# Structure Discrepancy of Riding Behavior of Heterogeneous Young Motorcyclists in Taiwan

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**Although young motorcyclists are more likely to conduct risky driving behaviors and be involved in crashes, not all young motorcyclists are the same. Past studies have examined such heterogeneity by grouping drivers and then assessing differences between the subgroups solely on variables or constructs such as drivers' personality traits, attitudes, and risky behaviors. However, the discrepancy of causal structure relationships between personality traits and risky driving behavior in different subgroups needs to be explored further. This study thus proposes a multigroup analysis based on structural equation modeling to investigate the structural discrepancy that may exist in distinct groups. On the basis of cluster analysis of personality traits, this work identifies four types of young motorcyclists in Taiwan. Findings show that significant difference on a single construct could result in significantly different causal structures. Sensation seeking, compared with other personality traits, has the highest effect on risky riding behavior for all clusters; nevertheless, sensation seeking causes risky riding behavior following various causal paths in distinct clusters: in the risky cluster, riding confidence and perceived utility mediate between sensation seeking and risky behavior; and in the aggressive cluster, sensation seeking directly connects to risky behavior. This research also finds discrepancies in other personality traits between clusters and discusses intervention strategies corresponding to the different features of causal relationships in each cluster.**

According to the National Highway Traffic Safety Administration, the number of motorcycle fatalities has been continuously rising since 1997 in the United States; in 2007, more than 5,000 motorcyclists were killed, accounting for 12.6% of all types of motor vehicle fatalities (*1*). This situation is even worse in developing countries where motorcycles are one of the most important means of transportation, and where the number of motorcycles has dramatically grown (*2*). For example, motorcycles comprise 67% of registered motor vehicles in Taiwan, and motorcycle accidents account for about 45% of total traffic accidents (*3*).

Examining possible causes is one critical step to reducing traffic accidents. One possible approach is to analyze the manifest features of motorcyclists and their relationships with accident records or risky behaviors. For example, Wick et al. (*4*) analyzed 86 motorcycle accidents in Bochum, Germany. They found that 90.7% of the accidents involved male motorcycle operators or operators aged between 25 and 30 years. Targeting more than 4,700 college students living in the urban and rural areas in Taiwan, Lin et al. (*5*) found that factors such as motorcycle crash history, riding exposure, alcohol use, and traffic violations all significantly related to the risk of motorcycle accidents. Rutter and Quine (*6*) surveyed more than 4,000 motorcyclists in the United Kingdom and found that most motorcycle accidents that involve young operators do not result from operators' inexperience but from the characteristics of operators themselves. Schmucker et al. (*7*) analyzed 66 motorcycle accidents and interviewed 66 injured motorcycle operators in Germany. They found that, compared with other types of transportation mode users, motorcycle operators are more likely to accept higher driving risks and conduct risky driving behaviors. Chang and Yeh (*8*) surveyed young motorcyclists' riding behavior in the Taipei metropolitan area and concluded that young male riders are more likely to violate traffic rules and ignore potential risks on roads, but female riders are more likely to be involved in an accident due to their inexperience or immature skills.

Although analyses based on the aforementioned approach have provided many insights to motorcycle accident occurrence, another type of research that analyzes risky driving behavior from a psychological perspective focuses more on exploring the reason for risky driving behaviors. For example, Wong et al. (*9*) applied structural equation modeling (SEM) to analyze 683 young motorcyclists aged between 18 and 28 years. They found that personality traits including sensation seeking, amiability, and impatience affect the likelihood of conducting risky-riding behavior via riding confidence, risk perception, utility perception, unawareness of traffic conditions, and attitude towards unsafe riding. Germeni et al. (*10*) investigated 523 senior high school students regarding their attitude towards using helmets while riding motorcycles. Their research results found that students reported frequent helmet use following a motorcycle accident or after having heard about safety information with respect to helmet use, leading them towards a higher degree of perceived threat; these students tended to wear helmets while riding motorcycles. On the other hand, students who are more egocentric or lack related safety knowledge or experience, have a lower degree of perceived threat for not wearing helmets and tend not to use helmets while riding.

In psychological studies, heterogeneity is a critical factor. If not carefully accounted for, heterogeneity may lead to erroneous data interpretation or biased coefficient estimates (*11*). Young drivers

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*Transportation Research Record: Journal of the Transportation Research Board, No. 2194,* Transportation Research Board of the National Academies, Washington, D.C., 2010, pp. 107–114.
DOI: 10.3141/2194-13

have been studied as a heterogeneous group and should not be analyzed as a whole. Ulleberg (*12*) suggested young drivers are heterogeneous in their personality traits. Their research results found that drivers with low levels of altruism and anxiety and high levels of sensation-seeking, irresponsibility, and driving-related aggression were more likely to conduct risky driving behaviors.

Although young motorcyclists have been considered as having heterogeneous driving behavior, it is still unclear how risky behaviors are structured differently in distinct groups of drivers. Previous studies have mostly focused on examining the differences between subgroups due to variables or constructs such as drivers' personality traits, attitudes, and risky behaviors (*12*); however, the paths for connecting these variables or constructs to risky driving behavior are missing. Consequently, in these heterogeneous groups, it becomes difficult to tell the difference between how these variables or constructs are causally related to risky driving behavior and thus challenging to devise effective intervention strategies. Therefore, following the findings of Wong et al. (*9*), this study proposes a multigroup analysis based on SEM to further investigate the riding behavior structure discrepancy that may exhibit among distinct subgroups of Taiwanese young motorcyclists.

The remaining elements in the paper are organized as follows: The next section introduces the methodology and precedes the section on research results. The final section provides discussion of the results.

## METHODOLOGY

### Data

This study adopts the data used by Wong et al. (*9*) to analyze the structure discrepancy of young motorcyclists' driving behaviors. In total, 683 young riders (366 males, 317 females) aged between 18 and 28 years ($M = 23.5$ years, $SD = 2.7$ years) participated in this study. The average length of riding experience was 5.2 years, and most participants rode motorcycles on 5 days per week, which implies that most of them were experienced riders and rode motorcycles to commute. Approximately 29.3% of the participants had been involved in accidents, and half of all participants experienced traffic violations. Running red lights and speeding were the most frequent violations. Readers interested in the sample distribution of other characteristics of the participants may refer to the article by Wong et al. (*9*).

### Analysis Framework

Samples were first grouped based on a two-step cluster analysis to identify meaningful groups of young riders. This study used Ward's method for hierarchical clustering to determine the number of subgroups or clusters present in the data. The *k*-means clustering method was then employed to produce *k* clusters by minimizing the sum of the squared distances from the cluster means. In this study, the cluster analysis was based on the scores derived from three personality constructs in the explanatory level of the model, i.e., sensation seeking, amiability, and impatience.

The scores of the explanatory variables were standardized to avoid the problem of comparing Euclidean distances based on different measurement scales (*13*). The derived clusters were examined for their difference in constructs. This work followed a multigroup analysis based on SEM to investigate the different causal relationships in each cluster, consisting of three steps. First, the equivalences of measurement model were assessed. Second, the equivalences of the structure model were then tested. Third, path analyses were conducted. A measurement model describes the relationships between constructs and their indicator variables that refer to the questionnaire items for each construct and the variance and covariance relationships between constructs (*14*). But structural model describes the predicted causal relationships between the constructs. The purpose of assessing measurement model equivalence is to test whether the questionnaire items for each construct and the variance–covariance relationships between constructs are consistently valid and reliable across clusters. The purpose of examining structure model equivalence is to analyze whether the proposed causal relationship, presented in the next section, is consistently appropriate across clusters. If the measurement model equivalence is satisfied and the proposed causal relationships are inappropriate for each cluster, path analyses for each cluster should be performed separately to explore the best causal relationships for each cluster.

### Riding Behavior Model

The explanatory level contains three personality traits—sensation seeking, amiability, and impatience—that reflect internal characteristics of individual differences and demonstrate consistent patterns and tendencies in individual reactions to the external environment. The latent-intermediate level consists of five constructs including riding confidence, affective risk perception, utility perception, unawareness of traffic conditions, and attitude towards unsafe riding. These constructs were developed mainly based on the theory of planned behavior (*15*) and risk homeostasis theory (*16*). Finally, the dependent level contains three constructs of which risky-riding behavior is the outcome of interest in this study, and the remaining two constructs—fast riding and riding violation—are adopted to explain risky-riding behaviors. Solid lines illustrated in Figure 1 represent significant paths. Appendix A provides questionnaire items for each construct. Readers may refer to Wong et al. (*9*) for detailed discussions of this model development and of related statistics such as the reliability of each construct and the goodness of fit of this model.

## RESULTS

### Number of Clusters

This study applies indexes derived with Ward's method for hierarchical clustering based on personality traits to determine the number of subgroups or clusters. These indexes include the cubic clustering criterion, the pseudo $t^2$ statistic, the root of mean square standard deviation, and the semipartial $R^2$. Index value results recommend three or four clusters. After inspecting individual profiles, this work retains a four-cluster solution because all four clusters are theoretically meaningful and interpretable. The four-cluster solution is then adopted for the final *k*-means cluster analysis.

### Cluster Characteristics

Table 1 presents the standardized cluster means of the variables used in the *k*-means analysis. The four clusters were named risky,

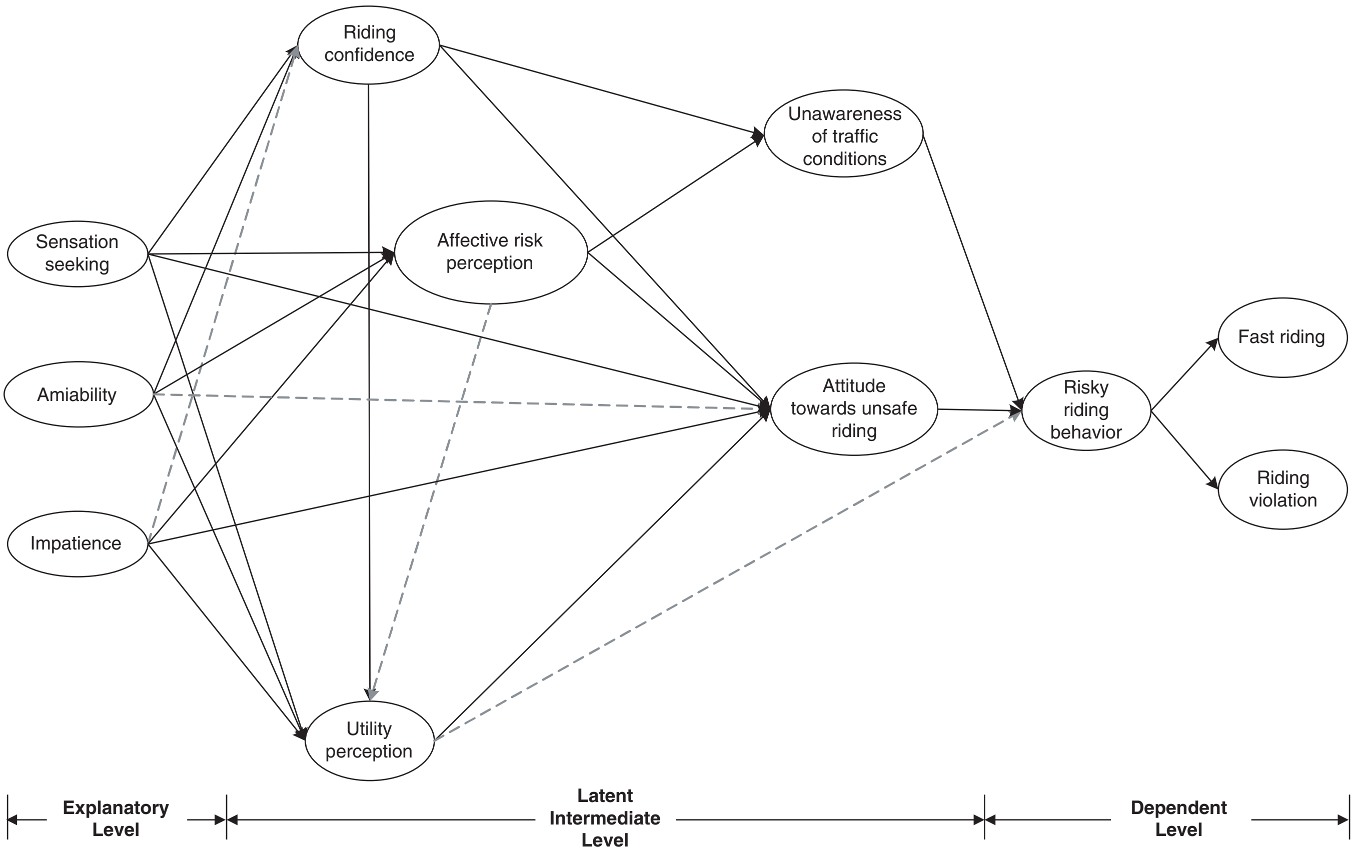


**FIGURE 1 Behavior model for risky riding (*9*).**

aggressive, conservative, and nervous. The patterns of cluster means indicated that the Risky cluster was the most sensation seeking and impatient. The lowest score for amiability also suggested that individuals in the risky cluster were the least amiable. Similar to those in the risky cluster, individuals in the aggressive cluster were both sensation seeking and impatient. Interestingly, contrary to the risky cluster, the aggressive cluster was the most amiable one.

On the contrary, the conservative cluster, consisting of 24.7% of the sample, had the lowest score on measures of impatience. Moreover, individuals in this cluster were amiable and not sensation seeking. Individuals in the nervous cluster were characterized by the lowest level of sensation seeking. They were slightly unfriendly and had a high level of impatience.

**TABLE 1 Mean Standardized Scores on Variables Defining Young Rider Clusters**

| | Clusters | | | |
|---|---|---|---|---|
| Variable | Risky ($n = 158$) | Aggressive ($n = 201$) | Conservative ($n = 169$) | Nervous ($n = 155$) |
| Sensation seeking | 0.64 | 0.61 | −0.24 | −1.18 |
| Amiability | −1.11 | 0.72 | 0.30 | −0.13 |
| Impatience | 0.47 | 0.35 | −1.21 | 0.40 |

## Riding Behavior Constructs

For each of the four clusters, the associated raw scores on the constructs defined in the risky-riding behavior model were calculated and summarized in Table 2. Their statistical differences are provided in the rightmost column. The first five constructs listed in Table 2 are those in the latent-intermediate level of the model, which are mediators between personality traits and risky-riding behaviors. The last three constructs in Table 2 are dependent constructs that explain risky-riding behaviors. Table 3 summarizes the pair-wise comparisons between clusters with Tukey's method.

Results of *F* tests show that these four clusters have distinct patterns in terms of their constructs. The risky and aggressive clusters were considered as high-risk groups in terms of reporting the highest likelihood of conducting risky-riding behavior. Moreover, both of their scores in the five latent-intermediate constructs are medium to high compared with the other two clusters. As Table 3 shows, the constructs in risky and aggressive clusters are not significantly different from each other except for riding confidence. The two clusters may seemingly be considered as one. However, although the two clusters are both sensation seeking and impatient, amiability is the critical factor to distinguish one from the other: Individuals in the risky cluster are the least amiable, and those in the aggressive cluster are the most amiable. This difference arouses a motivation to investigate further the possible structure discrepancy between the risky and aggressive clusters.

But individuals in the conservative and nervous clusters are less likely to conduct risky-riding behavior, especially those in the nervous cluster. These two clusters are significantly different from each other

**TABLE 2 Raw Scores of Constructs in the Risky-Riding Behavior Model**

| | Cluster | | | | |
|---|---|---|---|---|---|
| Construct | Risky | Aggressive | Conservative | Nervous | *F* |
| Riding confidence | 2.00 | 2.26 | 2.07 | 1.77 | 28.59** |
| Affective risk perception | 2.28 | 2.39 | 2.02 | 2.50 | 20.78** |
| Utility perception | 2.17 | 2.25 | 1.86 | 1.49 | 51.51** |
| Attitude toward unsafe riding | 1.34 | 1.35 | 1.00 | 0.86 | 35.18** |
| Unawareness of traffic conditions | 1.06 | 0.96 | 0.7 | 0.76 | 18.98** |
| Risky riding behavior | 1.33 | 1.32 | 1.02 | 0.83 | 49.04** |
| Fast riding | 1.66 | 1.70 | 1.38 | 1.08 | 26.73** |
| Riding violation | 0.94 | 0.90 | 0.65 | 0.62 | 17.64** |

NOTE: The range of the raw score (a five-point Likert scale) is between zero and four.
$^{**}p < 0.05$.

and from the other two clusters. Individuals in the conservative cluster are the most patient riders, with a moderate level of riding confidence and the lowest level of concern about risky-riding behavior. In particular, they are highly aware of traffic conditions. Individuals in the nervous cluster may be the most anxious riders. In addition to their lowest score in sensation seeking, they feel risks while riding on roads. They are characterized by their least sensation-seeking personality trait, lowest riding confidence, and highest perception of risk.

## Riding Behavior Structure

The table below summarizes the equivalence tests of measurement and structure consistency across clusters:

| *Test* | *Degree of Freedom* | *Chi-Square* | *p-Value* |
|---|---|---|---|
| Equivalence of measurement model | 51 | 61.975 | .140 |
| Equivalence of structure model | 120 | 186.043 | .000 |

Results show that the equivalence of measurement model is not significantly different but that the equivalence of structure model is significantly different. In other words, the questionnaire items for each construct and variance and covariance relationships adopted from Wong et al. (*9*) are appropriate across clusters. Yet, the causal relationship, i.e., the path structure in Figure 1, is not applicable to all the clusters. Consequently, the next step is to explore appropriate structures for each cluster as the basis for investigating possible structure discrepancies between clusters.

Figure 2 illustrates the best structure for each cluster, showing that the best causal relationships to describe the formation of risky-riding behaviors for each cluster are different from each other. In other words, although individuals in each cluster exhibit similar risky-riding behaviors, these behaviors may result from different reasons.

To analyze and compare the structures between clusters further, Table 4 identifies and summarizes all the paths starting from each personality trait to risky-riding behavior.

### Risky and Aggressive Clusters

Observations in Figure 2 and Table 4 show that the impact paths from personality traits (F1, F2, and F3) to risky-riding behavior (F9) are not completely consistent between the risky and aggressive clusters. The aggressive cluster has two links between personality traits and risky-riding behavior directly via attitude towards unsafe riding (F7): One starts from sensation seeking (i.e., F1→F7→F9)

**TABLE 3 Pair-Wise Comparisons Between Clusters with Tukey's Method**

| | Cluster | | | | | |
|---|---|---|---|---|---|---|
| Construct | R[a] Versus A | R Versus C | R Versus N | A Versus C | A Versus N | C Versus N |
| Riding confidence | A[b] | — | R | A | A | C |
| Affective risk perception | —[c] | R | N | A | — | N |
| Utility perception | — | R | R | A | A | C |
| Attitude toward unsafe riding | — | R | R | A | A | — |
| Unawareness of traffic conditions | — | R | R | A | A | — |
| Risky riding behavior | — | R | R | A | A | C |
| Fast riding | — | R | R | A | A | C |
| Riding violation | — | R | R | A | A | — |

[a]R, A, C, and N refers to risky, aggressive, conservative and nervous, respectively.
[b]The value in cells represents the cluster that has a significantly higher construct mean ($p < 0.01$) compared to the other cluster.
[c]— represents nonsignificant difference between the two specified constructs.

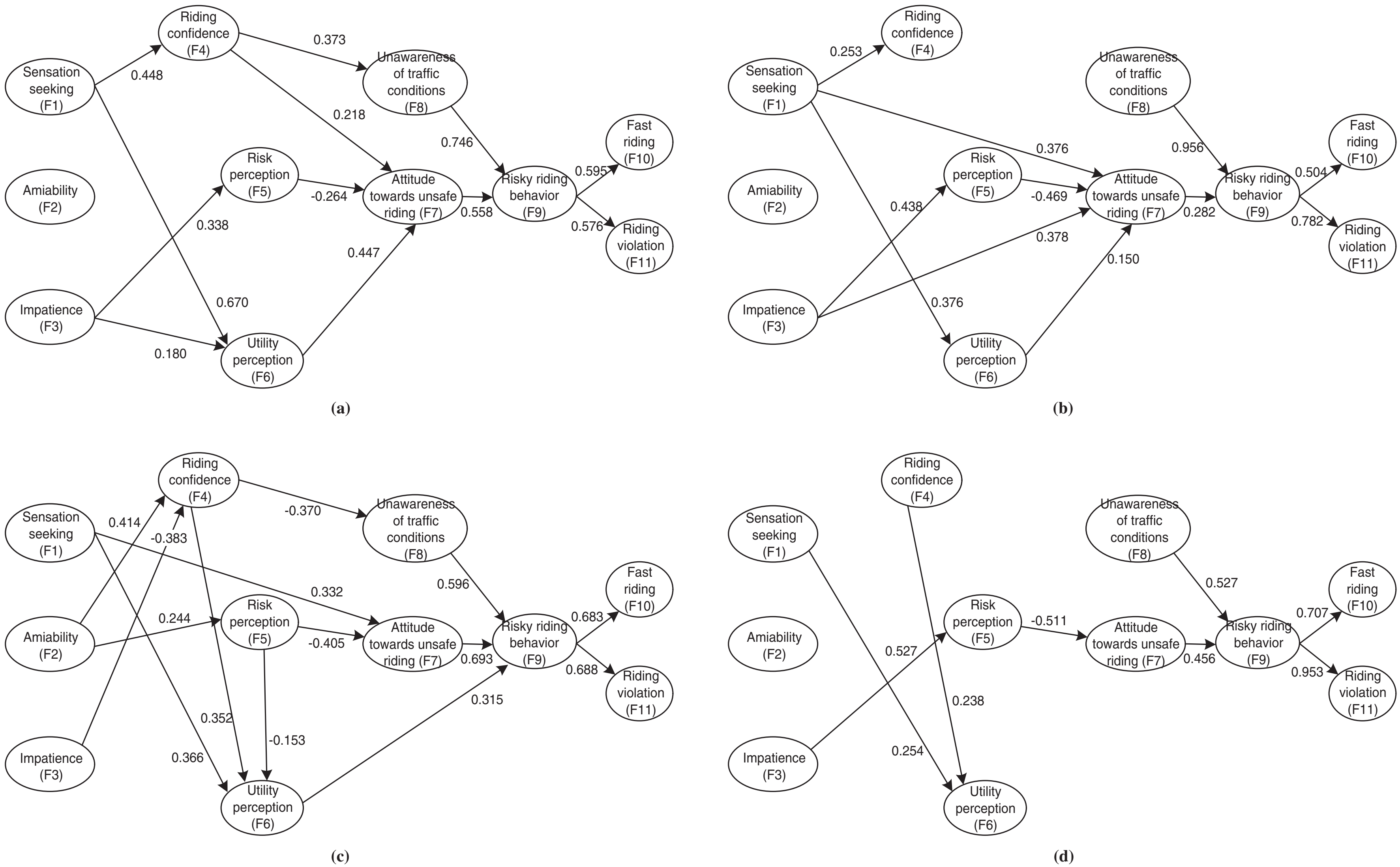


FIGURE 2 Estimated structures and path coefficients for clusters: (*a*) risky, (*b*) aggressive, (*c*) conservative, and (*d*) nervous.

**TABLE 4 Effects[a] of Personality Traits on Risky-Riding Behavior**

| | | Cluster | | | |
|---|---|---|---|---|---|
| Personality Trait | Impact Path | Risky | Aggressive | Conservative | Nervous |
| Sensation seeking | F1→F6→F9 | | | 0.115 (33.3) | |
| | F1→F7→F9 | | 0.106 (86.9) | 0.230 (66.7) | |
| | F1→F4→F7→F9 | 0.054 (15.6[b]) | | | |
| | F1→F4→F8→F9 | 0.125 (36.1) | | | |
| | F1→F6→F7→F9 | 0.167 (48.3) | 0.016 (13.1) | | |
| | Total effect[c] | 0.346 (100.0) | 0.122 (100.0) | 0.345 (100.0) | |
| Amiability | F2→F4→F6→F9 | | | 0.046 (−40.7) | |
| | F2→F4→F8→F9 | | | −0.091 (80.5) | |
| | F2→F5→F7→F9 | | | −0.068 (60.2) | |
| | Total effect | | | −0.113 (100.0) | |
| Impatience | F3→F7→F9 | | 0.107 (232.6) | | |
| | F3→F4→F6→F9 | | | −0.042 (−100.0) | |
| | F3→F4→F8→F9 | | | 0.084 (200.0) | |
| | F3→F5→F7→F9 | −0.050 (1000.0) | −0.061 (−132.6) | | −0.123 (100.0) |
| | F3→F6→F7→F9 | 0.045 (−900.0) | | | |
| | Total effect | −0.005 (100.0) | 0.046 (100.0) | 0.042 (100.0) | −0.123 (100.0) |

[a]Effects are the products of the coefficients along the path between the two specified constructs that involve intervening constructs.
[b]Numbers in parentheses represent percentages.
[c]Total effect is the sum of all impact path effects.

and the other begins at impatience (i.e., F3→F7→F9). These two paths do not exist in the risky cluster. On the contrary, the risky cluster has three indirect paths that the aggressive cluster does not have. These paths include two paths starting from sensation seeking (i.e., F1→F4→F7→F9 and F1→F4→F8→F9) and one path beginning at impatience (i.e., F3→F6→F7→F9). Obviously, different constructs mediate the connections between personality traits and risky-riding behavior in the two clusters.

Despite their structural differences, two common paths also appeared in the two clusters. One starts from sensation seeking (i.e., F1→F6→F7→F9), and the other begins at impatience (i.e., F3→F5→F7→F9). Furthermore, both clusters do not have any significant paths between amiability and risky-riding behavior. This may partially explain why the mean scores of most intermediate and dependent constructs for these two clusters have no significant difference (see Table 3) although their amiability scores are entirely different (see Table 1). Results in Table 4 also show that the total effects starting from sensation seeking in the two clusters are both much higher than those from the other personality traits, indicating the critical influence of sensation seeking on conducting risky-riding behavior for individuals in the risky and aggressive clusters.

### *Conservative and Nervous Clusters*

The conservative cluster has completely different paths from the other clusters except the one between sensation seeking and risky-riding behavior through attitude toward unsafe riding (i.e., F1→F7→F9). The conservative cluster is the only cluster that has significant paths starting from amiability. Its two paths begin at impatience, including F3→F4→F6→F9 and F3→F4→F8→F9, and do not appear in the other three clusters. This cluster is also the only one that has the path starting from sensation seeking via utility perception to risky-riding behavior (i.e., F1→F6→F9). Yet, similar to the risky and aggressive clusters, sensation seeking in the conservative cluster, compared with the other personality traits, also shows the most impact on risky-riding behavior.

The nervous cluster has the most-unique structure as shown in Figure 2. Only one significant path connects from its personality trait to risky-riding behavior. This path starts from impatience (F3) and goes through risk perception (F5) and attitude towards unsafe riding (F7) to risky-riding behavior (F9).

Overall, the nervous cluster has the simplest riding behavior structure, but the conservative cluster has the most complex one. The risky and aggressive clusters are in between.

## DISCUSSION OF RESULTS

This study examines the structure discrepancies of heterogeneous young motorcyclists' risky-riding behavior based on the causal model proposed by Wong et al. (*9*). Samples were first clustered based on their scores of three personality traits including sensation seeking, amiability, and impatience, deriving four clusters. This work then assesses the differences of construct scores and causal relationships between clusters. The results suggest that structure discrepancies do exist between young motorcyclists' riding behaviors.

### Construct Score and Causal Structure

Nonsignificant construct scores do not necessarily indicate a nonsignificant difference of causal relationships between heterogeneous groups. Solely investigating constructs may miss some critical information among heterogeneous riding behaviors. In the empirical study, results of mean score difference show that the risky and aggressive clusters have no significant difference in almost all constructs. However, results of causal relationship difference suggest that remedies to overconfidence, such as educating drivers to be aware of potential dangers in the riding environment, could be more effective in reducing risky-riding behavior in sensation seekers in the risky cluster compared with those in the aggressive cluster. The aforementioned findings are difficult to find by examining constructs only but can be demonstrated by analyzing the causal relationship difference.

Thus, a further investigation of the different causal relationships between heterogeneous groups is helpful for examining how these differences affect heterogeneous risky-riding behaviors and what countermeasures to employ.

### Theory of Planned Behavior

Researches commonly adopt the theory of planned behavior (*15*) to explain driving behaviors that also define part of the structures in our study.

Findings show that riding confidence, which reflects perceived behavior control in the theory of planned behavior, has significant impact on risky-riding behavior in the risky and conservative clusters. In the risky cluster, the path that directly connects riding confidence, attitude towards unsafe riding, and risky-riding behavior suggests that the higher is the perceived vehicle control, the more likely individuals are to exhibit risky-riding behaviors. This result is consistent with the description of planned behavior theory.

However, when unawareness of traffic conditions further mediates the connection between riding confidence and risky-riding behavior, the resulting effect may vary for different types of riders. Research results show that individuals in the risky cluster may overestimate their riding confidence. When their riding confidence rises, they come less aware of traffic conditions and are more likely to exhibit risky-riding behaviors. On the contrary, individuals in the conservative cluster may underestimate their riding confidence. When these riders are more confident about their riding skills, they become more aware of traffic conditions, leading to less risky-riding behaviors. Accordingly, although educating young motorcyclists to have an appropriate level of riding confidence is critical, the topics of education should be different for distinct riders. The focus for young riders in the risky cluster should be on preventing overestimation of riding confidence. Yet for those in the conservative cluster, building up their riding confidence could help them to reduce risky-riding behaviors.

Findings show that amiability, a personality trait adopted in this study, which partially reflects the subjective norm in the theory of planned behavior, has significant paths connecting risky-riding behavior only in the conservative cluster. Results suggest that when individuals in the conservative cluster have more concerns with other people, they are less likely to conduct risky-riding behavior, consistent with the description of the planned behavior theory. Nevertheless, the remaining clusters do not show such relationships.

The aforementioned discussions suggest that heterogeneous riders may present complicated causal relationships beyond the framework set on a neat theoretical structure.

### Risk Homeostasis Theory

Risk homeostasis theory (*16*) is another theory commonly adopted by researchers to explain driving behaviors. This theory mainly suggests that drivers compare the benefits and costs perceived in the driving process to maintain a target level of risk. Findings also show this comparison mechanism in all clusters except the nervous cluster.

An obvious example exists in the risky cluster. Observations show positive effects on all the paths starting from sensation seeking and one path beginning at impatience, but findings show a negative effect on the path between impatience and risky-riding behavior via risk perception and attitude towards unsafe riding. The likelihood of conducting risky-riding behavior is determined by comparing all the positive and negative effects. The aggressive and conservative clusters also reveal similar comparison mechanisms. Nonetheless, the nervous cluster does not exhibit this mechanism; only perceived risk presents significant effects on risky-riding behavior, and no perceived utility appears. In other words, individuals in the nervous cluster do not conduct risky-riding behavior because of increased perceived utility.

The comparison mechanisms reveal that effectively reducing risky-riding behaviors for riders in the risky, aggressive, and conservative clusters involves adjusting their intermediate constructs including risk perception, utility perception, and unawareness of traffic conditions. An intervention strategy of educating young motorcyclists to have appropriate risk estimation for potential risks on roads is especially crucial, because paths through risk perception play significant roles in providing negative effects on risky-riding behavior, particularly for the paths starting from impatience. Other intervention strategies can also be devised based on the discovered comparison mechanisms, such as (*a*) educating riders not to excessively pursue fun and excitement from riding and (*b*) using intelligent transport systems to inform riders to be aware of traffic conditions.

## ACKNOWLEDGMENTS

The authors thank the anonymous referees for their helpful suggestions and comments. This work was partially supported by the National Science Council of Taiwan.

## APPENDIX A

### QUESTIONNAIRE ITEMS FOR EACH CONSTRUCT

**Explanatory Constructs: Personality Traits**

Sensation seeking
- I often crave excitement.
- I sometimes do things just for kicks or thrills.
- It’s OK to get around laws and rules as long as you don’t break them directly.

Amiability
- Few people think I am selfish and egotistical.
- Few people think of me as calm and calculating.

Impatience
- Pedestrians block my way while I’m riding in an alley.
- I am stuck in a traffic jam.
- I am riding behind a truck and my views are blocked.

**Latent Intermediate Constructs**

Riding confidence
- I can handle any unexpected situation even when riding on unfamiliar roads.

*(continued on next page)*

If I run into danger while riding, I have the skills to get out of it safely.

Affective risk perception

Ride between two lanes of fast moving traffic.

Ride so close to the front vehicle that it would be difficult to stop in an emergency.

Merge onto major roads from a minor road when there is coming traffic.

Ride so fast into a corner that I feel like I'm losing control.

Utility Perception

Riding is not only for transportation but also for fun or recreation.

Riding a motorcycle makes me feel relaxed.

Attitude towards unsafe riding

It is acceptable to ride on the opposite lane of a two-lane road for convenience.

With good skills, speeding is OK.

I think it is OK to speed if the traffic condition allows me to do so.

Unawareness of traffic conditions

Do not use mirror to check surrounding vehicles while riding or turning.

Do not use turn signals when turning.

**Dependent Constructs: Risky-riding Behavior**

Fast riding

In order to ride faster, I squeeze through an extremely narrow space between one vehicle and another.

Compared to the surrounding traffic flow, I ride much faster.

Disregard the speed limit late at night or in early morning.

Riding violation

Drink and ride.

Run through red lights.

Do not wear a helmet while riding.

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*The Motorcycles and Mopeds Committee peer-reviewed this paper.*