# Machiavellianism, Impulsivity, and Empathy: Understanding Aggressive Driving Behavior

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**Abstract.** This study aimed to investigate the impact of impulsivity, Machiavellianism, and empathy on the inclination towards aggressive driving behavior. A cross-sectional analysis was conducted, utilizing a sample size of 315 Indonesian drivers. Accordingly, the instruments used include Aggressive Driving Behavior Scale (ADBS), Short Version of the UPPS-P (SUPPS-P) Scale, Machiavellian Personality Scale (MPS) and Interpersonal Reactivity Index (IRI) Scale. The multiple linear regression results showed that impulsivity, Machiavellianism, and empathy significantly influenced the tendency toward aggressive driving behavior with F count of 12.454 and significance level of .000 < .05. Furthermore, the dimensions of impulsivity, lack of perseverance, and Machiavellianism, were observed to partially have an effect on the tendency toward aggressive driving behavior at .221 or 22.1%, which was categorized as moderate. It was also important to acknowledge that the other dimensions observed in this study had no significant effect on the subject matter.

**Keywords:** Aggressive driving behavior, impulsivity, Machiavellianism, empathy, drivers

**Psympathic :**
**Jurnal Ilmiah Psikologi**
Vol.10:2, December 2023,
Page 177-184

eISSN: 2502-2903
pISSN: 2356-3591

**Article Info**
**Received:**
August 5, 2023
**Accepted:**
December 15, 2023
**Published:**
December 31, 2023

**DOI:**
https://doi.org/10.15575/psy.v10i2.19641



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## Introduction

In this modern era, mobility between locations is significantly enhanced by advancements in transportation. However, the convenience offered by this mode of transportation comes with escalated risks, which is primarily attributed to its high speeds, leading to accidents characterized by high fatality rates. For instance, in Indonesia, it was recorded that between January 1 and February 17, 2022, there were 15,265 accidents, causing 18,254 minor injuries, 1,562 severe injuries, and 2,816 fatalities, with estimated material losses of IDR 47 billion (Samudra & Parwata, 2022).

In accordance with this result, Jakarta Metro Police also showed a 43% surge in traffic accidents in Jakarta during the initial 8 months of 2023, which led to 443 fatalities, indicating a substantial rise compared to the preceding year (Taufan, 2023). This concerning increase underscores the urgency of addressing aggressive driving behaviors, an attribute largely identified as a significant factor behind the upsurge in accidents. As shown by Rizqiyah (2023), the concerning trend of increasing traffic accidents in Indonesia, particularly among students, as emphasized by the data from GoodStats. The dataset showed a persistent rise in incidents with student-age individuals (Rizqiyah, 2023). Accordingly, this pressing scenario underscored the critical necessity of comprehending the dynamics of driving behaviors among the youth, focusing particularly on psychological facets such as impulsivity and aggressive driving tendencies.

In response, it becomes important to grasp the various factors contributing to risky driving behaviors. Therefore, this study aims to examine factors including impulsivity, Machiavellianism, and empathy as crucial elements influencing aggressive driving conduct.

Various previous studies indicated impulsivity and aggression as fundamental predictors of perilous driving conduct. In this situation, it is important to establish that impulsivity, characterized by the struggle to restrain impulsive actions, not only pertains to cognitive executive function but also significantly influences personal and social behaviors, including driving practices (Bereczkei, 2015; Karras et al., 2023). According to Kovácsová et al. (2016), the correlation between dysfunctional impulsivity, a lack of forgiveness, negative emotions, and aggressive driving

elucidates the intricate psychological underpinnings of driving aggression (Kovácsová et al., 2016). Other studies extensively examined the manner in which impulsivity impacted risky driving among young drivers. These studies indicated the crucial role of self-control in determining impulsivity levels of different drivers. Impulsivity was observed to correlate with outward manifestations of anger, which subsequently influences risky driving behaviors. The results showed the substantial impact of impulsivity, as a psychological factor, on driving behavior, specifically concerning the expression of anger and engagement in risky driving actions (Mirón-Juárez et al., 2020).

Machiavellianism, which is characterized by a hostile worldview and a tendency toward manipulative and self-serving behavior, has been observed by several previous studies to significantly influence the interactions of individuals in traffic scenarios (Brankley & Rule, 2014; Ghavam et al., 2023; Zhao et al., 2023). The studies by Kokkinos et al. (2016) and Schimmenti et al. (2019) showed the association of this factor with relational aggression and deficient emotional regulation, while Moroń and Biolik-Moroń (2021) focused on its role in aggression associated with emotional awareness. This trait often leads individuals to disregard norms associated with risk-taking (Bereczkei, 2015, 2017), indicating the need to understand the impact on driving behavior. Meanwhile, empathy has been observed to play a substantial role in mitigating aggressive driving tendencies. It was found that drivers exhibiting higher emotional empathy levels typically steered clear of risky behaviors behind the wheel, including aggression (Ahmed et al., 2022; Stephens et al., 2022). This result is in line with the studies conducted by Decety et al. (2016) and Falla et al. (2021) where a correlation between heightened empathy and a propensity to avoid engaging in risky driving behaviors was shown (Decety et al., 2016; Falla et al., 2021).

In accordance with this, recent studies have emphasized the efficacy of interventions centered on emotional regulation and empathy in curbing aggressive driving tendencies. As stated by Stephens et al. (2022), training aimed at increasing emotional awareness and empathy among drivers can significantly reduce risky and aggressive driving behavior. This method not only has the capability to diminish inclinations toward aggressive driving but also fosters safe and responsible behavior behind the wheel, underscoring the crucial role of emotional and empathetic aspects in driver education and road safety initiatives (Stephens et al., 2022).

A significant correlation has been observed between primary psychopathic traits, traffic violations, the expression of anger during aggressive driving, and a negative association with pro-social driving behavior. This relationship, partially mediated by empathy, impulsivity, and sensation seeking, has been substantiated by various studies including (Campos et al., 2023; Khvatskaya & Lenzenweger, 2016; Owens et al., 2018; Stanger et al., 2016; van Dongen, 2020). These studies focusee on examining the significance of personality factors in shaping the management and expression of emotions and aggressive driving conduct on the roads.

The role of empathy in fostering aggressive driving behavior has been widely explored across different global contexts (Ahmed et al., 2022; Stephens et al., 2022). However, studies focusing on these dynamics in the specific context of Indonesia remain limited. In order to bridge this gap, the present study was carried out with a primary focus on examining the influence of psychological factors such as empathy and psychopathic traits on driving behavior in Indonesia, with special consideration of the distinctive social and cultural elements of the country (Karras et al., 2023). This study not only enriches the global comprehension of driving conduct but also offers crucial information for crafting more effective policies and interventions tailored to the unique context of Indonesia.

## Methods

The methodology adopted in this study includes a quantitative causal method using a cross-sectional design. Accordingly, data collection was carried out in a relatively concise timeframe, and the data were obtained with the aim of analyzing relationships without tracking changes or developments over time. It is also important to comprehend that the analysis method primarily used multiple regression.

To ensure the appropriateness of the instruments across cultures, adapted scales were used, following cross-cultural methodologies that are in line with the International Test Commission (ITC) Guidelines for Test Adaptation 2016. The adaptation process comprised several key steps which were outlined as follows:

1. Original Scale Content Analysis: A comprehensive analysis was conducted on each scale (such as Aggressive Driving Behavior Scale (ADBS), Short Version of the UPPS-P Impulsivity Scale (SUPPS-P), Machiavellian Personality Scale (MPS), and the Interpersonal Reactivity Index (IRI)) with the primary aim of ensuring the correspondence with the cultural and social context of Indonesia. For example, when examining MPS scale, an assessment was carried out to determine if the idea of Machiavellianism resonated with the societal and cultural norms in the country.
2. Initial and Back Translation: The scale was subsequently translated into the Indonesian

language by professional translators. Following this, back-translation" was performed by different translators to check consistency. For instance, the item "I often make rash decisions" from SUPPS-P was translated and then back-translated to ensure semantic correspondence.

3. Multidisciplinary Expert Panel: Psychologists, linguists, and Indonesian cultural experts were in charge of reviewing each of the study items. For example, these individuals assessed whether the item "I enjoy taking risks" from the Sensation Seeking scale is culturally appropriate.
4. Preliminary Test: A preliminary test was conducted on a small group of participants in Indonesia. The feedbacks, such as difficulties understanding some items in IRI scale, were used to revise those items.
5. Psychometric Validation: Validity and reliability tests of the adapted scale were performed with a larger sample. Following this, confirmatory factor analysis was conducted for each scale to ensure the factor structure was in line with the original theoretical model.
6. Cultural Sensitivity Evaluation: An evaluation was carried out with the aim of determining if the adapted scale was sensitive to cultural nuances. For example, in ADBS scale, the item "I get impatient with slow drivers" was adjusted to reflect traffic conditions in major Indonesian cities.
7. Feedback Collection and Analysis: Feedbacks were collected from participants and experts regarding the suitability of the scale. For example, participants were asked for their opinions on how well MPS scale reflected the concept of Machiavellianism in the Indonesian context.

In this study, various key instruments were used including ADBS, SUPPS-P, MPS, and IRI. To ensure the correspondence with the Indonesian cultural context, these scales were translated, retroverted, preliminarily tested, and validated by psychology and psychometrics experts.

ADBS, adapted by Soffania (2018) from Houston et al. (2003), was used to gauge aggressive driving tendencies through 11 questions covering conflict behavior and speeding. Furthermore, respondents were given the opportunity to rate the study items on a scale from Never (1) to Always (6), with all questions favoring a higher score. For instance, "Increasing speed when another vehicle attempts to overtake" is one such item, which reflected the reliability of the scale at .741.

Impulsivity was assessed using SUPPS-P developed by Cyders et al. (2007). This scale, comprising 20 questions, was used to explore five dimensions namely negative urgency (.770), lack of premeditation (.795), lack of perseverance (.880), sensation seeking (.796), and positive urgency (.747). Accordingly, respondents were availed of the opportunity to show the agreement on a scale ranging from 1 (strongly agree) to 4 (strongly disagree). For example, "I am accustomed to starting something until it is finished" typifies an item in this scale.

To evaluate Machiavellianism, MPS designed by Dahling et al. (2009) was adopted. This scale comprised 16 questions focusing on four aspects including distrust of others, amoral manipulation, desire for control, and the inclination towards status conflict, with a reliability coefficient of .734. Respondents rated these items on a scale from 1 (strongly disagree) to 5 (strongly agree). For instance, an item such as "I would cheat when the likelihood of getting caught is low" exemplifies this scale.

Empathy was assessed using IRI developed by Tahrir et al. (2021), which consisted of 16 questions divided into two aspects namely perspective-taking and concern for others. The scale showed a reliability of .697, with respondents rating items from 1 (does not describe me very well) to 5 (describes me very well). For example, "I tend to avoid conflict because I do not want to hurt others" represents one of the items in this scale.

Regarding respondents' criteria, this study targeted drivers of vehicles across various Indonesian provinces who have internet access. In this situation, responses were gathered using an online method through Google Forms and disseminated through different social media platforms. It is also important to comprehend that despite a calculated minimum sample size of 193 based on statistical calculations, the study included 315 drivers from diverse Indonesian provinces, predominantly from South Kalimantan, as outlined in Table 3. The sample collection method adopted was non-probability convenience sampling and data analysis was conducted using the multiple linear regression analysis method through SPSS (Statistical Package for the Social Sciences) version 27. This method was selected specifically because it allows measuring the impact of multiple predictor variables on the outcomes.

## Results and Discussion

In this study, respondents were drivers hailing from different provinces in Indonesia. Among these drivers, 191 (60.6%) were females, while 124 (39.4%) were males. Following this, the age range among the subjects varied, with the most prevalent age group falling between 20-29 years, representing 73.89% of the participants. Table 1 presents a detailed breakdown based on age distribution.

Table 1
*Overview of the Sample based on Age*

| Age | Frequency | Percentage |
|---|---|---|
| 17-19 | 51 | 15.92% |
| 20-29 | 232 | 73.89% |
| 30-39 | 18 | 5.73% |
| 40-49 | 10 | 3.18% |
| >50 | 4 | 1.27% |

Table 2
*Overview of the Sample Based on Employment Status*

| Employment status | Frequency | Percentage |
|---|---|---|
| Working | 94 | 29.9% |
| Not working | 60 | 19% |
| Students | 161 | 51.1% |

Table 2 shows the employment status of the subjects divided into 3 categories namely not working, working, and students.

Table 3
*Overview of the Sample based on Province*

| Province | Frequency | Percentage |
|---|---|---|
| Aceh | 2 | .63 |
| Bali | 5 | 1.59 |
| Banten | 5 | 1.59 |
| Bengkulu | 1 | .32 |
| Yogyakarta | 5 | 1.59 |
| Jakarta | 12 | 3.81 |
| Gorontalo | 1 | .32 |
| West Java | 20 | 6.35 |
| Central Java | 7 | 2.22 |
| East Java | 9 | 2.86 |
| West Kalimantan | 3 | .95 |
| South Kalimantan | 158 | 50.16 |
| Central Kalimantan | 11 | 3.49 |
| East Kalimantan | 2 | .63 |
| North Kalimantan | 5 | 1.59 |
| Riau islands | 1 | .32 |
| Lampung | 1 | .32 |
| North Maluku | 1 | .32 |
| West Nusa Tenggara | 1 | .32 |
| East Nusa Tenggara | 1 | .32 |
| Papua | 4 | 1.27 |
| West Papua | 1 | .32 |
| West Sulawesi | 1 | .32 |
| South Sulawesi | 47 | 14.92 |
| Southeast Sulawesi | 1 | .32 |
| North Sulawesi | 1 | .32 |
| West Sumatra | 3 | .95 |
| South Sumatra | 1 | .32 |
| North Sumatra | 4 | 1.27 |

Table 4
*SDescriptive Statistics of the Variables Used*

| Variable | N | Min | Max | Mean | Std. Dev |
|---|---|---|---|---|---|
| Aggressive driving behavior | 315 | 11 | 66 | 28.11 | 10.23 |
| Negative urgency | 315 | 4 | 16 | 9.14 | 3.01 |
| Lack of premeditation | 315 | 4 | 16 | 7.34 | 2.39 |
| Lack of perseverance | 315 | 4 | 16 | 7.67 | 2.38 |
| Sensation seeking | 315 | 4 | 16 | 10.71 | 2.61 |
| Positive urgency | 315 | 4 | 16 | 9.67 | 2.67 |
| Machiavellianism | 315 | 16 | 79 | 43.90 | 11.89 |

Based on the data presented in Table 3, it can be seen that the substantial geographical disparities in Indonesia among 315 respondents were emphasized. Amidst the geographical zones, South Kalimantan was found to be the dominant contributor with 50.16%, followed by South Sulawesi (14.92%) and West Java (6.35%). In accordance with this, Jakarta, East Java, and Central Kalimantan also made significant contributions. However, a significant imbalance in representation was observed, and this was evident in provinces such as Bengkulu, Gorontalo, and Lampung, each represented by only a single respondent. This phenomenon indicated a disparity in geographical representation in the sample.

Classical assumption tests were carried out in this study, which comprised normality, multicollinearity, and heteroskedasticity evaluations. For the normality test, the One-Sample Kolmogorov-Smirnov Test in SPSS showed that residuals from the regression model approximated a normal distribution, with a significance value of .200, surpassing the threshold of .05. This suggested that the residuals successfully met the normality assumption adequately. Meanwhile, to assess multicollinearity, tolerance and Variance Inflation Factor (VIF) values were scrutinized. Following recommendations by Hair et al. (2010), where tolerance values above .10 and VIF values below 10 indicated no significant multicollinearity, the analysis yielded tolerance values ranging from .464 (for LPM) to .901 (for IRI) and VIF values from 1.110 (for IRI) to 2.172 (for PU). This result showed that there was no significant multicollinearity among the variables, thereby meeting the established criteria.

Heteroskedasticity was evaluated through a scatterplot of standardized residuals against standardized predicted values (Figure 1). The visualization showed a random scattering of data points without discernible patterns indicating variance increase or decrease concerning predicted values. Furthermore, the even distribution of residual points both above and below the horizontal axis (representing zero predicted values) supported the assumption of homoskedasticity. In accordance with this, the absence

of distinct patterns, such as funnels or specific shapes, signified consistent variability of residuals across all prediction levels, affirming the absence of heteroskedasticity in the regression model used.

The results obtained from the data analysis showed that among various impulsivity dimensions, only 'Lack of Perseverance' significantly impacted aggressive driving behavior (p = .009). Meanwhile, 'Negative Urgency,' 'Lack of Premeditation,' 'Sensation Seeking,' and 'Positive Urgency' were not found to have a significant effect, with respective significance values exceeding .05.

Machiavellianism was observed to have a highly significant effect on aggressive driving behavior (p = .000). Meanwhile empathy failed to show a significant effect (p = .271).

Collectively, when impulsivity, Machiavellianism, and empathy were analyzed through the simultaneous F-test, the results showed a significant combined effect on aggressive driving behavior (p = .000). The coefficient of determination (R-squared) for this model was 22.1%, implying that these variables collectively explained 22.1% of the variability in aggressive driving behavior. The remaining variability was influenced by other factors, as presented in Table 5.

The results obtained from this study diverge from prior investigations. This is primarily because it showed that in impulsivity dimensions, 'Negative Urgency' and 'Sensation Seeking' lacked a significant impact on aggressive driving behavior. As earlier stated, this result contradicts earlier studies, such as those by Ju et al. (2022) and Luk et al. (2017), which identified these dimensions as crucial predictors of driving behavior. It suggested that not all facets of impulsivity directly relate to aggressive driving behavior. While previous studies often associated negative emotions such as anger, hostility, anxiety, and sadness to aggressive driving behavior, recent evidence has challenged the consistency and directness of this relationship. In accordance with this, Kovácsová et al. (2016) and Zimasa et al. (2017) found that while negative emotions might potentially influence driving behavior, the effect on aggressive driving behavior was not always straightforward or predictable. Recent studies by Karras et al. (2023) and Zhang et al. (2022) supported this result by emphasizing that dysfunctional impulsivity and a lack of forgiveness had stronger correlations with aggressive driving behavior. These studies were carried out with a focus on exploring alternative factors influencing driving behavior beyond the traditionally impulsivity dimensions.

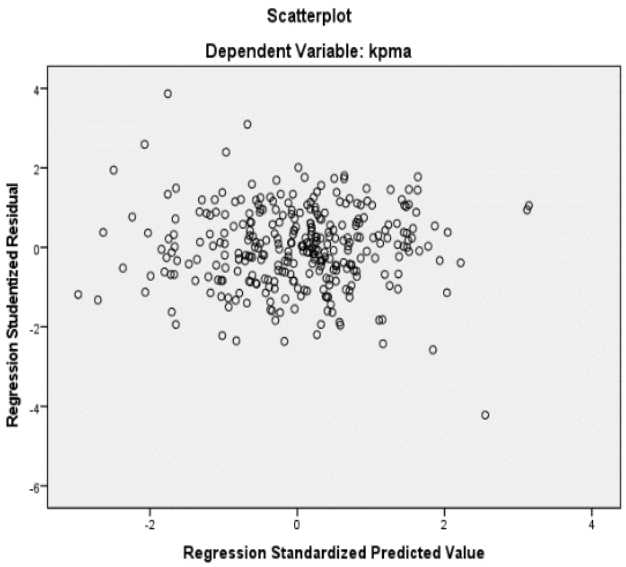


*Figure 1*. Scatterplot

Table 5
*The Effect of Impulsivity, Machiavellianism, and Empathy on Aggressive Driving Behavior*

| Variable | Sig p<.05 | Aggressive driving behavior |
|---|---|---|
| Impulsivity: | | |
| Negative Urgency | .635 | Insignificant |
| Lack of Premeditation | .763 | Insignificant |
| Lack of Perseverance | .009 | Significant |
| Sensation Seeking | .238 | Insignificant |
| Positive Urgency | .115 | Insignificant |
| Machiavellianism | .000 | Significant |
| Empathy | .271 | Insignificant |
| Simultaneous F Test (Impulsivity, Machiavellianism, Empathy) | .000 | Significant |
| Coefficient of Determination ($R^2$) | - | 22.1% |

According to Bogdan et al. (2016), while negative emotions might influence driving behavior, the specific link with aggressive driving nevessitates deeper investigation to unravel the intricacies and variability of this connection (Bogdan et al., 2016). For instance, individuals experiencing negative urgency might heighten the sensitivity while driving, yet this does not invariably translate into engaging in aggressive driving behavior. Similarly, dimensions of impulsivity such as 'Lack of Premeditation' were found to exhibit no significant effect. This is in line with literature associating impulsivity to various driving-related behaviors, including driving aggression and traffic violations (Bıçaksız & Özkan, 2016; Luk et al., 2017; Stephens & Sullman, 2015).

As stated in various previous studies, the profound impact of Machiavellianism on aggressive driving behavior underscores the association with hostile social perceptions (Ball et al., 2018; Brankley & Rule, 2014; Burtăverde et al., 2016; Jones & Paulhus, 2017; Liu et

al., 2022). This suggests that individuals with Machiavellian traits tend to showcase aggressive driving behavior, potentially stemming from the inclination to disregard social norms and prioritize personal goals. However, the lack of a significant effect of empathy on aggressive driving behavior (p = .271) is surprising. The crucial role of empathy in understanding and responding to the emotions of others have been found to theoretically reduce aggressive driving behavior. This raises questions about other influential factors that could potentially outweigh its impact on determining aggressive driving behavior (Decety et al., 2016).

The combined analysis of impulsivity, Machiavellianism, and empathy showed a significant impact on aggressive driving behavior (p = .000), elucidating a coefficient of determination ($R^2$) of 22.1%. This shows that while individual variables contribute differentially, the collective influence significantly affects aggressive driving behavior (Burtăverde et al., 2016; Liu et al., 2022). This result is in line with the perspective presented by Stephens & Sullman (2015) in the study on the Reducing Aggressive Driving (RAD) program, where the collective influence of these factors was thoroughly examined. In summary, these outcomes underscored the significance of considering various personality and psychological aspects in comprehending aggressive driving behavior.

## Conclusion

In conclusion, based on the obtained results and discussion, impulsivity, negative emotions, and aggressive driving behavior were found to have complex and not entirely consistent relationship. While traits such as 'Negative Urgency' and 'Sensation Seeking' were typically thought to predict aggressive driving, this study showed that these factors had no significant impact in this context. However, it is important to state that traits like 'Lack of Perseverance' were found to be more closely associated with aggressive driving. This showed that not all facets of impulsivity played a role, indicating the need to differentiate between different aspects of the factor in driving behavior.

The results further showed that emotions such as anger and anxiety, commonly linked to aggressive driving, did not always directly lead to this behavior. Rather, it was observed that Machiavellianism strongly influenced aggressive driving, underscoring the importance of social perception and personal goals in shaping behavior. Following this, the role of empathy in reducing aggressive driving was found to be less evident than expected, suggesting that there were other dominant factors in play. This complexity indicated the multidimensional aspects influencing aggressive driving.

This study possesses some limitations, particularly the reliance on self-reported data that may introduce social bias. In order to address this limitation, future studies could diversify methods by incorporating in-depth interviews or direct observations and adopting longitudinal method to track the development of aggressive driving behavior over time. Following this, a more inclusive and representative sample from the driving population of Indonesia would support the applicability of the results. In summary, the obtained results offered fresh information into understanding the factors influencing aggressive driving, thereby contributing to the advancement of psychology, particularly in comprehending the manner in which personality and emotions intersect in driving behavior. This shows the need for interdisciplinary methods in studying aggressive driving.

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