-Parker et al., 2015; Tao et al., 2017; Dotse & Rowe, 2021). Beyond the DBQ classification, some studies expanded these categories to include distraction-related behaviour (Sahu et al., 2022), eco-driving behaviour (Nègre & Delhomme, 2017), and risk-based approaches using cluster analysis to identify offender groups, such as Speeders or Driving Under the Influence (DUI) (Rabelo-da-Ponte et al., 2021).

The findings from this review consistently indicate that violations, particularly speeding and aggressive violations, represent the most dominantly studied behaviour and are generally reported more frequently among male drivers. This pattern appears consistent across various contexts, including WEIRD and non-WEIRD countries (Wagner & Sanchez, 2017; Varet et al., 2023; Alhomoud et al., 2022; Sahu et al., 2025). Conversely, errors tend to occur more often among female drivers, as found in studies by Yeh et al. (2015) Tao et al. (2017), and Dotse Rowe (2021). These errors are frequently unintentional and relate to distraction or miscommunication during decision-making.

However, several studies reported divergent results or no significant differences. For instance, Baran et al. (2024) found no significant differences in violations and errors between male and female drivers. Furthermore, other studies, such as Cullen et al. (2021)



and Lardelli-Claret et al. (2024), indicated that accident risk is not solely determined by the type of violation but also by the interaction between gender and driving environmental contexts, such as night driving or rainy conditions.

Overview of Key Findings

This systematic literature review explored gender differences in risky driving behaviour, specifically focusing on violations and errors while considering the influence of cultural context and research methodology. From the 21 included articles, a prominent pattern emerged: male drivers were consistently reported to engage more frequently in various forms of violations, including speeding, aggressive driving, and driving under the influence (Scott-Parker et al., 2015; Wagner & Sanchez, 2017; Alhomoud et al., 2022). Conversely, female drivers tended to exhibit a higher propensity for errors, often unintentional and linked to distractions or misjudgment (Yeh et al., 2015; Tao et al., 2017; Dotse & Rowe, 2021).

The review also highlights the modulating role of cultural context and research design on these gender-specific patterns. Studies conducted in WEIRD countries generally reinforced the male-violation and female-error dichotomy (Moè et al., 2015; Nicolleau et al., 2022). However, findings from non-WEIRD countries showed greater variability, with some studies indicating diminished gender differences when controlled for other factors (Baran et al., 2024; Sahu et al., 2025). Furthermore, experimental designs often revealed more nuanced psychological mechanisms influencing gendered behaviour (Moè et al., 2015; Varet et al., 2023), complementing the broader insights from non-experimental, questionnaire-based studies. These findings collectively underscore that while gender plays a significant role, its expression in risky driving is complex and context-dependent.

Explaining Inconsistencies and Contextual Nuances: The Role of Culture and Methodology

The observed inconsistencies in gender differences across various cultural contexts, particularly between WEIRD and non-WEIRD countries, suggest that biological sex alone is insufficient to explain the full spectrum of risky driving behaviour. In non-WEIRD settings, where social norms, cultural values, and specific driving conditions may differ significantly from WEIRD contexts, gendered behaviours appear more varied. For instance, while male drivers are consistently associated with violations in WEIRD countries, studies in some non-WEIRD contexts demonstrate diminished gender differences, even to the point where they may disappear when controlled for other factors such as driving experience, education, or driving intensity (Baran et al., 2024; Sahu et al., 2025).

This cultural variability can be partly understood through differing national values and road safety cultures. As highlighted by Nævestad et al. (2022), a national focus on individual freedom versus paternalistic values is a fundamental theme shaping traffic safety culture. Their study found that societies valuing individual freedom to take risks in traffic tend to exhibit higher levels of risky driving and accident involvement. Further reinforcing this, Berghe (2025) demonstrates a strong connection between national culture and road safety performance, particularly emphasizing the role of independent thinking and judgment. This suggests that varying societal values regarding risk-taking, autonomy, and individual responsibility, often rooted in broader national cultural dimensions, may implicitly or explicitly influence the manifestation of gendered risky



driving behaviours. In cultures where certain forms of risk-taking are more normalized or less overtly sanctioned for either gender, the distinct patterns observed in WEIRD settings might be less pronounced or even inverted.

Furthermore, the choice of research methodology significantly contributes to the heterogeneity of findings. Experimental designs (Moè et al., 2015; Varet et al., 2023) offer valuable insights into specific psychological mechanisms by controlling for confounding variables, such as stereotype threat observed by Moè et al. (2015), that mediate gender's influence on driving performance. These designs can reveal how situational factors, beyond inherent gender traits, shape behaviour. Conversely, the widespread use of survey-based and self-report studies (non-experimental) in the literature, while providing broad generalizability, may be susceptible to social desirability bias or an inability to capture nuanced real-world driving behaviours. This inherent subjectivity in self-reported data can contribute to less consistent or more varied findings across studies, especially when cultural differences in reporting tendencies are at play.

Deeper Insights into Gender and Risky Driving Behavior

Beyond mere biological sex, this review highlights the intricate interplay of socio-psychological factors that profoundly shape gendered risky driving behaviours. The concept of gender extends beyond biological categorization to include learned roles, expectations, and social pressures, all manifest in driving contexts.

Moè et al. (2015) add a crucial dimension by exploring the impact of gender stereotypes. Their experimental findings demonstrate that stereotype threat (the belief that "women are bad drivers") can adversely affect female drivers' performance in driving simulations, even when their underlying abilities are comparable. This illustrates that perceived social expectations and pressures, rather than inherent differences, can distort actual driving performance, particularly in high-stakes or evaluative situations. Such findings underscore that observed gender differences are not solely rooted in innate capabilities but are significantly influenced by social and psychological contexts.

Furthermore, Deniz et al. (2021) delve into the role of masculinity and femininity as psychological constructs rather than merely biological sex. Their research indicates that psychological masculinity is associated with verbal aggression and angry driving, while femininity correlates with greater self-control and adaptive responses to anger while driving. This shows how internalized gender roles and traits can directly influence emotional expression and coping mechanisms on the road, contributing to distinct behavioural patterns. Reinforcing this perspective, Brandenburg & Oehl (2021) confirm that driving anger correlates with general anger expression in daily life. This suggests that aggressive behaviours on the road are often facets of broader personality characteristics and emotional regulation styles, implying that pre-existing psychological factors can either exacerbate or mitigate risky driving tendencies, irrespective of biological sex.

Therefore, the findings collectively indicate that gender differences in risky driving behaviour are not solely attributable to biological factors. They are significantly influenced by a complex interplay of socio-psychological aspects, including the internalization of stereotypes, the adoption of gender roles, individual emotional expression, and broader personality traits. This necessitates a more holistic and nuanced approach to understanding gender dynamics within traffic safety.



Implications for Practice and Policy

The findings of this systematic review carry significant implications for developing more effective and gender-sensitive traffic safety education programs and policy interventions. Understanding the nuanced interplay of gender, culture, and specific driving behaviours is crucial for moving beyond generic approaches to road safety, aligning with a growing international recognition of gender dimensions in road safety.

Specifically, recognizing the predominant patterns of male drivers engaging in violations and female drivers being more prone to errors, driver education programs can be tailored to address these tendencies. For instance, interventions could target risk perception, impulse control, and aggressive behaviours for male drivers, given their higher propensity for violations such as speeding, aggressive driving, and driving under the influence (Scott-Parker et al., 2015; Wagner & Sanchez, 2017; Alhomoud et al., 2022). For female drivers exhibiting more errors (Yeh et al., 2015; Tao et al., 2017; Dotse & Rowe, 2021), educational modules might focus on enhancing situational awareness, decision-making skills under pressure, and strategies to mitigate distractions. Acknowledging that women are often more likely to be seriously injured in traffic accidents despite men being more likely to die, educational interventions should also aim to increase awareness of specific injury risks for each gender. Furthermore, building on the discussion of socio-psychological factors, such as stereotype threat (Moè et al., 2015), future educational interventions should dismantle harmful gender stereotypes in driving and foster a more inclusive and equitable perception of driver competence for all genders.

From a policy perspective, the review's findings suggest a critical need to move beyond a 'one-size-fits-all' approach to traffic safety. This aligns with global directives such as the Stockholm Declaration of February 18, 2020, which recognizes the higher number of men dying in traffic and commits to addressing the issue of gender in road safety. Similarly, the United Nations Road Safety Resolution 2020 explicitly highlights the need to ensure a gender perspective in transport planning due to the differential needs of men and women in road safety, calling for its inclusion in safety system implementation (OISEVI, 2023). Policies aimed at reducing risky driving could benefit from incorporating gender-sensitive considerations, as different behaviours in traffic support different policy measures. For instance, interventions for repeat offenders might be designed with gender-specific behavioural insights in mind. Additionally, the observed cultural variability (as discussed in previous sections) underscores the importance of culturally tailored safety campaigns and policy implementations, ensuring that messages resonate with local norms and values rather than adopting universal strategies. This also implies the importance of including women's voices in decision-making environments related to transport matters, ensuring non-discriminatory participation for both men and women in transport policies.

Limitations of This Systematic Review

Despite its comprehensive approach, this systematic review has several limitations that warrant consideration. First, the exclusive reliance on the ScienceDirect database for the literature search might have led to the omission of relevant studies published in other academic databases such as Scopus, Web of Science, and PubMed. While ScienceDirect is a robust platform, a multi-database search could have yielded more articles.

Second, the defined time limitation (2015-2025), while ensuring the review's focus on contemporary research, means that significant foundational studies or historical



trends published before 2015 were omitted. This might limit the historical context of gender differences in risky driving behaviour.

Third, the review was limited to articles published only in English. This language restriction potentially overlooked valuable insights and findings from studies published in other languages, particularly given the global nature of driving behaviour research and the cultural focus of this review.

Fourth, a notable limitation pertains to the methodological characteristics of the included studies. As identified in the Results section, most of the included studies employed non-experimental, self-report methodologies. While these studies provide broad insights into attitudes and perceived behaviours, they may be susceptible to social desirability and recall bias. They might not fully capture actual driving behaviours. This reliance on self-reported data could influence the generalizability and objectivity of some findings, particularly concerning behavioural frequency or intensity.

Lastly, while articles were retrieved from reputable peer-reviewed journals to ensure a baseline level of quality, a formal, standardized quality assessment of the included studies, such as using tools like the Joanna Briggs Institute (JBI) Critical Appraisal Checklists, was not explicitly performed for each article.

Future Research Directions

Building upon this systematic review's identified gaps and limitations, future research should prioritize several key areas to further advance the understanding of gender differences in risky driving behaviour. First, there is a clear need for more experimental and observational studies, particularly in non-WEIRD cultural contexts. The current reliance on self-report measures, as highlighted in the limitations, may introduce biases and might not fully capture actual driving behaviours. Objective behavioural data obtained through driving simulators, naturalistic driving studies, or direct observation could provide more robust insights into real-world gendered driving patterns and reduce the influence of social desirability bias.

Second, future studies should delve deeper into the specific socio-cultural mechanisms and psychological factors that explain the inconsistencies in gender differences across diverse cultural settings. This includes exploring how varying national values (individual freedom versus paternalism), broader national cultural dimensions (independent thinking and judgement), and gender roles influence risk perception, decision-making, and the manifestation of risky driving behaviours within different cultural milieus. Research on the interplay between gender stereotype threat (Moè et al., 2015) and actual driving performance in various cultural settings is also crucial.

Third, research exploring the effectiveness of gender-sensitive traffic safety education programs and policy interventions is warranted. Given the implications, future studies could design, implement, and rigorously evaluate tailored interventions that address gender-specific risk factors and behavioural tendencies. This would provide empirical evidence on the efficacy of such differentiated approaches.

Ultimately, longitudinal studies could provide valuable insights into how gender differences in risky driving behaviour evolve across various life stages, driving experiences, and shifts in socio-cultural contexts. Such studies could help identify critical periods for intervention and understand the dynamic nature of gendered driving behaviours over time.



CONCLUSION

This systematic literature review provides a comprehensive synthesis of the existing literature on gender differences in risky driving behaviour, highlighting a complex interplay of factors beyond simple biological distinctions. Our findings consistently indicate that while male drivers generally exhibit a higher propensity for violations (speeding and aggressive driving), female drivers tend to be more susceptible to errors (misjudgment or distraction-related mistakes). However, these patterns are not universal and are significantly modulated by cultural contexts and the methodological approaches employed in research. The review underscores that socio-psychological factors, including gender roles, stereotypes, and emotional regulation, play a crucial role in shaping these gendered behaviours on the road. Understanding these nuances is paramount for developing effective, gender-sensitive traffic safety interventions and policies. By tailoring driver education programs and policy frameworks to address specific gender-related risk factors and the underlying socio-cultural influences, we can move towards a more equitable and safer road environment for all users. Future research should prioritize objective behavioural studies, a more profound exploration of socio-cultural mechanisms, and the evaluation of gender-specific interventions to strengthen the evidence base in this critical domain.

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