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School of Transportation Sciences

Master of Transportation Sciences

Master's thesis

Social norms, attitude and risky riding behavioral factors as predictors of crash involvement among young adult motorcyclists in Indonesia: Testing a contextual model

Audinda Leinia

Thesis presented in fulfillment of the requirements for the degree of Master of Transportation Sciences, specialization Traffic Safety

SUPERVISOR :
Prof. dr. Kris BRIJS

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Master's thesis part 1

Social Norms, Attitude, and Risky Riding Behavioural Factors as Predictors of Crash Involvement Among Young Adult Motorcyclists in Indonesia: testing a contextual model

Audinda Virsa Leinia

SUPERVISOR :
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dr. Hera Widyastuti

Preface

This thesis is a completion of our study at Master Program of Transportation Science. This master thesis was written during the COVID-19 crisis in 2020. This global health crisis has had an impact on the (writing) process, the research activities and the research results that are at the basis of this thesis because the I was not able to collect the data directly to the respondent as planned, and also libraries and computation labs were closed during analysis process. However, We finally carried out thisresearch within the help and support of many people in my life.

Praise to God. I am so blessed that I could manage to put an end to the internship course successfully within His blessings. I would also praised Him for giving me a good health and ability to go through my internship well even we have to strive during COVID-19 pandemic issue.

I would also thankful for my Uhasselt supervisor and co-supervisors from school of transportation sciences, Prof. Kris Brijs and Dr. Veerle Ross for helping me with abundance information and solution during research days. Nonetheless, I would also express my deepest gratitude for my colleagues for giving me lots of information and helpful feedbacks to ease our research process. Many thanks also to the School of transportation sciences in Uhasselt for guiding us and helping us sorting of many problems during the research process and also providing us such a great opportunity to be able to choose our research region.

I would like to thank my local Supervisor from ITS, Dr. Hera Widyastuti for helping me collecting the data in Indonesia and also the endless support as well as feedbacks during this COVID-19 condition.

Moreover, I would like to express my deepest gratitude for my parents who always support me in any conditions and decisions I took in doing my internship days. Thank you so much also for my homebound best friend for always helping me sort all my problems while staying in Yogyakarta.

Abstract

The contextual mediated model was used to examined the effect of distal context in predicting the riding outcomes via proximal context as mediated factors. The objectives of the present study were to (1) to identify the most appropriate factor structure of MRBQ items for riders in Indonesia; and (2) investigate the correlation between distal context (socio-demographic, attitude, and social norms) and the involvement of violation or crash/near-crash via proximal context which performed in MRBQ items towards. Young adult riders (N=420) in East of Jawa Province of Indonesia were enlisted in this research. In this current study, the MRBQ was developed to measure the proximal context of risky riding behavior. Confirmatory factor analysis indicated that present data were lack of fit with the previous factor models in Turkey and UK for experienced riders. Principal Axis Factoring were carried out to respecify the MRBQ structural factor amongst young adult rider in Indonesia and contents of four scales; errors, violations, safety gear violations, and stunts. This structural factors were then analyzed through AMOS along with other latent variables. From the final path model, it was indicated that variables of distal context (attitude, social norms, and socio demographic data which controled by age, gender, and years of riding) were able to predict at least one of the proximal elements with high and significant path coefficient. Moreover, several MRBQ items except stunts as proximal elements yielded a direct effect to the self reported violations, near crashes or crashes. While distal factors like social norms yielded an indirect correlation which mediated through MRBQ items such as errors and violations. This present study also revealed that distal factors also able to predict riding outcomes although the cofficient was weaker than predicting abberant riding behaviors. All in all, the study was able to extends findings related to contextual mediated model for young adult riders in Indonesia. Results were carried out considering the implication of the needs of refinement and development of MRBQ items before using the instrument widely particularly amongst young adult riders and also the practical implication for developing procedure of riding license were discussed.

Keywords : attitutes, social norms, errors, violations, safety gear violations, stunts, near-crash/crash, young adult riders, MRBQ, risky riding behavior.

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1 Background

1.1 Problem Statement

Indonesia is a developing country in South East Asia with a total population of 261,115,456 people. The economic development has also led to the increase of mobility demand. One of the main mobility modes of transportation in Indonesia is motorcycle. It is extremely affordable in operational cost and convenient to use in both rural and urban areas (Abdul Manan and Varhelyi, 2012). According to Indonesian National Traffic Police record (2019) from 2013 until 2018, motorcyclist had the highest mortality rate of over 70% followed by car passengers with 10% to 12% and trucks for approximately 10% or lower. Motorcycle accidents have caused more than 73% of fatalities and severe injuries out of the total number of traffic accidents with AIS>3 from 2013 until 2018 (Fatmawati, 2019).

The growth imbalance between the motorcycle number and its supporting facilities has caused an increase in traffic accidents and fatalities (Santosa et al., 2017). The growth of motorcycle infrastructure is only 4%, which is significantly lower than that of the motorcycle (14%) during ten years of observation.

In addition to the previous studies, it has been stated that human factor is the main cause of accidents at 85.57%, followed by road properties at 7.71%. Approximately 45.66% accidents caused by the human factor were the results of undisciplined drivers violating the prevailing regulations and laws (Indonesia National Police Department, 2014). Of all road accidents in Indonesia, it was found that young adults, those aged 18 – 25 years old (Wulandari, 2018) has the highest risk of crash at 51% (Riskiansah and Zain, 2016). Based on National Police Department (2017), there were 24.023 of students involved in traffic accidents from January to May 2017. High school students and college students are the highest groups involved in traffic accidents. The highest number of accidents happened during the early morning (06.00 – 08.00) and late afternoon (14.00-16.00) (CNN Indonesia, 2018). Students in Indonesia are allowed to use motorcycle at an early age without parents or teachers concern. As they grow, their behaviour on riding motorcycle is more likely to affect by their friends than parents (Riskiansah and Zain, 2016). Moreover, The absence of safety education system and significant peer influence to perform risky behaviour were stated as the main problems for young adult riders in Indonesia (Wulandari, 2018).

The number of accidents caused by the reckless behaviour of the young adult motorcyclists is a major problem in Indonesia. Such findings are useful, but it is more beneficial to combine all contributing factors to measure all aspects of riding behaviour. However, there is limited research on the risky riding behaviour of the young adult motorcyclists in Indonesia. This in-depth study aims to identify factors that correlate with risky riding behaviour among young adult rider as a predictor of crash involvement.

1.2 Risky Riding Behavioural Factors influencing Traffic Safety

Motorcycle safety has been the focus of safety studies for a long time. The main reason is the high probability of serious crashes and fatalities involving riders. The crash severity is not only because of property design for motorcyclists or riders' vulnerability due to lack of restraint and protection, but behaviour is also cited as the crucial contributing factor in road traffic accidents (Susilo et al., 2015). Human factors in driving behavior can be seen in two different components: driving style and driving skills, or in other words, driver behavior and performance (Elander et al., 1993, Evans, 1991; Summala, 1976). Driving skills or performance include motorskils and information processing that could improve with practice and training i.e. driving experience. Driving style or behavior is the way driver choose to drive or their habitual drive, including choice of speed and habitual of general attentiveness (Elander et al., 1993). Due to evident relevance of driving style

or accident risk, there are lots of instruments to measure driving style or driving behavior (Ozkan et al., 2006).

The first investigation to measure riding behaviour was done through the Driver Behaviour Questionnaire, aimed to measure traffic violation and risk-taking behaviour of riders (Reason et al., 1990). They only divide the factors into two categories: error and violation (Reason et al., 1990; Haworth and Mulvihill, 2005). Error is related to cognitive processing problems and identified as a failure of a planned action to achieve individual intended consequences such as lapses, mistakes, or slips. Meanwhile, violation is defined as the deliberate deviation of action from believing practices to maintain safe operation such as speeding (Haworth and Mulvihill, 2005). It has proved to be a valuable tool to investigate drivers' behaviour and its typology has been successfully used in many other studies (Aberg&Rimmo, 1998; Parker et al.,1995). However, riders' behaviour questionnaire needs to be benchmarked for different cultures and countries (Ozkan et al.,2006) due to differences in social norm and traffic system. This effect is reported on the DBQ application in Australia where the factors are defined in tripartite typology: general error, dangerous error, and violation (Blockey & Hartley, 1995). It was also found that certain subsets of some factors loaded differently. For instance, in company driver's set, some violations and errors loaded into the same factor (Dimmer & Parker, 1999). Some studies reported different numbers of factors from the original structure (Parker et al., 2000). Therefore, benchmarking risky behaviour factors is needed for each country.

Several personal variables could also affect the decision to attempt risky riding behaviour. To obtain a clear view on risky behaviors' determinants, psychological factors was recommend to be one of the determinants on risky behavior (Groeger nad Rothengatter, 1998). Additionally, Another psychology theory related to human behavior was explained by Asch (1955) in Normative Social Influence Theory. This theory mentioned that social factors, perception of others behavior and society perspective will influence behavioral changes of an individual and the action of behavioral changes itself called as conformity. The other theory that focuses on human psychology was also explained by Schwarz's norm activation theory (1977). This theory argue that moral obligation could help to predict individual behavior, perticularly to explain the behavior of an individual with great responsibility. In the current study, Normative Social Influence Theory (Sukor et al., 2016) reflects that perceived behavior of others could pressure riders to perform the same behavior as others. The theory mentioned that people have their own level of risk they are willing to accept, and they will adjust their behavior in line with their perceived level of risk they are willing to accept. In the study of Adams (1995), Slovic (1987), and Wilde (2001) argue that riders would adjust their behavior to maintain their prefered risk level that they are willing to accept.

Socio-cognitive determinant provides the framework to understand the risky behaviour of young adult riders related to personal variables (Armitage and Conner, 2000). Social norm is a socio-cognitive factor taken into account to predict riders' behaviour (Carter et al.,2014). It is defined as patterns that define an individual's belief or understanding in a group on how each of group members should behave in a certain condition. Social norm could affect the decision of a person implicitly or explicitly. Individual levels of risk perception might be different based on the influence of social norm exerted by friends, colleagues, or parents. Another study on risky driving behaviour confirmed the influence of social norm was evoked from friends or peers on young people's driving behaviour (Carpentier et al., 2014). It was found that young male drivers tend to have weaker normative motivation regarding the social norm to follow traffic laws compared to their female and older counterparts (Yagil, 1998).

Attitude also part of socio-determinant factors that could affect safety riding behaviour among young riders (Armitage and Conner, 2000). Attitude indicates the tendency of people to favour or disfavour some behaviors (Ajzen, 1991). In terms of road safety, attitude often seen as the utterance of like or dislike towards variety of unsafe behaviors. It has been reported that attitude is a crucial

predictors of riding behaviour (De Palsmakers and Janssens, 2007; Iversen, 2004; Elliot and Thompson, 2010; Ulleberg and Rundmo, 2003; Paris and Broucke, 2008; Carpentier et al., 2014). Therefore, the attitude towards road safety will be included in this study as predictors of risky riding behaviour.

In addition, it has been shown that age and gender affect the motorcycle riding behaviour. Young male motorcyclists tend to be more ignorant about potential risk and safety checks of the motorcycle. (Chang and Yeh, 2006). They are at the highest risk of encountering traffic accidents due to their over-eagerness on compromising their risky behaviour compared to the other socio-demographic groups (Wong et al., 2010). They may underestimate the risk or accept it as the consequence of sensation experience (Susilo et al., 2015). As stated in the dual-system model, the risk-taking, risk-decision making and risk behaviour decrease with age and thus young adolescents will take higher risk. It is presumably because of immaturity of executive controls in relation to high sensitivity of reward (Lambert et al., 2014). Meanwhile, older adolescents have better cognition and working memory to increase mental work due to negative emotions such as anger and depression (Lambert et al., 2014). However, based on Musselwhite et al. (2012), the older adolescent (24 - 35) motorcyclists are aware of the high-risk exposure on traffic accidents but they tend to view safety as a capability to handling the motorcycle and knowing their limitation, without losing the sense of thrill while driving.

The interaction of risky riding behavioural factors in motorcycle and the accidents on motorized vehicles have been extensively studied in the developed countries, but studies on this issue are still limited in the developing countries. Therefore, there is a need to create a structural model where factors related to young adult risky riding behaviour could explain the correlation with their crash involvement.

1.3 MRBQ as a Predictor of Crashes

Based on DBQ, another type of questionnaire, "Motorcycle Rider Behaviour Questionnaire" (MRBQ) was developed (Elliot et al.,2007). It has been widely used in the high-income countries to find the best predictors for crashes. It comprises 43 items that represent five categories: traffic error, speed violation, stunt performance, control error, and safety equipment. Traffic error is an unintentional mistake made by a motorcyclist, while stunt is intentional sensation seeking. Control error is an unintentional or intentional mistake related specifically to motorcycle handling. Speed violation is a deliberate deviation of action related to speed from believing practices to maintain safe operation, while the safety equipment factor is measures through the wearing of protective gear for riders (Stephen et al., 2017)

In several past studies (Ozkan et al., 2012; Sakashita et al., 2014), the five categories of behaviour are not always implemented in several studies. For instance, Sakashita et al. (2014) used only four-factors of general behaviour and combine control error with traffic error into a single factor. These differences in factor structure might arise due to different sampling procedure and sample size. Elliot et al. (2007) used larger sample (N=8666) of registered motorcycle owners in the UK through postal questionnaire, while Sakashita et al. (2014) collected only 1305 of young novice drivers in Australia with probationary motorcycle license of 12 months, via telephone and online survey.

According to Sakashita et al. (2013), there have been two studies on examining validity and reliability of MRBQ for motorcyclists in Turkey (Ozkan et al., 2012) and the United Kingdom (Elliott et al.,2007). It was found that the five broad categories showed reliable internal consistency. However, the items assigned to each category were not precisely the same. Both findings also stated inconsistency on predictive validity of some MRBQ scales in terms of self-reported crashes. Elliot et al. with UK sample (2007) and Sexton et al. (2004) found that 13-items factor for traffic errors are the best predictor of the self-reported crash involvement in the previous 12 months. However, traffic error

and speed violation were found to be able to predict crashes when only at fault crashes are considered (Elliott et al., 2007). On the other hand, Ozkan et al. (2012) in Turkey found that stunts reliably predict self-reported fault crashes in the previous three years and no MRBQ factor can predict not-at-fault crashes. In the study of Sakashita et al. (2014) that measured self-reported crashes and attained police record on the participants' crash information, it was found that 17 items-factor of error (that combine control and traffic errors) and 7 items-factor of speed violation predicted self-reported crashes, and only stunts performance contributed on police record crashes. In both studies, the respondents' age and experience were controlled, but the crash data periods were different. For instance, Elliot et al. (2007) asked the crash involvement in the previous 12 months, while Ozkan et al. (2012) obtained data of crash involvement in the previous three years. These differences, combined with the configuration factor differences and different sampling, could elucidate the inconsistent results. However, it remains consistent that the latent constructs of safety equipment and control error were not contribute to crashes, while traffic errors, stunts , and violations might affect the crash risk. At last, benchmarking risky behaviour factors is needed for every country to create more contextual model with the sample tested (Oluwadiya, 2018)

The inconsistent findings regarding behavioural factors contributing to crash risk highlight the need to develop further understanding. In Indonesia, there is a limited study on MRBQ and there has been no study that examines the association between the influencing factors of riding behaviour and MRBQ factors as predictors of crash involvement.

1.3.1 Determinants in Indonesian MRBQ

The investigation of motorcyclist behaviour is rather limited in Indonesia because there is a belief that to reduce traffic accidents, larger spaces and better supporting infrastructure for each road user are needed. However, there have been few studies using the MRBQ in Indonesia with its limitations, particularly the inexistence of best predictors for crash involvement of motorcyclists and predictive validity test stated in the previous studies.

As shown by the results of Leksmono (2014), there are eight components used to predict motorcyclist behaviour: "speed-related aggressive behaviour", "safety violation", "control error", "traffic violation", "prediction error", "external human disturbance", "braking error", and "selfish behaviour". However, the components identification is not properly named (e.g.: speed-related aggressive behaviour) and the internal consistency of the study has not been tested yet. In another paper of Leksmono (2014), the MRBQ factors assigned are only six general factors by dividing errors into control and traffic errors and violations into speed, traffic, and safety violation, and stunts. However, similar to the previous paper, the components identification is not properly named, the internal consistency of MRBQ factors and their correlation with crash exposure have not been tested yet. Therefore, this study will deeply explore and identify the appropriate MRBQ structure and examine its correlation with crash involvement in Indonesia, particularly among young adult riders.

1.4 Contextual Mediated Model

Based on Elander et al. (1993), the main objective of a contextual model is to differentiate distal and proximal factors related to crash involvement through a mediating framework and to identify risky driving correlation based on their contextual closure to crash involvement. The classification is assumed to assist the researcher to construct models for investigating the predictive power of behavioural and personality variables. Sumer (2003) argued that proximal context involving transitory and stable factors has a close relationship with crash involvement. The stable driving elements (e.g. traffic error, violation, speed preference, and overtaking behaviour), critical behavioural factor (e.g. antisocial, fatigue), and transitory factors (e.g. texting while riding) which directly could increase crash risk were identified as proximal factors. Consistent with Lajunen (1997), the distal context will involve external elements extending from general cultural factors (e.g. traffic

law, safety attitudes), socio-demographic factors (age, gender, or environmental factors), social norms, stable personality factors, beliefs, and attitudes (e.g. aggression, sensation seeking, psychopathology, and risk taking) to cognitive factors (e.g. attributes related crash causation) that has an indirect impact to crash causes or can predict crashes through proximal factors. Contradictory to the statement, Sumer (2003) also stated that the association between proximal and distal context is assumed to be stronger than the association between frequency of crash as an outcome and proximal context based on the Poisson distribution given in Haight (2000) and Elander et al. (1993) related to the distance created between crash involvement and distal context. It is also suggested that distal context is expected to significantly but indirectly affect crash involvement, but it can hardly, if not at all, predict crashes (Sumer, 2003).

1.4.1 Proposed Contextual Model

Based on the literature reviewed, the distal factors could contribute to the variety of risky riding behaviour and driving outcomes. It was hypothesized that distal factors; socio-demography, attitude towards road safety and social norms could substantially affect the proximal context performed in MRBQ factors and the proximal context is expected to directly predict the number of crashes. However, it is assumed that the distal factors such as socio-demography and social norms, and attitude are linked indirectly to driving outcomes such as the number of crashes/near-crashes/traffic violation through risky riding behaviour which perfomed in MRBQ factors.

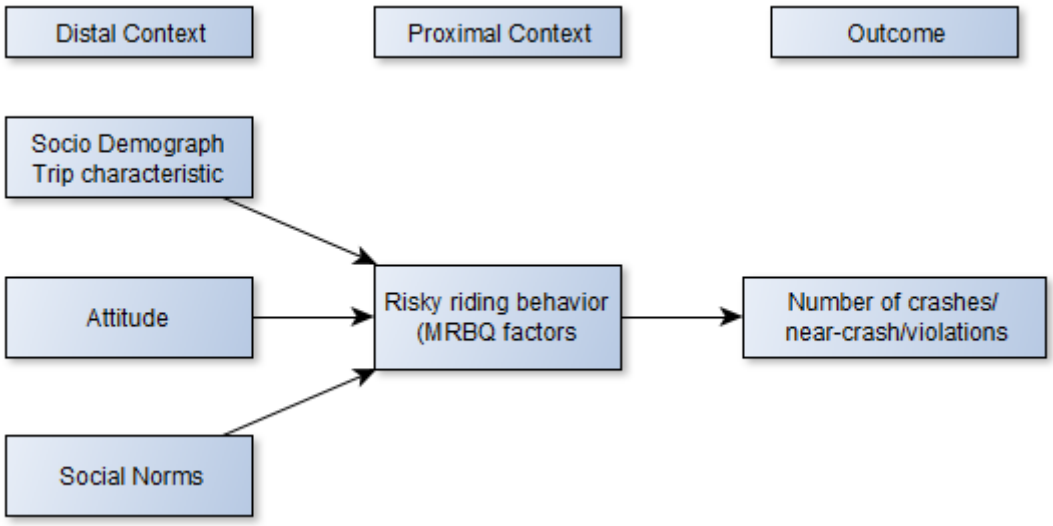

Figure 1 Proposed Contextual Model

2 Objectives

Based on the previous research discussed, there are inconsistent findings related to the behaviour types that could contribute to crash risk. Therefore, further studies are needed to improve the understanding of this issue particularly in Indonesia. This study aims to identify the most appropriate factor structure of MRBQ for a young adult riders in Indonesia and investigate the correlation between distal context (socio-demographic, attitude, and social norms) and proximal context related to behavioural factors in MRBQ towards young adult crash/near-crash, or violation involvement.

2.1 Framework

2.1.1 Scope

1. The study will only take individual respondents aged 18-25 years old with Type C driving license in Indonesia

2. It focuses on modifying the original version Motorcycle Rider Behaviour Questionnaire into an Indonesian version.
3. It will eliminate non-relevant items mentioned in the original version of Motorcycle Rider Behaviour Questionnaire and add new items that are deemed suitable with Indonesian current motorcyclist behaviour based on the preliminary study and previous study discussed through Focus Group Discussion with experts.
4. Distribution of questionnaire will takes place in Surabaya and its surrounding.

2.1.2 Limitation

1. Data collection will be conducted in a certain period and is only valid in a certain period.
2. This study will not refer to another type of survey other than the MRBQ.
3. The number of the population is limited by the total population of riders in Indonesia.
4. Response bias due to online-based questionnaire with sets of questions. It might affect the consistency of the answer, therefore the researcher try to contact the respondent via online class, video conferencing or video call to reduce ambiguity and inconsistency answer.
5. Social desirability bias may be caused by a person who gives wrong information by giving more favourable answer. Therefore, a detailed explanation on the objective of the study and the importance of the respondents' contribution to the study will be given to the respondents before conducting the questionnaire survey.
6. The number of questions is limited to explaining the behaviour of motorcyclists in detail. However, limiting the questions is needed to prevent respondents from fatigue or boredom that can cause bias information.

3 Methodology

3.1 Participants

According to Surabaya Police Department (2016), there were 427,587 registered driving licence of Type C (driving licence for motorcyclists) for people aged 18 - 25 years old in 2015. The participants were selected using inclusion criteria of having provisional or full Type C driving license. The sample size was determined through single population proportion formula of one sample with a dichotomous outcome variable. Based on Pratiwi and Rahman (2016), the proportion of motorcyclist crash involvement during 2016 was 47.4% with the desired margin of 0.05. There should be at least 383 participants selected based on sampling formula from the corresponding area.

3.2 Instruments

3.2.1 Motorcycle Rider Behaviour Questionnaire (MRBQ)

The original Motorcycle Rider Behaviour Questionnaire (MRBQ) developed by Elliot et al. (2007) has been modified based on the studies related to motorcyclist behaviour in Indonesia. The example of modification was provided from the previous study of Leksmono (2014) discussing the behavioural factors through Focus Group Discussion by experts in Tarumanegara University. The Likert scale was used to measure each factor in the questionnaire by dividing into 5 statement categories: never (1), rarely (2), occasionally (3), sometimes (4), almost always (5). This study also aims to define the social norms and values from Indonesian motorcyclists.

The modification of items from the original MRBQ of Elliot et al. (2007) was made in several question items on the Indonesian version of MRBQ. Preliminary survey using field observation would also help the modification of MRBQ factors by adding the more contextual factors for riders' behaviour in Indonesia. The modification of the MRBQ based on the literature review is shown in Table 4 in the Annex. For example, items 8 are added since Indonesia is a left-side driving country and it is quite often for people to overtake from the left side; Item 14 "Exceed the speed limit on a country/rural road", Item 16 "Exceed the speed limit on a motorway", and Item 17 "Exceed the speed

limit on a residential road" are modified from the original MRBQ into "Exceed the speed limit on an arterial/ urban road" and "Exceed the speed limit on a local/rural road". Items 27, 28, 29, 30, 31, 32, 33, 34, 39, 42, 43 are not included in the Indonesian version because there are no regulations related to protective clothes and their properties. To compensate lost items, items 31, 32, 33, 35, 36 are added related to helmet usage and passengers' safety protection, which is more common in Indonesia. Item 41 is excluded due to the assumption of low loadings of factors since it is not common to ride under alcohol influences in Indonesia and the compensation is exerted in Item 30; "Ride when taking drugs or medications which might have effects on your riding". Other items added are available in Table 4 in the Annex, such as numbers 25, 26, 27, 28, 29 since these violations are common in Indonesia so it is expected to have high loadings to predict risky behaviour.

3.2.2 Social Norms

The social norms section provided in Table 4 in the Annex is also modified by involving factors related to traffic violations caused by social norm breaches. There are 7 items related to social norms which respondents experience implicitly or explicitly exerted by other riders such as friends or colleague. In this study, the variables were taken based on the previous study of Susilo et al. (2015) and then modified to contextual condition. For instance, the social norms related to the safety protection, where Indonesians are more likely to not wearing helmet since it will destroy their fashion style, and also related to honking behavior which sometimes more likely to be done just to annoy their peers. In this study, there are 6 items related to social norms which express in negative connotation. These items was divided into 3 exogeneous variables which are perceived others on speeding, perceived others on helmet usage, and perceived others on disregarding the rules (moral obligation). In this section, the participants will express their agreement or disagreement on a 5-point Likert scale.

3.2.3 Attitude towards safety

The attitude towards unsafe riding provided in Table 5 in the Annex was added by involving 5 items adopted from Wong et al. (2010) and modifying to the contextual condition in Indonesia through preliminary survey from field observation and supported by previous study of Pratiwi and Rahman (2016). The factors covered topics of speed, driving in opposite way (Wong et al., 2010), and multitasking driving i.e. using maps or answering phone call. In this current study there are 6 items about attitude towards safety which express in negative connotation. These items was then will be divided into 2 exogenous variables which are perceived danger of disregarded rules and perceived danger in speeding as these two perception is the most common influence for riders (Sukor et al. 2016). The participants will express their agreement or disagreement on 5-point Likert scale from "strongly agree" and "strongly disagree".

3.2.4 Socio-demography, trip characteristics and crash exposure history

The questionnaire included general socio-demographic characteristics of the rider, such as gender, age, education level, employment status, motorcycle ownership (the number and type of motorcycle), type of driving licence owned, and riding experience. The trip characteristic questions will be distinguished between weekdays and weekends, which comprise the number of trips made, the purpose of trips, and hours and kilometres of riding. The participants will also provide information related to their motorcycle crashes and near-crash experience for the past 12 months. Any traffic violation that the participants commit during the past 12 months will also be considered. Finally, the participants will have to respond to questions related to the national traffic law of speed regulation.

3.2.5 Translation and Pilot Study

The translation process from the original questionnaire into the official national language of the country, Bahasa Indonesia, was done through back translating method with a professional lecturer in National University. It is a procedure where a translator interprets a document that has been

translated into another language back to the original language. The researcher explained the orientation and purpose of the study to the lecturer. However, it was difficult to translate the English version of MRBQ into Indonesian version since there are a lot of discrepancies and inequivalent meaning. For instance, the word "wheelie" would be difficult to understand if translated directly to Bahasa Indonesia. Another example is the usage of terms "delay in noticing the front vehicle when opening door suddenly", where if the full sentence is directly translated to Bahasa Indonesia, it will create ambiguities and lead to another perception. Therefore, instead of dictionary meanings, the researchers tried to modify the language based on contextual meanings to obtain more logical question items. Under the supervision of a local lecturer, each question item is assessed for its meaning both in English and in Bahasa Indonesia to obtain more equivalent contextual meanings.

During the pilot study, 50 participants took part and the study was conducted by the help of a local lecturer in Sepuluh Nopember Institute of Technology. However, the orientation and purpose were delivered by the local lecturer to the students of Sepuluh Nopember Institute of Technology. Besides, the questionnaire contains explanation on the orientation and purpose of the study on the first page. The participants must read it before they agreed to proceed to the questionnaire itself. The respondents will have to answer the initial Indonesian Version of MRBQ online depending on the respondent's preferences.

3.3 Procedure

The online-based questionnaire will be distributed to participant in Jawa. Several questionnaires will be distributed to the university student of Sepuluh Nopember Institute of Technology via pdf reader file. Another participant were student of high school and young officer in several offices in Jawa. Data was collected during weekdays and working time. Before conducting the questionnaire survey, the researcher will conduct preliminary survey through field observation to obtain the general picture of the rider's behaviour and also to adjust the MRBQ factors to be more contextual with the Indonesian motorcyclists. The preliminary survey will generally cover spots in Surabaya and Yogyakarta.

Data collection will be carried out by the researcher with the help of a lecturer in Sepuluh Nopember Institute of Technology. Several other participants were approached through online meeting or online conference via google meet and zoom to delivered the instruction of the questionnaire. Meanwhile the rest of participant are willing to fulfilled the questionnaire via google docs. During the data collection, the participants will be approached if they are willing to voluntarily take part in the study. An informed consent form will be attached on to the first page of the questionnaire that will explain the orientation and purpose of the study. The confidentiality of the participants' data will be assured since they do not have to share any private data (e.g. name or telephone number). The approximate time to fulfil the data was between 15 to 20 minutes. Sticker of road safety awareness will be given to compensate their contribution.

3.4 Data Handling and Analysis

The data obtained will first be handled by treating the number of cases with missing data. Stephen et al. (2017) stated that the cases with over 10% missing responses, which means four or more missing items, should be removed from further analysis. However, if the missing responses are under 10%, the 5% trimmed values could replace the missing values. Descriptive statistics to find the frequency, mean, and standards deviation will also be used to define the characteristics of sample.

The first step after treating the data is testing the MRBQ model using CFA through AMOS. software. In order to explore the stuctural factor, the fit of structural factor were tested via confirmatory factor analysis based on previous study in United Kingdom and Turkey (Sakashita, 2014). However, it is stated in Stephen et al. (2017) that the original model fit indicates a consistent lack of fit (Thompson, 2004; Hu & Bentler, 1998). Therefore, the new model of factor structure should be respecified through exploratory factor analysis. The factor structure of MRBQ will be

respecified by Principal Axis Factoring (PAF) with a direct Oblimin rotation that will take correlated factors into account. It will also estimate the correlation among latent variables. The last step is to test the general structural model that indicates the relationship among latent variables using AMOS software. Structural path analysis will be used as model fit test to the proposed model.

4 Results

4.1 Descriptive Statistics

Out of the total of 420 approached respondents, the actual participants are 417 respondents which results in a 95% response rate. The sample characteristics are displayed (see Table 1). The majority of the participants are male (56.10%) aged between 24-25 years. Regarding the educational level, most of the respondents (62.40%) are reported having above the university level. Most of the riders also have a motorcycle riding license (56.80%) or even have a combination of both car and motorcycle riding licenses (29.80%). There are almost 82% of respondents who have ridden a motorcycle for less than 10 years. It means that there were some of them who started using motorcycle underage. However, there are still riders who do not have motorcycle riding license (14.20%) out of all respondents. The common type of motorcycle used by young adult riders is Automatic Transmission type (73.90%). Moreover, the average weekly kilometers is stated that almost 73% (SD=20.84) of the sample is reported riding less than 20 km during the weekday, while during the weekend it decreases to less than 66% (SD=22.26). Most of the riders are full-time employees (47.80%), followed by students (39.40%). Thus during weekdays, the main reason for riding a motorcycle is commuting and followed by travel for education purposes.

When it comes to the history of fines, there are 11.70% of respondents who have received a traffic violation due to committed offenses while riding a motorcycle in the past 12 months. Almost half of the respondents (48%) have been reported to have near-crash experience within the past 12 months. Moreover, 11.90% of samples have been recorded to be involved in a motorcycle crash in the past 12 months. The descriptive statistics and reliability for all variables included in the study (see Table). All variables except safety and stunts indicates acceptable internal consistency reliability which has a value of Cronbach alpha more than commonly regard standard (Cronbach Alpha > 0.70). However, as recommended by Schmitt (1996), considering the items number in a given dimension, it then does not need to use an alpha standard above 0.07. Thus, if the variables contain a small number of items, for instance, the safety variable which only has 5 items and stunts variables which only have 4 items, they will be expected to have lower alpha value.

Table 1 Descriptive statistics as the result of the study

	Min	Max	Mean	Std. Deviation	Skewness	Kurtosis	Cronbach Alpha
Attitudes	1	5	2.35	0.502	-0.1	0.42	0.77
Social norm	1	5	1.97	0.476	0.36	-0.51	0.77
Error	1	5	2.45	0.648	0.1	-0.01	0.76
Violation	1	5	3.89	0.742	0.04	-0.3	0.79
Safety	1	5	1.49	0.286	0.48	0.19	0.55
Stunts	1	5	1.06	0.780	5.53	3.82	0.37

4.2 Correlation among variables

A simple bivariate correlation among major variables is calculated (see Table). It shows that a negative attitude towards safety is significantly correlated with four variables of aberrant behavior.

Specifically, it shows that riders with a high score in negative attitudes are reported having a higher score in violation since they have the highest correlation among other variables (r=0.600, p<0.01). It also shows that negative social norms on safety are significantly correlated with three out of four variables of proximal context. Motorcycle riders with a high score in negative social norms are reported to have a higher score in violation (r=0.452, p<0.01), error variables (r=0.353, p<0.01), and safety violation variables (r=0.268, p<0.01). Specifically, riders with a negative influence on social norms towards safety are more likely to gain errors and violations. Similarly, negative attitudes also reveal a significant correlation with all variables of MRBQ and also positive correlation towards the history of traffic crash involvement (r=0.167, p<0.01). It means higher negative attitude towards safety are more likely to engage with violation or near-crash or crash involvement during past 12 months. Meanwhile, there are three out of four variables of MRBQ are highly correlated with traffic crash involvement, unless performing stunt variable. In the context of socio-demographic variables, it also reveals that they have a significant link with attitude and social norms. In regards to gender, it shows that men have a higher negative attitude and negative influence on social norms towards safety value than women. Meanwhile, men are also reported to have higher score in violation (r=-0.232, p<0.01) and performing stunts while riding (r=-0.199, p<0.01). Similarly, in regards to age, the older participants are performed high score in performing accepting negative influence on social norms towards safety (r=0.107, P<0.05). On the other hand, younger participants show having a higher score in performing errors while riding. Not to mention that age also has a significant correlation with the history of crash involvement (r=-0.157, p<0.01) where younger participants have tended to encounter more crash involvement during the past 12 months. Statistically, all variables that are significantly correlated with one another have a weak relationship among others since they only have a coefficient between 0.1 until 0.6 (Suryani and Hendrayadi, 2015).

Table 2 Bivariate correlation among major variables

	Gender	Age	Years of Riding	Travel Pattern	Neg SocNorm	Neg Att	Error	Violation	Stunt	Safety	Output
Gender	1										
Age	.098*	1									
Years of Riding	.162**	.555**	1								
Travel Pattern	.114*	.139**	.231**	1							
Neg SocNorm	-106*	.107*	.037	.086	1						
NegAtt	-.192**	-.027	.024	-.068	.449**	1					
Error	.005	-.161**	.051	.007	.353**	.373**	1				
Violation	-.232**	-.085	.143**	.057	.452**	.600**	.564**	1			
Stunt	-.199**	-.065	.006	.057	.009	.146**	.049	.162**	1		
Safety	.078	.045	-.022	.01	.268**	.368**	.330**	.466**	.081	1	
Output	.016	-.157**	-.122*	.054	-.061	.167**	.236**	.159**	.009	.216**	1

Correlation is significant at 0.01 level (2-tailed)**

Correlation is significant at 0.05 level (2-tailed)*

4.3 Factor Analysis

The most frequent aberrant behavior reported by riders in this study is related to violating the traffic rules. For an instance, from an average score in the range of 1 = never to 5 = almost all the time, it is found that three highest items score are: item 30 ‘exceed the speed limit on a local/rural road’ (M= 3.79 ± 0.053); item 31 ‘race away from traffic lights to beat the driver/rider next to you’

(M=3.47± 0.055), and item 32 'riding between two lanes of fast-moving traffic' (M=3.23± 0.060). On the other hand, the three lowest scoring items are related to performing stunts: item 26 'smoking while riding' (M=1.20± 0.031); item 21 'intentionally do a wheel spin' (M=1.09± 0.021); item 20 'attempt to do, or actually do, a wheelie' (M=1.07± 0.018).

A confirmatory factor analysis (CFA) is carried out before exploring the factor structure for MRBQ among young adult drivers in Indonesia. CFA will examine the fit of the factor structure that has been found in the previous study by Elliot et al. (2007). Based on Elliot's model, the following indicators (see table 8 Annex) are used for each of the five factors: traffic errors (1, 2, 3, 4, 6, 8, 28, 32): control errors (6, 9, 14, 15, 16, 29, 30, 31): speed violations (7, 9, 10, 11, 12, 17, 18, 19): stunts (20, 21): and safety (36, 38). It is found that there is only less than 1% of the data that is missing and random. Therefore, there is no missing data treatment that is executed, and a conservative methodology of listwise deletion is carried out. CFA is executed in maximum likelihood estimation. The result is found significantly (λ^2= 1636.691) with the root-mean-square errors of approximation (RMSEA= .06) that are less than 0.1 as the standard of the goodness of fit criteria, and GFI of 0.82 which is also lower than 0.9. However, the value of NFI and CFI are respectively 0.62 and 0.73 which are lower than the criteria of Goodness of Fit (0.9). This model consistently indicates a lack of fit (Thompson, 2004). Therefore, a new model should be re-identified using exploratory factor analysis.

The initial PAF produces ten factors that have eigenvalues larger than 1, however the parallel analysis of Monte Carlo is also carried out in SPSS (O'Connor, 2000; Stephen et al., 2017) and indicates four factors to be the most appropriate model (Sakashita et al., 2014). Furthermore, PAF uses direct oblimin rotation that is executed on 39 items retaining on four factors of MRBQ. Consistently with another two studies (Elliot et al., 2007; Ozkan et al., 2012), only items with the loading of 0.35 or more will be kept for further analysis (Stephen et al., 2017).

The four-factor analysis is examined through Principal Axis Factoring (PAF). Items which have low loading factor (items 3,17, 28 <0.3 and 4, 27, 37<0.35) is excluded from the model. Based on 33 items (see Table 3), KMO and Bartlett's Test show a measure of KMO *Measure of sampling adequacy* (MSA) 0.852 which means that the sample is adequate to represent the factor analysis ('>0.5). Moreover, the value of KMO and Bartlett's test is indicated by 3735.23 chi-squares with 0.00 significance. This means that there is a correlation among variables and it is suitable for factor analysis. Based on item-interrelationship that is examined through anti-image matrices, there are not any significant relationships among each item. Therefore, all 33 items can be included in further analysis.

However, due to the similarity of the previous study, some factors are retained unless protective gears are renamed into 'safety violation'. Factor 1 contains 14 items which can explain 17.92% of the total variance. There are 9 items where all is from the traffic error factor and 7 items from control error (Elliot et al., 2007; Sexton et al.,2004). Yet, based on Sakashita et al. (2014) all 14 items are all from error factor. There is an agreement from previous studies (Elliot el al., 2007; Secton et al., 2004; Ozkan et al., 2012) that state that these 14 items belong to the MRBQ factor related to errors. Factor 2 can explain 5.88% of the total variance of the scale and contains 10 items in which six of them are from the speed violation factor (Elliot et al., 2007). Meanwhile, the other six items are additional items related to a traffic violation that is highly correlated with riders' behavior in the contextual area. Factor 3 explains 3.67% of the total variance and contains 6 items which only two of them are from protective gear factor from Sakashita et al. (2014). This factor is highly correlated with violating protective gear. Factor 4 accounts for 4.37% of the total variance and contains 3 items, which two of them are originally from stunts factor (Elliot et al., 2007; Sexton et al., 2004)

Based on the composite scores on each factor that represents the average summed items, the violation factors are the most frequent behavior that is reported in this study (M = 3.89 ± 0.487), followed by the error factor (M = 2.45 ± 0.393). However, safety violations and stunts are rare to be performed by young adult riders in Indonesia. Furthermore, regarding the correlation among factors, it shows that all factors share weak relationships. It means that they share several commonalities but remain independent in structure. The strongest relationship is found between errors and safety

violations (r=0.365). Safety gear violation is not related to errors and stunts, therefore it means that fault on riding behaviors is not correlated with the safety gear riders wear.

Table 3 Factor structure of the MRBQ items

		Factor			
		Error	Violation	Safety gear violation	Stunts
Q24	Attempt to overtake from the left side	0.758			
Q35	Failed to notice or anticipate another vehicle pulling out in front of you and had difficulty stopping	0.595			
Q51	Ride so fast into a corner that you scare yourself	0.592			
Q28	Ride so fast into a corner that you feel like you might lose control	0.552			
Q26	Ride so close to the vehicle in front that it would be difficult to stop in an emergency	0.532			
Q49	Find that you have difficulty controlling the bike when riding at speed	0.523			
Q27	Delay in noticing to in the front car when the opening door suddenly	0.517			
Q21	Queuing to turn left on the main road, you pay such close attention to the main traffic that you nearly hit the vehicle in front	0.517			
Q33	Not noticed someone stepping out from behind a parked vehicle until it is nearly too late	0.501			
Q34	Pulled out on to the main road in front of a vehicle you hadn't noticed or whose speed you misjudged	0.489			
Q50	Skid on a wet road or manhole cover	0.466			
Q48	Run wide when going around a corner	0.454			
Q25	Find it difficult to stop in time when a traffic light has turned against you	0.431			
Q20	Failed to notice that pedestrians are crossing when turning into a side street from the main road	0.412			
Q29	Exceed the speed limit on an arterial/ urban road		0.782		
Q37	Disregard the speed limit late at night or in the early hours of the morning		0.716		
Q30	Exceed the speed limit on a local/rural road		0.710		
Q31	Race away from traffic lights to beat the driver/rider next to you		0.538		
Q32	Riding between two lanes of fast-moving traffic		0.522		
Q38	Get involved in unofficial 'races' with other riders or drivers		0.462		
Q42	Riding in the opposite direction of the roadway		0.415		
Q41	Cross junction when the traffic light is red		0.404		
Q54	Chatting with other riders/passengers while driving		0.384		
Q44	Call/texting with a mobile phone while riding		0.360		
Q43	Riding in sidewalk		0.351		
Q57	Riding without helmet			0.669	
Q58	Carry a passenger who has not worn a helmet			0.637	
Q53	Carry more than one passenger with your motorcycle			0.518	
Q52	Carry a large carriage with motorcycle			0.449	
Q55	Using helmet without chin straps or not fastening it			0.365	
Q39	Attempt to do, or actually do, a wheelie				0.758
Q40	Intentionally do a wheel spin				0.747
Q45	Smoking while riding				0.425

4.4 Factors affect violations and accident (contextual mediated model)

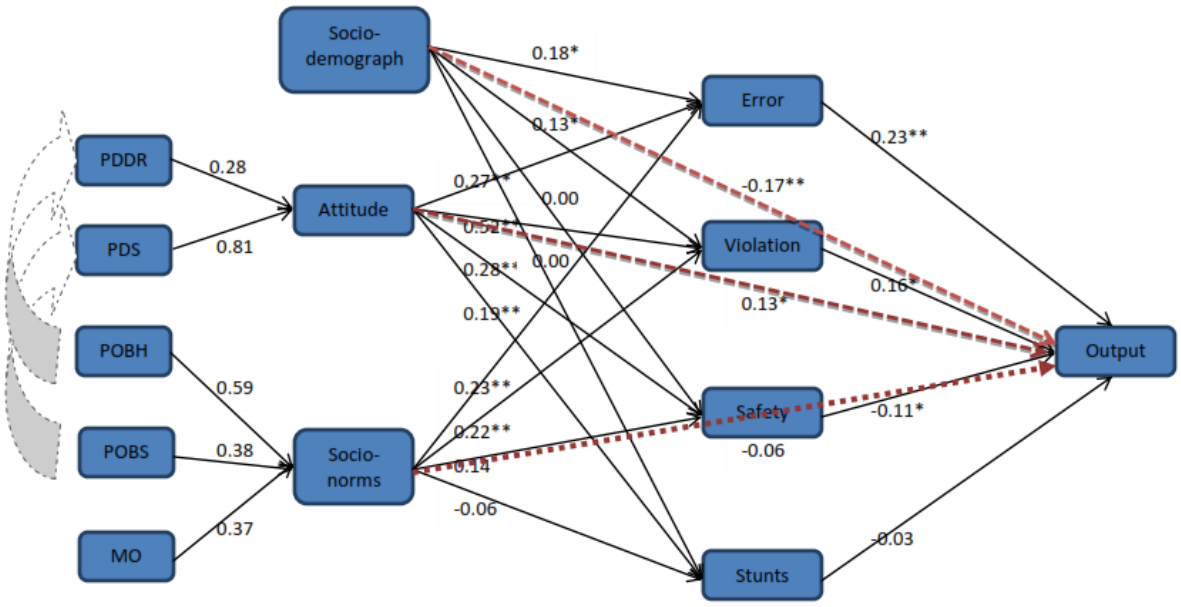

Figure 2 Final path model of contextual mediated analysis

Significant paths obtained at p<0.05 *
Significant path obtained at p<0.01 **
The dashed lines were presenting the indirect correlation between distal context and outcomes

The path modeling analysis is examined to investigate the hypothesized model where socio-demographic, negative social norms on safety and negative attitude towards safety can affect the riders' crash involvement as a distal context through MRBQ factors as proximal factors which consist of 4 main variables. The number of samples can affect the estimation method of the model. In this study, the sample is less than 500 respondents. Therefore, to estimate the models, it can use maximum likelihood and generalized least square method. The maximum likelihood method is used to examine path coefficients. The coefficient itself is examined for its significance at p<0.05, p<0.01, and -<0.001. The regression analysis is performed to test the predictive role of attitude and social norms by controlling the age, gender, and years of riding as socio-demographic variables.

The final modification of path model is hypothesized that negative attitudes towards safety and negative influence on social norms towards safety can predict self-report crash involvement directly and also through the effects of risky riding behavior (see Figure). The paths between risky riding behavior measures and self-reported crash or violation involvement show that MRBQ errors are the highest percentage of variance (β=.23, p<0.001) in the outcome measures. The second highest variable that contributes to percentage variance in violation or crashes involvement is MRBQ violation (β=.16, p<0.05) which is then followed by MRBQ safety (β=.11, p<0.05). While the path between distal context and proximal context is considered, it shows that a negative attitude towards safety is affected by all variables in risky riding behavior. Negative attitude towards safety has the highest percentage of variance in the MRBQ violation measures (β=.52, p<0.001), which is then followed by the percentage of variance in the MRBQ safety variables (β=.28, p<0.001). Similarly, a negative attitude towards safety also has a significant effect on MRBQ errors as they present a percentage of the variance of 27% (p<0.001). More specifically, motorcycle riders with a negative attitude towards safety are more likely to commit errors. Likewise, negative attitudes also present the percentage of the variance of 19% towards MRBQ stunt variables. Another distal context where socio-demographic also has a significant effect on two variables of risky riding behaviors. They are MRBQ error (β=.18, p<0.05) and MRBQ violation variables of 13.4% (p<0.05). Moreover, the effect

of negative influence on social norms towards safety is found significantly affecting the error scale (β=.23, p<0.001) and violation scale (β=.22, p<0.001).

Surprisingly, as far as the relationship between distal context and outcome measures, a socio-demographic item which controls based on age, gender, and years of riding has a significant effect on the outcome by 17% of the variance (β=-.17, p<0.001) in the outcome measures. Another direct network of distal context is found between negative attitude and the outcome (β=.13, p<0.05). More specifically, riders with a negative attitude towards safety are more likely to encounter a crash or violation while riding a motorcycle.

The model used in this study is also examined its goodness of fit based on the cut off value of several criteria (see Table 4). The first criteria's cut off value is chi-square which demands to be as least as possible. The least chi-square means that there is not a significant difference between predicted matrix covariance and the observed data. In this study, the value of chi-square is 53.331 (N=411; d.o.f = 20; p<0.001). Another criteria that are shown by the models are; the goodness of fit index (GFI=.97), the comparative fit index (CFI=.97), the adjusted goodness of fit (AGFI=.92), the normed fit index (NFI=.95), the root mean square residual (RMSR=.80), and the root mean square error of approximation (RMSEA=.06). Moreover, the result of the final model supports the hypothesized theory of a contextual mediated model where negative attitudes and negative influences in social norms can predict the self-report crash or violation involvement through the risky riding behavior variables.

Table 4 Interpretation of the Goodness-of-fit of the final model

Criteria GOF	***Cut off Value***	**Model**	**Interpretation**
GFI	> 0.9	0.97	Fit
AGFI	> 0.9	0.92	Fit
RMSEA	< 0.1	0.06	Fit
RMR	< 0.05	0.8	Lack of fit
NFI	> 0.9	0.95	Fit
CFI	> 0.9	0.97	Fit

The standardized direct effect between distal context and outcome is also examined. Based on the result of the model (see Table 5), it is found that a negative attitude towards safety has a positive direct correlation with a standardized value of 0.13 towards the outcome. Specifically, it means that when the negative attitude towards safety increases, then the number of self-reported violations or crashes will increase as well. Meanwhile, a lower score of negative influence on social norms towards safety and socio-demographic will be associated with higher variance in the outcome of self-reported violation or crashes with the standardized value of -0.064 and -0.18 respectively. As far as the indirect path, it shows that there is a reduction value on all three variables. The negative attitude towards safety decreases to 0.06, while variables of negative social norms towards safety and variable of socio-demographic do not only decrease to 0.027 and 0.052 but also they change the direction of correlation. However, the total value shows that the variable of socio-demographic and negative influence on social norms towards safety return into negative and decrease into -0.15 and -0.01 respectively. Meanwhile, the variable of negative attitude towards safety increases in total value from standardized direct value into 0.19. It means that the mediated variable in which the contents of four major risky riding behavior can increase the positive function of negative attitude towards safety variable to the reported violations or crashes. On the other hand, the mediated variable will weaken the function of negative social norms towards safety and socio-demographics towards the driving outcome which is indicated by value reduction and change of correlation's direction.

It is also worth mentioning that exogenous factors are to built distal factors in consideration of their impact on the variables of negative attitude and negative influence on social norms towards

safety. There are found that perceived danger of disregarding rules is correlated with perceived others on helmet usage, while the perceived danger of speeding is linked to perceived others on speeding.

Table 5 Direct,indirect, and total effects of distal context towards self-reported violations, near-crashes, and crashes during 12 months

	Socio demographic	Negative Attitude	Negative Social Norm
Direct	-0.177	0.13	-0.064
Indirect	0.027	0.059	0.052
Total	-0.15	0.189	-0.013

5 Discussion

In this study, the observation on psychometric properties of MRBQ among young adult riders in Indonesia is undertaken. As a result of the factor analysis, these current outcomes are not consistent with factor structure that is found in the previous study in terms of self-reported traffic violations and crashes among experienced motorcycle riders in Turkey and the United Kingdom (Ozkan et al., 2012; Elliot et al., 2007). The five factors that are presented among experienced motorcycle riders in the previous study are not able to reflect the sample in Indonesian young adult riders. The four-factors structure as found in Sakashita et al. (2016) shows to be the most appropriate. The four factors are errors, violations, stunts, and safety gear violations. It is previously found that there is a distinction between control errors and traffic errors (Elliot et al., 2007; Ozkan et al., 2012) which is not proven in this study, and those two scales are loaded into single errors scale.

Among 39 items are formulated in the four-factor solution. 6 items are dropped due to low loadings. In the current study, 14 factors associates with errors based on the previous study of Sakashita et al. (2016) are all used with 2 other additional items that are commonly performed by young riders in Indonesia; “Find it difficult to stop in time when a traffic light has turned against you” and “attempt to overtake from the left side”. There are 2 items are dropped due to low loadings. While in violation factors that contain 12 factors, 6 items are associated with speed violation in the previous study, yet the other 6 items are applied since it is highly correlated with young adult riders in Indonesia. Two items are dropped. One of them is “another driver deliberately annoys you or puts you at risk” since this item is related to the emotional response of another respondent when other items are closely related to their behavior. It might not be too reliably across riders since this item is such an emotional reaction. However, this item is involved in a speed violations factors based on the Turkish study. Yet it is still an paradoxical item due to cross-loadings between speed violations and control errors (Ozkan et al., 2012). As for the factors of safety, there are only 2 items that are originally cited from the previous study, while the 4 other items are related to safety gear rules that are commonly violated by adult riders in Indonesia. One item is dropped due to loadings which is “riding with an impaired motorcycle”. This might caused by lots of Indonesian youths that demand brand-new motorcycles that have higher performance than the old one. Regarding the stunt factors, there are only 2 items that are originally found in the previous study (Elliot et al., 2007; Ozkan et al., 2012) from 3 remained items. Out of four factors, only stunts factor which is not significantly correlated with the self –reported violation or crashes.

Considering the individual items, it shows that the most frequent behavior done by young adult riders in Indonesia is related to speed violation, particularly in “exceeding the speed limit on a local/rural road” (item 11), which is unsurprising as there are not any specific rules regarding the speed limit on a local road. Similarly, riders reported nearly always to “race away from traffic lights to beat the driver or rider next to them” (item 12) which commonly happens since young riders have a high socio-emotional system that causes them to feel triggered with the situation. In contrast, behaviors that are rarely undertaken are related to performing stunts, including an item on the “attempt to do, or actually do, a wheelie” (item 20) and “intentionally do a wheel spin” (item 21) which is not surprising since the most common type of motorcycle among young riders is Automatic Transmission type which can not support riders to attempt any kind of stunts.

As a result of the path analysis, it illustrates that the overall fit of the observed data can explain the tested theoretical model. This study also provides evidence by replicating the previous study related to the relationship among negative attitudes towards safety, the effect of social norms, and socio-demographic factors towards driving outcomes. The negative attitudes towards safety and socio-demographic safety show a direct effect on proximal variables of MRBQ factors as well as an indirect effect on driving outcomes. The negative attitudes towards safety link significantly towards all factors of aberrant behavior, particularly to the violations factors. This is in line with the previous findings which are mentioned that attitude towards safety is a crucial predictor of riding behavior. (De Palsmakers and Janssens, 2007; Iversen, 2004; Elliot and Thompson, 2010; Ulleberg and Rundmo, 2003; Paris and Broucke, 2008; Carpentier et al., 2014).

The correlation between riders' socio-demographic characteristics and MRBQ makes it conceivable to link profiles of riders that likely to engage with aberrant behaviors. In this study, the variable of socio-demographic is summed of age, gender, and years of riding which show a significant effect on risky behavior. This action is taken since SEM can not receive ordinal data, thus the relationship on each variable is then rechecked through bivariate correlation. As described in the bivariate correlation too, male riders are reported to have more frequent violation and performing stunts while riding compared to female riders. This finding is supported by the previous findings from young novice riders in Australia (Sakashita et al., 2014). This may be because of their over-eagerness on compromising their risky behavior compared to female riders (Wong et al., 2010; Chang and Yeh, 2006). Our results also show that younger riders with fewer riding experiences are more associated with errors and violations. It is supported by the previous findings where younger riders with lower driving experience tend to underestimate the risk or accept it as the consequence of sensation experience (Susilo et al., 2015). Meanwhile, the correlation of negative influence on social norms towards safety can be performed in this model where they significantly affect errors and violations. Similarly, the findings on Normative Social Theory (Asch, 1995) that argues social factors and perception of others' actions can influence an individual's behavior.

While the paths between proximal context and the driving outcomes are concerned. MRBQ errors appear to contribute the highest share (β=0.23, $p<0.001$) followed by MRBQ violations (β=0.16, $p<0.05$), and other items from MRBQ safety (β=-0.11, $p<0.05$). This finding is also supported by the outcomes from UK studies and Australian novice riders where errors and violation scales are significantly correlated with the self-reported crash and near-crash (Af Wahlberg, Dorn, & Kline, 2011; De Winter & Dodou, 2010; Sakashita, 2014). The safety gears violation is also considered to have a significant correlation with driving outcomes which have been supported by the findings from Sakashita et al (2014) where negative correlation is found between protective gear scale and self-reported crashes and violations. This means that riders who use the protective gear more frequently will have fewer cases of violations and crashes (Sakashita et al., 2014). While the stunts are the only risky riding behaviors factors that are associated with crash involvement as reported in Stephen et al (2017). It is contradictory to this current study since it is found that there is no correlation between stunts and self-reported crashes. The unsupported type of motorcycle which commonly used by young riders (73.90%), Automatic Transmission motorcycle might affect them to not able to perform stunts while riding. Therefore it is not significantly correlated with the outcome.

As observed in the final model, the fact that not all distal variables can not predict driving outcomes directly. It also will support the theory of the contextual mediated model. Considering the indirect effect from the negative influence of social norms towards safety, this study proves the contextual mediated model, labeling that social norms like perceived other behavior on speeding, perceived behavior towards helmet usage, and perceived behavior on moral disregarding rules affect self-reported crashes and violations via aberrant driving behavior, particularly in errors and violations scale as it is significantly correlated with being supported in bivariate correlation result too.

6 Conclusion and Practical Recommendation

The present study examines both structural factors of MRBQ and testing the hypothesized model where socio-demographic, negative social norms on safety and negative attitude towards safety can affect the riders' crash involvement as a distal context, through MRBQ factors as a proximal factor.

A four-factor structure model that consists of errors, violations, safety gear violations, and stunts are found to be the most appropriate model to represent the sample. However, the present result is not consistent with the previous findings of the five-factor structure and its predictive validity towards self-reported crashes among experienced riders in Turkey and UK (Ozkan et al., 2012; Elliot et al., 2007). The present finding also shows an inconsistency in allocating the structural factors since this study contents many additional items that are related to the contextual area with limited numbers of respondents compare to sample of previous study. Therefore, this result has limited validity and reliability. Another limitation on this current result is the bias response from the participants due to online-based data collection. The abundant amount of MRBQ items and another items form questionnaire might affect their consistency on answering the questionnaire truthfully. Therefore, for further research it will be useful to validate the result via paper-based and direct instruction to the participant. Moreover, it will also be useful to refine MRBQ items for young adult riders in Indonesia to increase validity before using the MRBQ instrument widely. In particular, it is needed to improve the measure of behavior in errors, violations, and safety gear usage because, in the contextual area, these behaviors are exhibited quite often and proven to lead into a crash.

As the results of the path analysis, the findings in the present study have both practical implications and theoretical statements. Theoretically, present findings succeed to adopt a contextual mediated model that links between distal context towards driving outcomes indirectly via the proximal context of MRBQ items. Until now, there is no previous study that uses this model to predict traffic violations or crashes among young adult riders in Indonesia. This current study also serves as the first research in understanding social norms and attitudes that affect the underlying risky behavior of the riders in the contextual area. A practical implication of this current study will be understanding the importance of socio-cognitive variables such as social norms influence and attitude towards safety, in order to establish the road-safety campaign or the decision on traffic rules and laws. Interventions that encompass the social groupings within the social environment (Ward et al., 2010) have proven to be more effective than classical punishments. The message which contents positive perception of social norms like “most Indonesian young riders, do not ride above 50 km/hour” can lead to influence riders to follow what it says as the perception of the community. Moreover, training and traffic safety curriculum can also be applied in high school or university before obtaining any license to ride a motorcycle. This method will strengthen the value of the social norm for young adult riders as this method will address the misperceived norms and eventually produce safety-related behavioral norms.

So far, it is the best option to understand traffic psychology in Indonesia since it is too infant to use another intelligence monitoring as road safety technology. Another implication of this study is that we can adapt the method of GDLP (Graduate Driving Licence Program) in Europe where riders have to follow 3 main stages before obtaining the driving license. It can start from a learner’s permit by allowing young riders to practice their riding skills and safe riding practices under full-supervision. In this stage, parents will play an important role to strengthen the safety-related behavioral norms. The second stage is the intermediate license where young riders are allowed to practice under restricted conditions. During the stage, the government, teachers, and friends have a role to support the safety perception. Lastly, it is the full license that allows riders to have unlimited riding privileges where the government plays an important role to maintain safety-related behavioral norms.

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8 Annex

Table 6 Indonesian Version of MRBQ items

	Items	Never	Rarely	Occasionally	Sometimes	Almost always
1	Fail to notice that pedestrians are crossing when turning into a side street from the main road	1	2	3	4	5
2	Not notice someone stepping out from behind a parked vehicle until it is nearly too late	1	2	3	4	5
3	Pull out on to the main road in front of a vehicle you hadn't noticed or whose speed you misjudged	1	2	3	4	5
4	Fail to notice or anticipate another vehicle pulling out in front of you and had difficulty stopping	1	2	3	4	5
5	While queuing to turn left from the main road, you pay such close attention to the main traffic that you nearly hit the vehicle in front	1	2	3	4	5
6	Realise that vehicle in front has slowed and have to brake hard to avoid collision	1	2	3	4	5
7	Attempt to overtake someone that you had not noticed to be signalling a right turn	1	2	3	4	5
8	Attempt to overtake someone from the left side	1	2	3	4	5
9	Find it difficult to stop in time when a traffic light has turned against you	1	2	3	4	5
10	Ride so close to the vehicle in front that it would be difficult to stop in an emergency	1	2	3	4	5
11	Run wide when going round a corner	1	2	3	4	5
12	Find that you have difficulty controlling the motorcycle when riding at speed	1	2	3	4	5
13	Skid on a wet road or manhole cover	1	2	3	4	5
14	Another driver deliberately annoys you or puts you at risk	1	2	3	4	5
15	Carry a large carriage with motorcycle	1	2	3	4	5
16	Delay in noticing to the front car when opening door suddenly	1	2	3	4	5

	Items	Never	Rarely	Occasionally	Sometimes	Almost always
17	Ride so fast into a corner that you feel like you might lose control	1	2	3	4	5
18	Exceed the speed limit on a country/rural road	1	2	3	4	5
19	Disregard the speed limit late at night or in the early hours of the morning	1	2	3	4	5
20	Exceed the speed limit on a residential road	1	2	3	4	5
21	Race away from traffic lights with the intention of beating the driver/rider next to you	1	2	3	4	5
22	Ride in between two lanes of fast-moving traffic	1	2	3	4	5
23	Get involved in unofficial 'races' with other riders or drivers	1	2	3	4	5
24	Ride so fast into a corner that you scare yourself	1	2	3	4	5
25	Cross junction when traffic light is red	1	2	3	4	5
26	Riding in the opposite direction of road way (wrong-way driving)	1	2	3	4	5
27	Riding in sidewalk	1	2	3	4	5
28	Call/text with a mobile phone while riding	1	2	3	4	5
29	Smoking while riding	1	2	3	4	5
30	Ride when taking drugs or medications which might have effects on your riding	1	2	3	4	5
31	Using helmet without chin straps or not fastening it	1	2	3	4	5
32	Carry more than one passenger with your motorcycle	1	2	3	4	5
33	Riding with an impaired motorcycle	1	2	3	4	5
34	Riding without helmet	1	2	3	4	5
35	Chatting with other riders/passengers while driving	1	2	3	4	5
36	Carry a passenger who has not worn a helmet	1	2	3	4	5
37	Attempt to do, or actually do, a wheelie	1	2	3	4	5

	Items	Never	Rarely	Occasionally	Sometimes	Almost always
38	Intentionally do a wheel spin	1	2	3	4	5
39	Crash with a parked vehicle, do damage to it, but escape from the crash scene	1	2	3	4	5

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Our reference	Your reference	Hasselt
REC/SMEC/VRAI/190/115		16 April 2020

Concerning: Ethical Advice – "Social Norms, Attitude, and Risky Riding Behavioural Factors as Predictors of Crash Involvement Among Young Adult Motorcyclists in Indonesia: testing a contextual model"

To whom it may concern,

In my capacity as chairman of the Social-Societal Ethics Committee (SSEC) at Hasselt University I hereby declare that the SSEC has addressed the ethical issues involved in the research project *'Social Norms, Attitude, and Risky Riding Behavioural Factors as Predictors of Crash Involvement Among Young Adult Motorcyclists in Indonesia: testing a contextual model',* as presented by you on March 5, 2020.

The SSEC carefully considered the ethical issues related to the project and the preparatory documents that were made available to the SSEC. The committee can agree with the ethical provisions made in the proposed project plan and can deliver a positive advice.

The Committee recommends making the researchers (more) aware of the fact that this research involves confidential information, as personal data are requested. This research also touches upon sensitive topics, both implicitly and explicitly, and some questions may cause anxiety.

Furthermore, the SSEC urges that, when conducting the research, all researchers respect the COVID19 measures of the government and Hasselt University.

For any further information, please feel free to contact me.

Sincerely yours,

Prof. Dr. Johan Ackaert
Chairman
Social-Societal Ethics Committee
Hasselt University