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Exploring the Impact of Riding Fatigue on Risky Riding Behavior among P-Hailing Riders in Malaysia: The Mediating Role of Moral Disengagement

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Abstract

P-hailing riders, who are frequently exposed to long working hours and demanding schedules, often experience fatigue that can impair their decision-making and lead to risky behaviors such as speeding and ignoring traffic signals. This study investigates the impact of riding fatigue on risky riding behavior among p-hailing riders in Malaysia and explores the mediating role of moral disengagement. Using a quantitative research design, data were collected from 200 p-hailing riders in the northern region of Malaysia through a structured survey. The findings reveal a significant positive relationship between riding fatigue and risky riding behavior. Moreover, the results demonstrate that moral disengagement plays a crucial mediating role in this relationship, as fatigued riders tend to rationalize their unsafe behaviors through cognitive mechanisms that diminish feelings of guilt and responsibility. This highlights the importance of addressing both the physical and psychological factors that contribute to unsafe riding practices. The study suggests that implementing fatigue management strategies, such as mandatory rest breaks and targeted safety training, could help reduce the incidence of risky riding behaviors. Policymakers and delivery platforms must develop comprehensive interventions that focus on managing both external job demands and internal cognitive processes to enhance road safety and well-being for p-hailing riders.

Keywords: P-Hailing, Risky Riding Behavior, Riding Fatigue, Moral Disengagement.

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1. INTRODUCTION

Road traffic accidents (RTAs) continue to be a primary cause of injury and death worldwide, with motorcyclists facing heightened vulnerability due to their exposure to traffic hazards. In Malaysia, motorcyclists represent more than 60% of road traffic fatalities (MIROS, 2021). P-hailing riders, who are delivery workers for platforms like GrabFood and Foodpanda, face particularly high risks. These individuals navigate intricate urban environments while adhering to demanding schedules, frequently resulting in fatigue that substantially impairs their capacity to ride safely.

The nature of p-hailing work involves extended hours on the road, frequent stops, and the physical demands of handling deliveries. These factors contribute to the onset of riding fatigue, which is characterized by both physical and mental exhaustion. Riding fatigue leads to decreased attention, slower reaction times, and impaired decision-making, all of which increase the likelihood of engaging in risky riding behaviors, such as speeding, running red lights, and failing to maintain proper lane discipline (Williamson et al., 2011; May & Baldwin, 2009). The pressure to meet delivery deadlines exacerbates the fatigue experienced by p-hailing riders. Many riders work long hours with minimal rest, driven by the need to maximize their earnings in a competitive gig economy. Younger and less experienced riders are particularly susceptible to these pressures, lacking the judgment and experience needed to manage fatigue effectively. This makes riding fatigue a critical factor influencing risky riding behavior among p-hailing riders (Demerouti et al., 2001; Bakker & Demerouti, 2017).

Despite the growing body of literature on fatigue, moral disengagement, and risky behavior, there remain significant gaps in understanding these dynamics within the p-hailing industry. While some studies have explored the impact of fatigue on general driving behavior, there is limited research focusing specifically on how fatigue influences p-hailing riders in Malaysia. Additionally, the role of moral disengagement as a mediator between riding fatigue and risky riding behavior is underexplored, particularly in the context of gig economy jobs like p-hailing. This study addresses these gaps by providing empirical evidence on the relationships between these variables, offering new insights into how p-hailing riders navigate the demands of their work and the implications for road safety.

Thus, this study investigates the impact of riding fatigue on risky riding behavior among p-hailing riders in Malaysia and examines the mediating role of moral disengagement. The objectives of this study are: (1) to examine the relationship between riding fatigue and risky riding behavior, (2) to investigate the impact of riding fatigue on moral disengagement, (3) to explore the relationship between moral disengagement and risky riding behavior, and (4) to

evaluate the mediating role of moral disengagement in the relationship between riding fatigue and risky riding behavior.

2. LITERATURE REVIEW

2.1 Underpinning and Supporting Theories

This study utilizes Bandura's Moral Disengagement Theory as the underpinning theory, and the Job Demand-Resources (JD-R) Model as a supporting theory.

2.1.1 Bandura's Moral Disengagement Theory

Bandura's Moral Disengagement Theory (1991) explains how individuals rationalize unethical behaviors to diminish feelings of guilt or responsibility. Moral disengagement involves cognitive mechanisms such as diffusion of responsibility, dehumanization, and attribution of blame, which allow individuals to engage in behaviors they would otherwise find unacceptable. In the context of p-hailing riders, moral disengagement can explain how riders justify risky behaviors under conditions of fatigue, such as speeding or using mobile phones while riding (Bandura, 2002; Moore, 2015).

2.1.2 Job Demand-Resources (JD-R) Model

The Job Demand-Resources (JD-R) model posits that job demands, such as riding fatigue, can lead to stress and burnout, which in turn can result in adverse outcomes like risky behavior (Demerouti et al., 2001). According to this model, resources such as training and support can mitigate the negative effects of job demands. This study uses the JD-R model to understand how riding fatigue as a job demand influences risky riding behavior and how resources can help in mitigating these effects (Bakker & Demerouti, 2017; Schaufeli & Taris, 2014).

2.1.3 Integration of Moral Disengagement Theory and JD-R Model

This study integrates Bandura's Moral Disengagement Theory and the Job Demands-Resources (JD-R) Model to elucidate the mechanisms underlying risky riding behavior among p-hailing riders. The JD-R Model posits that job demands, such as extended working hours and high delivery pressures, contribute to physical and mental strain, subsequently affecting individual performance and well-being (Schaufeli & Taris, 2014). In this study, riding fatigue functions as a job demand that leads to both physical exhaustion and psychological stress. By incorporating the Moral Disengagement Theory, the study further explores how riders cognitively justify engaging in risky behaviors, thereby detaching themselves from the consequences of their actions. The integration of these theories provides a more detailed understanding of how fatigue (a job demand) can activate cognitive mechanisms (moral disengagement), which in turn precipitate risky behaviors. This theoretical relationship highlights the interaction between external job demands and internal cognitive processes, offering a comprehensive approach to understanding and mitigating risky riding behaviors within the high-pressure context of the gig economy.

2.2 Riding Fatigue

Riding fatigue is a critical factor affecting the safety and performance of motorcyclists, particularly those involved in occupations that require long hours on the road, such as p-hailing riders. Fatigue is defined as a state of physical and mental weariness that reduces a rider's capacity to perform tasks safely and efficiently (Williamson et al., 2011). It is often caused by prolonged periods of physical exertion, repetitive tasks, and insufficient rest. In the context of p-hailing, fatigue can lead to a significant decline in cognitive and motor functions, increasing the likelihood of risky riding behaviors such as speeding, ignoring traffic signals, and making errors in judgment (May & Baldwin, 2009). Previous studies have shown that fatigue is a leading cause of traffic accidents among motorcyclists. For instance, research by Brown (1994) found that fatigue contributes to slower reaction times, reduced vigilance, and impaired decision-making, all of which are critical for safe riding. Fatigue can also exacerbate the effects of other stressors, such as time pressure and environmental conditions, further increasing the risk of accidents (Connor et al., 2001).

2.3 Risky Riding Behavior

Risky riding behavior refers to actions that increase the likelihood of traffic accidents and injuries. Common risky behaviors include speeding, tailgating, running red lights, and using mobile devices while riding (Rowe et al., 2019). These behaviors are particularly prevalent among motorcyclists, who are already at higher risk of injury or death in the event of a collision due to their lack of physical protection compared to other road users (World Health Organization, 2023). Risky riding behaviors are influenced by a variety of factors, including individual characteristics, situational factors, and external pressures such as fatigue (Ulleberg & Rundmo, 2003). In the context of p-hailing, risky riding behavior is often driven by the demands of the job, which require riders to complete multiple deliveries within a limited timeframe. The pressure to meet delivery deadlines can lead to an increase in risky behaviors, as riders may prioritize speed over safety to ensure timely deliveries (Ali et al., 2022). Furthermore, the repetitive nature of the work and the constant exposure to traffic hazards can lead to a normalization of risk, where riders become desensitized to the dangers associated with their behavior (Charlton et al., 2020).

2.4 Moral Disengagement

Moral disengagement is a psychological process that allows individuals to rationalize unethical or unsafe behavior, thereby avoiding feelings of guilt or shame (Bandura, 1991). This process involves several cognitive mechanisms, such as minimizing the consequences of one's actions, displacing responsibility, or dehumanizing others (Bandura, 2002). In the context of road safety, moral disengagement can explain why riders engage in risky behaviors despite knowing the potential consequences of their actions (Moore, 2015). For p-hailing riders, moral disengagement may manifest as justifications for behaviors that compromise safety, such as speeding or ignoring traffic rules, under the belief that these actions are

necessary to meet job demands (Shu et al., 2011). Research has shown that when individuals are under stress or facing significant job demands, they are more likely to engage in moral disengagement as a coping mechanism (Detert et al., 2008). This is particularly relevant for p-hailing riders, who may feel pressured to complete as many deliveries as possible within a limited time, leading them to rationalize unsafe behaviors as necessary for job performance.

2.5 Relationship Between Riding Fatigue, Moral Disengagement, and Risky Riding Behaviour.

Riding fatigue significantly affects riders' cognitive and physical capabilities, resulting in impaired judgment, delayed reaction times, and decreased situational awareness, factors that are crucial for maintaining riding safety (Zheng et al., 2019; Qian et al., 2024). Fatigue further impairs emotional regulation, contributing to irritability and a reduced ability to remain composed under stressful conditions, which exacerbates risky decision-making. Such fatigue-induced impairments increase the likelihood of engaging in hazardous behaviors, including speeding and violating traffic rules, as fatigued riders attempt to meet stringent work demands while coping with declining cognitive and physical capacity (Qian et al., 2024). Moreover, fatigue compromises riders' ability to accurately assess road hazards and adapt to sudden changes, heightening the risk of collisions and other adverse incidents. Thus, it could be hypothesized that;

H1: Riding fatigue has a significant influence on risky riding behavior among p-hailing riders.

Riding fatigue has significant cognitive consequences, prompting riders to morally disengage from their actions. Moral disengagement allows individuals to rationalize unsafe behaviors and mitigate feelings of guilt associated with those behaviors (Bandura, 2002). At elevated levels of fatigue, cognitive impairments hinder riders' judgment, making them more likely to justify risky riding as a necessity for meeting work-related demands (Shu et al., 2011). This rationalization process often involves cognitive mechanisms, such as moral justification and displacement of responsibility, which facilitate the alignment of unsafe actions with job requirements while minimizing personal accountability. Fatigue-induced moral disengagement is particularly prevalent in high-pressure environments (Yusuf & Ismail, 2020) like the gig economy, where riders are continually incentivized to maximize delivery numbers, often at the expense of their safety (Detert et al., 2008; Moore, 2015). Repeated exposure to such conditions can foster a habitual disengagement from safety norms, as productivity becomes prioritized over individual well-being. Understanding the cognitive pathways through which fatigue fosters moral disengagement is crucial for developing effective interventions aimed at promoting safety and reducing risky behaviors among delivery riders. Thus, it could be hypothesized that;

H2: Riding fatigue has a significant influence on moral disengagement among p-hailing riders.

Moral disengagement, as conceptualized by Bandura (2002), involves psychological mechanisms such as moral justification, euphemistic labeling, and displacement of responsibility, which allow individuals to engage in behaviors they would typically consider unethical or unsafe. These mechanisms operate by cognitively reframing unethical actions in a way that reduces the emotional and moral burden associated with those behaviors. Within the context of p-hailing riders, moral disengagement can result in risky riding behaviors, such as disregarding traffic regulations, speeding, or engaging in aggressive maneuvers, as these actions are rationalized as essential for completing deliveries efficiently, particularly when under time constraints and financial pressures (Bandura, 2002; Moore, 2015). The normalization of such risky practices is often reinforced by a work culture that prioritizes efficiency and productivity over rider safety. Empirical evidence suggests that individuals with a greater propensity for moral disengagement are more likely to engage in unsafe actions, perceiving fewer negative repercussions and experiencing reduced personal accountability for their behavior (Detert et al., 2008; Shu et al., 2011). This phenomenon is especially pronounced in gig economy settings, where the pressure to meet delivery quotas and secure sufficient earnings can drive riders to justify progressively unsafe practices (Yusuf & Ismail, 2020). The cumulative impact of moral disengagement not only elevates the risk of accidents but also fosters a work environment in which risky behaviors become habitual and socially normalized. Thus, it could be hypothesized that;

> *H3: Moral disengagement has a significant influence on risky riding behavior among p-hailing riders.*

Moral disengagement serves as a mediating mechanism through which riding fatigue translates into risky riding behavior. Fatigue-induced impairments lead individuals to justify risky behaviors through moral disengagement, effectively reducing the psychological barriers to engaging in unsafe actions (Nguyen et al., 2024). This justification process often involves cognitively reframing the behavior as necessary or minimizing its perceived harm, thereby allowing fatigued riders to align their actions with occupational demands without significant emotional dissonance. The mediating role of moral disengagement has been well-documented across various high-stress occupations, where individuals rationalize behaviors that might otherwise be considered irresponsible or hazardous (Bandura, 2002; Moore, 2015). In the context of the p-hailing job, the chronic exposure to high demands and relentless performance pressures fosters an environment in which moral disengagement becomes a coping strategy, enabling riders to reconcile the inherent dissonance between established safety norms and the imperative for productivity. Over time, repeated instances of moral disengagement contribute to the entrenchment of a culture of normalized risk-taking, wherein the distinction between acceptable and unacceptable behavior becomes increasingly obscured. This erosion of behavioral boundaries not only elevates the probability of accidents but also perpetuates systemic safety challenges within the industry, highlighting the critical need for interventions aimed at mitigating both the physiological and cognitive drivers of unsafe practices. Thus, in this study it could be hypothesized that;

H4: Moral disengagement mediates the relationship between riding fatigue and risky riding behavior among p-hailing riders.

These above hypotheses are illustrated in the following Figure 2.1, which serves as a conceptual model for understanding risky riding behaviour of p-hailing riders in the gig economy.

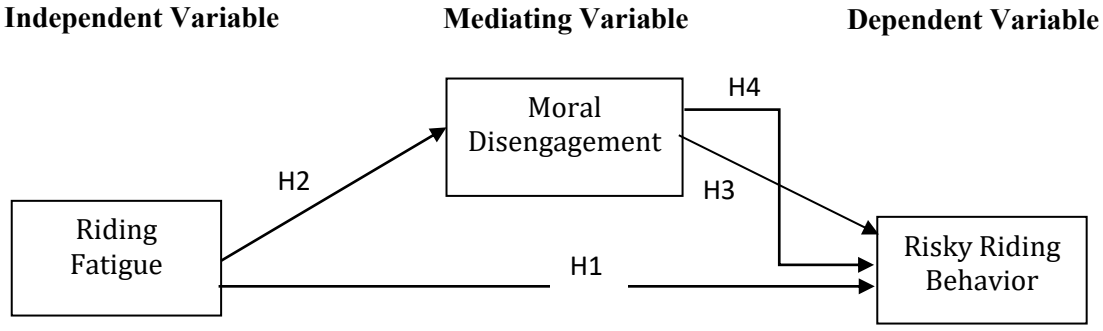

Figure 2.1 Research Framework

Despite the well-documented dangers of riding fatigue, there is a paucity of research focusing specifically on how fatigue impacts p-hailing riders in Malaysia, particularly in relation to their engagement in risky behaviors. Besides, the specific role that riding fatigue plays in exacerbating these behaviors has not been fully explored, particularly in the context of p-hailing riders in Malaysia. However, while moral disengagement has been studied extensively in other contexts, its role as a mediator between riding fatigue and risky riding behavior in p-hailing remains underexplored. This study seeks to address this gap.

3. METHODOLOGY

3.1 Research Design

This study employs a quantitative research design to investigate the relationships between riding fatigue, moral disengagement, and risky riding behavior among p-hailing riders in Malaysia. A self-administered questionnaire was used to collect data from the respondents. The quantitative approach allows for the systematic examination of the hypothesized relationships and provides a robust framework for statistical analysis (Creswell, 2014).

3.2 Sample and Data Collection

The target population for this study comprises 53,000 p-hailing riders in the northern region of Malaysia, specifically those affiliated with major delivery platforms such as GrabFood and Foodpanda, which distributed across three states; Perlis (3,000 riders), Kedah (20,000 riders), and Penang (30,000 riders) (Rusli et al., 2022). Based on G*power analysis, a minimum of 166 respondents was determined to be necessary for the study. However, to ensure a more robust sample, a total of 200 respondents were targeted using stratified sampling to ensure representativeness across the three states. The states were used as the criteria for stratification, with the number of respondents from each state calculated proportionally to their population size. As shown in Table 4.1, the stratified sampling resulted in 12 respondents from Perlis, 75 from Kedah, and 113 from Penang.

Table 3.1 Stratifiction of Respondents

Strata	**No of Estimated Population**	**Proportionate Ratio**	**Minimum Respondents for Each Strata**	**Actual Respondents for Each Strata**
Perlis	3000	166 (3000/53,000)	~ 10	12
Kedah	20,000	166 (20,000/53,000)	~ 63	75
Penang	30,000	166 (30,000/53,000)	~ 94	113
Total	53,000	166 (53,000/53,000)	~ 167	200

While stratified sampling was used to determine the number of respondents from each state, the actual selection of participants employed a convenient sampling technique. This approach was necessitated by the lack of a comprehensive sample frame or name list of every p-hailing rider in the region.

Data collection was conducted through face-to-face interactions at popular eateries frequented by p-hailing riders in each locality. The researchers approached riders during their breaks and requested their participation in the study. This method allowed for efficient data collection while ensuring a diverse representation of riders across different platforms and locations. Respondents were assured of the confidentiality and anonymity of their responses, in line with ethical research practices (Saunders et al., 2016).

3.3 Measurement Instruments

The questionnaire consisted of three sections: demographic information, constructs measuring riding fatigue, moral disengagement, and risky riding behavior. Each construct was measured using a Likert scale, with items adapted from existing validated scales in the literature.

Table 3.2 Research Instrument

Construct	Source	Number of Items
Riding Fatigue	Williamson et al. (2011)	6
Moral Disengagement	Bandura (1991); adapted by Nguyen et al. (2024)	8
Risky Riding Behavior	Qian et al. (2024)	10

Riding Fatigue is evaluated using a 6-item scale adapted from Williamson et al. (2011), which focuses on the physical and mental exhaustion experienced by riders. Moral disengagement is measured through an 8-item scale adapted from Bandura (1991) and Nguyen et al. (2024), examining the cognitive mechanisms that justify risky behaviors. Lastly, Risky Riding Behavior is assessed using a 10-item scale adapted from Qian et al. (2024), which evaluates specific actions such as speeding, running red lights, and using mobile phones while riding.

3.4 Data Analysis

Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) to test the hypothesized relationships and the mediating effect of moral disengagement. PLS-SEM is suitable for this study due to its ability to handle complex models and its robustness with smaller sample sizes (Hair et al., 2017). PLS-SEM was used to assess the structural model (inner model) and measurement model (outer model).

4. RESULTS

The demographic analysis of the study participants revealed a diverse sample of p-hailing riders across the northern region of Malaysia as shown in Table 4.1. It presents key characteristics of the respondents, including age distribution, education level, riding experience, and average working hours.

Table 4.1 Demographic Findings

Demographic Variable	Category	Frequency (n = 200)	Percentage (%)
Age	18-24 years	100	50%
	25-34 years	60	30%
	35-44 years	30	15%
	45 years and above	10	5%
Education Level	High School	90	45%
	Diploma/Technical Cert	60	30%
	Bachelor’s Degree	40	20%

Demographic Variable	Category	Frequency (n = 200)	Percentage (%)
	Postgraduate	10	5%
Riding Experience	Less than 1 year	40	20%
	1-2 years	110	55%
	3-5 years	40	20%
	More than 5 years	10	5%
Average Working Hours	Less than 4 hours/day	30	15%
	4-6 hours/day	50	25%
	6-8 hours/day	80	40%
	More than 8 hours/day	40	20%

The age distribution of the p-hailing riders in the sample shows a strong skew towards younger individuals. The largest age group is the 18-24 years category, which constitutes 50% of the sample. This dominance of younger riders is consistent with the nature of p-hailing work, which often appeals to individuals who are seeking flexible job opportunities, such as students or those early in their careers. The 25-34 years age group makes up 30% of the sample, indicating that a significant portion of riders are in their mid-20s to early 30s, potentially balancing the demands of this work with other life responsibilities. The older age groups, 35-44 years and 45 years and above, represent 15% and 5% of the sample, respectively, suggesting that p-hailing is less commonly pursued as a long-term career by older individuals. Besides, the education level of the riders reveals that nearly half of the sample (45%) has only a high school education. This indicates that p-hailing is a viable job option for individuals with lower educational qualifications, offering them a way to earn income with relatively low entry barriers. The next largest group, with 30%, holds a Diploma or Technical Certificate, which suggests that some riders have pursued vocational training or higher education but may not yet be utilizing those qualifications in their current employment. Additionally, 20% of the riders have a Bachelor's degree, highlighting that some individuals with higher education are also engaging in p-hailing, possibly due to the flexible nature of the work or as a temporary employment solution. Only 5% of the sample has postgraduate qualifications, indicating that highly educated individuals are less likely to be involved in p-hailing. On the other hand, the riding experience data shows a substantial portion of the sample (75%) has less than three years of experience, with 20% having less than 1 year and 55% having between 1-2 years. This high percentage of relatively inexperienced riders suggests that many individuals are new to p-hailing or have only recently entered the field. This lack of experience can contribute to increased vulnerability to risky riding behaviors, as less experienced riders may not have fully developed the skills or judgment necessary to navigate the challenges of the job safely. The remaining riders have more experience, with

20% having 3-5 years of riding experience and only 5% having more than 5 years, indicating that long-term engagement in p-hailing is relatively uncommon. Furthermore, the data on average working hours per day indicates that p-hailing riders typically work between 4 to 8 hours daily, with 40% of the sample working 6-8 hours and 25% working 4-6 hours. This suggests that for many riders, p-hailing represents a significant daily commitment, potentially contributing to fatigue and time pressure, which are critical factors influencing risky riding behaviors. Another 20% of the sample works more than 8 hours per day, likely representing those who rely heavily on p-hailing as their primary source of income. Lastly, 15% of the sample works less than 4 hours a day, possibly indicating part-time involvement or using p-hailing as supplementary income.

The assessment of the measurement model is crucial to ensure the reliability and validity of the constructs in the model. The outer loadings for the indicators associated with each construct were assessed to evaluate indicator reliability. As shown in Table 4.2, all outer loadings exceed the threshold of 0.70, indicating strong correlations between the indicators and their respective constructs (Hair et al., 2019). For example, the outer loadings for "Riding Fatigue" range from 0.786 to 0.843, demonstrating that these indicators reliably measure the construct. Similarly, "Moral Disengagement" (0.805 to 0.884) and "Risky Riding Behavior" (0.797 to 0.878) also show strong outer loadings, supporting the robustness of the measurement model.

Table 4.2 Outer Loadings

Indicator	Riding Fatigue	Moral Disengagement	Risky Riding Behavior
RF1	0.811		
RF2	0.843		
RF3	0.786		
RF5	0.831		
MD1		0.826	
MD2		0.884	
MD3		0.851	
MD6		0.809	
MD7		0.805	
MD8		0.813	
RRB1			0.878
RRB2			0.834

Indicator	Riding Fatigue	Moral Disengagement	Risky Riding Behavior
RRB3			0.869
RRB4			0.822
RRB7			0.855
RRB9			0.797

Notes: Indicators below than 0.70 were deleted

Composite reliability and average variance extracted (AVE) were used to assess the internal consistency and convergent validity of the constructs. Table 4.3 indicates that all constructs have composite reliability values above the recommended threshold of 0.70, with "Riding Fatigue" showing a composite reliability of 0.882, "Moral Disengagement" at 0.913, and "Risky Riding Behavior" at 0.901. The AVE values for all constructs are above 0.50, confirming that the constructs capture sufficient variance from their indicators, thus supporting convergent validity (Hair et al., 2019).

Table 4.3 Composite Reliability and AVE

Construct	Composite Reliability	AVE
Riding Fatigue	0.882	0.652
Moral Disengagement	0.913	0.765
Risky Riding Behavior	0.901	0.722

The Discriminant Validity of the study was evaluated using the Fornell and Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio. The Fornell and Larcker criterion compares the square root of the AVE for each construct with the correlations between constructs. Table 4.4 shows that the square root of the AVE for each construct is greater than its correlation with any other construct, indicating that each construct shares more variance with its indicators than with other constructs (Hair et al., 2019). For example, the square root of the AVE for "Riding Fatigue" is 0.817, which is higher than its correlations with "Moral Disengagement" (0.493) and "Risky Riding Behavior" (0.558), confirming discriminant validity.

Table 4.4 Fornell and Larcker Criterion

Construct	Riding Fatigue	Moral Disengagement	Risky Riding Behavior
Riding Fatigue	0.817		
Moral Disengagement	0.493	0.874	

Construct	Riding Fatigue	Moral Disengagement	Risky Riding Behavior
Risky Riding Behavior	0.558	0.626	0.857

Meanwhile, the HTMT ratio was also used to assess discriminant validity. As shown in Table 4.5, all HTMT values are below the threshold of 0.85, indicating that the constructs are distinct from one another (Henseler et al., 2015). The HTMT value between "Moral Disengagement" and "Risky Riding Behavior" is 0.684, which is well within the acceptable range, further supporting discriminant validity.

Table 4.5 HTMT Criterion

Construct	Riding Fatigue & Moral Disengagement	Riding Fatigue & Risky Riding Behavior	Moral Disengagement & Risky Riding Behavior
HTMT	0.609	0.662	0.684

Multicollinearity was assessed by examining the variance inflation factor (VIF) values for the constructs. Table 4.6 shows that all VIF values are below the threshold of 5, indicating that multicollinearity is not an issue in the model (Hair et al., 2019). For example, the VIF values for "Riding Fatigue," "Moral Disengagement," and "Risky Riding Behavior" are 1.354, 1.397, and 1.385, respectively, suggesting that the constructs are not excessively correlated.

Table 4.6 Multicollinearity Analysis (VIF)

Construct	VIF
Riding Fatigue	1.354
Moral Disengagement	1.397
Risky Riding Behavior	1.385

The path coefficients were analyzed to test the hypothesized relationships between the constructs. As shown in Table 4.7, all path coefficients are positive and significant at the $p < 0.01$ level. Specifically, the relationship between "Riding Fatigue" and "Risky Riding Behavior" is significant (path coefficient = 0.476, t-value = 7.628), indicating that higher levels of fatigue are associated with increased risky riding behavior. "Riding Fatigue" also has a significant positive effect on "Moral Disengagement" (path coefficient = 0.523, t-value = 8.051), and "Moral Disengagement" significantly influences "Risky Riding Behavior" (path coefficient = 0.427, t-value = 6.921). These findings support the proposed hypotheses and

demonstrate the critical role of fatigue and moral disengagement in influencing risky riding behavior among p-hailing riders as depicted in Figure 4.1.

Table 4.7 Path Coefficient

Path	Coefficient	t-value	p-value
Riding Fatigue -> Risky Riding Behavior	0.476	7.628	<0.001
Riding Fatigue -> Moral Disengagement	0.523	8.051	<0.001
Moral Disengagement -> Risky Riding Behavior	0.427	6.921	<0.001

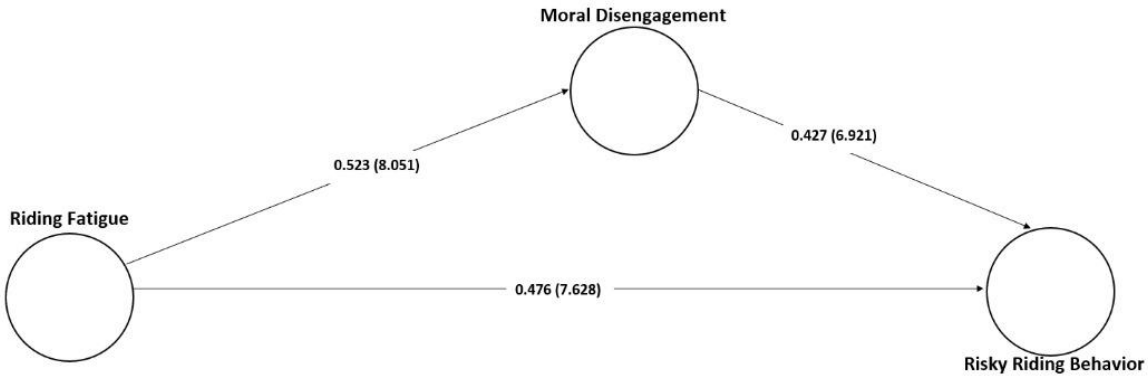

Figure 4.1 Measurement Model

The indirect effect of "Riding Fatigue" on "Risky Riding Behavior" through "Moral Disengagement" was also examined. As indicated in Table 4.8, the indirect effect is significant (coefficient = 0.229, t-value = 6.487, $p < 0.001$), confirming that moral disengagement mediates the relationship between riding fatigue and risky riding behavior. This finding highlights the importance of cognitive mechanisms, such as moral disengagement, in explaining how fatigue can lead to unsafe practices among riders.

Table 4.8 Indirect Effect

Indirect Path	Coefficient	t-value	p-value
Riding Fatigue -> Moral Disengagement -> Risky Riding Behavior	0.229	6.487	<0.001

The explanatory power of the model was assessed using R^2 and f^2 values. As presented in Table 4.9, the R^2 value for "Moral Disengagement" is 0.475, indicating that riding fatigue explains 47.5% of the variance in moral disengagement. The R^2 value for "Risky Riding Behavior" is 0.495, suggesting that riding fatigue and moral disengagement together explain 49.5% of the variance in risky riding behavior. The f^2 values indicate moderate to large effect

sizes, with "Riding Fatigue" having an f^2 of 0.369 on "Moral Disengagement" and 0.354 on "Risky Riding Behavior." These results demonstrate the substantial impact of riding fatigue and moral disengagement on risky riding behavior.

Table 4.9 Coefficient of Determination (R2) and Effect Size (f2)

Construct	R^2	f^2
Moral Disengagement	0.475	0.369
Risky Riding Behavior	0.495	0.354

The Predictive Relevance was assessed using Q^2 values, as shown in Table 4.10 The Q^2 values for "Moral Disengagement" (0.198) and "Risky Riding Behavior" (0.372) are both above zero, indicating that the model has good predictive relevance. This means that the model can accurately predict the outcomes of the constructs, reinforcing the robustness of the findings.

Table 4.10 Predictive Relevance (Q^2)

Construct	Q^2
Moral Disengagement	0.198
Risky Riding Behavior	0.372

5. DISCUSSIONS

Research Objective 1: To examine the relationship between riding fatigue and risky riding behavior among p-hailing riders in Malaysia

The analysis revealed a significant positive relationship between riding fatigue and risky riding behavior among p-hailing riders in Malaysia, as evidenced by the path coefficient of 0.476 ($p < 0.01$). This indicates that increased fatigue directly correlates with a higher propensity for engaging in behaviors that elevate accident risk. Fatigue has a deleterious effect on cognitive functioning, leading to diminished attention, delayed reaction times, and compromised decision-making, all of which are essential for safe riding practices. These findings are well-aligned with existing literature, which consistently identifies fatigue as a primary determinant of unsafe motorcycling behaviors. Specifically, fatigue impairs riders' ability to accurately judge distances, detect hazards, and respond appropriately to sudden changes in traffic conditions, thereby significantly heightening the risk of accidents (Williamson et al., 2011; May & Baldwin, 2009). The younger riders in the sample, who formed the majority, are particularly susceptible due to prolonged working hours and inadequate rest, which contribute to fatigue-induced errors such as excessive speeding and failure to obey traffic signals. Moreover, the competitive nature inherent in the gig economy often necessitates that these riders forgo adequate rest to complete more deliveries, further intensifying fatigue and the consequent likelihood of risky riding behaviors.

Research Objective 2: To investigate the impact of riding fatigue on moral disengagement among p-hailing riders in Malaysia.

The study also examined the impact of riding fatigue on moral disengagement, finding a significant positive effect (path coefficient = 0.523, $p < 0.01$). This indicates that fatigued riders are more susceptible to cognitive rationalizations that justify risky behaviors, such as disregarding safety protocols or taking shortcuts to meet delivery demands. These rationalizations function as psychological defenses, allowing riders to reconcile unsafe actions with their occupational obligations despite inherent risks. This finding is consistent with prior research showing that individuals under high job demands often resort to moral disengagement as a coping strategy to alleviate stress or rationalize unsafe behaviors (Shu et al., 2011; Detert et al., 2008). Moral disengagement provides a psychological mechanism for distancing oneself from the negative outcomes of one's actions, thereby minimizing feelings of guilt or accountability. Given that 75% of the sample had less than three years of riding experience, it is plausible that these less experienced riders lack effective coping mechanisms, making them more prone to moral disengagement when fatigued. Additionally, inexperienced riders may find it challenging to recognize the long-term consequences of their actions, leading to an underestimation of the risks associated with moral disengagement and risky behaviors (Shu et al., 2011; Detert et al., 2008). The structural pressures of the gig economy, coupled with inadequate support systems, foster an environment where moral disengagement emerges as a prevalent coping mechanism, ultimately jeopardizing rider safety.

Research Objective 3: To explore the relationship between moral disengagement and risky riding behavior among p-hailing riders in Malaysia.

The analysis demonstrated that moral disengagement significantly influences risky riding behavior (path coefficient = 0.427, $p < 0.01$). Riders who disengaged morally were more inclined to take risks, such as ignoring traffic signals or speeding, behaviors often rationalized as necessary for meeting delivery targets. These rationalizations can be attributed to the pressures and demands inherent in their occupation, where meeting tight schedules and maintaining productivity often take precedence over safety. The demographic analysis highlighted that a substantial portion of the riders had only a high school education (45%), which may influence their moral reasoning and susceptibility to disengagement mechanisms (Bandura, 2002; Moore, 2015). A lower level of formal education might contribute to limited awareness of the risks associated with risky riding behaviors, making individuals more vulnerable to cognitive distortions that justify such actions. Furthermore, the repetitive nature of delivery tasks, coupled with the lack of adequate institutional support or safety training, exacerbates the reliance on moral disengagement as a coping mechanism. These findings underscore the role of cognitive processes in the perpetuation of risky riding practices, particularly in a high-pressure work environment where there is an ongoing struggle between the need for efficiency and the imperative for safety. The interaction between individual characteristics, such as education level, and occupational pressures highlights the multifaceted nature of moral disengagement and its influence on risky behaviors.

Research Objective 4: To evaluate the mediating role of moral disengagement in the relationship between riding fatigue and risky riding behavior among p-hailing riders in Malaysia.

The mediation analysis confirmed that moral disengagement serves as a partial mediator in the relationship between riding fatigue and risky riding behavior (indirect effect = 0.229, $p < 0.01$). This finding suggests that while fatigue exerts a direct influence on risky riding behavior, a substantial part of its impact is mediated through cognitive mechanisms that facilitate the rationalization of unsafe actions. Cognitive mechanisms, such as moral justification and displacement of responsibility, provide fatigued riders with a framework to align their unsafe behaviors with the occupational demands they face, effectively diminishing their sense of personal accountability. The predominance of younger riders within the sample likely amplifies this indirect effect, as their relative lack of experience renders them more vulnerable to cognitive rationalizations as a means to cope with fatigue and work-related pressures (Nguyen et al., 2024; Detert et al., 2008). Furthermore, the high proportion of younger riders indicates a particular susceptibility to the convergence of inexperience and performance pressure, creating an environment highly conducive to moral disengagement. This emphasizes the necessity for targeted interventions that not only mitigate physical fatigue but also address the cognitive distortions that underpin risky riding behaviors, especially among younger and less experienced riders.

6. CONCLUSION

This study highlights the significant impact of riding fatigue on risky riding behavior among p-hailing riders, with moral disengagement serving as a key mediator in this relationship. The findings suggest that fatigue not only directly contributes to risky behaviors but also indirectly influences them through cognitive rationalizations that justify unsafe actions. These rationalizations often emerge as a coping mechanism for riders facing demanding schedules, where adherence to delivery timelines takes precedence over personal safety. The prominence of younger, less experienced riders in the sample highlights the heightened vulnerability of this demographic, particularly in the context of the gig economy, where performance pressures and inadequate rest are prevalent. Younger riders, due to their inexperience, may lack adequate strategies to manage fatigue effectively, making them more prone to moral disengagement and risky behaviors. Moreover, the gig economy's structure, which incentivizes speed and productivity, exacerbates these risks by fostering an environment where taking shortcuts becomes normalized.

The findings of this study have important theoretical and practical implications for the safety and well-being of p-hailing riders. Theoretically, this study contributes to the understanding of how fatigue and moral disengagement interact to influence risky behaviors in a gig economy context. Practically, addressing both the physical and cognitive dimensions of fatigue is crucial for reducing risky riding behavior and enhancing rider safety. Practical interventions should include mandatory rest breaks, education on recognizing and managing

fatigue, and restructuring incentives that do not disproportionately reward speed over safety. Training programs that address both the physical and psychological aspects of riding can be particularly effective, focusing not only on managing physical fatigue but also on reducing moral disengagement by fostering a strong safety culture. Awareness campaigns emphasizing the risks associated with rationalizing unsafe practices could also help riders understand the potential consequences of their actions, promoting safer riding behaviors.

This study, however, is not without limitations. First, the cross-sectional design limits the ability to infer causal relationships among the variables studied. Future researchers could address this limitation by employing longitudinal designs that capture the temporal dynamics of fatigue, moral disengagement, and risky riding behavior. Second, the sample was confined to p-hailing riders in Malaysia, which may limit the generalizability of the findings to other regions or different types of motorcyclists. Expanding the geographical scope and including other occupational groups could help validate and broaden the applicability of these results. Additionally, the study relied on self-reported data, which is subject to biases such as social desirability and recall errors. Future research should consider incorporating objective measures, such as GPS tracking for fatigue assessment or observational data, to enhance the validity of the findings. Lastly, the influence of other potential mediators, such as stress levels or individual personality traits, was not explored in this study. Future research could investigate these factors to provide a more nuanced understanding of the mechanisms linking fatigue and risky riding behavior.

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