The effect of emotion regulation on driving anger of motorbike drivers in Jakarta

A C J Siagian¹ and E Andangsari¹,²*

¹ Psychology Department, Faculty of Humanities, Bina Nusantara University, Jakarta, Indonesia 11480
² Research Interest Group Cross Cultural Communication, Bina Nusantara University, Jakarta, Indonesia 11480

E-mail: esther@binus.edu

Abstract. The rapid growth of vehicles in Jakarta results in various problems, from air pollution, traffic jam to an increase in the amount of traffic accidents. Road rage is also one of the most common emotions caused by traffic growth. This research aims to identify if there is a significant effect of emotion regulation toward driving anger on motorbike drivers in Jakarta. The research was conducted on 102 motorbike drivers aged 18-24 who regularly passed across Jakarta. Emotion Regulation Questionnaire (ERQ) and Driving Anger Scale (DAS) were used to obtain the data. Logistic regression analysis shows a significant effect of cognitive reappraisal (Sig. 0.00) and expressive suppression (Sig. 0.039) toward driving anger.

Keywords: emotion regulation, driving anger, motorbike drivers

1. Introduction

Road accident is responsible for approximately 1.35 million deaths and 50 million people suffering from non-fatal injuries every year. It is one of the highest causes of death for people aged 10 to 24 years [1]. In Indonesia, road accidents cause approximately three deaths every hour, with cases involving human error as much as 61%. It is followed by infrastructure factors of 30%. It results in human error as the biggest factor in road accidents [2], with motorbike holds the highest rate for the road accident involvement [3]. The number of the rapid growth of vehicle ownership in Jakarta suggests that more of its residents utilize the motorized vehicle to facilitate their mobility. Jakarta’s Transportation Statistic (2018) stated the number of motor vehicles in Jakarta reached 18.73 million with 3.99 million cars and 14.74 million motorbikes, making it the most vehiculated city in the country [4]. Indonesian Central Bureau of Statistics revealed the contrast between the rapid growth of vehicle ownership (5% growth in the last five years) and slow road expansion with a growth of less than 0.1% [2]. The gap between two elements raises concerns about traffic density and more common traffic jams, which likely to prompt aggressive driving behavior as a clue of frustration feel in the congested road [5]. Anger is one most common emotions experienced by drivers [6]. Furthermore, angry drivers are twice as likely to be involved in a road accident than non-angry drivers. They are likely to engage in aggressive driving and embrace a higher-level of risky driving style [7].

The previous finding suggested that drivers with regular practice of reappraising emotion tend to be less angry while driving and express milder, even no aggressive behavior [8]. The finding shared a similar idea with Mauss et al. [9]. Controlling emotion promotes psychological wellbeing, especially in dealing with anger and distress. Considering anger as the most common emotion in the driving situation
emotion regulation is regarded as one important factor in regulating the outcome of drivers’ behavior, especially in engaging in anger-provoking situation and distress during driving. As Jakarta’s traffic is increasingly congested over time, studying driver’s behavior and its effect on psychological effect is considered essential to prevent future ascent in the number of road accident cases.

Considering the huge number of motorbike riders in Jakarta, accompanied by motorbike’s high rate of accident involvement, this study aimed to identify the effect of emotion regulation strategies on driving anger, specifically for motorbike riders in Jakarta. Emotion regulation strategies play a significant role in appraising environment and situation, which activates emotion and generates responses in physiological and psychological forms. Stressful traffic situations (e.g., traffic jams, another driver’s aggressive driving, and others) are identified as the first stage, where the situation provokes emotion. As emotion regulation activated, the most adaptive strategy come up to deal with the situation, resulting in the act as a response to the situation. The response of the situation is driving anger, which can be manifested in overt behavior, like the use of vehicles to express anger or verbal aggression.

The hypothesis of this study as follows:
H1: Cognitive reappraisal significantly affecting driving anger on motorbike riders in Jakarta
H2: Expressive suppression significantly affecting driving anger on motorbike riders in Jakarta

2. Literature review
2.1. Driving anger
Driving anger is intense anger experienced by the driver [10]. Sullman, Stephens, and Yong [11] suggested driving anger as a predictor in aggressive driving behavior and traffic accidents. Angry drivers also tend to be more aggressive, engaged in risky driving style, and has very real consequences, both for driver, any passengers, and other road users [7]. Deffenbacher [10] classified driving anger into six clusters; (1) hostile gesture involving signals of anger or obscene gesture by another driver, (2) illegal driving including others breaking common traffic law like speeding or running stop signs, (3) police presence involving police presence in a driving situation, (4) slow driving comprising of a situation where another driver or pedestrian impedes traffic flow, (5) discourtesy which is anger as a response to discourteous or disrespectful behavior of others, and (6) traffic obstructions including events, other than another slow driving, that frustrates or obstructs the driver such as traffic jams or road construction [12].

In addition, research developed on the previous study [6], discovered two types of anger expression that significantly related to potentially crash-related conditions, such as losing control of the vehicle and use of the vehicle to express anger (UOV) and verbal aggressive expression (VAE) positively correlated with road rage perpetration.

2.2. Emotion regulation
Adapting James-Lange’s definition of emotion, the term emotion in emotion regulation concept refers to bodily changes and physiological processes. It occurs due to environmental stimuli that evoke certain feelings in the conscious mind [13]. Emotion arises when an individual attends to a situation and perceives it as relevant to his or her goals, which gives meaning and evokes the emotion to emerge [14]. Emotion regulation refers to the activation of an intention to modify the emotion-generative process [15], that often executed automatically without much conscious awareness or deliberation [16]. During emotion regulation, the subject may increase, maintain, or decrease positive and negative emotions, which often involves changes in emotional response [17]. For instance, one’s may down-regulate his anger to feel less stress. Emotion regulation requires not only psychological changes on its subject but also the tendency to act in a certain way [18]. Therefore, the role of emotion regulation is not limited to regulate one or more emotions but also the future action as a response to a certain situation.

There are two specific strategies in emotion regulation. First, cognitive reappraisal is a form of cognitive change that involves construing a potentially emotion-eliciting situation changing its emotional impact. Second, expressive suppression is in the form of response modulation that involves inhibiting ongoing emotion-expressive behavior [16]. Cognitive reappraisal is a cognitive-linguistic strategy that alters the trajectory of emotional responses by reformulating the meaning of the situation.
Meanwhile, expressive suppression is a strategy directed toward inhibiting behaviors associated with the emotional response. Thus, it produces decreased expressive behavior and emotional experience compared to cognitive reappraisal [19]. It should be noted that expressive suppression is not a negative strategy, rather a strategy inhibiting emotion-related behavior and one’s sincere belief because of his or her concern on self-presentation and social values [20].

3. Method
3.1. Participants
Participants in this study involve motorbike riders with valid driving license and regular travel routes across Jakarta. Motorbike is considered the main concern in this study as it is the most common mode of transportation, especially in Jakarta, compared to automobiles and buses. Sample characteristics for this study are (1) motorbike rider, male or female, (2) regular travel route in protocol road, main road, or severely congested road in Jakarta, and (3) aged 18-24 years referring to emerging adulthood characteristics and emotion regulation strategies. A study involving emotion regulation reports that during this development, the use of expressive suppression is often when experiencing fear. Meanwhile, dysregulation and dysfunctional rumination are likely to be applied when dealing with anger [21]. One distinct information about emerging adulthood is several types of risk behavior, such as driving at high speed. It peaks during this stage of development as part of identity exploration before settling down into the roles and responsibilities in adult life [22]. The course of employing risky behavior turns to be a notable characteristic in studying driving anger, especially for young drivers. The data of the available participants in Table 1.

Table 1. Participants’ Data.

| Aspects                  | N   | %    |
|--------------------------|-----|------|
| Gender                   |     |      |
| Male                     | 54  | 54.5 |
| Female                   | 45  | 45.5 |
| Total participants       | 99  | 100  |
| Frequency of driving     |     |      |
| habit                    |     |      |
| 1-2 days/week            | 18  | 18.2 |
| 3-5 days/week            | 31  | 31.3 |
| Everyday                 | 50  | 50.5 |
| Emotion regulation strategy |   |      |
| Cognitive Reappraisal    | 86  | 86.9 |
| Expressive Suppression   | 13  | 13.1 |
| Driving anger results    |     |      |
| High                     | 54  | 54.5 |
| Normal                   | 45  | 45.5 |

3.2. Instruments
Emotion regulation was measured using emotion regulation questionnaire (ERQ) translated into Bahasa Indonesia and adapted from 10 items to 15 items [23] from the original version of ERQ [16]. Participants were asked to rate their experience in regulating emotions as listed on the items. Confirmatory factor analysis for the instrument produced a good fit: RMSEA = 0.09; CFI = 0.95; TLI = 0.93 [23].

To measure driving anger, participants were asked to complete 33-items of Driving Anger Scale (DAS) by Deffenbacher et al. [10]. The instrument had been used for over 20 years with decent reliability [12]. Recent study involving driving anger in Malaysia proposed good confirmatory factor analysis result: S-B,2(496) = 883.60, p < 0.0001, S-B,2/df = 1.78, RMSEA = 0.05; CFI = 0.91 [11]. The internal reliability test from this study showed α = 0.929 for entire subscales.
3.3. Procedure and analysis
The participants were asked to fill all the items of the instruments. Online instruments were given to the participants. It included a brief explanation of this study and informed consent for them. After filling the online instruments, the author gave a small token of appreciation to them. For the analysis, Binary logistic regression was used to test both hypotheses.

4. Results
The Nagelkerke R²=0.556 indicated that the proportion of emotion regulation influenced driving anger as much as 55.6%. Meanwhile, the other 44.4% were made by other influences. Hosmer and Lemeshow test showed 0.099, indicating this model of regression was capable of predicting the outcome. Hypotheses test showed both hypotheses were significant, where p-value=0.000 (p<0.005) on cognitive reappraisal and p-value=0.039 (p<0.005) on expressive suppression (see Table 2 and Figure 1).

Table 2. Calculation result of emotion regulation on driving anger.

| Emotion Regulation Strategy | B     | S.E.  | Wald   | df | p-value | Exp (B) |
|-----------------------------|-------|-------|--------|----|---------|---------|
| Cognitive Reappraisal       | 2.228 | .440  | 25.617 | 1  | .000    | 9.280   |
| Expressive Suppression      | -.630 | .306  | 4.258  | 1  | .039    | .532    |
| Constanta                   | .152  | .274  | .305   | 1  | .581    | 1.164   |

The result suggested a positive coefficient score on cognitive reappraisal (B=2.228). In contrast, a negative score occurred on expressive suppression with B=-.630. The result indicates higher cognitive reappraisal contributes to more intense driving anger, while higher expressive suppression contributes to lower driving anger.

Figure 1. Model Measured.

To compare between male and female motorbike drivers, the cross tabulation calculation was made (see Table 3).
Table 3. Cross Tabulation Between Male-Female and Driving Anger Scale.

| Driving Anger Scale Result | Male     | Female    | Total    |
|----------------------------|----------|-----------|----------|
| High                       | 26 (26.3)| 28 (28.3) | 54 (54.5)|
| Normal                     | 28 (28.2)| 17 (17.2) | 45 (45.5)|
| Total                      | 54 (54.5%)| 45 (45.5)| 99 (100)|

Table 3 showed that female had higher numbers in high level of driving anger than male. Male in other way, had a quite similar numbers between high and normal level of driving anger.

5. Discussion
The result of this study indicates a contrasting view from the previous study conducted by Papusoi and Holman [8]. They mentioned that drivers with a habitual way of reappraising emotions tended to be less angered while driving, and the inducing effect of anger was significantly reinforced in participants who habitually suppressed their feelings. However, the cultural factor is considered to contribute to the adaptive strategy of emotion regulation since most research in emotion regulation has taken an individual-centered approach. The major assumption is that people strive for independence, self-fulfillment, and authentic expression of emotions based on autonomy [24]. Thus, cognitive reappraisal is considered as more adaptive than the other. On the other hand, eastern individuals associate suppression with interpersonal harmony, consequently have higher well-being and relationship satisfaction when they suppress negative emotions [25]. Furthermore, research developed by Sheppes, Scheibe, Suri, and Gross [26] suggested that individuals were prone to employ distraction over reappraisal when engaging with high-intensity negative emotion.

Alongside cultural factors, participants in this study were in the developmental stage, referring to emerging adulthood. Zimmerman and Iwanski [22] suggested that expressive suppression started to increase in emerging adulthood and presented more often in anger situations. Furthermore, this study found that driving anger scored higher in female participants. This finding supported the research by Iglesias, Fraguela, and Martin [27], which suggested that females showed higher driving anger scores than males. Given that males travel with motorbike more frequently, it is considered that they are adapting to heavily congested traffic and anger-provoking events more successfully, which in turn, may contribute to lower score of driving anger.

The result of this study is subject to several limitations. The driving anger scale used in this study was adapted from the original full-scale of DAS, which targeted automobile drivers. Therefore, the responses might not fully represent the actual intensity of anger experienced by participants. Convenience sampling employed in this study also resulting in numbers of invalid responses, which later should be eliminated. Also, the severity of congestion and undisciplined road users potentially influenced participants' perceptions about anger-provoking events, as demonstrated in driving anger scale.

Development of driving anger scale for motorbike riders is highly advised should future study aimed to involve participants with similar characteristics, especially with items aligning heavily congested traffic, careless driving behaviors, and common traffic obstructions.

6. Conclusion
This study finds that both emotion regulation strategies have a significant effect on driving anger. The data are collected from a sample of motorbike riders in Jakarta, specifically those on emerging adulthood. Furthermore, the result shows that cognitive reappraisal has a positive coefficient on driving anger, indicating that those who use cognitive reappraisal more often are prone to experience intense anger while driving. Meanwhile, expressive suppression shows a negative coefficient, which means that individuals with higher expressive suppression tend to experience less intense anger while driving.
Development of driving anger scale for motorbike riders is highly suggested should future study aimed to involve participants with similar characteristics, especially with items aligning heavily congested traffic, careless driving behaviors, and common traffic obstructions. Due to the inherent limitations of this study, consideration of more accurate measurement for emotion (e.g., eye tracking, EDA/GSR, fMRI, and so on), a larger amount, and a more diverse background of participants are suggested to generate more reliable outcome. Furthermore, an experimental method such as usage of driving simulator expected to generate more accurate results in addition to DAS. A better understanding of emotion regulation and its relevance in driving anger may further advance traffic psychology. Simultaneously, it may alleviate the level of driving anger for road users, especially within the urban area.

References
[1] Road traffic injuries. 2020. Available from: https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries
[2] Ada 18 juta kendaraan bermotor masuk Jakarta setiap hari. 2018. Available from: https://finance.detik.com/berita-ekonomi-bisnis/d-3878286/ada-18-juta-kendaraan-bermotor-masuk-jakarta-setiap-hari
[3] Angka Kecelakaan Tahun 2019, Truk dan Sepeda Motor Sering Terlibat. 2019. Available from: https://otomotif.kompas.com/read/2019/09/09/160200815/angka-kecelakaan-tahun-2019-truk-dan-sepeda-motor-sering-terlibat
[4] Berapa jumlah kendaraan di DKI Jakarta? 2019. Available from: https://databoks.katadata.co.id/datapublish/2019/08/02/berapa-jumlah-kendaraan-di-dki-jakarta
[5] Lajunen T, Parker D and Summalu H 1999 Transportation Research Part F 2 225–236
[6] Sullman M J 2015 Safety Science 72 153–159
[7] Stephens A N and Groeger J A 2012 Advances in Traffic Psychology Human Factors in Road and Rail Transport ed M Sullmann and L Dorn (Surrey: Ashgate Publishing Group) pp 3–15
[8] Papuso1 S and Holman A 2016 Bulletin of the Transilvania University of Brasov 9 153–163
[9] Mauss I B, Cook C L, Cheng J Y and Gross J J 2007 International Journal of Psychophysiology 66 116–124
[10] Deffenbacher J L, Oetting E R and Lynch R S 1994 Psychological Reports 74 83–91
[11] Sullman M J, Stephens A N and Yong M 2014 Accident Analysis and Prevention 71 1–9
[12] Deffenbacher J L, Stephens A N and Sullman M J 2016 Transportation Research Part F 42 236–247
[13] Coleman A and Snarey J 2011 Encyclopedia of Child Behavior and Development (Boston: Springer) pp 844–846
[14] Gross J J 2007 Handbook of Emotion Regulation (New York: Guilford Press) pp 3–24
[15] Gross J J, Sheppes G and Urry H L 2011 Cognition and Emotion 25 765–781
[16] Gross J J and John O P 2003 Journal of Personality and Social Psychology 85 348–362
[17] Koole S L 2009 Cognition and Emotion 23 4–41
[18] Gross J J 2015 Psychological Inquiry 26 1–5
[19] Gross J J, Goldin P R, McRae K and Ramel W 2008 Biological Psychiatry 63 577–586
[20] Butler E A and Gross J J 2004 The Regulation of Emotion (New Jersey: Lawrence Erlbaum Associates) pp 103–115
[21] Arnett J J 2000 American Psychologist 55 469–480
[22] Zimmerman P and Iwanski A 2014 International Journal of Behavioral Development 38 182–194
[23] Andangsari E W, Dhowi B, Djunaidi A, Fitriani E and Harding D 2018 Proceeding of the 2nd International Conference on Informatics and Computing Vol February 2 pp 1–6
[24] Trommsdorff G and Heikamp T 2013 Socialization of Emotions and Emotion Regulation in Cultural Context Cultural Variations in Psychopathology: From Research to Practice ed S Barnow and N Balkir (Gottingen: Hogrefe Publishing) pp 67–92
[25] Ford B Q and Mauss I B 2015 Current Opinion in Psychology 3 1–5
[26] Sheppes G, Scheibe S, Suri G, and Gross J J 2011 Psychological Science 22 1391–1396
[27] Iglesias B G, Fraguela J A, and Martin M A 2012 Transportation Research Part F 15 404–414