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ASIAN TRANSPORTATION RESEARCH SOCIETY

Risk Riding Behaviors and Interventional Approaches among Young Motorcyclists in Big Cities of Thailand

October 2015

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ATRANS
ASIAN TRANSPORTATION RESEARCH SOCIETY

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Abstract

The research objectives are to (1) examine risky riding patterns of young riders (2) explore determinants behind risk riding behaviors among young people (3) test whether the developed model is fit to the empirical data and (4) give suggestions and recommendations for policy makers. The samples of this study were 3,191 young motorcyclists in 6 big cities in Thailand namely Bangkok, Chiangmai, Chonburi, Khonkaen, Songkla, and Ubon-Ratchathani. Questionnaire was employed to collect the data. The gathered data then were analyzed using structural equation modeling technique. Discussion on the findings as well as providing suggestions and recommendations for policy makers will be also made in the latter part of this report.

Acknowledgements

This research granted by ATRANS is made possible through the help and support from everyone, including: project members, and participants who provided real facts and information. Especially, please allow me to dedicate my acknowledgment of gratitude toward the following significant advisors and contributors:

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Second, I would like to thank Assoc. Prof.Dr. Chumnong Sorapipatana of KMUTT, and Dr. Vittaya Chartbunchachai of Khon Kaen Hospital who gave us valuable advices and suggestions.

Finally, I sincerely thank to ATRANS for granting this project.

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CHAPTER I INTRODUCTION

Introduction

The World Health Organization (WHO) reported that road traffic accident caused 1.24 million fatalities worldwide accounting for 3,397 deaths per day (WHO, 2013, p. 4). It also reported that Thailand had the highest fatalities rate in ASEAN and ranked the third in the world (38.1deaths/100,000 populations). In addition, about 23 and 33 percent of deaths occur among motorcyclists worldwide and among motorcyclists in ASEAN countries respectively. According to Thailand, young people between 15-24 years of age had the highest fatality rate accounting for 32.70 deaths/100,000 populations (The National Statistics Office, 2014, p. 2).

Motorcycles are very popular mode of transport among young people in Thailand (Pitaktong et al., 2004, p. 232). During 2004-2014, the number of registered motorcycles has been increasing dramatically from 13,206,580 in 2004 to 20,141,213 in 2014 accounting for 34.43 percent (Department of Land Transport, 2015). Not surprisingly, the number of deaths from motorcycle-related accidents in Thailand is still very high. The study conducted by Namwat et al. in 2001 (as cited in Pitaktong et al., 2004, p. 233) found that about 74 percent of traffic injuries were related to motorcycle accidents. However, the Bureau of Epidemiology, Department of Disease Control, Ministry of Public Health (2012, p. 481) reported that about 82.25 percent of injuries was caused by motorcycle-related accidents. It also reported that about 15.45 percent of deaths were riders who are between 15-19 years of age. This age group had the highest fatality rate compared to other age groups.

The road traffic fatalities among young people are caused by unprotected riding and alcohol drinking (Pitaktong et al., 2004, p. 234). Nayum (2008, p. 34) found that female are likely to hold negative attitudes on speeding compared to male. The study conducted by Banu et al. (2013, pp.4251-4252) also found similar results. Their study showed that aggressive riding behaviors were reported more often by men than women. Speeding and traffic law violation were the most prevalent risky behavior according to their study. Hongsranagon et al. (2008, p. 31) suggested that the main causes of traffic accidents among young people results from personal behavior, such as traffic law violation and drunk riding. Some young riders perform

risky riding due to positive emotions, for instances, pleasure, fun, and happiness. Hence, they enjoy risk-taking and speeding. The motives that associated with risky behaviors are experience-seeking, sensation-seeking, confidence/ familiarity, and underestimation of risk (Jevtic et al., 2012, p. 1139). Wong, Chung, and Huang (2010, p.280) suggested that personal traits play an important role on riding behavior. According to their study, personal traits were divided into three categories known as sensation seeking, amiability, and impatience. In additions, there are other determinants affecting risky riding behavior, such as riding confidence, affective risk perception, unawareness of traffic condition, utility perception, and attitude towards unsafe riding. They also defined risky riding behavior as fast riding and traffic violation.

We, therefore, are interested in doing a research on risky riding behaviors among young motorcyclists in some big cities of Thailand.

Objectives

The objectives of this study are as followings:

1. To examine risky riding patterns of young riders.
2. To explore determinants behind risk riding behaviors among young people.
3. To test whether the developed model is fit to the empirical data.
4. To give suggestions and recommendations for policy makers.

Scope of the research

The scope of this study focused on six big cities in Thailand namely, Bangkok, Chiang Mai, Chon Buri, Khon Kaen, Songkla, and Ubon-Ratchathani. It also emphasized on risky riding behaviors of young riders whose age is between 15-24 years old and be the residents of the given big cities. Furthermore, the theory of planned behavior (TPB) was the major theory employed in this study.

Research questions

1. What are the most important kinds of risky riding among young motorcyclists in big cities of Thailand?
2. What are the most important factors affecting risky riding behaviors among young motorcyclists in big cities of Thailand?
3. Is the developed model fit to the empirical data?

Research Hypothesis

H1: knowledge of traffic law has an influence on attitude toward behaviors

H2: knowledge of traffic law has an influence on behavioral intentions

H3: knowledge of traffic law has an influence on risky riding behaviors

H4: attitude toward behaviors has an influence on behavioral intentions

H5: attitude toward behaviors has an influence on risky riding behaviors

H6: traffic law enforcement has an influence on behavioral intentions

H7: traffic law enforcement has an influence on risky riding behaviors

H8: group influence has an influence on behavioral intentions

H9: group influence has an influence on risky riding behaviors

H10: road structure has an influence on behavioral intentions

H11: road structure has an influence on risky riding behaviors

H12: behavioral intentions has an influence on risky riding behaviors

Advantages of the research

1. Agencies responsible for road safety promotion can apply the findings yielded from this study as academic references to support their decision making in any related road safety project.
2. Policy makers can employ the findings from this study to support their initiatives on road safety policy of not only provincial, regional, and national levels.
3. Scholars, students, and general researchers can use the findings from this study to

Research streams

A short summary of each research streams is illustrated in Table 1.

Table 1 Research streams

Stream	Description	Responsible person	Main support
1	Review of literature	Pol.Lt.Col. Dr. Waiphot	Pol.Col.Chinda Mr. Patipol
2	Construction of questionnaire	All members	Dr. Tuenjai Assoc.Prof.Dr. Chumnong

Table 1 (Con't)

Stream	Description	Responsible person	Main support

3	Questionnaire validation	All members	Dr. Tuenjai Assoc.Prof.Dr. Chumnong Dr. Vittaya
4	Data collection	All members	Advisors
5	Data analysis	Pol.Lt.Col. Dr. Waiphot	Mr. Patipol Pol.Col.Chinda
6	Roundtable discussion and workshop	All members	Dr. Tuenjai Assoc.Prof.Dr. Chumnong Dr. Vittaya
7	Preparation of reports	All members	Dr. Tuenjai Assoc.Prof.Dr. Chumnong Dr. Vittaya

Timeframe

The timeframe of this research is scheduled as illustrated in Table 2.

Table 2 Timeframe

Activities	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Review of literature	X											
Inception report submission	X											
Questionnaire Validation		X										
Progress report			X									
Data collection				X	X							
Data analysis						X						
Interim report presentation & submission							X					
Roundtable discussion & workshop								X				
Final report presentation & comments									X			
Final report preparation & submission										X	X	X

Project oversight

The project oversight component of this research has been designed to track and provide guidance, comments, and recommendations at key stages of the project from different perspectives.

1. Project advisors – three advisors are assigned to provide independent assessment and review of major outputs. Then, they responsible for giving comments and recommendations on technical excellence and relevance.

2. Consultative forum – to ensure the relevance and completeness of the findings, this forum or roundtable discussion will be held in order to gain comments and recommendations from various perspectives.

Terminology

1. Attitude toward behavior refers to the degree to which an individual has a favorable or unfavorable evaluation or appraisal of the behavior in question.

2. Behavioral intention refers to an ability of an individual to decide at will to perform or not perform the behavior.

3. Group influence refers to a social pressure by members of one's group to take a certain action, adopt certain values, or otherwise conform in order to be accepted by other members.

4. Knowledge of traffic law refers to the extent to which the motorcyclists know about traffic law.

5. Risky riding behaviors refers to rider intentions and behavior that may lead to fatal or serious injury crash involvement for the motorcyclist, their passenger, or other road users.

6. Road structure refers to a condition of road physically obstructs riding motorcycle and lead to traffic law violation.

7. Traffic law enforcement refers to the extent to which motorcyclists perceive about how restriction of detection of a violation through to the penalty.

This chapter consists of seven topics namely, theory of planned behavior (TPB), risky riding behavior, attitude toward risky riding behavior, linkage between knowledge of traffic law, group influence, traffic law enforcement, and road structure and risky riding behaviors.

Theory of planned behavior (TPB)

Ajzen (1991, p. 181) claimed that the theory of planned behavior (TPB) is an extension of the theory of reasoned action initiated by Ajzen and Fishbein in 1980. This theory stated that one's behavior is influenced by his/her intention. The most likely the stronger intention, the more likely the behavior he/she will perform.

The theory also explained that the perceived behavioral control can be used directly to predict the behavioral intentional and behavioral achievement. The perceived behavioral control has similar meaning with self-efficacy of Bandura (1982, p. 122). He defined the term as "is concerned with judgments of how well one can execute courses of action required to deal with prospective situations." Hence, it can be concluded that people's behavior is strongly influenced by their confidence in their ability to perform such behaviors.

The theory of planned behavior also explained three antecedents of intention which are attitudes toward behaviors, subjective norm, and perceived behavioral control. The attitude toward behavior means the degree to which an individual has a favorable or unfavorable evaluation or appraisal of the behavior in question. Subjective norm which is a social factor can be defined as a perceived social pressure for an individual to perform or not to perform the behavior. The perceived behavioral control refers to the perceived ease or difficulty of performing the behavior and it is assumed to reflect past experience of an individual. Hence, the stronger the attitude toward behavior, subjective norm, and perceived behavioral control, the stronger intention an individual will perform a behavior. For ease understanding, the structural diagram of this theory is depicted in Figure 1 as follow:

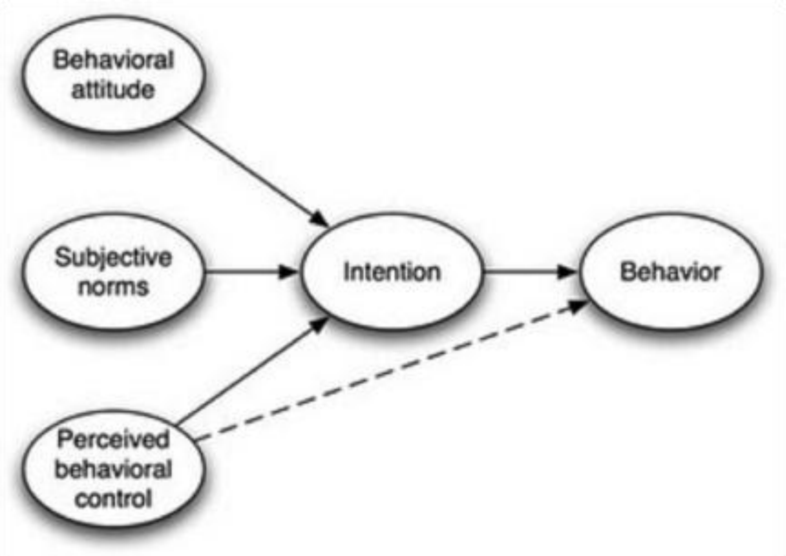


Figure 1 Structure diagram of TPB

Source: Ajzen (1991)

Risky riding behavior

Watson et al. (2007, p1) defined risky riding behavior as rider intentions and behavior that may lead to fatal or serious injured crash involvement for the motorcyclist, their passenger, or other road users. Suangka (2016, pp. 13-14) gave a very short definition of risky riding behaviors. She defined the behaviors as an action of driver or rider that lead to fatal and injured traffic accidents. She also provided various kinds of risky riding behaviors as follows:

1. Not wearing helmet while riding
2. Drunk riding
3. riding over the speed limit
4. Inexperienced riding
5. Sudden overtaking
6. Sudden braking
7. Riding while ability impaired

According to Watson et al. (2007, pp. 67-68), there are six themes of safe and risky riding behavior as followings;

1. Handling skills
2. Concentration and focus
3. Road rules
4. Impairment
5. Pushing your limits
6. Stunts/extreme speed.

Attitude toward risky riding behavior

Attitude toward risky riding behavior is involved with the nature of pro and con evaluation of an individual. The behavioral intention he/she will perform is associated with the perceived consequence of the behavior. For example, if an individual perceives that speeding will provide him/her a positive outcome, he/she may intend to perform such behavior. A study by Forward (2009) found that driver who violated the law perceived driving over the speed limit will give them pleasant results; arriving at the destination quicker, and getting more excitement. A study by Elliot (2010) who adopted an extended version of the TPB to examine motorcyclists' intentions to speed on urban roads and motorways found that attitude is an important factor predicting motorcyclists' intentions. Hence, they in turn will perform risky riding behavior. The study of Fergusson, Swain-Campbell, and Horwood (2003) also confirmed that young people are more likely to perform risky riding than older people.

Knowledge of traffic law and risky riding behavior

The study by Waiyanate (2010) found that more than 70 percent of young riders had not been officially trained in school about traffic law, rules, regulation, and safety riding. Hence, training after they had more experience in riding motorcycle could not give positive impact on their riding behavior. The result of her study indicated that riders having training from driving school had lower rate of traffic law violation than those who did not.

Group influence and risky riding behavior

Group or peer plays an important role in risky riding behavior among young people. It can be defined as a social pressure by members of one's group to take a certain action, adopt certain values, or otherwise conform in order to be accepted by other members (Dictionary.com website, 2017). Sela-Shayovitz (2008) stated that the influence of peer pressure on behavior is particularly strong. The study by Møller and Haustein (2014) showed that peer pressure contributed to increased speeding behavior of young people. However, peer pressure did not affected riding behavior of people of 28 years old.

Traffic law enforcement and risky riding behavior

Suangka (2016, p. 9) stated that non rigid law enforcement enhance road users to drive and ride carelessly and illegally. The study by (Waiyanate, 2010, p. 13) found that about 87.88 percent of young riders always violate traffic law when there is no presence of traffic police. Traffic law enforcement can affect riding behavior of motorcyclists in various degrees. Mäkinen et al. (2003, p. 40) concluded that traffic law enforcement against speeding provided fair effects on rider behavior. The speed will decrease prior to approaching the surveillance point and it start increasing again after passing the point. According to enforcement against drunk driving, the study by Mäkinen and Veijalainen (1997) showed that about 40 percent of drivers are tested annually in Finland. In addition, the number of caught driver has fallen during the past 10 years. This can be implied that traffic law enforcement will have negative effect on performing risky riding behavior.

Road structure and risky riding behavior

Road structure refers to a condition of road physically obstructs riding motorcycle and lead to traffic law violation and accidents. For instances, width of traffic lane, barriers, rough road surface, and under-construction road (Suangka, 2016, p.8). Road surface not only leads to violation but also traffic accidents. Haworth (1999, p.3) found that the condition of the road; lack of visibility or obstructions, unclean road or loose material, poor road markings and horizontal curvature contributed to about 15 percent of road traffic accidents in Australia.

Conceptual framework

According to the review of literature, the conceptual framework is proposed as follow;

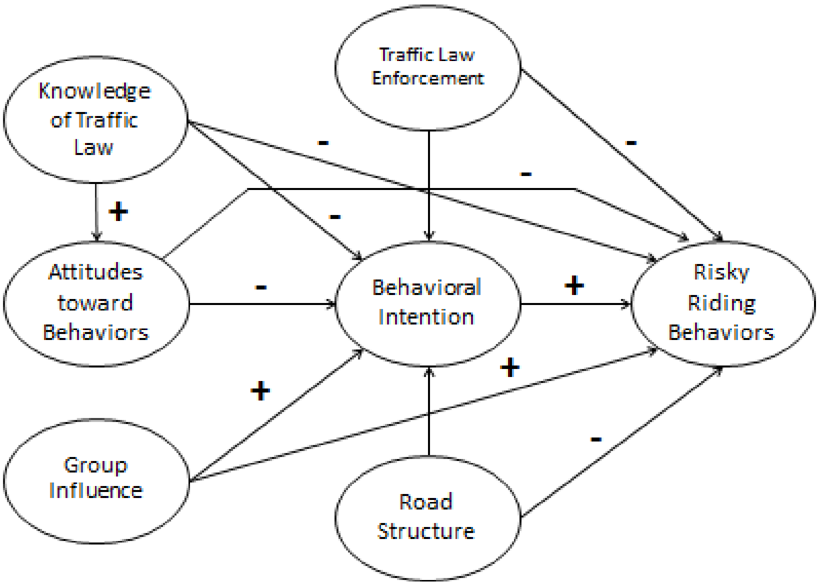


Figure 2 Conceptual framework

CHAPTER 3 METHODOLOGY

Population

The population of this study is young people living in six big cities of Thailand, namely Bangkok, Chon Buri, Khon Kaen, Ubon Ratchathani, Chiang Mai, and Songkla accounting for 1,971,525 persons.

Sample

The samples of this study are young people who are at the age cohort of 15-24 according to the United Nations (UN) definition. They are residents in six big cities in Thailand; Bangkok, Chon Buri, Khon Kaen, Ubon Ratchathani, Chiang Mai, and Songkla. At least 500 samples from each city will be studied.

Sampling

According to this study, nonprobability sampling method will be employed. In this sampling method, we have no objective way of evaluating how far away from the population parameter our estimate may be. The drawback of this method is that, when we do not select our sample randomly out of the entire population of interest, our sampling results may be biased. In addition, the sample may not be a true representative of the population of interest. However, it is well suited for exploratory research intended to generate new ideas that will be systematically tested later (Salant & Dillman, 1994, p.64). Furthermore, it can save time and budget to collect data from the sample.

Questionnaire

Questionnaire will be employed to collect primary data from the samples. The questionnaire is divided into 8 parts;

1) Demographic data
2) Knowledge of traffic law
3) Attitude toward behaviors
4) Traffic law enforcement
5) Group influence
6) Road structure
7) Behavioral intentions
8) Risky riding behaviors

Validity

Each item will be assessed by transportation experts giving the item rating of 1 for clearly measuring, -1 for clearly not measuring, and 0 for unclear measuring. Finally, the index of item – objective congruence (IOC) will be calculated using the formula developed by Rovinelli and Hambleton (as cited in Kotchapong, 2008) for each item of the questionnaire. According to Rovinelli and Hambleton (as cited in Kotchapong, 2008), IOC value I_{ik} for *i*-th item on *k*-th objective is an average of rating for each combination of each item and objective, and IOC is defined as follows:

$$I_{ik} = \frac{1}{N}\sum_{j=1}^{N} S_{ijk}, i = 1,\dots,M, k = 1,\dots,K,$$

where S_{ijk} = the rating of (-1, 0, 1) of *i*-th item as measure of *k*-th objective by *j*-th specialist

M = total number of items

N = the number of specialists

K = the number of objectives

Prasitrattasin (2007) suggested that the IOC index higher than .50 is determined as valid. Hence, any item with IOC index lower than .50 will be deleted or the statements will be revised in accordance with the recommendations of the experts.

Reliability

After all items of the questionnaire are validated, the questionnaires will be revised and then sent approximately 30 samples as a pilot survey. Then, the reliability of each measurement, measure of internal consistency, will be examined employing Cronbach's alpha coefficient (Cronbach, 1951). For this research, the Cronbach's Alpha coefficient for *k*-th object is defined as follows:

$$\alpha_k = \frac{M_k}{1 - M_k}\left(1 - \frac{\sum_{i=1}^{M_k}\sigma^2(Y_i)}{\sigma_k^2}\right),$$

where M_k = the number of items in *k*-th objective

$\sigma^2(Y_i)$ = variance of rating of *i*-th item on *k*-th object

σ^2_k = ni (sgnitar) etisopmoc latot fo ecnairav*k*-th object

George and Marry (as cited in Gliem & Gliem, 2003) suggested that the Cronbach's alpha coefficient >.90 – Exccellent, >.80 – Good, >.70 – Acceptable, >.60 – Questionable, >.50 - Poor, and <.50 – Unacceptable. The result of reliability analysis is illustrated in Table 3.

Table 3 Reliability of each measure

Measure	Items	α
Knowledge of traffic law	7	.861
Attitude toward behaviors	10	.957
Traffic law enforcement	3	.855
Group influence	4	.902
Road structure	4	.800
Behavioral intentions	10	.829
Risky riding behaviors	10	.944

Analysis

The primary data will be collected using questionnaires as a research tool. Well-trained research assistants are assigned to collect data in October 2015. Then, descriptive statistics such as frequency, percentage, mean, median, and standard deviation (SD) will be applied in data analysis. In addition, confirmatory factor analysis (CFA) will be employed in order to test the construct validity of each measurement model. Finally, structural equation modeling (SEM) technique using statistical software will be employed to examine relationship between each variable.

CHAPTER 4 RESULTS

Participants

The majority of participants were male accounting for 60.3 percent. Most of them were pursuing/having bachelor degree (56.3%). About 57.4 percent of the participants lived with parents. The majority of the participants had parents living together. Interestingly, about 16 percent of them were living alone as illustrated in Table 4.

Table 4 Demographic information

Demographic details	Frequency	Percentage
Sex		
- Male	1,923	60.3
- Female	1,268	39.7
Educational background		
- High school or lower	751	23.1
- Vocational/High vocational School	638	20.0
- Bachelor degree	1,816	56.3
Living		
- With parents	1,833	57.4
- With relatives	229	7.2
- With friends	546	17.1
- Alone	512	16.0
- Others	71	2.2
Marital status of parents		
- Living together	2,460	72.1
- Separated	282	8.8
- Divorced	239	7.5
- Single mom/Dad	210	6.6

Motorcycle ownership

When asking about motorcycle ownership, 2,165 participants (67.8%) reported having their own motorcycles as showed in Figure 3.

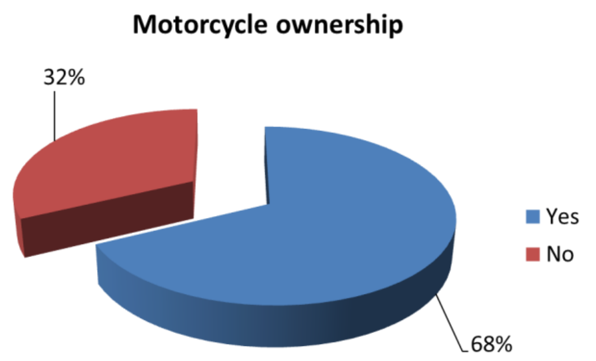


Figure 3 Motorcycle ownership

Riding license ownership

The majority of participants (56%) had riding license. This data showed indicated that some riders had no license even they own motorcycles. This can be implied that some people ride motorcycle without riding license (see Figure 4).

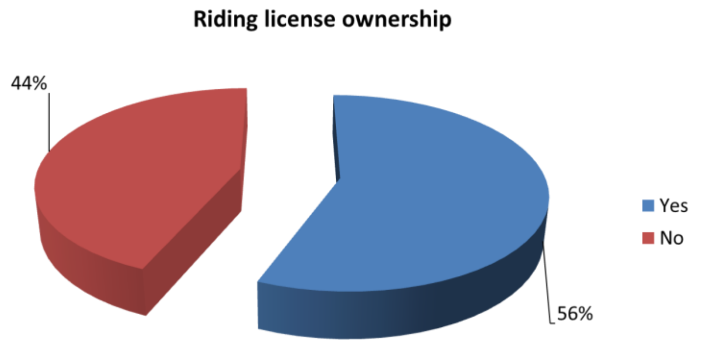


Figure 4 Riding license ownership

Training

When asking participants about practice riding motorcycle, most of them (43.6%) reported that they practiced riding on their own. About 41.6 percent reported having been trained by their parents. There were only 7.8 percent of participants who were able to ride had training in driving/riding schools as showed in Table 5. This indicated that most of them were not qualified to ride on the road safely even they had the riding license issued by the Department of Land Transport.

Table 5 Training

Rank	Type of training	Percentage
1	Self-practice	43.6
2	Parents	41.6
3	Relatives	17.4
4	Friends	14.6
5	Driving/Riding school	7.8
6	Others	3.4

Riders' experience in accident

Most participants (58.3%) reported having experience in road traffic accidents in the past five years. About 47.1 percent of them reported having accidents 1-3 times. In addition, 42.5 percent reported having slightly injury and 3.8 percent reported having serious injury (see Table 6).

Table 6 Riders' experience in accident

Details	Frequency	Percentage
Experiencing accident		
- Yes	1,859	58.3
- No	1,332	41.7
Frequency of accidents in the past 5 year		
- None	478	15.0
- 1-3	1,504	47.1
- 4-6	259	8.1
- 7-10	47	1.5
- >10	49	1.5
Consequences of accident		
- Non-injured	381	11.9
- Slightly injured	1,356	42.5
- Serious injured	122	3.8

Reasons of using motorcycle

The majority of participants (87.5%) reported that the main reason for riding motorcycle is convenience. Reaching the destination very quick is another important reason for them to ride on motorcycle (see Table 7).

Table 7 Reasons of using motorcycle

Rank	Reason	Frequency	Percentage
1	Convenience	2,793	87.5
2	Reaching destination quicker	2,421	75.9
3	Economic reason	1,330	41.7
4	Challenging	599	18.8
5	Safety	425	13.3
6	No other modes	351	11.0
7	Others	73	2.3

Violation of traffic law

Participants were asked whether they used to violate the traffic law. The majority of them (73.6) reported not wearing helmet while riding (see Table 8).

Table 8 Violation of traffic law

Rank	Offence	Frequency	Percentage
1	Not wearing helmet	2,350	73.6
2	No riding license	1,547	48.5
3	Riding against the traffic flow	1,393	43.7
4	Red light running	1,288	40.4
5	Using mobile phone while riding	1,110	34.8
6	Speeding	805	25.2
7	Riding on footpath	631	19.8
8	Following to close	588	18.4
9	Drunk riding	576	18.1
10	Others	132	4.1

Confirmatory factor analysis

As a preliminary step, confirmatory factor analysis (CFA) was conducted to test the validity of the measurement models. This is a comparison between theoretical measurement models against reality, the empirical data. Hence, the overall model fit and construct validity were examined according to Hair et al. (2014). Figure 5 illustrated the result of CFA and overall fit details are detailed in Table 9.

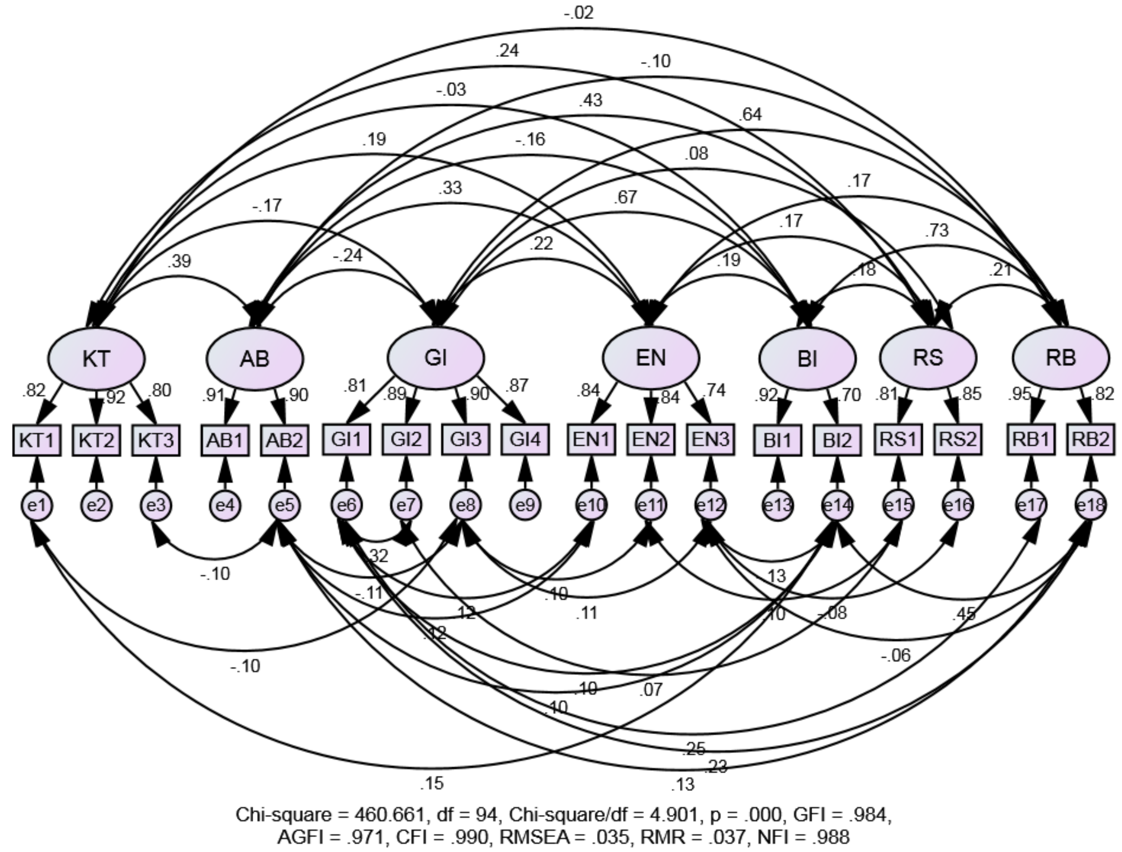


Figure 5 CFA analysis

Table 9 includes selected fit statistic from the CFA output. The overall model chi-square is 460.661 with 94 degree of freedom. The *p*-value associated with the result is .000. This *p*-value is significant using the Type 1 error rate .05. Thus, the chi-square goodness of fit statistic does not indicate that the observed covariance matrix matches the estimated covariance matrix within sampling variance. However, this study has the sample size of 3,191. The significant *p*-value is expected according to Hair et al. (2014). The value of RMSEA, an absolute fit index, is .035. This value indicates additional support for model fit. The normed Chi-square is 4.901 is considered acceptable fit for the CFA model. According to the incremental fit indices, the CFI has a value of .990 which exceeds the suggested cutoff values. In addition, the AGFI has the value of .971 which reflects moderate model fit.

Table 9 The CFA Goodness-of-fit statistics

Goodness-of-fit statistics	Acceptable values	Results
Chi-square	Significant *p*-value expected	Chi-square = 460.661 Degree of freedom = 94 *p*-value = .000
Absolute fit measures		
Goodness-of-fit index (GFI)	>.90	.984
Root mean square error of approximation (RMSEA)	<.07	.035
Root mean square residual (RMR)	Low	.037
Normed Chi-square	Between 2 and 5	4.901
Incremental fit indices		
Normed fit index (NFI)	Approach to 1.0	.988
Comparative fit index (CFI)	Above .92	.990
Relative fit index (RFI)	Approach to 1.0	.980
Parsimony fit indices		
Adjusted goodness-of-fit index (AGFI)	Approach to 1.0	.971
Parsimony normed fit index (PNFI)	Approach to 1.0	.607

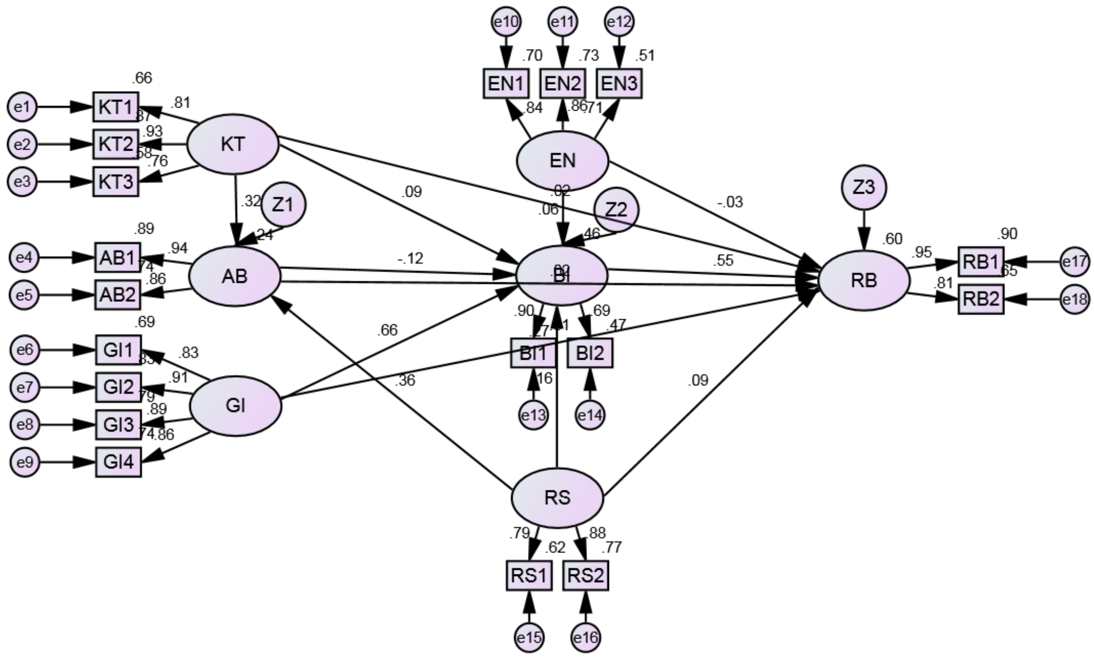
Source: Hair et al. (2014)

SEM Analysis

According to SEM analysis, all exogenous latent variables were allowed to covary in the hypothesized model (Kline, 2005). Hence, the full SEM model including all indicators was tested. The fit indices of initial SEM test for the hypothesized model are presented in Table 10. The information in Table 10 shows the overall fit statistics from testing the hypothesized model. The chi-square is 2716.588 with 133 degree of freedom (p < .05), and the normed chi-square is 20.425. The model CFI is .930 with RMSEA of .078. All of these measures are not in a range that would be associated with good fit. These suggest that the model provides overall poor fit. The standardized path coefficients are illustrated in Figure 6.

Table 10 Comparison of goodness-of-fit measures between hypothesized SEM model and CFA model

Goodness-of-fit statistics	SEM model	CFA model
Absolute fit measures		
Chi-square	2716.588	460.661
Degree of freedom	133	94
p-value	.000	.000
GFI	.913	.984
RMSEA	.078	.035
RMR	.134	.037
Normed Chi-square	20.425	4.901
Incremental fit indices		
NFI	.927	.988
CFI	.930	.990
RFI	.916	.980
Parsimony fit indices		
AGFI	.889	.971
PNFI	.806	.607



Chi-square = 2716.588, df = 133, Chi-square/df = 20.425, p = .000, GFI = .913, AGFI = .889, CFI = .930, RMSEA = .078, RMR = .134, NFI = .927

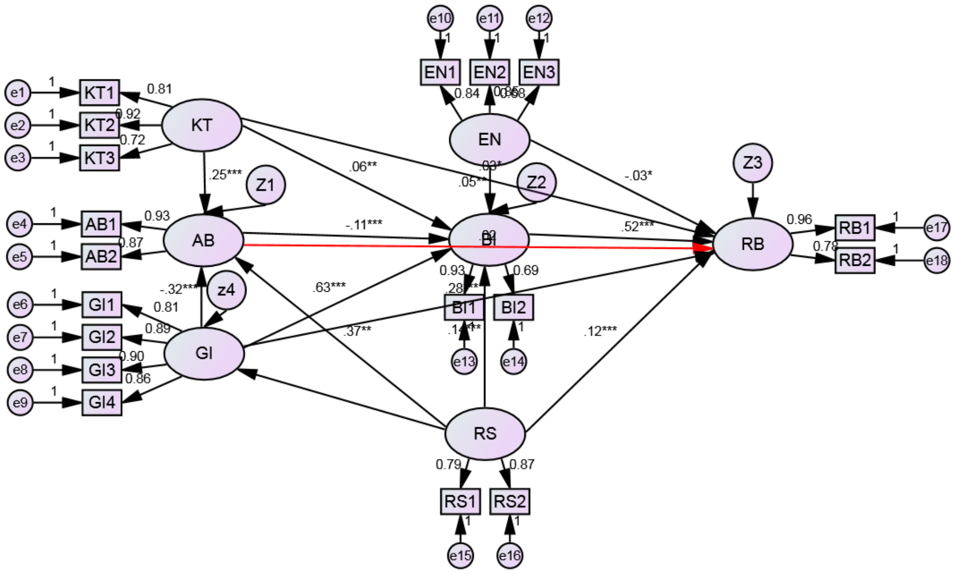
Figure 6 Standardized path estimates for the hypothesized SEM model

Based on the residuals and modification indices information from the initial SEM model, we conducted the post hoc analysis adding a direct relationship between GI and AB, and allowing covary between error of each observed variable. Then, the model was re-estimated. The model fit statistics are shown in Table 11 and Figure 7.

Table 11 Comparison of goodness-of-fit measures between hypothesized SEM model and revised SEM model

Goodness-of-fit statistics	SEM model	Revised SEM model
Absolute fit measures		
Chi-square	2716.588	444.509
Degree of freedom	133	105
p-value	.000	.000
GFI	.913	.984
RMSEA	.078	.032
RMR	.134	.026
Normed Chi-square	20.425	4.233
Incremental fit indices		
NFI	.927	.988
CFI	.930	.991
RFI	.916	.983
Parsimony fit indices		
AGFI	.889	.973
PNFI	.806	.678

Table 11 shows the overall fit statistics from testing the revised model. The chi-square is 444.509 with 105 degree of freedom ($p < .05$), and the normed chi-square is 4.233. The model CFI is .991 with RMSEA of .032. All of these measures are within a range that would be associated with good fit. These suggest that the model provides overall good fit. The overall model fit changed very little from the hypothesized model. The standardized path coefficients are illustrated in Figure 7.



Chi-square =444.509, df = 105, Chi-square/df = 4.233, p = .000, GFI = .984, AGFI = .973, CFI = ,991,
RMSEA = .032, RMR = .026, NFI = .988, RFI = .983, PNFI = .678

Figure 7 Standardized path estimates for the revised SEM model

When considering the most influential factor on risky riding behaviors, group influence (GI) is ranked the first with total effect of .62. The other influential factors are behavioral intention (BI), road structure (RS), knowledge of traffic law (KT), and traffic law enforcement (EN) with the total effects of .52, .16, .05, and -.03 respectively.

Hypothesis Testing

According to the SEM analysis, the revised model is fit with the empirical data. The relationships between each variable are illustrated in Figure 7. The results of hypothesis testing are as illustrated in Table 12.

Table 12 Hypothesis testing

H	Description	Result
H1	knowledge of traffic law has an influence on attitude toward behaviors	Supported
H2	knowledge of traffic law has an influence on behavioral intentions	Supported
H3	knowledge of traffic law has an influence on risky riding behaviors	Supported
H4	attitude toward behaviors has an influence on behavioral intentions	Supported

Table 12 (Con't)

H	Description	Result
H5	attitude toward behaviors has an influence on risky riding behaviors	Not-supported
H6	traffic law enforcement has an influence on behavioral intentions	Supported
H7	traffic law enforcement has an influence on risky riding behaviors	Supported
H8	group influence has an influence on behavioral intentions	Supported
H9	group influence has an influence on risky riding behaviors	Supported
H10	road structure has an influence on behavioral intentions	Supported
H11	road structure has an influence on risky riding behaviors	Supported
H12	behavioral intentions has an influence on risky riding behaviors	Supported

The study also found that road structure has an effect on group influence. In addition, group influence also had an effect on attitude toward riding behavior. The results of the study will be discussed in Chapter 5.

CHAPTER 5 CONCLUSION, DISCUSSION, AND SUGGESTIONS

Conclusion

Motorcycles are very popular mode of transport among young people and the number of deaths from motorcycle-related accidents is still very high in Thailand. Young people with the age of 15-19 years of age had the highest fatality rate compared to other age groups. Risky riding behavior is one of the most important factors leading to road traffic accidents among young motorcyclists. Hence, this research aimed to (1) examine risky riding patterns of young riders (2) explore determinants behind risk riding behaviors among young people (3) test whether the developed model is fit to the empirical data and (4) give suggestions and recommendations for policy makers. There were 3,191 young motorcyclists in 6 big cities in Thailand namely Bangkok, Chiangmai, Chonburi, Khonkaen, Songkla, and Ubon-Ratchathani, participating in the survey. Questionnaire was employed to collect the data. The gathered data then were analyzed using structural equation modeling technique.

For descriptive analysis, the majority of them were male. Most of them were pursuing/having bachelor degree. About 57.4 percent of the participants lived with parents. The majority of the participants had parents living together. Interestingly, and about 16 percent of them were living alone. Most of their parents live together accounting for 72.1 percent. More than 67 of the participants reported having their own motorcycles. However, only 56 percent had riding license. Most of them practiced riding on their own and some trained by their parents. Only 7.8 percent of the participants had trained in driving school. Approximately 58 percent used to have road traffic accident. About 47 percent had 1-3 accidents in the previous year and 42.5 percent of them reported having slightly injury. The major reason of riding motorcycle was its convenience accounting for 87.5 percent. They sometimes violated the traffic law, especially not wearing helmet while riding (73.6%).

Discussion

This study found that knowledge of traffic law has an influence on attitude toward behaviors, behavioral intentions, and risky riding behaviors. This can be implied that when young motorcyclists have enough knowledge of traffic law, they will have positive attitude toward safety riding and less intention to perform risky riding behavior. This finding was consistent with the study of Waiyanate (2010) who found

that young people having been trained about traffic law are less likely to perform traffic violation.

Attitude toward risky riding behaviors had negative influence on behavioral intentions. However, it had no influence on risky riding behaviors. This finding was not consistent with previous research (Elliot, 2010). According to traffic law enforcement, it had positive impact on behavioral intentions but had negative impact on risky riding behaviors. These were consistent with previous findings (Suangka, 2016; Waiyanate, 2010, Mäkinen et al., 2003; Mäkinen & Veijalainen, 1997).

This study also found that group influence had positive impact on behavioral intention and risky riding behaviors. These supported the findings of previous researches (Sela-Shayovitz, 2008; Møller & Haustein, 2014). In addition, road structure also had impact on behavioral intentions and risky riding behaviors. Physical condition of road such as width of traffic lane, barriers, rough road surface, and under-construction road will obstruct riding motorcycle (Suangka, 2016) leading to traffic law violation and road traffic accidents (Haworth, 1999).

Suggestions

This study found that group influence is the most influential factor leading to risky riding behaviors. Most of young motorcyclists may perform risky riding behaviors since they are forced by their group members. Some of them may perform these behaviors because they want to be accepted by the group members. Providing them more training on safe riding and traffic law will enhance them to have positive attitude on safe riding. When they get more knowledge on traffic law and safe riding, they will have less intention to perform risky riding behaviors. However, provided training and activities should be group based activities by letting them to learn and share experiences in their groups. Road structure is also important factor leading to traffic violation among young motorcyclists. Related agencies responsible for road construction should design pavement, footpath and u-turn which do not obstruct riding. Road safety audit should be performed to correct hazard spot along roadways. Regular monitoring of road surface should be conducted so some obstruction can be detected and then improved. Police should perform more rigid traffic law enforcement since the finding shows that it has negative impact on risky riding behaviors. This means the more rigid traffic law enforcements, the less likely young motorcyclists will perform risky riding behaviors.

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APPENDIX

SEM Analysis

D:\1. RESEARCH\1. ATRANS RESEARCH\2015\1. FINAL ANALYSIS\SEM FINAL\SEM2ND.amw
Analysis Summary
Date and Time
Date: 18 พฤษภาคม 2560
Time: 21:45:16
Title
Sem2nd: 18 พฤษภาคม 2560 21:45
Groups
Group number 1 (Group number 1)
Notes for Group (Group number 1)
The model is recursive.
Sample size = 3191
Variable Summary (Group number 1)
Your model contains the following variables (Group number 1)
Observed, endogenous variables
TKN3
TKN2
TKN1
ATT2
ATT1
GINF4
GINF3
GINF2
GINF1
LENF1
LENF2
LENF3
BIN2
BIN1
RSTR2
RSTR1
RRB1
RRB2
Unobserved, endogenous variables
AB
BI
RB
Unobserved, exogenous variables
KT
e3
e2
e1
e5
e4
GI
e9
e8
e7
e6

EN
e10
e11
e12
e14
e13
RS
e16
e15
e17
e18
Z1
Z2
Z3

Variable counts (Group number 1)

Number of variables in your model: 46
Number of observed variables: 18
Number of unobserved variables: 28
Number of exogenous variables: 25
Number of endogenous variables: 21

Parameter Summary (Group number 1)

	Weights	Covariances	Variances	Means	Intercepts	Total
Fixed	39	0	0	0	0	39
Labeled	0	0	0	0	0	0
Unlabeled	14	27	25	0	0	66
Total	53	27	25	0	0	105

Models

Default model (Default model)

Notes for Model (Default model)

Computation of degrees of freedom (Default model)

Number of distinct sample moments: 171
Number of distinct parameters to be estimated: 66
Degrees of freedom (171 - 66): 105

Result (Default model)

Minimum was achieved
Chi-square = 444.509
Degrees of freedom = 105
Probability level = .000

Group number 1 (Group number 1 - Default model)
Estimates (Group number 1 - Default model)
Scalar Estimates (Group number 1 - Default model)
Maximum Likelihood Estimates
Regression Weights: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
AB	<---	KT	.306	.049	6.238	***	
AB	<---	RS	.334	.122	2.733	.006	
AB	<---	GI	-.295	.070	-4.193	***	
BI	<---	EN	.043	.016	2.666	.008	
BI	<---	RS	.114	.016	6.930	***	
BI	<---	KT	.063	.020	3.109	.002	
BI	<---	AB	-.105	.020	-5.255	***	
BI	<---	GI	.548	.016	34.553	***	
RB	<---	EN	-.030	.015	-1.984	.047	
RB	<---	BI	.560	.024	22.876	***	
RB	<---	RS	.096	.016	6.015	***	
RB	<---	KT	.037	.019	1.951	.051	
RB	<---	AB	.024	.019	1.247	.212	
RB	<---	GI	.264	.021	12.663	***	
TKN3	<---	KT	.800				
TKN2	<---	KT	.920				
TKN1	<---	KT	.820				
ATT2	<---	AB	.900				
ATT1	<---	AB	.910				
GINF4	<---	GI	.870				
GINF3	<---	GI	.900				
GINF2	<---	GI	.890				
GINF1	<---	GI	.810				
LENF1	<---	EN	.840				
LENF2	<---	EN	.840				
LENF3	<---	EN	.740				
BIN2	<---	BI	.700				
BIN1	<---	BI	.920				
RSTR2	<---	RS	.850				
RSTR1	<---	RS	.810				
RRB1	<---	RB	.950				
RRB2	<---	RB	.820				

Standardized Regression Weights: (Group number 1 - Default model)

			Estimate
AB	<---	KT	.253
AB	<---	RS	.373
AB	<---	GI	-.318
BI	<---	EN	.050
BI	<---	RS	.136
BI	<---	KT	.055
BI	<---	AB	-.112
BI	<---	GI	.631
RB	<---	EN	-.033
RB	<---	BI	.519
RB	<---	RS	.106
RB	<---	KT	.031
RB	<---	AB	.024
RB	<---	GI	.281
TKN3	<---	KT	.723
TKN2	<---	KT	.922
TKN1	<---	KT	.811
ATT2	<---	AB	.871
ATT1	<---	AB	.934
GINF4	<---	GI	.863
GINF3	<---	GI	.904
GINF2	<---	GI	.891
GINF1	<---	GI	.805
LENF1	<---	EN	.836
LENF2	<---	EN	.847
LENF3	<---	EN	.684
BIN2	<---	BI	.693
BIN1	<---	BI	.927
RSTR2	<---	RS	.872
RSTR1	<---	RS	.792
RRB1	<---	RB	.956
RRB2	<---	RB	.782

Covariances: (Group number 1 - Default model)

			Estimate	S.E.	C.R.	P	Label
KT	<-->	EN	.193	.020	9.477	***	
KT	<-->	GI	-.149	.019	-7.766	***	
GI	<-->	RS	.111	.026	4.219	***	
GI	<-->	EN	.322	.028	11.449	***	
EN	<-->	RS	.214	.030	7.081	***	
KT	<-->	RS	.241	.021	11.261	***	
Z1	<-->	RS	.020	.156	.125	.900	
Z1	<-->	EN	.343	.037	9.298	***	
Z1	<-->	GI	.107	.085	1.249	.212	
e14	<-->	e18	.195	.010	20.340	***	
e7	<-->	e6	.112	.009	12.650	***	
e1	<-->	e14	.044	.007	6.372	***	
e5	<-->	e10	.041	.009	4.787	***	
e12	<-->	e14	-.053	.011	-4.924	***	
e6	<-->	e10	.055	.009	6.285	***	
e6	<-->	Z3	.064	.009	6.949	***	
e12	<-->	GI	.103	.020	5.155	***	
e14	<-->	KT	.096	.011	8.345	***	
e3	<-->	KT	.063	.010	6.056	***	
e14	<-->	RS	.083	.016	5.312	***	
e12	<-->	EN	.081	.020	4.029	***	
e18	<-->	GI	.067	.013	5.240	***	
e10	<-->	GI	-.096	.017	-5.599	***	
e11	<-->	RS	.048	.018	2.719	.007	
e1	<-->	GI	-.065	.011	-5.617	***	
e6	<-->	RS	.060	.014	4.155	***	
e3	<-->	Z1	-.030	.011	-2.708	.007	

Correlations: (Group number 1 - Default model)

			Estimate
KT	<-->	EN	.195
KT	<-->	GI	-.152
GI	<-->	RS	.084
GI	<-->	EN	.249
EN	<-->	RS	.159
KT	<-->	RS	.236
Z1	<-->	RS	.019
Z1	<-->	EN	.344
Z1	<-->	GI	.108
e14	<-->	e18	.427
e7	<-->	e6	.322
e1	<-->	e14	.122
e5	<-->	e10	.123
e12	<-->	e14	-.090
e6	<-->	e10	.129
e6	<-->	Z3	.135
e12	<-->	GI	.110
e14	<-->	KT	.156
e3	<-->	KT	.123
e14	<-->	RS	.101
e12	<-->	EN	.085
e18	<-->	GI	.092
e10	<-->	GI	-.134
e11	<-->	RS	.068
e1	<-->	GI	-.111
e6	<-->	RS	.076
e3	<-->	Z1	-.058

Variances: (Group number 1 - Default model)

	Estimate	S.E.	C.R.	P	Label
KT	.754	.022	34.616	***	
GI	1.280	.035	36.878	***	
EN	1.308	.040	32.757	***	
RS	1.373	.043	32.213	***	
Z1	.760	.029	26.341	***	
Z2	.508	.020	26.054	***	
Z3	.493	.017	28.839	***	
e3	.342	.011	32.481	***	
e2	.112	.007	15.916	***	
e1	.264	.008	31.528	***	
e5	.283	.012	24.191	***	
e4	.133	.010	13.163	***	
e9	.331	.011	31.106	***	
e8	.231	.009	26.193	***	
e7	.263	.009	27.682	***	
e6	.457	.014	33.367	***	
e10	.399	.015	25.830	***	
e11	.364	.015	24.565	***	
e12	.694	.021	32.544	***	
e14	.499	.014	35.176	***	
e13	.134	.012	11.597	***	
e16	.313	.018	17.193	***	
e15	.536	.020	26.711	***	
e17	.095	.010	9.185	***	
e18	.416	.013	32.042	***	

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
AB	.308
BI	.474
RB	.561
RRB2	.663
RRB1	.914
RSTR1	.627
RSTR2	.760
BIN1	.859
BIN2	.494
LENF3	.546
LENF2	.717
LENF1	.698
GINF1	.648
GINF2	.794
GINF3	.818
GINF4	.745
ATT1	.873
ATT2	.759
TKN1	.658
TKN2	.851
TKN3	.630

Matrices (Group number 1 - Default model)

Factor Score Weights (Group number 1 - Default model)

	RRB2	RRB1	RSTR1	RSTR2	BIN1	BIN2	LENF3	LENF2	LENF1	GINF1	GINF2	GINF3	GINF4	ATT1	ATT2	TKN1	TKN2	TKN3
RS	-.005	.041	.336	.604	.010	.022	-.005	.013	-.012	.022	-.010	-.001	-.001	.069	.034	.006	.017	.003
EN	-.014	.011	-.007	-.012	.009	.017	.201	.404	.391	-.044	.049	.035	.024	.081	-.019	.018	.019	.001
GI	.012	.031	.000	-.001	.056	.015	.020	.021	-.013	.092	.273	.359	.242	-.019	-.007	-.024	-.003	.001
KT	.002	.005	.003	.006	.004	.001	.003	.003	.002	-.004	.001	-.001	-.001	.023	.011	.219	.585	.191
AB	.000	.002	.015	.027	-.016	.000	.009	.029	-.005	-.001	-.009	-.011	-.007	.653	.303	.012	.028	-.002
BI	-.051	.141	.002	.004	.694	.172	.015	.004	.002	-.005	.030	.032	.022	-.016	-.008	-.030	.004	.006
RB	.174	.757	.006	.011	.096	-.049	-.001	.003	-.004	.026	.000	.012	.008	.001	.001	.007	.004	.001

Total Effects (Group number 1 - Default model)

	RS	EN	GI	KT	AB	BI	RB
AB	.334	.000	-.295	.306	.000	.000	.000
BI	.079	.043	.579	.031	-.105	.000	.000
RB	.148	-.006	.581	.062	-.035	.560	.000
RRB2	.122	-.005	.476	.051	-.028	.459	.820
RRB1	.141	-.006	.552	.059	-.033	.532	.950
RSTR1	.810	.000	.000	.000	.000	.000	.000
RSTR2	.850	.000	.000	.000	.000	.000	.000
BIN1	.072	.039	.533	.028	-.097	.920	.000
BIN2	.055	.030	.406	.021	-.074	.700	.000
LENF3	.000	.740	.000	.000	.000	.000	.000
LENF2	.000	.840	.000	.000	.000	.000	.000
LENF1	.000	.840	.000	.000	.000	.000	.000
GINF1	.000	.000	.810	.000	.000	.000	.000
GINF2	.000	.000	.890	.000	.000	.000	.000
GINF3	.000	.000	.900	.000	.000	.000	.000
GINF4	.000	.000	.870	.000	.000	.000	.000
ATT1	.304	.000	-.268	.278	.910	.000	.000
ATT2	.300	.000	-.265	.275	.900	.000	.000
TKN1	.000	.000	.000	.820	.000	.000	.000
TKN2	.000	.000	.000	.920	.000	.000	.000
TKN3	.000	.000	.000	.800	.000	.000	.000

Standardized Total Effects (Group number 1 - Default model)

	RS	EN	GI	KT	AB	BI	RB
AB	.373	.000	-.318	.253	.000	.000	.000
BI	.094	.050	.667	.027	-.112	.000	.000
RB	.164	-.007	.620	.051	-.034	.519	.000
RRB2	.128	-.005	.485	.040	-.027	.406	.782
RRB1	.157	-.007	.593	.049	-.033	.496	.956
RSTR1	.792	.000	.000	.000	.000	.000	.000
RSTR2	.872	.000	.000	.000	.000	.000	.000
BIN1	.087	.046	.618	.025	-.104	.927	.000
BIN2	.065	.035	.462	.019	-.078	.693	.000
LENF3	.000	.684	.000	.000	.000	.000	.000
LENF2	.000	.847	.000	.000	.000	.000	.000
LENF1	.000	.836	.000	.000	.000	.000	.000
GINF1	.000	.000	.805	.000	.000	.000	.000
GINF2	.000	.000	.891	.000	.000	.000	.000
GINF3	.000	.000	.904	.000	.000	.000	.000
GINF4	.000	.000	.863	.000	.000	.000	.000
ATT1	.349	.000	-.297	.237	.934	.000	.000
ATT2	.325	.000	-.277	.221	.871	.000	.000
TKN1	.000	.000	.000	.811	.000	.000	.000
TKN2	.000	.000	.000	.922	.000	.000	.000
TKN3	.000	.000	.000	.723	.000	.000	.000

Direct Effects (Group number 1 - Default model)

	RS	EN	GI	KT	AB	BI	RB
AB	.334	.000	-.295	.306	.000	.000	.000
BI	.114	.043	.548	.063	-.105	.000	.000
RB	.096	-.030	.264	.037	.024	.560	.000
RRB2	.000	.000	.000	.000	.000	.000	.820
RRB1	.000	.000	.000	.000	.000	.000	.950
RSTR1	.810	.000	.000	.000	.000	.000	.000
RSTR2	.850	.000	.000	.000	.000	.000	.000
BIN1	.000	.000	.000	.000	.000	.920	.000
BIN2	.000	.000	.000	.000	.000	.700	.000
LENF3	.000	.740	.000	.000	.000	.000	.000
LENF2	.000	.840	.000	.000	.000	.000	.000
LENF1	.000	.840	.000	.000	.000	.000	.000
GINF1	.000	.000	.810	.000	.000	.000	.000
GINF2	.000	.000	.890	.000	.000	.000	.000
GINF3	.000	.000	.900	.000	.000	.000	.000
GINF4	.000	.000	.870	.000	.000	.000	.000
ATT1	.000	.000	.000	.000	.910	.000	.000
ATT2	.000	.000	.000	.000	.900	.000	.000
TKN1	.000	.000	.000	.820	.000	.000	.000
TKN2	.000	.000	.000	.920	.000	.000	.000
TKN3	.000	.000	.000	.800	.000	.000	.000

Standardized Direct Effects (Group number 1 - Default model)

	RS	EN	GI	KT	AB	BI	RB
AB	.373	.000	-.318	.253	.000	.000	.000
BI	.136	.050	.631	.055	-.112	.000	.000
RB	.106	-.033	.281	.031	.024	.519	.000
RRB2	.000	.000	.000	.000	.000	.000	.782
RRB1	.000	.000	.000	.000	.000	.000	.956
RSTR1	.792	.000	.000	.000	.000	.000	.000
RSTR2	.872	.000	.000	.000	.000	.000	.000
BIN1	.000	.000	.000	.000	.000	.927	.000
BIN2	.000	.000	.000	.000	.000	.693	.000
LENF3	.000	.684	.000	.000	.000	.000	.000
LENF2	.000	.847	.000	.000	.000	.000	.000
LENF1	.000	.836	.000	.000	.000	.000	.000
GINF1	.000	.000	.805	.000	.000	.000	.000
GINF2	.000	.000	.891	.000	.000	.000	.000
GINF3	.000	.000	.904	.000	.000	.000	.000
GINF4	.000	.000	.863	.000	.000	.000	.000
ATT1	.000	.000	.000	.000	.934	.000	.000
ATT2	.000	.000	.000	.000	.871	.000	.000
TKN1	.000	.000	.000	.811	.000	.000	.000
TKN2	.000	.000	.000	.922	.000	.000	.000
TKN3	.000	.000	.000	.723	.000	.000	.000

Indirect Effects (Group number 1 - Default model)

	RS	EN	GI	KT	AB	BI	RB
AB	.000	.000	.000	.000	.000	.000	.000
BI	-.035	.000	.031	-.032	.000	.000	.000
RB	.052	.024	.317	.025	-.059	.000	.000
RRB2	.122	-.005	.476	.051	-.028	.459	.000
RRB1	.141	-.006	.552	.059	-.033	.532	.000
RSTR1	.000	.000	.000	.000	.000	.000	.000
RSTR2	.000	.000	.000	.000	.000	.000	.000
BIN1	.072	.039	.533	.028	-.097	.000	.000
BIN2	.055	.030	.406	.021	-.074	.000	.000
LENF3	.000	.000	.000	.000	.000	.000	.000
LENF2	.000	.000	.000	.000	.000	.000	.000
LENF1	.000	.000	.000	.000	.000	.000	.000
GINF1	.000	.000	.000	.000	.000	.000	.000
GINF2	.000	.000	.000	.000	.000	.000	.000
GINF3	.000	.000	.000	.000	.000	.000	.000
GINF4	.000	.000	.000	.000	.000	.000	.000
ATT1	.304	.000	-.268	.278	.000	.000	.000
ATT2	.300	.000	-.265	.275	.000	.000	.000
TKN1	.000	.000	.000	.000	.000	.000	.000
TKN2	.000	.000	.000	.000	.000	.000	.000
TKN3	.000	.000	.000	.000	.000	.000	.000

Standardized Indirect Effects (Group number 1 - Default model)

	RS	EN	GI	KT	AB	BI	RB
AB	.000	.000	.000	.000	.000	.000	.000
BI	-.042	.000	.036	-.028	.000	.000	.000
RB	.058	.026	.339	.020	-.058	.000	.000
RRB2	.128	-.005	.485	.040	-.027	.406	.000
RRB1	.157	-.007	.593	.049	-.033	.496	.000
RSTR1	.000	.000	.000	.000	.000	.000	.000
RSTR2	.000	.000	.000	.000	.000	.000	.000
BIN1	.087	.046	.618	.025	-.104	.000	.000
BIN2	.065	.035	.462	.019	-.078	.000	.000
LENF3	.000	.000	.000	.000	.000	.000	.000
LENF2	.000	.000	.000	.000	.000	.000	.000
LENF1	.000	.000	.000	.000	.000	.000	.000
GINF1	.000	.000	.000	.000	.000	.000	.000
GINF2	.000	.000	.000	.000	.000	.000	.000
GINF3	.000	.000	.000	.000	.000	.000	.000
GINF4	.000	.000	.000	.000	.000	.000	.000
ATT1	.349	.000	-.297	.237	.000	.000	.000
ATT2	.325	.000	-.277	.221	.000	.000	.000
TKN1	.000	.000	.000	.000	.000	.000	.000
TKN2	.000	.000	.000	.000	.000	.000	.000
TKN3	.000	.000	.000	.000	.000	.000	.000

Modification Indices (Group number 1 - Default model)
Covariances: (Group number 1 - Default model)

	M.I.	Par Change
e18 <--> KT	17.084	.040
e18 <--> Z1	5.887	.025
e17 <--> KT	10.897	-.029
e15 <--> GI	6.981	.044
e15 <--> Z2	6.035	.031
e16 <--> GI	5.777	-.037
e16 <--> Z2	5.042	-.026
e12 <--> KT	6.903	-.036
e12 <--> Z3	4.043	-.025
e12 <--> e18	4.929	-.022
e11 <--> e15	4.900	.025
e10 <--> KT	5.125	.026
e10 <--> Z3	4.955	.023
e6 <--> KT	8.532	.029
e6 <--> e18	17.366	.030
e6 <--> e17	10.943	-.022
e6 <--> e14	9.162	.023
e7 <--> RS	7.617	.032
e7 <--> GI	5.514	-.024
e7 <--> e18	4.673	.013
e7 <--> e15	11.465	.028
e7 <--> e14	9.196	-.019
e7 <--> e11	4.648	-.015
e8 <--> RS	10.996	-.042
e8 <--> EN	4.240	.024
e8 <--> Z1	8.791	-.028
e8 <--> e18	15.363	-.026
e8 <--> e12	6.878	.024
e8 <--> e7	9.151	-.016
e9 <--> GI	5.296	.029
e4 <--> GI	14.943	.043
e4 <--> e18	8.266	-.018
e4 <--> e17	6.926	.015
e4 <--> e11	7.936	-.021
e4 <--> e8	6.259	.015
e5 <--> GI	18.129	-.051
e5 <--> e18	24.219	.034
e5 <--> e17	18.484	-.027
e5 <--> e14	4.155	.015
e5 <--> e6	7.302	.019
e5 <--> e8	24.321	-.032
e1 <--> RS	4.931	.027
e1 <--> e18	17.827	.026
e1 <--> e17	5.563	-.013
e1 <--> e12	13.168	-.032
e1 <--> e6	10.698	.021
e1 <--> e8	12.064	-.020

e1 <--> e4	6.325	-.014
e1 <--> e5	16.528	.025
e2 <--> RS	7.232	-.029
e2 <--> Z2	5.791	-.017
e2 <--> e8	11.121	.017
e3 <--> Z2	9.005	.028
e3 <--> e4	8.331	.019
e3 <--> e5	8.540	-.020

Variances: (Group number 1 - Default model)

Regression Weights: (Group number 1 - Default model)

	M.I.	Par Change
RRB2 <--- RS	5.529	.024
RRB2 <--- EN	8.544	.031
RRB2 <--- KT	21.788	.063
RRB2 <--- AB	22.414	.053
RRB2 <--- LENF2	8.168	.028
RRB2 <--- LENF1	12.243	.034
RRB2 <--- GINF1	5.918	.024
RRB2 <--- GINF3	4.619	-.021
RRB2 <--- ATT1	12.778	.039
RRB2 <--- ATT2	37.026	.063
RRB2 <--- TKN1	34.642	.075
RRB2 <--- TKN2	15.422	.051
RRB2 <--- TKN3	9.058	.035
RRB1 <--- EN	5.427	-.023
RRB1 <--- KT	13.837	-.046
RRB1 <--- AB	14.235	-.039
RRB1 <--- LENF2	6.353	-.023
RRB1 <--- LENF1	4.151	-.018
RRB1 <--- ATT1	7.680	-.028
RRB1 <--- ATT2	24.205	-.047
RRB1 <--- TKN1	17.564	-.049
RRB1 <--- TKN2	12.234	-.042
RSTR1 <--- GI	10.299	.045
RSTR1 <--- BI	15.816	.065
RSTR1 <--- RB	9.587	.046
RSTR1 <--- RRB2	7.292	.037
RSTR1 <--- RRB1	8.184	.041
RSTR1 <--- BIN1	15.091	.061
RSTR1 <--- BIN2	8.113	.044
RSTR1 <--- LENF2	6.421	.034
RSTR1 <--- GINF1	7.641	.037
RSTR1 <--- GINF2	17.196	.056
RSTR1 <--- GINF3	4.561	.029
RSTR1 <--- GINF4	4.442	.028
RSTR2 <--- GI	10.606	-.042
RSTR2 <--- BI	14.835	-.059
RSTR2 <--- RB	9.330	-.042
RSTR2 <--- RRB2	7.788	-.036

RSTR2	<---	RRB1	7.739	-.038
RSTR2	<---	BIN1	14.137	-.055
RSTR2	<---	BIN2	6.770	-.037
RSTR2	<---	LENF3	5.159	-.026
RSTR2	<---	LENF2	4.607	-.027
RSTR2	<---	GINF1	7.585	-.034
RSTR2	<---	GINF2	11.594	-.043
RSTR2	<---	GINF3	7.369	-.034
RSTR2	<---	GINF4	4.954	-.028
LENF3	<---	RS	6.596	-.038
LENF3	<---	KT	9.944	-.061
LENF3	<---	RRB2	6.354	-.036
LENF3	<---	RSTR2	6.194	-.035
LENF3	<---	TKN1	19.320	-.079
LENF3	<---	TKN2	6.475	-.047
LENF3	<---	TKN3	4.644	-.036
LENF2	<---	ATT1	4.136	-.026
LENF1	<---	KT	6.301	.041
LENF1	<---	AB	6.172	.033
LENF1	<---	RSTR2	4.424	.025
LENF1	<---	ATT1	5.586	.031
LENF1	<---	ATT2	4.278	.025
LENF1	<---	TKN1	7.740	.042
LENF1	<---	TKN2	5.515	.036
GINF1	<---	EN	5.689	.025
GINF1	<---	KT	12.314	.048
GINF1	<---	AB	5.677	.027
GINF1	<---	RRB2	20.193	.046
GINF1	<---	BIN2	27.267	.060
GINF1	<---	LENF2	5.062	.022
GINF1	<---	GINF3	4.114	.020
GINF1	<---	ATT2	9.752	.033
GINF1	<---	TKN1	21.129	.059
GINF1	<---	TKN2	8.068	.037
GINF1	<---	TKN3	6.288	.030
GINF2	<---	EN	5.628	-.021
GINF2	<---	GI	5.600	-.021
GINF2	<---	RSTR1	7.669	.022
GINF2	<---	BIN2	5.911	-.023
GINF2	<---	LENF2	7.351	-.023
GINF2	<---	GINF3	10.246	-.027
GINF3	<---	RS	10.647	-.031
GINF3	<---	AB	11.593	-.035
GINF3	<---	RRB2	12.406	-.033
GINF3	<---	RSTR1	11.175	-.029
GINF3	<---	RSTR2	6.176	-.023
GINF3	<---	ATT1	6.111	-.025
GINF3	<---	ATT2	25.062	-.048
GINF3	<---	TKN1	8.972	-.035

GINF4	<---	GINF2	4.119	.021
GINF4	<---	GINF3	4.065	.021
ATT1	<---	RS	5.842	-.023
ATT1	<---	GI	14.610	.036
ATT1	<---	KT	7.039	-.033
ATT1	<---	AB	8.072	-.027
ATT1	<---	BI	5.702	.026
ATT1	<---	RB	4.177	.020
ATT1	<---	RRB1	5.269	.022
ATT1	<---	RSTR1	4.633	-.018
ATT1	<---	RSTR2	4.557	-.019
ATT1	<---	BIN1	5.687	.025
ATT1	<---	LENF2	4.672	-.019
ATT1	<---	GINF1	4.352	.019
ATT1	<---	GINF2	10.503	.029
ATT1	<---	GINF3	17.717	.038
ATT1	<---	GINF4	11.438	.030
ATT1	<---	ATT2	6.190	-.023
ATT1	<---	TKN1	14.548	-.044
ATT1	<---	TKN2	6.376	-.030
ATT2	<---	RS	7.020	.027
ATT2	<---	GI	17.541	-.042
ATT2	<---	KT	8.452	.039
ATT2	<---	AB	10.663	.035
ATT2	<---	BI	6.405	-.030
ATT2	<---	RB	4.417	-.023
ATT2	<---	RRB1	6.797	-.027
ATT2	<---	RSTR1	4.917	.020
ATT2	<---	RSTR2	5.827	.023
ATT2	<---	BIN1	6.235	-.028
ATT2	<---	BIN2	4.214	.023
ATT2	<---	GINF2	10.282	-.031
ATT2	<---	GINF3	28.962	-.052
ATT2	<---	GINF4	10.764	-.032
ATT2	<---	ATT1	8.814	.032
ATT2	<---	TKN1	23.809	.061
ATT2	<---	TKN2	5.999	.031
TKN1	<---	RS	8.277	.026
TKN1	<---	AB	7.862	.028
TKN1	<---	RRB2	13.385	.032
TKN1	<---	RSTR1	4.870	.018
TKN1	<---	RSTR2	6.457	.022
TKN1	<---	LENF3	5.419	-.019
TKN1	<---	GINF1	4.415	.018
TKN1	<---	ATT2	17.095	.038
TKN2	<---	RS	10.052	-.026
TKN2	<---	AB	4.016	-.017
TKN2	<---	BI	7.549	-.026
TKN2	<---	RB	11.390	-.029
TKN2	<---	RRB2	9.461	-.024

TKN2 <--- RRB1	10.589	-.027
TKN2 <--- RSTR2	9.648	-.024
TKN2 <--- BIN1	6.843	-.023
TKN2 <--- BIN2	6.512	-.022
TKN2 <--- GINF1	4.343	-.016
TKN3 <--- GI	4.153	.021
TKN3 <--- BI	12.439	.043
TKN3 <--- RB	10.315	.035
TKN3 <--- RRB2	4.799	.022
TKN3 <--- RRB1	10.244	.034
TKN3 <--- BIN1	11.889	.040
TKN3 <--- BIN2	6.373	.029

Minimization History (Default model)

Iteration		Negative eigenvalues	Condition #	Smallest eigenvalue	Diameter	F	NTries	Ratio
0	e	35		-.473	9999.000	29599.848	0	9999.000
1	e*	25		-.345	1.245	18522.199	18	1.013
2	e	19		-.267	.444	14875.607	5	.844
3	e*	7		-.221	.819	7777.598	5	.920
4	e	1		-.007	.899	2270.797	5	.771
5	e	0	116324.021		.408	689.565	5	.886
6	e	0	652.745		.255	675.169	6	.000
7	e	0	545.563		.302	462.987	1	1.033
8	e	0	1493.086		.091	445.797	1	1.095
9	e	0	1740.065		.083	444.610	1	1.104
10	e	0	2478.220		.019	444.510	1	1.060
11	e	0	2562.895		.004	444.509	1	1.010
12	e	0	2524.497		.000	444.509	1	1.000

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	66	444.509	105	.000	4.233
Saturated model	171	.000	0		
Independence model	18	37162.517	153	.000	242.892

RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.026	.984	.973	.604
Saturated model	.000	1.000		
Independence model	.370	.348	.272	.312

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.988	.983	.991	.987	.991
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.686	.678	.680
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	339.509	278.111	408.461
Saturated model	.000	.000	.000
Independence model	37009.517	36379.140	37646.177

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	.139	.106	.087	.128
Saturated model	.000	.000	.000	.000
Independence model	11.650	11.602	11.404	11.801

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.032	.029	.035	1.000
Independence model	.275	.273	.278	.000

AIC

Model	AIC	BCC	BIC	CAIC
Default model	576.509	577.300	977.003	1043.003
Saturated model	342.000	344.049	1379.643	1550.643
Independence model	37198.517	37198.732	37307.742	37325.742

ECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	.181	.161	.202	.181
Saturated model	.107	.107	.107	.108
Independence model	11.661	11.463	11.861	11.661

HOELTER

Model	HOELTER .05	HOELTER .01
Default model	933	1017
Independence model	16	17

Execution time summary

Minimization: .047
Miscellaneous: 1.091
Bootstrap: .000
Total: 1.138

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ATRANS