Introducing Case Examples of Analyses of Actual Situation of Use of Two-Wheeled Vehicles by High School and University Students in Phnom Penh, Cambodia

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Situation Related to Local Traffic Safety

In Cambodia, the rate of traffic accident fatalities due to motorcycles involving young people is high, making it an urgent social problem.
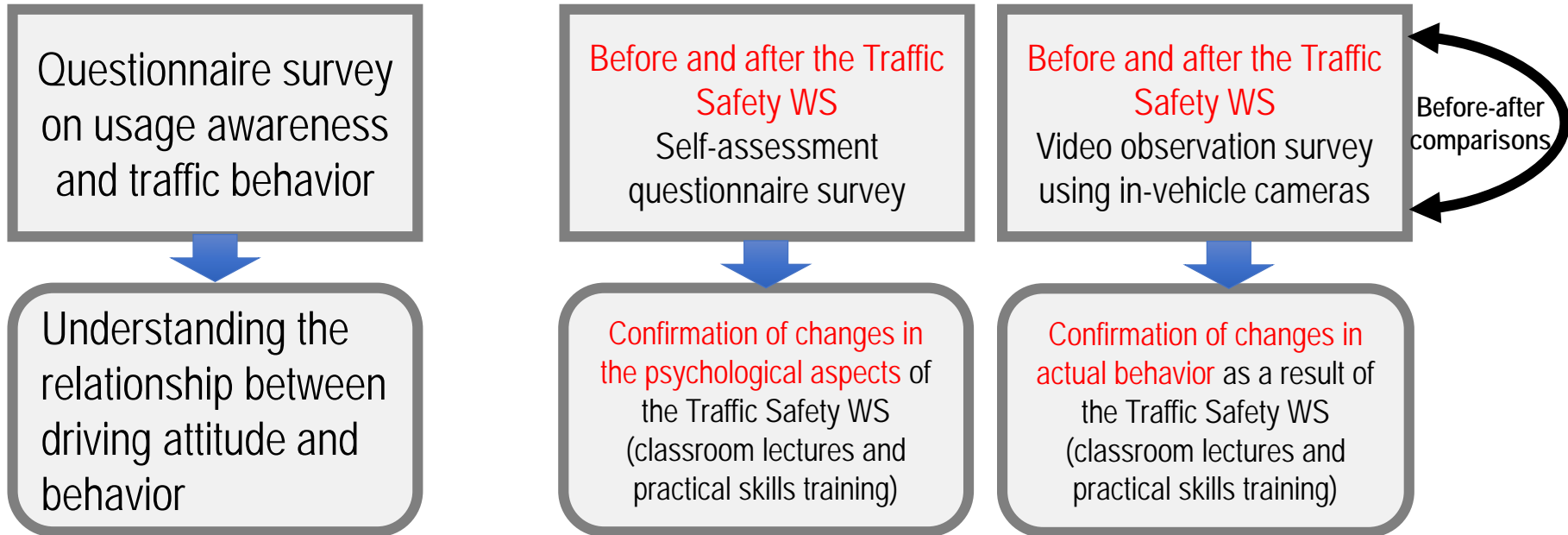

Generally, traffic safety policies are implemented from the aspects of the 3Es (Engineering, Enforcement, and Education), but there still are no places for conducting official driving training tests in Cambodia, and that is a problem in traffic safety education.

In research on traditional traffic safety education, questionnaire surveys are used to get a grasp of the psychological process involved in driving behavioral changes.

Purpose of the Research

By observing the psychological aspect through questionnaire surveys and the actual behavior through in-vehicle videos, (1) an understanding of the mechanism of motorcycle driving behavior is gained, and (2) a road safety WS (workshop) is held based on the knowledge obtained in (1), and specific knowledge that contributes to traffic safety education is gained by assessing its impact.
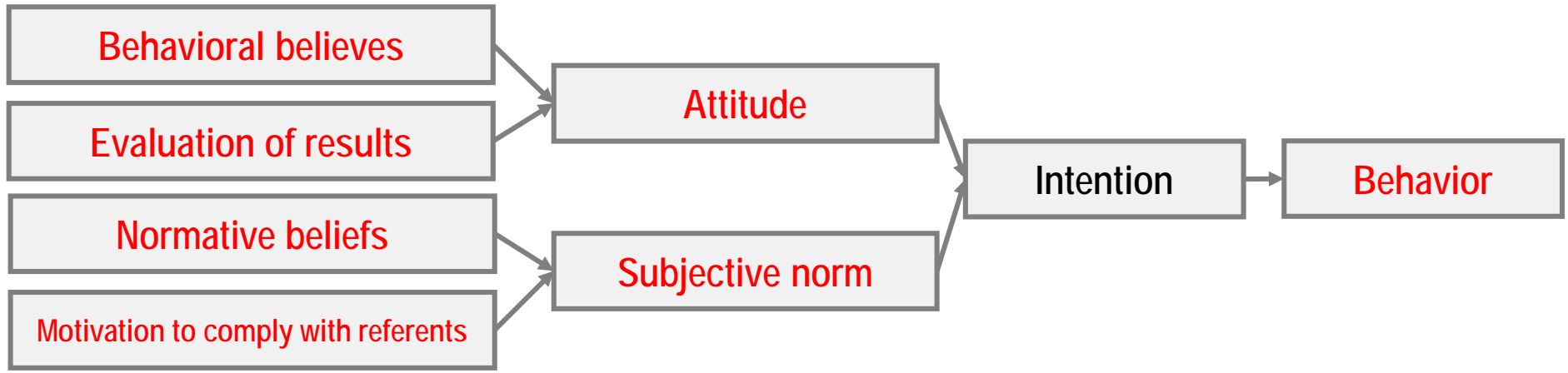
Overview of Local Surveys

Questionnaire survey on usage awareness and traffic behavior

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Understanding the relationship between driving attitude and behavior

Before and after the Traffic Safety WS Self-assessment questionnaire survey

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Confirmation of changes in the psychological aspects of the Traffic Safety WS (classroom lectures and practical skills training)

Before and after the Traffic Safety WS Video observation survey using in-vehicle cameras

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Confirmation of changes in actual behavior as a result of the Traffic Safety WS (classroom lectures and practical skills training)

Before-after comparisons

Questionnaire survey on two-wheeled-vehicle usage awareness and traffic behavior

Implementation	2015
Executer	Faculty of Education, the University of Tokyo and the Royal University of Phnom Penh
Target people	1,079 Cambodian high school and college students, of whom 412, excluding those who did not respond, were analyzed

Self-assessment questionnaire survey of driving behavior before and after the Traffic Safety WS

Implementation	2018
Executor	Osaka City University Graduate School and the International Association of Traffic and Safety Sciences
Target people	20 Cambodian high school and college students who participated in the Traffic Safety WS

Behavior reason model (Fishbein & Ajzen, 1975)

Behavioral believes

Evaluation of results

→ | Attitude |

Normative beliefs

Motivation to comply with referents

→ | Subjective norm |

Attitude → | Intention | → | Behavior |
Subjective norm → | Intention |

Driving Behavior Observation Survey Using In-Vehicle Cameras and Local WS

Driving behavior observation survey using in-vehicle cameras

Camera position

		Before the WS	After the WS	Total
Observation date and time		December 2015 – January 2016	July 2017	
Number of observers (people)		17	10	27*
Gender (people)	Male	8	5	
	Female	9	5	
Student category (people)	High school student	9	5	
	College student	8	5	
Driving experience (people)	Under one year	5	0	
	One year or more	12	10	
Video observation time (min)		362	211	573
Number of observation sections		584	430	1014
Sections subject to analysis (where the road is divided into two or more lanes in each direction)		267	275	542

* Four of whom participated in the video survey both before and after the WS

Analysis of the Results of the Questionnaire (Covariance Structure Analysis)

Results of covariance structure analysis indicating the relationship between driving attitude and risk cognition

Q10.17

Driving confidence — 0.74 → Q10.17

Driving confidence — -0.08 → Severe violations

Severe violations:
- 0.69 → Q9.8
- 0.85 → Q9.13
- 0.84 → Q9.14

Normative consciousness:
- 0.55 → Q10.19
- 0.84 → Q10.21
- 0.77 → Q10.22

Normative consciousness → Driving confidence: -0.65

Normative consciousness → Frustrations while driving: -0.18

Frustrations while driving → Severe violations: -0.03

Driving confidence → Minor violations: -0.11

Frustrations while driving → Minor violations: -0.01

Minor violations → Severe violations: 0.53

0.06, 0.07

Q1.1

Q1.5 → -0.03

Q2.5.1

Frustrations while driving:
- 0.59 → Q10.7
- 0.70 → Q10.8

Minor violations:
- 0.90 → Q9.16
- 0.61 → Q9.19

Observation variables (rectangle)
Latent variables (ellipse)

GFI: 0.94
AGFI: 0.92
RMSEA: 0.06
Numerical standardization coefficient
* With regard to arrows pointing to latent variables, the variables where p < 0.05 are marked in red underline.

List of items to be observed for use in analysis

| Question category	Question No.	Description of question
	Q1.1	Female dummy
Personal attributes	Q1.5	College student dummy
	Q2.5.1	Dummy for driver with a driving experience of one year or more

Frustration while driving	Q10.7	I feel frustrated when waiting at a traffic light or when traffic is congested
	Q10.8	I don't feel good when I can't drive the way I want
Driving confidence	Q10.17	It is all right to commit a violation as long I don't cause an accident
	Q10.19	It is a rule of society, so it is better not to commit a violation
Normative consciousness	Q10.21	It is better not to commit a violation because it may lead to an accident
	Q10.22	It is better not to commit a violation considering paying fines or having your license suspended
Severe violations	Q9.8	When turning left at an intersection, I make the turn immediately before an oncoming vehicle.
	Q9.13	I drink and drive
	Q9.14	I drive at night without my headlights turned on I drive while listening to music wearing earphones
Minor violations	Q9.16	There are times when I drive with only one hand on the steering wheel.
	Q9.19	I feel frustrated when waiting at a traffic light or when traffic is congested

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Comparison of Self-Assessment Before and After the WS

Question
- How much confidence do you think you have in your motorcycle driving skills?
- How much do you think you know about Cambodian traffic rules?
- How much do you think you can reduce the chance of getting involved in a traffic accident if you are able to drive a motorcycle by following traffic rules?

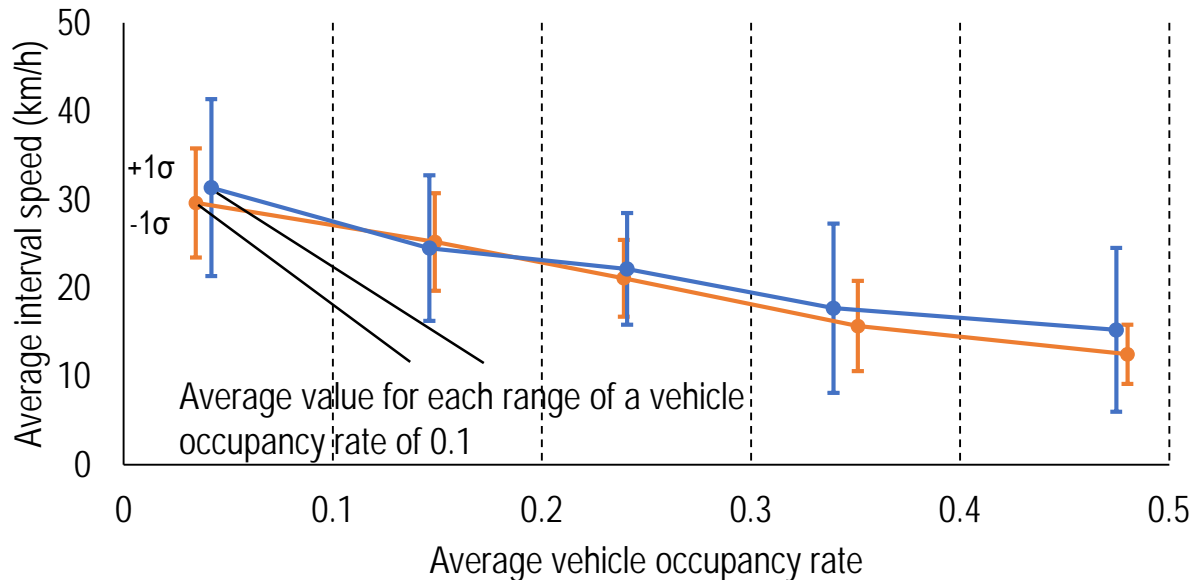Answer: 0 = "Do not think so at all" to 10 = "Think so very much"
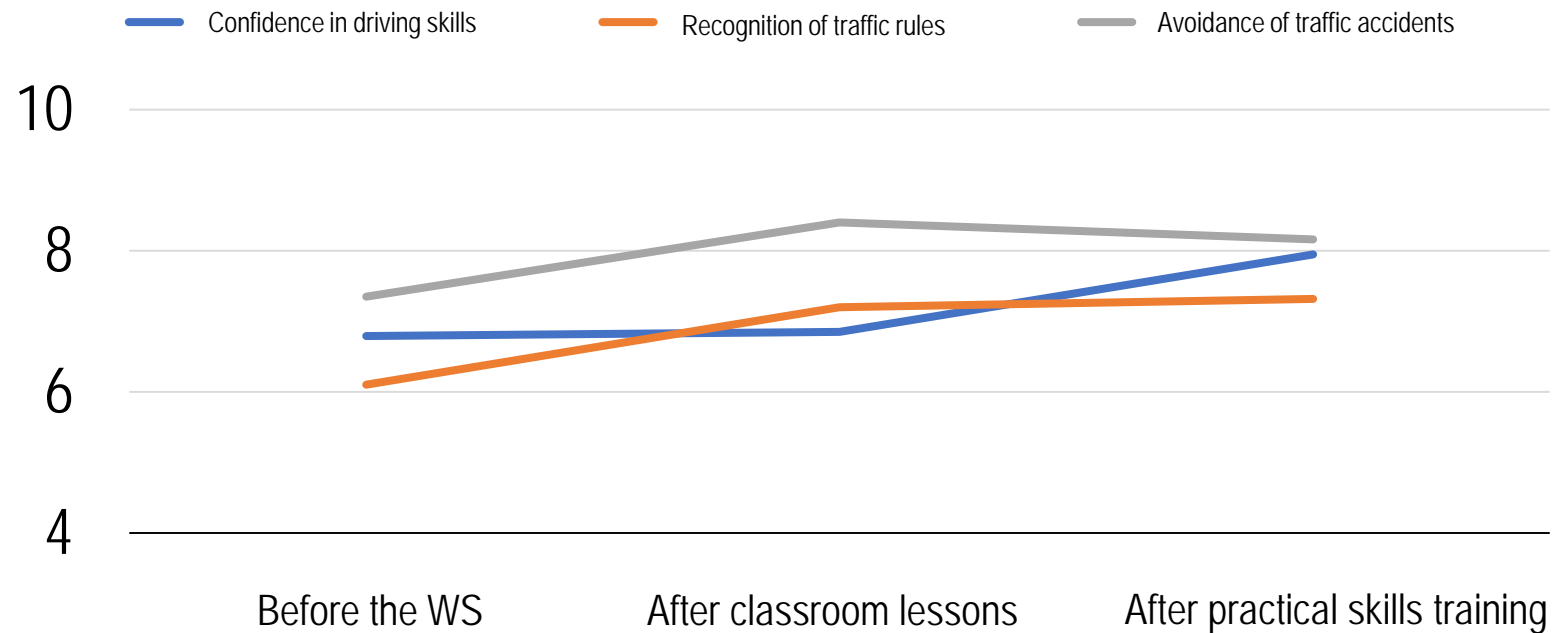
Normative consciousness rose after the classroom lessons, while confidence in driving rose after the practical skills training.

Results of In-Vehicle Video Analytics
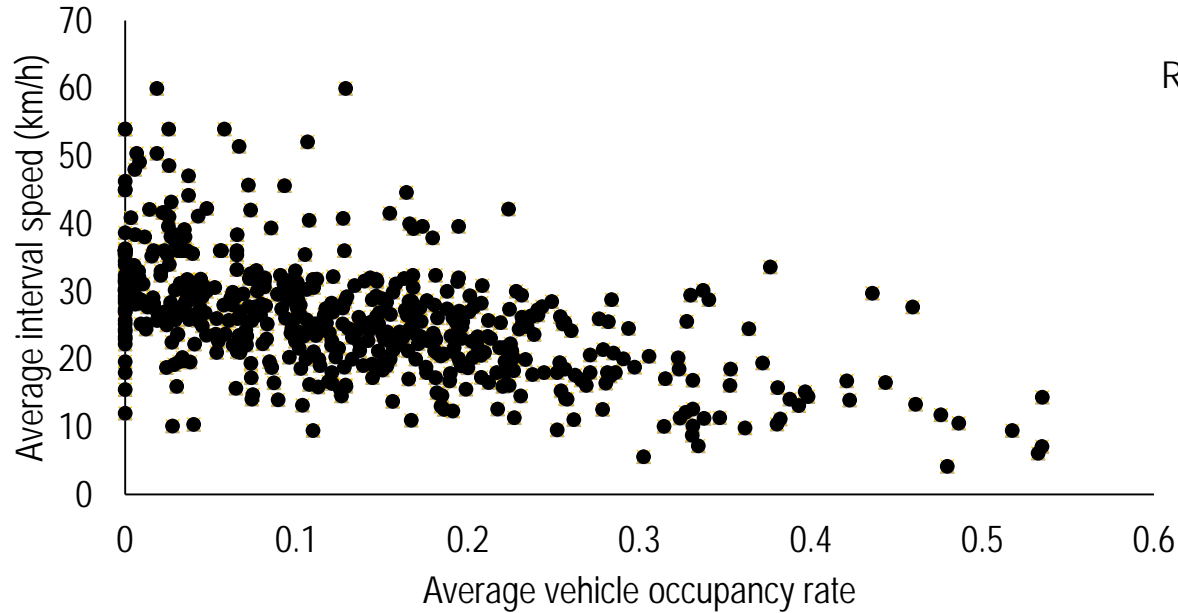
Relationship between the average interval vehicle occupancy rate and average interval speed (comparison before and after the WS)

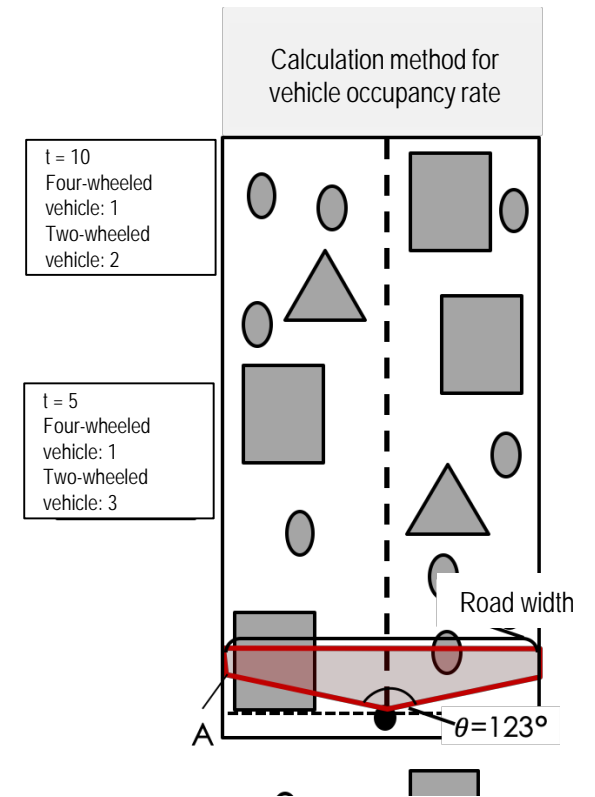Speed decreased as the vehicle occupancy rate increased

Relationship between vehicle occupancy rate and the average speed (between sections where the road is divided into two lanes in each direction)

Vehicle occupancy rate around the observer
The average for the same section calculated by counting the number of vehicles within the visual range in front of the observer every five seconds by vehicle type and obtaining the instantaneous vehicle occupancy rate.

Relationship between vehicle occupancy rate and average speed (comparison before and after the WS)

Reduction in speed after WS
Standard deviation also decreased significantly

Average value for each range of a vehicle occupancy rate of 0.1

Calculation method for vehicle occupancy rate

t = 10
Four-wheeled vehicle: 1
Two-wheeled vehicle: 2

t = 5
Four-wheeled vehicle: 1
Two-wheeled vehicle: 3

Road width

A   θ=123°

Results of Traveling Speed Analysis Using In-Vehicle Videos

Results of multiple regression analysis for 542 sections on arterial roads

|	Coefficient	Value t	
Constant term	32.15	45.20	**
Vehicle occupancy rate	-39.76	-15.69	**
Female dummy	-3.79	-6.22	**
College student dummy	1.48	2.54	*
WS dummy	-2.16	-3.90	**
Dummy where there are white lines (lane division line)	1.73	2.98	**
Dummy where the next intersection has right and left turns	-2.70	-3.36	**
Number of times of overtaking a motorcycle: times/km	0.18	6.86	**
Number of times of being overtaken by a motorcycle: times/km	-0.10	-5.17	**
Decision coefficient	0.49		
Number of sections	542		

$*p < 0.05$, $**p < 0.01$

Changes in Driving Behavior and Awareness Before and After the WS (Summary)

Psychological process for young drivers' driving behavior based on behavior reason models
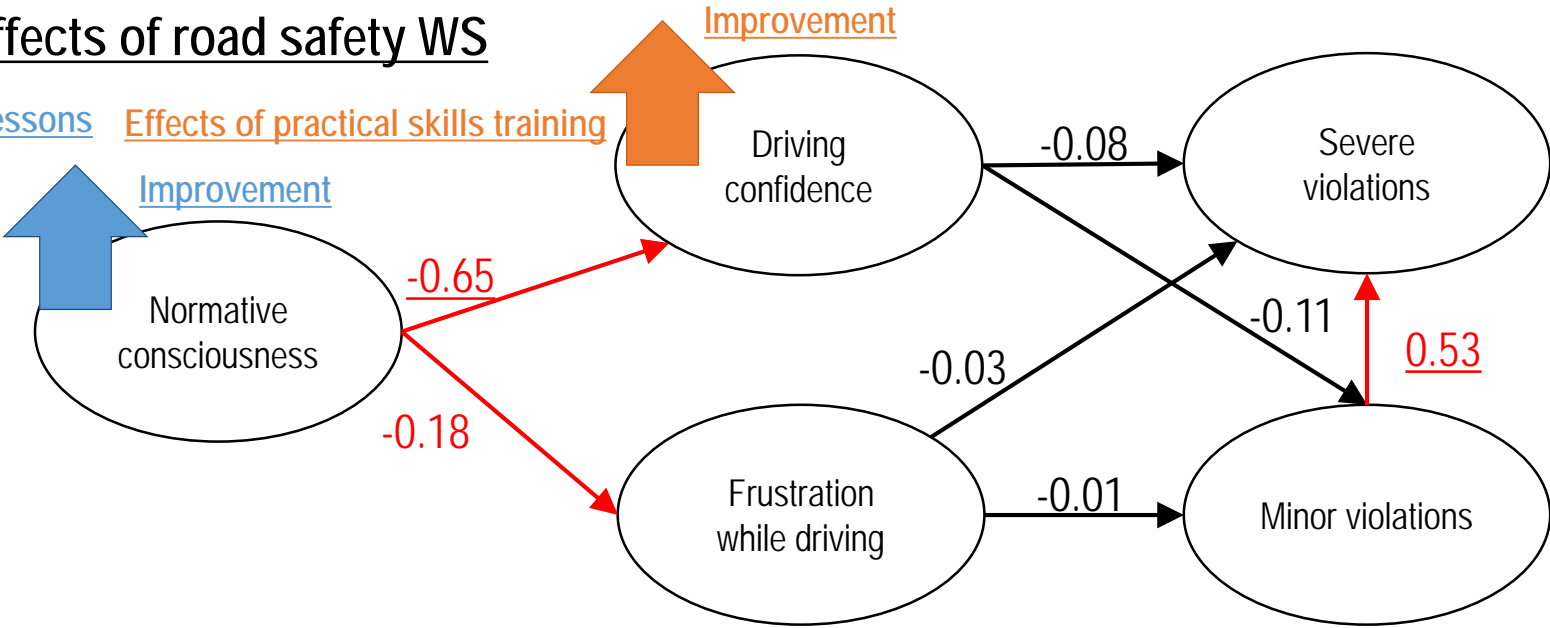
Results of comparisons of actual behavior before and after the Traffic Safety WS

Significant decrease in speeding

Future developments: Try to secure and disseminate opportunities for driver education in Cambodia and enhance educational content

Policy Issues and Proposals from Case Examples of Studies in Cambodia

- System related to two-wheeled vehicles (actual traffic conditions in developing countries)
  - System related to safety education
    - Driver's license system
    - Training system
    - Enhancement of educational content and establishment of an education system (school/home)
  - Other systems
    - Road system: Applicability of the safe system approach
    - System related to parking
    - Displaying of regulations and improvement of law enforcement capacity
- Proposals
  - Ratings on safe usage dedicated to two-wheeled vehicles
  - Proposal of evidence-based measures to decision-makers
  - Training of researchers, engineers, and planners concerning traffic safety