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ASIAN TRANSPORTATION RESEARCH SOCIETY

Evaluation of unsafe driving behaviour change by road safety education

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ASIAN TRANSPORTATION RESEARCH SOCIETY

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Table of Contents

CHAPTER 1 Introduction

1.1 Introduction

Road accident is a very serious problem. Human factors appear to be one of the main causes for almost of the crashes. It was found that three distinct patterns of behaviour have a powerful influence on driver safety: (1) lapses or absentminded behaviour, (2) errors caused by misjudgement of danger or failures of observation, and (3) violations or deliberate neglect of safe driving (Blockey and Hartley 1995; Parker et al. 1995). However, many studies on driver behaviour have focused almost entirely on individual differences as contributors to unsafe driving behaviour (Moeckli and Lee, 2007). They suggest that safety culture is an important influence on driving behaviour, and plays a critical role in driving safety (Lee, 2006).

It is very likely that improving driving behaviour can decrease accident rate significantly. In Thailand many activities, such as raising public awareness on driving safely through public events and media, improving road geometries, and law enforcement, have been deployed to manage change in driving behaviour, in order to reduce number of accidents. However, numbers of road fatality in Thailand has still not shown any sign of reduction.

In Thailand, approximately 10-15% of road fatalities are 15-24 year olds (Road Traffic Death Data Integration (RTDDI), Bureau of Non Communicable Disease, Thailand). An ATRANS previous research on students' unsafe driving behaviour (Jaensirisak et al, 2018) found that students (mainly motorcyclists) are less likely to perceive road accident as "my serious problem". So they value the cost of accident less than the convenience of unsafe driving behaviours e.g. not wearing helmet, speeding, and drunk driving. Driving behaviour change is the first and most important thing that has to be changed, in order to create safe society. However, typical campaigns and activities (TV, roadside messages, etc.) are unlikely to influence behaviour (only intention). The study suggests that enforcement is the most effective strategy to influence the change, particularly in a short term. However, safe driving behaviours cannot be achieved by law enforcement alone. For a long term, road safety education would increase individuals' perception of road accident. The study found that education measures that could affect the behaviour change include campaigns promoting to save lives of families and friends, direct campaigns for each road user group and each behaviour, and campaigns to change perception of "no accident for short distance traveling".

Although, enforcement is generally judged as more efficient and able to bring quicker benefits than education in changing unsafe driving behaviour; we need education approaches to have a balanced and comprehensive traffic safety policy, as well as, gain social acceptability of other strategies (Assailly, 2017).

Road safety education has three main targets (ROSE 25 project, 2005): (1) Promotion of knowledge and understanding of traffic rules and situations, (2) Improvement of skills through training and experience, and (3) Strengthening and/or changing attitudes toward risk awareness, personal safety and the safety of other road users. However, education program need to be designed to match type of person (Assailly, 2017).

Road safety education for changing driver behaviour must be a structured process. In 2018-19 an ATRANS research (Jaensirisak et al, 2019) titled "Influencing change in unsafe driving by road safety education" was targeted to understand unsafe driving behaviour of youngsters, to design and organise road safety education campaigns for managing change in unsafe driving behaviour; and to evaluate effectiveness of the road safety education campaigns in changing unsafe driving behaviour.

The research designed and organised various road safety campaigns, including:
- Establishing a safety club at Thaluang Cementhaianusorn Technical College
- A 2 hours-workshop (30 participants) at the college on 27 June 18 (with Pre- and post-tests)
- Data collection (165 samples – not attending workshop) on perception and behaviour
- Helmet wearing campaign during June – November 2018
- One day training (44 participants) at TPRO Training Center on 26 October 2018 (with Pre- and post-tests)
- The 1st Road Safety on Campus (about 1000 participants) on 22 November 2018
- The 2nd Road Safety on Campus (about 2000 participants) on 20 December 2018

The initial evaluation results found that:
- Top 3 risk behaviours are speeding, no helmet wearing, and telephone using;
- Enforcement is effective in short term for changing behaviour, particularly CCTV;
- General safety education campaign is effective in changing intention, not behaviour;
- Safety education needs to be designed with specific purposes, for each target group, and with multiple interventions and events; and
- Integration between safety education and enforcement is effective in behaviour.

Thus, the main aim of this research for 2019-20 is to keep continuing to manage unsafe driving behaviour by road safety education, and to evaluate the behaviour change.

1.2 Objectives

The objectives of this research are:

(1) to design and organise road safety education campaigns for managing change in unsafe driving behaviour; and

(2) to evaluate effectiveness of the road safety education campaigns in changing unsafe driving behaviour.

1.3 Outputs of the projects

Outputs of the projects include:

- Understanding unsafe driving behaviour of young motorcyclists
- Road safety education campaigns for managing change in unsafe driving behaviour
- Effectiveness of road safety education

CHAPTER 2 Road Safety Education

2.1 Introduction of Road Safety Education

While traditional driver education programs tended to focus primarily on increasing overall knowledge, today's effective programs attempt to promote safe driving through increases in knowledge, attitudes, and skills (Ferguson, 2003; King et al., 2008).

The objective of road safety education is defined as achieving an optimal use of the transportation system with optimal safety for all road users (OECD, 1986). Road safety education covers all measures that aim at positively influencing traffic behaviour patterns, with three main targets (ROSE 25 project, 2005): (1) Promotion of knowledge and understanding of traffic rules and situations, (2) Improvement of skills through training and experience, and (3) Strengthening and/or changing attitudes toward risk awareness, personal safety and the safety of other road users.

Road safety education is a lifelong learning process. It is very important to link safety education to specific problems and to a target group (Assailly, 2017; GIZ, 2017). When planning a road safety education, attitudes of teenagers or young adults, such as avoidance of risk taking, resistance to peer group pressure, no overestimation of one's own skills, etc. should be considered (Arnett, 2002), including:

- Adolescents are strongly influenced by their peers and friends. When together, adolescent friends often generate a state of elation.
- Adolescents try to escape form the control of parents and other adults, and to experiment with what is explicitly forbidden by parents and other authorities;
- Adolescents underestimate the likelihood of negative events such as getting involved in a crash.
- Adolescents overestimate their own skills and competencies.
- Adolescents have strong mood swings;
- Male adolescents have a tendency to aggressiveness and sensation seeking.

Assailly (2017) reviews many road safety education programs and identify characteristics of good practices, as follows.

- The most effective teaching methods are those that encourage active student participation (role playing, simulations, etc.) and interaction with adults (discussion).

- The best results are achieved by interventions that improve the psycho-social skills of students such as self-esteem, assertiveness and resistance to peer pressure.
- It is necessary to adapt the program to the level of maturity and experience of the students.
- Interventions on "at risk groups" are usually more efficient, but school contexts are not well suited to this type of approach for reasons of ethics and confidentiality.
- "Multifocal" interventions that combine multiple targets seem to be more effective (youth, interventions with parents, teachers, action on the environment of the school, etc...), especially those which actively involve parents throughout the program.
- The consistency of messages is a key success factor, consistency in the speech of stakeholders, consistency between rhetoric and action.
- The quality of the implementation of the program is as important as the program itself (involvement of teachers).
- The training and supervision of stakeholders is essential for the success of the action, such as training teachers to group dynamics in order to ensure their relationships with students.
- The quality of the school environment plays a role beyond teacher training on the program: provision of new school activities, tutoring for students, development of the relationship between parents and teachers, involving health services, representation of parents.
- The main causes of failure are related to interventions in crisis situations or moralistic approaches based on fear, or programs too dependent on the outside (that is, not having enough involved the school staff and parents), or did not, or insufficiently developed teacher training.

2.2 Good Practices of Road Safety Education for Young Adults

Many interventions for road safety education have been used in many countries. Good Practices of road safety education for young adults can be categorised into eight groups, including:
- Road safety messages
- Social norms media marketing
- E-learning
- Workshop
- Traffic clubs
- Peer-to-peer road safety intervention

- Parental involvement
- Comprehensive strategies

2.2.1 Road safety messages

Lewis et al. (2008) examine message-relevant affect and, in particular, the relative effectiveness of negative and positive emotional appeals in the road safety advertising context.

The results revealed, as predicted, interactions of the key variables and evidence of the greater persuasiveness of negative appeals immediately after exposure whilst greater improvement of positive appeals over time. The findings highlight the importance of continuing the exploration of positive appeals as a persuasive alternative to negative appeals.

For instance, given that appeals to positive emotions are seldom used in the road safety context they may be considered relatively less effective than fear-based approaches simply because the latter approach is utilised more frequently (see Lewis, Watson, White, & Tay, 2007).

Despite the frequent use of fear-based health messages, a substantial body of literature attests to the contradictory findings between the level of fear evoked and the extent of subsequent persuasion achieved (for review of the use of fear in road safety campaigns, see Elliott, 2003; Lewis, Watson, Tay, & White, 2007).

2.2.2 Social norms media marketing

Social norms media marketing can be effective at changing behaviours by correcting normative misperceptions. Perkins et al. (2010) evaluated the efficacy of a high-intensity social norms media marketing campaign. The results demonstrate the campaign reduced normative misperceptions, increased use of designated drivers, and decreased drinking and driving among those young adults. Social norms media marketing can be effective at changing drinking-related behaviours. This research provides a model for utilizing social norms media marketing to address other behaviours related to public health.

Social norms marketing consists of disseminating accurate norms such as with drinking usually in the form of newspaper ads, flyers, posters, electronic media, etc. The social norms media campaign was comprised of television, radio, print, and theatre ads, in addition to posters and promotional gifts, college newspaper advertisements, theatre slides, billboards, various print

and promotional items (i.e., t-shirts, key chains, pens, and windshield scrapers), and indoor advertisements.

The approach has a theoretical foundation that can be expressed by four tenets (Perkins, 2003). First, perceived norms are consistently and positively associated with drinking. Second, people tend to overestimate the drinking of their peers (i.e., normative misperception). Third, overestimation of peer drinking is associated with heavier subsequent drinking. Fourth, and finally, successful correction of normative misperception should reduce drinking.

2.2.3 E-learning

Wahlberg (2011) study that new ways of educating offending drivers are being introduced, notably e-learning. The results seem to indicate a positive effect of the e-learning course for young driving offenders. An e-learning course for offending young drivers was therefore evaluated as to its effects upon offence. Significant reductions in number of offences and penalty points were found for an e-learning group, while this was not the case for drivers who had been fined only, or had taken a more traditional solely class-room based educational scheme. On-line driver education has a number of features that are different from standard educational approaches. It is highly visual and interactive, and not requires any travel or pacing, apart from a deadline for completion. Moreover, the lack of possible embarrassment for the drivers may be a very positive attribute of e-learning.

2.2.4 Workshop

Road safety education has been used to influence driving attitudes and behaviours. An example of effective road safety workshop for young adults (Rosenbloom, et al., 2009) is used in the Loewenstein Hospital Rehabilitation Center (Israel). It is a 4–5h workshop (groups of 50–100 students). Activities include: (1) watching a video documenting the lives of young people like themselves leading up to a road accident and the ensuing recovery process, (2) meeting with a young person who has survived an accident, hearing this person's story, participating ask questions and hold a discussion, and (3) taking part in a ''simulation'' in which they learn about living with a disability – for example, by controlling a wheelchair or by attempting routine activities with one limb tied to their body. However, the workshop should be tailored to the need of the participants.

Fylan and Stradling (2014) evaluated interventions and to identify the effective mechanisms by which behaviour can be changed. They reviewed 26 behavioural change techniques (BCTs)

(that reports in Abraham and Michie (2008) as having been used in changing health-related behaviours, with an emphasis on smoking) and then mapped with six interventions to change young people's road user behaviour. An effective intervention was 1-day workshop. The workshop could provide (1) giving information ("*Information about risk*" - information about the increased risk associated with risk behaviour and "*Information about consequences*" - information about what might happen to themselves and/or others if they are involved in a collision, get demerit points, lose their licence, etc.), (2) teaching (*"Instruction"* - telling people how they can achieve the target behaviour), (3) planning *("Identifying and overcoming barriers"* - anticipating what might prevent people from carrying out the new behaviour and identifying how they can overcome any potential difficulties) and (4) implementing (*"General encouragement"* - giving the person praise and encouragement while they try to change, independent of the success they actually have in changing).

2.2.5 Traffic clubs

Traffic clubs represent a form of the road safety education. Dragutinovic and Twisk (2006) review implementation and effectiveness of Traffic clubs. They found that traffic clubs were first established in the 1960s in Norway, and later were introduced in other Scandinavian countries, Great Britain, Germany and Luxemburg. The main idea of a traffic club (focusing on children from 3-7 years old) is to involve parents in teaching their children road safety. Books on road safety are sent to children (members) on regular basis (most cases is free of charge). However, study on the effectiveness of the traffic club cannot reach a conclusion.

2.2.6 Peer-to-peer road safety intervention

It is widely accepted that peer passengers is one of the key factors implicated in the risky driving behaviour and increased collision rate of young drivers (e.g. Preusser et al., 1998; Rice, Peek-Asa, and Kraus, 2003; Shope and Bingham, 2008; Williams and Tefft, 2014).

Weston and Hellier (2018) explored the relationship between susceptibility to peer influence and young drivers' engagement in risky driving - specifically how different types of active and passive peer influence predicted self-reported engagement in risky driving. They also used this insight to facilitate and evaluate a novel peer-to-peer education intervention.

The data suggest
- that high susceptibility to peer influence is related to more self-reported risky driving behaviours and

- that attaining social prestige (passive influence) and peers intervening in decisions (active influence) were the specific aspects of peer influence that predict violations.

High susceptibility to peer influence is found to be related to more self-reported risky driving behaviours. Young drivers perceive the input of their peer passengers to be collaborative, rather than coercive; and they appear to be using their passengers to help them decide their driving behaviour (be it safe or dangerous).

Road safety interventions (RSIs) may be able to utilise the susceptibility of young people to peer influence – by using that influence for positive effect. RSIs might seek to provide young drivers with strategies to identify and resist peer influence.

- Peer education might need multiple 'doses of intervention' to produce long-term changes in behaviour. Participants had many opportunities during the intervention to have the safe driving message reinforced, through multiple events and email reminders.
- In this way if a young driver's social group no longer considers risky driving to be acceptable, then they will have nothing to gain by engaging in it, and this should lead to safer driving. Siegel's (2014) research supports this strategy, he suggested that removing the 'rewarding' aspects of risky driving would make young drivers less likely to want to engage in it (Siegel, 2014).
- The intervention presented here moved away from the fear appeal model (focussing on the negative and shocking consequences of collisions). Previous evaluations have found that fear appeals have limited efficacy, despite their substantial cost and continued use (e.g. McKenna, 2010).

2.2.7 Parental involvement

Simons-Morton et al. (2008) describes the contexts of and opportunities for parental involvement in teenage driving and the effectiveness of interventions to increase and improve parental management of young drivers. Parents can be involved in their teenagers' driving. Parents can and should be involved in novice teenage driving, and their appropriate involvement might partially alleviate the teenage driving problem. The evidence indicates that the most important actions would be to delay licensure and then, for some months after licensure, to maintain strict limits on high-risk driving conditions while novices gain experience and develop complex driving skills.

2.2.8 Comprehensive strategies

Comprehensiveness and synergy between various techniques are needed. Theory and practice, knowledge and skills are complementary. King and Vidourek (2008) evaluated the short–and long–term efficacy of the You Hold the Key (YHTK) Teen Driving Countermeasure.

YHTK was associated with significant immediate and long–term improvements in teen seatbelt use, safe driving, and perceived confidence in preventing drunk driving. Compared to pretests, students at immediate and long–term posttest more frequently wore seatbelts when driving or riding, required passengers to wear seatbelts, and limited the number of passengers to the number of seatbelts in the vehicle. Students were more likely at both posttests to avoid drinking and driving and to say no to riding with a friend who had been drinking. In summary, YHTK was associated with increases in safe teen driving and passenger behaviors. Future programs should consider comprehensive strategies when attempting to modify teen behaviors.

Recent research indicates that reducing young drivers' risk–taking decisions and behaviors may result in decreased crashes, crash–related injuries and crash–related fatalities (Beirness & Simpson, 1997; McKnight, 1999).

The You Hold the Key (YHTK) Teen Driving Countermeasure was developed by the Hamilton County General Health District in Cincinnati, Ohio to increase safe driving and passenger behaviors among teens 15–19 years of age in Hamilton County, Ohio.

YHTK is a 10 week comprehensive school–based program consisting of safety promotion education, cooperative learning, student–oriented discussion, interactive lessons, student–led role–plays, prevention videos, and presentations from safety experts.

Students in YHTK receive information on the consequences of motor–vehicle collisions, importance of safe and healthy decision–making, potential consequences to risky driving behaviors, problem–solving skills related to driving, and the legal ramifications of risky driving behaviors.

The YHTK teen driving program produced significant increases in student likelihood to wear seatbelts, to require passengers to wear seatbelts, to avoid drinking and driving, and to reduce distractions while driving.

YHTK concentrates on a variety of teen driving behaviors including distractions, passengers, seatbelt use, drinking and driving, resistance skills, and strategies to reduce crashes. Unique features of YHTK include: (a) a trauma slide presentation graphically depicting car crashes and their devastating consequences to human life; (b) presentations from law enforcement officials regarding the laws related to driving safety, driver responsibility, drinking and driving, and field sobriety tests; (c) presentations from judicial prosecutors regarding the county court system, charges and mandatory penalties for driving under the influence, operating a motor–vehicle while intoxicated and 1st, 2nd, and 3rd moving violations; (d) panel discussions of community young adults discussing how their lives were drastically affected by risky driving behaviors and/or drinking and driving; (e) crash victims' experiences of being victimized by risky and unsafe drivers; (f) youth videos addressing drinking and driving, seat belt and air bag usage, how to avoid collisions, and ways to reduce risky behaviors; and (g) educational prevention videos including the Making the Right Choice video.

All of the activities and presentations provided by YHTK are focused on increasing safe driving knowledge, attitudes, and behaviors among young drivers.

This program also includes activities that require students to work in small cooperative learning groups to develop effective strategies to prevent high–risk driving behaviors and situations.

Based on the findings of this study several recommendations are offered.
- First, schools should offer a comprehensive prevention program as a means to increase safe driving attitudes and behaviors.
- Second, a three–year program cycle is recommended to ensure program consistency and cost–effectiveness. In the first year, schools would receive the program, be extensively trained on the program, and would be supplied with a program coordinator to lead program implementation. In the second year, schools would take on more responsibilities with some technical assistance from the program coordinator. In the third year, schools would implement the program completely on their own. Data would be collected in all three years and subsequently analyzed.
- Third, annual evaluations of school–based countermeasures should be conducted. Ideally, these evaluations should be conducted at the same point in time each year and seek to measure students' knowledge, attitudes, and behaviors regarding safe driving.

2.3 Summary

Key findings from the review can be summarised as shown in Table 2.1. There are many interventions can be applied to influence driving attitudes. However, from the previous studies it was found that in order to produce long-term behaviour change, RSE needs multiple interventions, events and reminders.

Table 2.1 Key findings from the review of road safety interventions

Interventions	Key findings	Sources
Road safety messages	Positive and negative (fear-based) appeals	Lewis et al. (2008) Elliott (2003)
Social norms media marketing	Changing behaviors by correcting normative misperceptions	Perkins et al. (2010)
E-learning	Re-education of young driving offenders (better than fine and class-room based education)	Wahlberg (2011)
Workshop	Influence driving attitudes and behaviours (e.g. watching video documenting, meeting accident survivors, simulation, playing games, …)	Rosenbloom, et al. (2009); Fylan and Stradling (2014)
Traffic clubs	Messages and booklets on road safety are sent to members on regular basis.	Dragutinovic and Twisk (2006)
Peer-to-peer road safety intervention	Relationship between susceptibility to peer influence and young drivers' engagement in risky driving	Preusser et al. (1998) Rice, et al. (2003) Shope and Bingham (2008) Williams and Tefft (2014) Weston and Hellier (2018)
Parental involvement	Appropriate involvement of parents could alleviate the teenage driving problem.	Simons-Morton (2008)
Comprehensive strategies	A 10 week comprehensive school–based program. Comprehensiveness and synergy between various techniques require students to work in small cooperative learning groups.	King and Vidourek (2008)

CHAPTER 3 Methodology and Case Study

The project is divided two tasks: (1) organising road safety campaigns, and (2) evaluating behaviour change.

3.1 Organising road safety campaigns

In this study, road safety campaigns for managing change in driving behaviour will be designed. Then the trial campaigns through workshops will be organised in universities and/or communities. The purposes are to help students to evaluate road accident problem in their communities, to understand road safety concept, to be able to find out causes of road accidents, and to encourage communities to drive safely on roads. The main target is motorcyclists which are the main travel mode for students. Campaigns focus on three main behaviours including helmet wearing, speeding, and drink and drive.

This study applies the Behavior-Based Safety (BBS) approach to manage the behaviour change. Behavior-Based Safety (BBS) is a behavioural approach to improving safety in the workplace, and has been extensively used for one-on-one employee safety education (Geller, 2001). According to Connor et al. (2009, 2010) and Choudhry (2014), BBS education considers individual features, and has two further improvements over traditional safety education: (1) it concentrates on observable individual safety behaviours rather than unobservable attitudes toward safety, and (2) it focuses on describing and encouraging safe behavior rather than on punishment. Geller (2001) observes that BBS education includes three phases: observation, feedback, and training; and has applied these phases to the safety education of commercial drivers. In the first two phases, risky behaviours of drivers are observed by management and then identified to the drivers one-on-one. Then, training is implemented based on the individual observable risky behaviours.

However, BBS methods vary in their combinations of delivery frequency, mode and content, all of which may influence effectiveness. Chapman and Underwood (2000), for example, found that drivers forget over 80% of their near-crashes after a month's time, which suggests that the frequency of education may be an important factor. Wang et al. (2018) also evaluated and compared the effectiveness of BBS education methods for risky driving behavior of commercial vehicles. They found that found that more frequent education led to greater learning effectiveness, and also with the recognized success of verbal delivery (face-to-face) over written delivery.

Behavior-Based Safety (BBS) approach (Geller, 2005) suggests three main kinds of interventions, including:

- Instructional intervention (unknowingly risky) - to get the participants' attention and instruct them to transition from unknowingly at-risk to knowingly safe
- Supportive intervention (knowingly risky) - Continued practice leads to fluency and to automatic or habitual behavior
- Motivational intervention (knowingly safe) - knowing what to do but don't, they require some external encouragement (incentive program) to change.

These incentives intend to transfer from unknowingly risk behaviour, knowingly risk behaviour, knowingly safe to fluently safe behaviour, which is the ultimate goal, as shown in Figure 3.1.
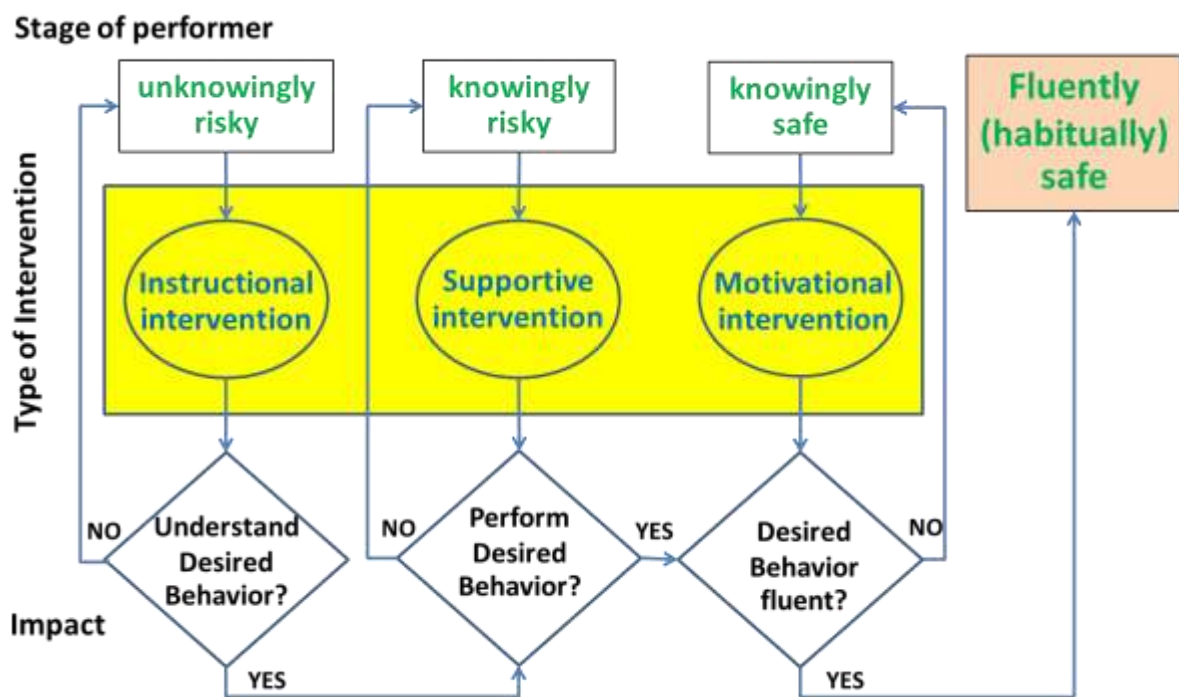
(adapted from Geller, 2005)

Figure 3.1 The Flow of Behavior Change model

3.2 Evaluating behaviour change

After the workshops for encouraging change of unsafe driving behaviour, the project is planned to evaluate the behaviour change based a questionnaire survey. The evaluation is based on

the Transtheoretical Model (TTM) which aims to explain a change in a risky behaviour (see Appendix A).

TTM identifies four transtheoretical dimensions of change (Prochaska & DiClemente, 1984; Prochaska et al.,1992; Prochaska & DiClemente, 2005; Prochaska et al., 2008), as shown in Figure 3.2.
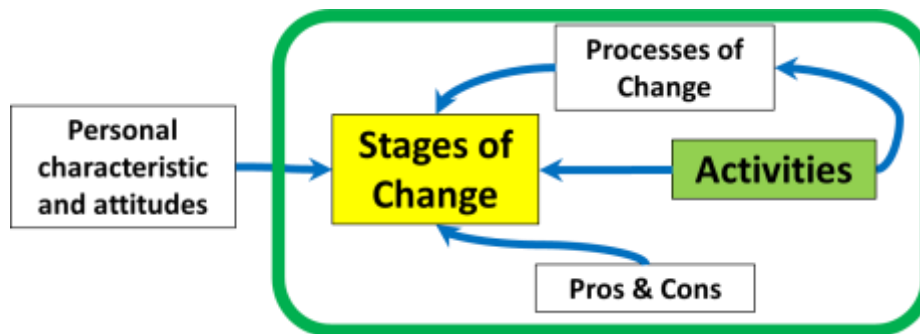

Figure 3.2 Concept of the Transtheoretical Model (TTM)

1. Stages of Change: people make attitudinal, intentional, motivational, and behavioural changes as they move through the precontemplative, contemplative, preparation, action, and maintenance stages of readiness for change.

- Precontemplation stage – being unaware of the problem behaviour
- Contemplation stage – starting to think about the problem and ambivalence
- Preparation stage – being motivated to take action in the immediate future
- Action stage – investing time and energy in taking the necessary steps toward an actual behavioural change
- Maintenance stage – working steadily to sustain the achieved change

These stages of change were applied to helmet wearing behaviour by grouping into 3 stages, including unaware, having intention, and being behavior, as shown in Table 3.1.

Table 3.1 Stages of change for the case of helmet wearing

Stages of change		
1	Wearing helmet is not an important behavior - Precontemplation stage	**Unaware**
2	Wearing helmet is an important behavior - Contemplation stage	**Having intention**
3	Wearing helmet is a behavior that I should do - Preparation stage	
4	I usually ware helmet - Action stage	**Being behavior**
5	I have been wearing helmet more than a year - Maintenance stage	

2. Processes of Change: These are the overt and covert activities that various therapy systems use to initiate change.

Experiential processes include:

- "consciousness raising" (greater awareness) is characterized by active gathering of information about oneself and the problem behaviour;
- "dramatic relief" (emotional arousal) is the process of experiencing and expressing feelings about the problem behaviour and possible solutions;
- "environmental revaluation" (social reappraisal) means the consideration and assessment of how the problem behaviour affects the physical and social environment;
- "self-reevaluation" (self-reappraisal) is the emotional and rational analysis of how the problem behaviour or the behaviour change affects the self and self-perception;
- "social liberation" (environmental opportunities) is characterized by awareness, availability, and acceptance of alternative life styles and cues that support the change;

Behavioural processes include:

- "self-liberation" (committing) means deciding to commit to changing the problem behaviour, including the belief in the ability to change successfully;
- "stimulus control" (re-engineering) involves the control or avoidance of situations, persons, or other cues that trigger the problem behaviour, in order to support the occurrence of new behaviour;
- "counter-conditioning" (substituting) is the act of substituting an alternative and healthier behaviour for the problem behaviour;

- "helping relationships" (supporting) implies the active use of social support to make the attempts to change easier;
- "reinforcement management" (rewarding) is the systematic use of reinforcement and (self-)rewarding strategies to attain and stabilize the target behaviour.

These ten processes of change were applied to helmet wearing behaviour, as shown in Table 3.2.

Table 3.2 Processes of change for wearing helmet behaviour

Experiential process		Wearing helmet
Consciousness raising	Finding and learning new facts, ideas, and tips that support the healthy behaviour change	The activities let me know and learn importance of wearing helmet
Dramatic relief	Experiencing the negative emotions (fear, anxiety, worry) that go along with unhealthy behavioural risks	The activities make me feel that not wearing helmet is a risk
Self-reevaluation	Realizing that the behaviour change is an important part of one's identity as a person	The activities make me realize that wearing helmet is an important thing for me
Environmental reevaluation	Realizing the negative impact of the unhealthy behaviour or the positive impact of the healthy behaviour on one's proximal social and/or physical environment	The activities make me realize that wearing helmet is an important thing to do in the society
Social liberation	Realizing that the social norms are changing in the direction of supporting the healthy behaviour change	The activities make me realize that social norm is supporting wearing helmet
Behavioural process		
Self-liberation	Making a firm commitment to change	The activities make me interested to wear helmet
Stimulus control	Removing reminders or cues to engage in the unhealthy behaviour and adding cues or reminders to engage in the healthy behaviour	The activities make me remembrance of wearing helmet when riding motorcycle
Counterconditioning	Substitution of healthier alternative behaviours and cognitions for the unhealthy behaviour	The activities let me meeting those who always wear helmet
Helping relationships	Seeking and using social support for the healthy behaviour change	The activities support me to wear helmet
Reinforcement management	Increasing the rewards for the positive behaviour change and decreasing the rewards of the unhealthy behaviour	The activities make me feel that wearing helmet is useful

3. Pros and Cons of Changing: The relative pros and cons of changing undergo a shift as clients move through the stages. Cons outweigh pros in the precontemplative stage, become equivalent by the contemplative stage, and lose relevance by the action stage. Pros gain strength and motivation increases as clients move through the stages.

In this study, pros and cons of changing are reasons of wearing and not wearing helmet. Reasons of wearing helmet include:

- Reducing accident injury
- Police enforcement
- Families or close friends force to wear
- Families or close friends suggest to wear
- Others wear

Reasons of not wearing helmet include:

- Short distance travelling
- Travelling on small roads
- No police
- In a hurry
- Difficulty in carrying
- Loss of hair style
- Uncomfortable
- No helmet
- Confidence in riding without accident
- Others not wearing

4. Levels of Change: More intensive intervention is required depending on whether problems are conscious or unconscious. Some problems are symptomatic responses to a difficult situation, but more complex problems may have nested levels: e.g., symptoms may be supported by maladaptive cognitions, which create interpersonal conflicts that repeat childhood family conflicts, which were internalized in the form of intrapersonal conflicts.

In Chapter 4, the study will analyse and evaluate behavior change and what factors affect the stages and processes of change, according to the Figure 3.2.

3.3 Case study

This project includes three case studies, in order to trial road safety education interventions and evaluate their effectiveness, including:

- Thaluang Cementhaianusorn Technical College in Thaluang, Saraburi province,
- Chainat Technical College, Chainat province,
- Suphanburi Technical College, Suphanburi.

CHAPTER 4 Results

The project is divided two tasks: (1) organising road safety campaigns, and (2) evaluating behaviour change, as presented in Chapter 3. This chapter presents results of the activities. Section 4.1 presents summary of designing and organising road safety campaigns. Then Section 4.2 presents results of evaluation of the activities, which is based on a focus group and questionnaire survey.

4.1 Designing and organising road safety campaigns

4.1.1 Designing road safety campaigns

ATRANS Safe You Safe Me (SYSM) Road Safety Clubs (called SYSM Clubs) were established in the three colleges (1. Thaluang Cementhaianusorn Technical College in Thaluang, Saraburi province; 2. Chainat Technical College, Chainat province; and 3. Suphanburi Technical College, Suphanburi. Each club had 50 members, divided into 5 groups. Each group designed and implemented safety education projects. Therefore, there were five projects for each college.

Apart from the safety education projects, members of the clubs also attended several safety campaigns, in order to increase awareness of road safety of the members. These campaigns included:

- Safety Workshops at the three colleges
- Visiting "Safety Hunter" at Child Safety Promotion and Injury Prevention Research Center (CSIP), Mahidol University
- Visiting TPRO driving training center
- Sharing experiences of safety projects (5 projects for each colleges)
- Training road safety for children

4.1.2 Organising road safety campaigns

Safety Workshops

The safety workshops (Figure 4.1) at the three colleges: Saraburi on 25 July 2019, Chainat on 26 July 2019, and Suphanburi on 15 Aug 2019. The workshop was for training the safety clubs' members to learn about current road accident situation, causes of the accidents, and unsafe

driving behaviours. Overall, the workshops were expected to increase awareness of road safety of the members.

Figure 4.1 The safety workshops

Visiting "Safety Hunter"

On 6 November 2019, the members were taken to visit "Safety Hunter" at Child Safety Promotion and Injury Prevention Research Center (CSIP), Mahidol University (Figure 4.2).

There were three learning activities: child safety, First Aid - CPR training, and Brain training games. This visit was expected that the members can learn how to train children on safety.

Figure 4.2 Activities at the Safety Hunter

Visiting TPRO driving training center

On 11 Nov 19, the members were taken to visit TPRO driving training center. There were four learning activities, including: seatbelt wearing, drink don't drive, breaking distance, and blind spot (Figure 4.3). This visit was expected that the members can learn about safety skills when using roads.
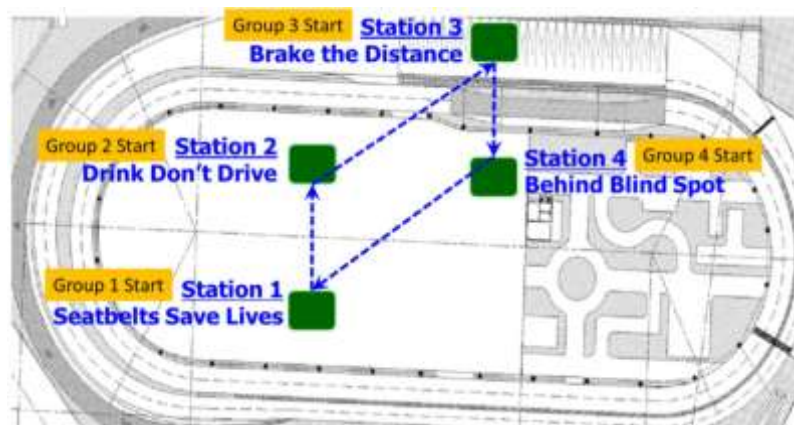

Figure 4.3 Learning activities at TPRO driving training center

Sharing experiences of safety projects

The SYSM clubs in the three colleges designed road safety projects (Table 4.1). These projects were implemented to encourage safety behaviours among friends in their colleges (Peer-to-peer road safety intervention, see Section 2.2.6). After that a workshop was set in Bangkok on 22 November 2019 to provide a chance for the students to share their experiences of safety projects.

Table 4.1 Road safety projects designed by the SYSM clubs

Suphanburi	Saraburi	Chainat
• Driving license • Smart helmet • Vehicle checking • Smart lighting • Helmet renting	• Driving license • Smart warning • Helmet wearing 100% • Reducing speed • Smart helmet	• Smart helmet • Vehicle checking • Smart lighting • Application "Ready for driving"

Training road safety for children

Apart from the road safety projects in their colleges, the SYSM clubs also designed and run safety courses and activities to teach and train students in primary schools (Figure 4.4). This was expected to have two faces of benefits. One was for increasing safety awareness of the children. On the other hand, those youngsters need to prepare themselves to have knowledge and awareness of road safety before being the trainers.

Figure 4.4 Activities in primary schools

4.2 Evaluation of the behaviour change

4.2.1 Evaluation based on the focus groups

The focus groups were set at the three colleges. The focus groups included members from the SYSM clubs. In summary, the students mentioned that:

- Accidents were perceived more seriously,
- More students wore helmet more than before,
- The safety campaigns would be more effective when combining with enforcement,
- The safety interventions were less likely to change the behaviours of those who have aggressive behaviour (particularly male students).

However, some issues have still not achieved:

- Many students still not wear helmet when riding for short distance,
- Those who have aggressive behaviour (particularly male students) tended not to wear helmet,
- A main risky behaviour was speeding behaviour (even those who always wore helmet). This was likely because of habit, time saving, fun, available road condition.

These findings led to some suggestions for further research:

- Education may not enough to change the behaviour
- Safety campaigns should focus more on short distance travelling and speeding
- More incentive interventions should be designed on encourage safe behaviour.

4.2.2 Evaluation based on the questionnaire survey

This year data by questionnaire surveys were collected three times in 2019-2020 (July 19, November 19, and February 20. These were to evaluate perception and behaviour change. The results comparing to the previous surveys in 2018 (June and November 18) are shown in Table 4.1-4.4. There were two groups of samples. One was random group which were randomly interviewed in the colleges. The other one was control group which were members of the SYSM clubs (who joined the activities presented in Section 4.1).

Characteristics of samples are presented in Table 4.1. Students age between 15-22 years old. The main transport mode for students is motorcycle. Most of them do not have driving license, and ever have experience in road accidents.

Table 4.1 Sample characteristics

Date of collection	Pre-test 27 June 18	Nov 18	Jul 19	Nov 19	Feb 20	
	Random	Random	Random	Control	Random	Control
Samples	165	424	300	94	259	41
Age	15-22	15-22	15-22	16-24	15-23	16-21
Gender male female	41% 59%	59% 41%	43% 57%	79% 21%	65% 35%	29% 71%
Travelling to school by MC	65%	75%	80%	72%	76%	75%
MC by own MC with parent MC with friend	37% 17% 12%	58% 5% 12%	61% 7% 12%	66% 4% 2%	57% 9% 10%	53% 12% 10%
Involving road accident	62%	67%	66%	57%	66%	56%
No driving license (MC users)	78%	63%	58%	28%	66%	71%

Proportion of those who always wear helmet tend to increase significantly, compared to the pre-test on June 2018, both control and random groups (as presented in Table 4.2).

Table 4.2 Wearing helmet behaviour (unit: %)

Wearing helmet	Pre-test 27 June 18	Nov 18	Jul 19	Nov 19	Feb 20	
	Random	Random	Random	Control	Random	Control
Always	41	63	51	44	64	63
Often	43	33	38	44	25	20
Sometimes	14	3	10	12	11	10
Never	3	1	0	0	0	7

Most students wear helmet because they think helmet can reduce accident injury, and when there is police enforcement (as presented in Table 4.3). They tend to not wear helmet when travelling for a short distance or on small roads (as presented in Table 4.4). These attitudes are similar results between before and after the event. However, the students seem to perceive more on reducing accident injury by wearing helmet.

Table 4.3 Reasons wearing helmet (unit: %)

Wearing, because	June 18 (Pre-test)	Nov 18	Jul 19	Nov 19	Feb 20	
	Random	Random	Random	Control	Random	Control
Reducing accident injury	81	84	91	87	93	95
Police enforcement	72	66	77	66	84	77
Families or close friends force to wear	36	30	32	24	44	32
Families or close friends suggest to wear	39	28	28	29	56	43
Others wear	29	16	25	15	47	37

Table 4.4 Reasons not wearing helmet (unit: %)

Not wearing, because	June 18 (Pre-test)	Nov 18	Jul 19	Nov 19	Feb 20	
	Random	Random	Random	Control	Random	Control
Short distance travelling	56	54	66	55	77	74
Travelling on small roads	53	48	57	38	64	61
No police	16	18	21	34	47	36
In a hurry	25	18	18	26	43	30
Difficulty in carrying	14	12	11	13	16	8
Loss of hair style	11	9	15	16	23	29
Uncomfortable	12	9	11	16	19	29
No helmet	7	13	8	11	25	15
Confidence in riding without accident	4	4	5	13	12	15
Others not wearing	2	3	3	6	6	8

Most students perceive that police is the most effective to influence them to wear helmet. The results are similar for both cases before and after the safety activities (as presented in Figures 4.5).
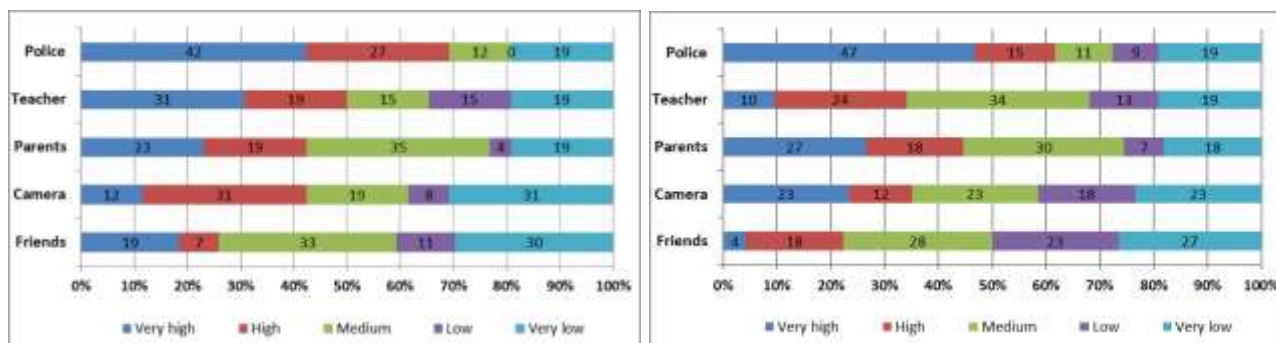

(a) June 2018 (Pre-test)　　　　　　　　　　　(b) Feb 2020

Figure 4.5 Influence on helmet wearing – comparing before and after survey

However, when comparing control and random group (post survey in Feb 2020), it found that police was less influence on wearing helmet to those were members of SYSM than to those who were non-members of SYSM (as presented in Figures 4.6). This reflects that SYSM members (attended safety activities) are more willing to wear helmet by themselves, rather than being enforced by police.
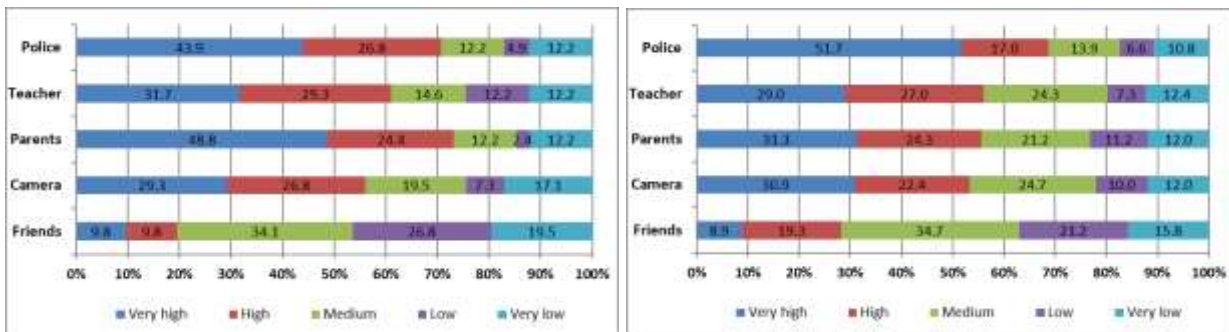
(a) Members of SYSM (control group)   (b) Non-members of SYSM (random group)

Figure 4.6 Influence on helmet wearing – comparing control and random group

According to TTM, stages of change for wearing helmet behaviour are divided into five stages (as presented in Chapter 3). The questionnaire asks students to indicate which stages they are. The results found that proportion of those who often (Stage 4) and always (Stage 5) ware helmet (considering helmet wearing as behaviour) is 18% for pre-test in June 2018, increase to 30% in November 2019 (surveyed after the safety campaign), and decrease to 23% in July 2019 and 21% in November 2019 (as presented in Table 4.5). However, the post-test in February 2020 finds significant difference between control and random groups. This shows that members of the control group (who attended safety activities) consider helmet wearing as behaviour more than the random group (who did not attended safety activities).

Table 4.5 Stages of behaviour change (unit: %)

Stages of change	June 18 (Pre-test)	Nov 18	Jul 19	Nov 19	Feb 20	
	Random	Random	Random	Control	Random	Control
Wearing helmet is not an important behavior	1	2	1	3	5	5
Wearing helmet is an important behavior	42	33	38	37	43	28
Wearing helmet is an behavior that I should do	39	35	37	39	32	38
I often ware helmet	8	15	14	12	12	15
I always ware helmet	10	15	9	9	8	15

This study applies TTM to evaluate behaviour change of helmet wearing. The core constructs of the TTM contain three main dimensions: stages of change (5 stages), processes of change (10 processes) and decisional balance (Pros & Cons), as explained in Chapter 3. The behaviour change is evaluated through the stage of change. Activities or campaigns could directly influence wearing helmet behaviour or through the processes of change. Wearing helmet behaviour could be also affected by personal characteristics, experiences and perceptions. The framework for evaluation of the helmet behaviour change is shown in Figure 4.7.
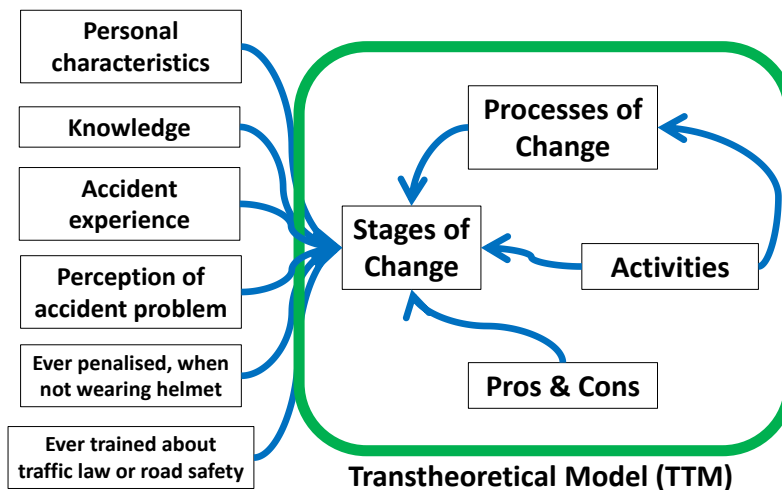

Figure 4.7 Framework for evaluation of the helmet behaviour change

According to TTM, stages of change for wearing helmet behaviour are divided into five stages, and can be seen as three broad groups as: unaware, having intention, and being behaviour, as shown in Table 4.6.

Table 4.6 Stages of change for wearing helmet behaviour

Stages of change		Wearing helmet	
Precontemplation stage	being unaware of the problem behaviour	Wearing helmet is not an important behaviour	Unaware
Contemplation stage	starting to think about the problem and ambivalence	Wearing helmet is an important behaviour	Having intention
Preparation stage	being motivated to take action in the immediate future	Wearing helmet is a behaviour that I should do	
Action stage	investing time and energy in taking the necessary steps toward an actual behavioural change	I usually ware helmet	Being behaviour
Maintenance stage	working steadily to sustain the achieved change	I have been wearing helmet more than a year	

All data collected by the questionnaire was analysed basing on the framework in Figure 4.7. The five stage of change (in Table 4.6) were grouped into three categories of behaviours (unaware, having intention and being behaviour). However, the sample of the unaware group was rather low and not significantly different from having intention group, so these were merged to be one group. Thus, in the statistical analysis, there were two stages of behaviour: helmet wearing as behaviour (helmet behaviour) and not wearing helmet as behaviour (others).

There were two types of measurement scales for the collected data: nominal and ordinal. These data were analysed by nonparametric methods, including: Chi Square test[1] and Phi and Cramer's V[2], in order to test which factors significantly associate with helmet wearing behaviour (dependent variable). The variables that associated with the behaviour change were included in the logistic regression model, as follows.

$$ln\left[\frac{Pr\ (Helmet\ behaviour)}{Pr\ (Others)}\right] = Constant + \ \beta1(SYSM) + \beta2(ET) + \beta3(EA) + \beta4(FM) + \ \beta5(SR)$$

Where

SYSM = Those who are members of the SYSM club
ET = Those who ever been trained
EA = Those who ever involved accident
FM = Female
SR = Process of self-reevaluation

All data from both control and random groups are included in the data analysis (300 samples). The result of parameter in the model is presented in Table 4.7, and summarised in Figure 4.8.

The five variables that significantly influence wearing helmet behaviour (at least 90% confident level) include: (1) those who are members of the SYSM club, (2) those who ever been trained, (3) those who ever involved accident, (4) female, and (5) process of self-reevaluation (the activities make me realize that wearing helmet is an important thing for me). All other variables in Figure 4.7 do not significantly influence wearing helmet behaviour.

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[1] to test whether 2 nominal variables are associated.
[2] Value between 0 and 1 that indicates how strongly two nominal variables are associated.

Table 4.7 Coefficients of variables in logistic regression model for wearing helmet behaviour

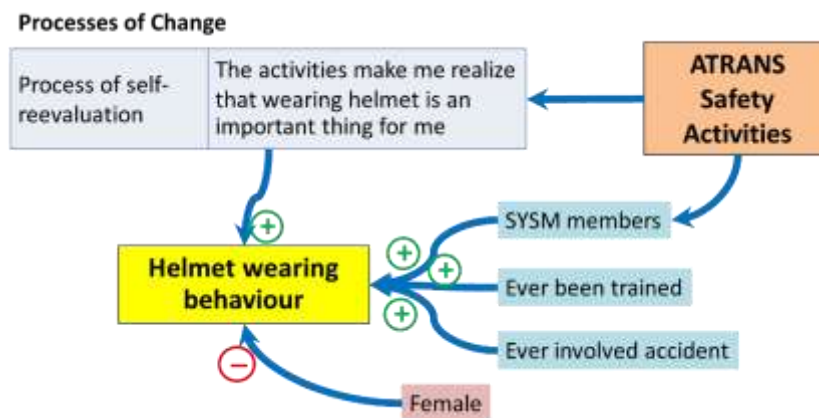| Variables	Coefficients	P-value
SYSM (β1)	0.712	0.087
ET (β2)	0.600	0.046
EA (β3)	0.525	0.085
Female (β4)	-0.941	0.005
SR (β5)	1.517	0.048
Constant	-2.484	0.001
No. of sample	300	
Nagelkerke R^2_N	0.101	

Figure 4.8 Summary of the results

Coefficients of those who are members of the SYSM clubs, those who ever been trained, and those who ever involved accident have positive sign, indicating that those who attend safety activities in the SYSM clubs, those who do not attend the SYSM clubs but have been ever trained on road safety, and those who have ever involved accident tend to wear helmet as behaviour more than the others.

Coefficient of the process of self-reevaluation has positive sign, indicating that the process that make students to realize that wearing helmet is an important thing would influence wearing helmet behaviour.

On the other hand, coefficients of female has negative sign indicating that female tend to wear helmet as behaviour less than male. This may be because of they wonder about hair style. However, this issue needs further study.

The constant also has significant negative sign, indicating that without any encouragement; students basically are not likely to wear helmet as behaviour. It also indicates that although the five variables are significant, still there are unknown various factors that affect the behaviour.

CHAPTER 5 Conclusions

The main aim of this research was to manage unsafe driving behaviour of youngsters by road safety education, and to evaluate the behaviour change. This study applied the Behavior-Based Safety (BBS) approach to manage the behaviour change. Various safety interventions were designed basing on reviewed experiences.

In order to trial road safety education interventions and evaluate their effectiveness, this project includes three case studies: (1) Thaluang Cementhaianusorn Technical College in Thaluang, Saraburi province, (2) Chainat Technical College, Chainat province, and (3) Suphanburi Technical College, Suphanburi. ATRANS Safe You Safe Me (SYSM) Road Safety Clubs (called SYSM Clubs) were established in the three colleges. Each club had 50 members. They designed and implemented safety education projects in their campuses. They also attended several safety activities, in order to increase awareness of road safety. These activities were multiple interventions, events and reminders.

The evaluation was based on the Transtheoretical Model (TTM) which aims to explain a change in a risky behaviour. Data collection was based on focus groups and questionnaire surveys (pre- and post-tests).

The study cannot evaluate effect on each safety intervention individually on behaviour change, but it shows overall influences of the multiple interventions with multiple events on the helmet wearing intention.

The interventions used in this study are related mainly to instructional and supportive interventions. These tend to instruct youngsters to transition from unknowingly risk behaviour to knowingly risk behaviour, and then knowingly safe behaviour. In order to be fluently safe behaviour, motivational interventions should be useful (according to Behavior-Based Safety-BBS approach). Therefore, further study needs to focus on designing motivation interventions to influence fluently (habitually) safe behaviour.

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Appendix A: Transtheoretical Model

The Transtheoretical Model (or TTM, Prochaska & DiClemente,1984; Prochaska, DiClemente, & Norcross, 1992; Prochaska,Redding, & Evers, 2008) is aimed at explaining a change in an unhealthy or risky behavior. This appendix provide a summary of TTM, which is from Prochaska et al. (2008), as follows.

The TTM uses stages of change to integrate processes and principles of change across major theories of intervention. The TTM emerged from a comparative analysis of leading theories of psychotherapy and behavior change in an effort to integrate a field that had fragmented into more than 300 theories of psychotherapy (Prochaska, 1984).

From initial studies of smoking, the stage model rapidly was expanded to include investigations and applications to a broad range of health and mental health behaviors, including alcohol and substance abuse, anxiety and panic disorders, bullying, delinquency, depression, eating disorders and obesity, high-fat diets, HIV/AIDS prevention, mammography and other cancer screening, medication compliance, unplanned pregnancy prevention, pregnancy and smoking, radon testing, sedentary lifestyles, sun exposure, and physicians practicing preventive medicine.

The core constructs of the TTM includes (as briefly describes in Table A1):

- Stages of Change
- Processes of Change
- Decisional Balance
- Self-Efficacy

Table A1 Transtheoretical Model Constructs

Constructs		Description
Stages of Change	Precontemplation	No intention to take action within the next 6 months
	Contemplation	Intends to take action within the next 6 months
	Preparation	Intends to take action within the next 30 days and has taken some behavioral steps in this direction
	Action	Changed overt behavior for less than 6 months
	Maintenance	Changed overt behavior for more than 6 months
Processes of Change	Consciousness raising	Finding and learning new facts, ideas, and tips that support the healthy behavior change
	Dramatic relief	Experiencing the negative emotions (fear, anxiety, worry) that go along with unhealthy behavioral risks
	Self-reevaluation	Realizing that the behavior change is an important part of one's identity as a person
	Environmental reevaluation	Realizing the negative impact of the unhealthy behaviour or the positive impact of the healthy behavior on one's proximal social and/or physical environment
	Self-liberation	Making a firm commitment to change
	Helping relationships	Seeking and using social support for the healthy behaviour change
	Counterconditioning	Substitution of healthier alternative behaviors and cognitions for the unhealthy behavior
	Reinforcement management	Increasing the rewards for the positive behavior change and decreasing the rewards of the unhealthy behavior
	Stimulus control	Removing reminders or cues to engage in the unhealthy behavior and adding cues or reminders to engage in the healthy behavior
	Social liberation	Realizing that the social norms are changing in the direction of supporting the healthy behavior change
Decisional Balance	Pros	Benefits of changing
	Cons	Costs of changing
Self-Efficacy	Confidence	Confidence that one can engage in the healthy behavior across different challenging situations
	Temptation	Temptation to engage in the unhealthy behavior across different challenging situations

Stages of Change

The stage construct is important, in part, because it represents a temporal dimension. In the past, behavior change often was construed as a discrete event, such as quitting smoking, drinking, or overeating. The TTM posits change as a process that unfolds over time, with progress through a series of five stages, although frequently not in a linear manner.

Precontemplation is the stage in which people do not intend to take action in the near term, usually measured as the next six months. The outcome interval may vary, depending on the behavior. People may be in this stage because they are uninformed or under-informed about the consequences of their behavior. Or they may have tried to change a number of times and become demoralized about their abilities to change. Both groups tend to avoid reading, talking, or thinking about their high-risk behaviors.

In contemplation, people intend to change their behaviors in the next six months. They are more aware than precontemplators of the pros of changing but are also acutely aware of the cons. This balance between the costs and benefits of changing can produce profound ambivalence and keeps people stuck in contemplation for long periods of time. This phenomenon is often characterized as chronic contemplation or behavioural procrastination. These folks also are not ready for traditional action-oriented programs that expect participants to take action immediately.

In preparation, people intend to take action soon, usually measured as the next month. Typically, they already have taken some significant step toward the behaviour in the past year. They have a plan of action, such as joining a health education class, consulting a counselor, talking to their physician, buying a self-help book, or relying on a self-change approach. These are the people who should be recruited for actionoriented programs.

People in the action stage have made specific, overt modifications in their lifestyles within the past six months. Because action is observable, behavior change often has been equated with action. Typically, not all modifications of behavior count as action in this model. In most applications, people have to attain a criterion that scientists and professionals agree is sufficient to reduce risks for disease.

Maintenance is the stage in which people have made specific, overt modifications in their lifestyles and are working to prevent relapse, but they do not apply change processes as frequently as people in action. They are less tempted to relapse and are increasingly more

confident that they can continue their changes. Based on temptation and selfefficacy data, it was estimated that maintenance lasts from six months to about five years.

Processes of Change

Processes of change are the covert and overt activities people use to progress through stages. Processes of change provide important guides for intervention programs, as processes are like independent variables that people need to apply to move from stage to stage. Ten processes have received the most empirical support in research to date.

1. Consciousness raising involves increased awareness about the causes, consequences, and cures for a particular problem behavior. Interventions that can increase awareness include feedback, confrontations, interpretations, bibliotherapy, and media campaigns.

2. Dramatic relief initially produces increased emotional experiences, followed by reduced affect or anticipated relief if appropriate action is taken. Role-playing, grieving, personal testimonies, health risk feedback, and media campaigns are examples of techniques that can move people emotionally.

3. Self-reevaluation combines both cognitive and affective assessments of one's self-image with and without an unhealthy behavior, such as one's image as a couch potato and an active person. Values clarification, healthy role models, and imagery are techniques that can move people evaluatively.

4. Environmental reevaluation combines both affective and cognitive assessments of how the presence or absence of a personal behavior affects one's social environment, such as the impact of one's smoking on others. It can also include awareness that one can serve as a positive or negative role model for others. Empathy training, documentaries, testimonials, and family interventions can lead to such reassessments.

5. Self-liberation is both the belief that one can change and the commitment and re-commitment to act on that belief. New Year's resolutions, public testimonies, and multiple rather than single choices can enhance what the public calls willpower.

6. Social liberation requires an increase in social opportunities or alternatives, especially for people who are relatively deprived or oppressed. Advocacy, empowerment procedures, and appropriate policies can produce increased opportunities for minority health promotion, gay health promotion, and health promotion for impoverished people. These same procedures can

be used to help all people change, as is the case with smoke-free zones, salad bars in school lunchrooms, and easy access to condoms and other contraceptives.

7. Counterconditioning requires learning healthier behaviors that can substitutefor problem behaviors. Relaxation, assertion, desensitization, nicotine replacement, and positive self-statements are strategies for safer substitutes.

8. Stimulus control removes cues for unhealthy habits and adds prompts for healthieralternatives. Avoidance, environmental re-engineering, and self-help groups can provide stimuli that support change and reduce risks for relapse.

9. Contingency management provides consequences for taking steps in a particular direction. Although contingency management can include the use of punishment, we found that self-changers rely on reward much more than punishment. Reinforcements are emphasized, since a philosophy of the stage model is to work in harmony with how people change naturally. Contingency contracts, overt and covert reinforcements, incentives, and group recognition are procedures for increasing reinforcement and the probability that healthier responses will be repeated.

10. Helping relationships combine caring, trust, openness, and acceptance, as well as support for healthy behavior change. Rapport building, therapeutic alliances, counselor calls, and buddy systems can be sources of social support.

Decisional Balance

Decisional balance reflects an individual's relative weighing of the pros and cons of changing. Originally, TTM relied on Janis and Mann's (1977) model of decision making that included four categories of pros (instrumental gains for self and others and approval from self and others) and four categories of cons (instrumental costs to self and others and disapproval from self and others). Over many studies attempting to produce this structure of eight factors, a much simpler two-factor structure was almost always found—pros and cons of changing.

Self-Efficacy

Self-efficacy is the situation-specific confidence that people can cope with high-risk situations without relapsing to their former behaviors.

Temptation reflects the converse of self-efficacy—the intensity of urges to engage in a specific behavior when in difficult situations. Typically, three factors reflect most common types of temptations: negative affect or emotional distress, positive social situations, and craving.

Relationships Between Stages and Processes of Change.

One of the earliest empirical integrations was the discovery of systematic relationships between people's stages and the processes they were applying. Table A2 presents the empirical integration (Prochaska, DiClemente, and Norcross, 1992). This integration suggests that, in early stages, people apply cognitive, affective, and evaluative processes to progress through stages. In later stages, people rely more on commitments, conditioning, contingencies, environmental controls, and support for progressing toward maintenance or termination.

Table A2 Processes of Change That Mediate Progression Between the Stages of Change

	Precontemplation	Contemplation	Preparation	Action	Maintenance
Processes	Consciousness raising				
	Dramatic relief				
	Environmental reevaluation				
		Self-reevaluation			
			Self-liberation		
				Counterconditioning	
				Helping relationships	
				Reinforcement management	
				Stimulus control	

Note: Social liberation was omitted due to its unclear relationship to the stages.

Table A2 has important practical implications. To help people progress from precontemplation to contemplation, such processes as consciousness raising and dramatic relief should be applied. Applying processes like contingency management, counterconditioning, and stimulus control to people in precontemplation would represent a theoretical, empirical, and practical mistake. But for people in action, such strategies would represent optimal matching.

As with the structure of processes, relationships between the processes and stages have not been as consistent as relationships between stages and pros and cons of changing. Although part of the problem may be due to the greater complexity of integrating ten processes across five stages, processes of change need more basic research and may be more specific to each problem behavior.

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