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Enhancement of road safety education for safe road using and driving behaviour

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Table of Contents

CHAPTER 1 Introduction

1.1 Introduction

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 needs to be designed to match type of person (Assailly, 2017).

Road safety education for changing road user and 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. It was 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 done, 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 although enforcement is the most effective strategy to influence the change, particularly in a short term, safe driving behaviours cannot be achieved by law enforcement alone. For a long term, road safety education would increase individuals' attitudes and perceptions toward risk awareness. 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."

In 2018, 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 practical training on risk perception of blind spots (47 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

In 2019, the continuing research activities included:
- Establishing ATRANS Road Safety Clubs in the 3 technical colleges (each has 50 members)
- Workshops at 3 colleges – Jul-Aug 19
- Visiting and training Safety Hunter at CSIP – 6 Nov 19
- Visiting and training at TPRO training center – 11 Nov 19
- Implementing safety projects by targeted student groups (5 projects for each colleges)
- Training road safety for children (transfer knowledge from seniors to juniors)

The evaluation found that safety projects designed by students mainly focus on instructional (training) interventions, and supportive interventions (tools), not motivational interventions. These projects seem to be successful in designing interventions to encourage knowingly risky behaviour, but not fluently (habitually) safe behaviour. In short, the designed interventions have not been successful in changing the risk behaviours.

Thus, the main aim of this research for 2020-21 is to keep continuing to design and implement road safety education interventions to manage unsafe road using and driving behaviour, and to evaluate the behaviour change. In addition to youngsters as a target group, this study expands to children (grades 1-6) as the other target group.

1.2 Objectives

The objectives of this research are:
- to design road safety education interventions
- to influence safe driving behaviour by road safety education
- to evaluate effectiveness of the road safety education campaigns

1.3 Outputs of the projects

Output of the projects is road safety education interventions for children, and youngsters.

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, including: providing road safety education and Organising road safety campaigns, and evaluating behaviour change.

3.1 Designing and organising road safety workshops

In this study, road safety education and campaigns for managing change in unsafe road using and driving behaviour will be re-designed. Then the trial road safety education program and campaigns through workshops will be organised in case studies in technical colleges and primary schools. The purposes are to enhance students to perceive and assess road accident problem in their communities, to understand road safety concept, to be able to find out causes of road accidents, and to encourage them to drive safely on roads. The main targets are divided into 3 different age groups (children, youngsters and elderly) who are potentially going to be using motorcycle as their main travel mode as it's convenient and affordable.

The design of road safety education measures is based on the Behavior-Based Safety (BBS) approach (Geller, 2005). This includes three kinds of interventions (shown in Fig. 3.1) as follows:

- 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 want to, they require some external encouragement and enhancement (incentive program) to change.
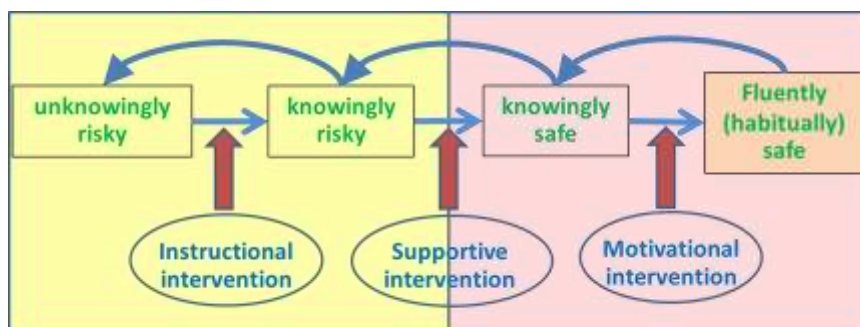

Figure 3.1 Behavior-Based Safety (BBS) approach (adapted from Geller, 2005)

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):

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

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.

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.

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.

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 earlier. 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 3.2.
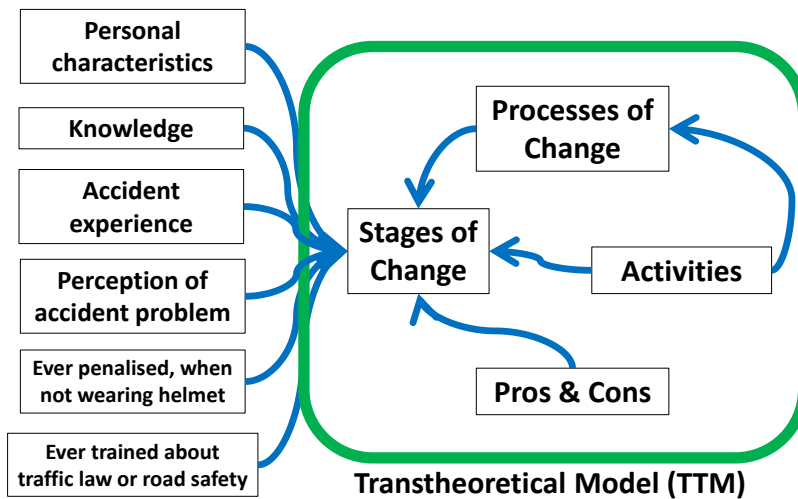
Figure 3.2 Framework for evaluation of the helmet behaviour change

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 (to test whether two nominal variables are associated) and Phi and Cramer's V (value between 0 and 1 that indicates how strongly two nominal variables are associated), 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,

3.3 Case study

This project has two main target groups, including children (age 6-12 years old) and youngsters (age 15-22 years old).

The first target group is children. The project will target 100 school children in Nakornratchasima Province. The objective is to educate children (age 6-12 years old) about road safety. The first target group will work closely in cooperation with the Road Safety Education Center, Pak Chong district, Nakhon Ratchasima which is constructed and operated under the Highway Police. Education method will provide theoretical knowledge, traffic rules, practical riding (bicycle), through five learning activities, including:

- Overview of road safety including introduction of the Road Safety Education Center, rules of roads (road signage, traffic signs), road accident example cases and their causes.
- Learning traffic signal by using hand gesture
- Helmet wearing and seat belt knowledge
- Accident from Motorcycle racing
- Practical riding by using bicycle to educate children on traffic sign, pavement marking,

traffic light and, etc.

Expected output is a suitable teaching method of Road safety for children. Outcome is that children have awareness on road safety after learning at the Road Safety Education Center.

The second target group is youngster (age 15-22 years old). This case study is the Road Safety Club at Supanburi, and Thaluang Technical Colleges in Supanburi and Saraburi Provinces, respectively. The project targets 50 students from each technical college equivalent to 150 students of both males and females in total. The re-designed road safety campaigns by students (continuing from the last year project) for managing change in unsafe driving behaviour will be implemented and evaluated. The concept of this activity is "learning by doing."

CHAPTER 4 Activities and Results

As presented in Chapter 3, the project has two target groups. One is road safety education (RSE) for Children (6-12 years old). The other one is road safety education (RSE) for Youngster (15-22 years old). The results are presented in Section 4.1 and 4.2, respectively. Each group is divided into two tasks (1) encouragement of behaviour change, and (2) evaluation of attitude and behaviour change.

4.1 Road Safety Education for Children (6-12 years old)

4.1.1 Encouragement of attitude and behaviour change for children

The activities of RSE for Children were done at the Road Safety Education center, operated by the Highway Police. Contexts of the activities included:

- Overview of road safety
- Learning traffic signal by hand
- Importance of helmet and seat belt wearing
- Danger of racing
- Practical riding on the road by using bicycle to educate children on traffic sign, pavement marking, traffic light and etc.

The concept of activities was "Learning by doing" by role playing on the practice field. Children were assumed as drivers (using bicycle) and pedestrians (see pictures of the activities in Figure 4.1). In total there are 218 children attending the courses (Table 4.1).

Table 4.1 Number of Children

Grade	Age	Number
1	6-7	26
2	7-8	39
3	8-9	31
4	9-10	39
5	10-11	41
6	11-12	42
Total		218

Figure 4.1 Activities at the Road Safety Education center

4.1.2 Evaluation of attitude and behaviour change for children

The study evaluated change of children' knowledge, attitude and behaviour by observations, focus groups, and pre- and post-tests. These were to test on knowing safe for pedestrians, knowing safe for each transport mode, and knowing traffic sign (as examples presented in Figures 4.2-4.5.
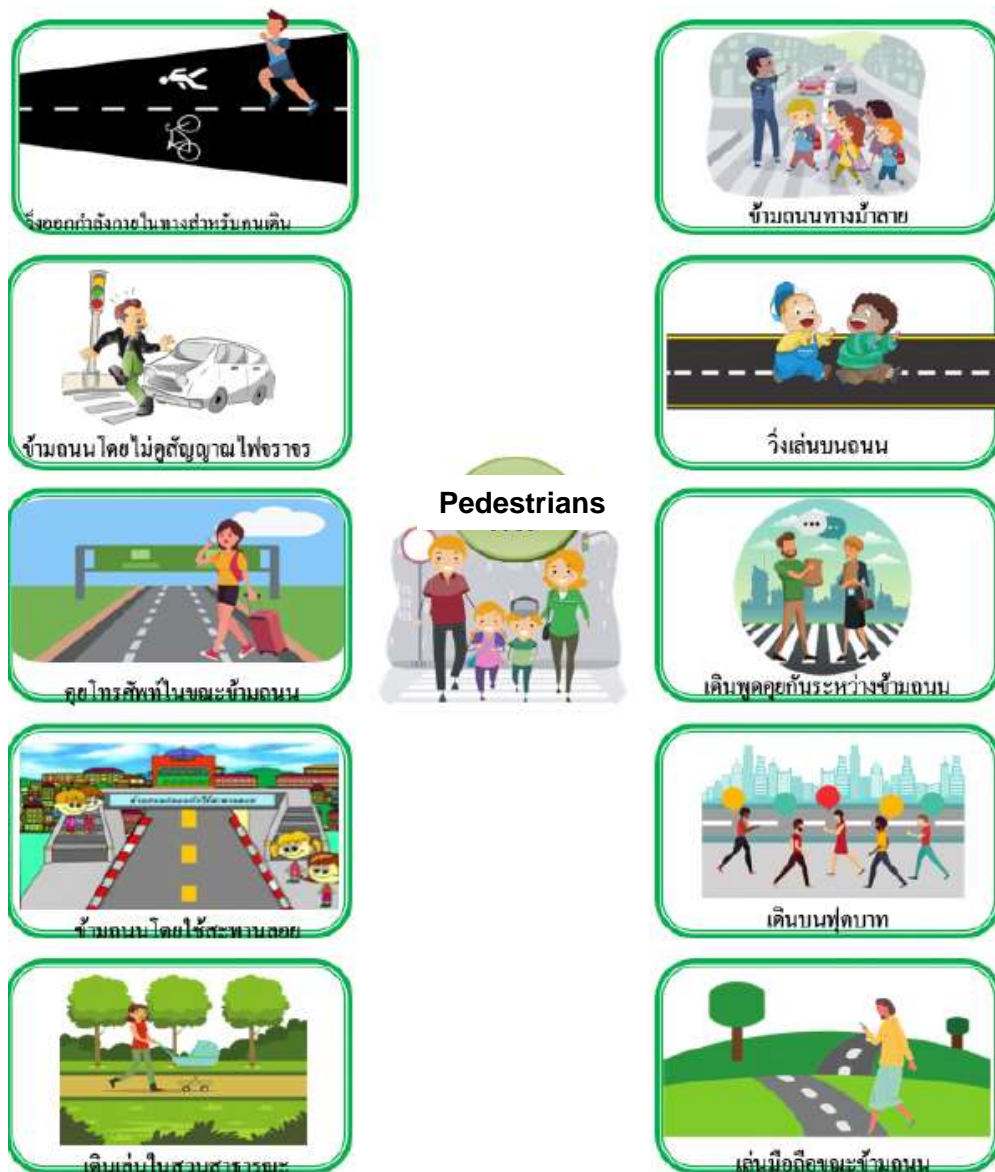

Figure 4.2 Test on knowing safe for pedestrians
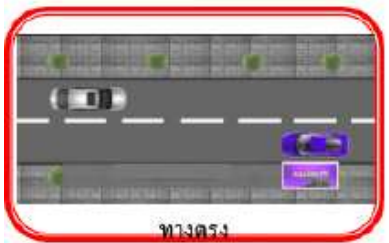
Figure 4.3 Test on knowing safe for each transport mode
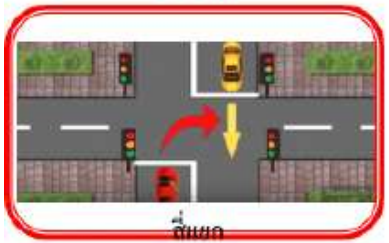
Figure 4.4 Test on knowing traffic sign

Figure 4.5 Test on knowing traffic sign at appropriate locations

In summary, the key findings from RSE for Children (6-12 years old) are:

- Scores in the post-tests were significantly higher than the pre-tests. This reflects that primary school children can learn and understand about road safety and traffic rules.
- There is no difference in learning between boys and girls.
- Younger children (Grade 1-3) can learn about road safety as well as older children (Grade 4-6).
- Learning in a smaller group is better than in a bigger group. In a big group, some children trend to lose concentration.
- The activities need to be designed carefully for each purpose. This is to reflect situations in the real world.

I conclusion, "Learning by doing" concept with role playing is suitable for road safety education for primary school children. The RSE program is a combination of interventions following the Behavior-Based Safety (BBS) approach (Geller, 2005), as mentioned in Chapter 3. This includes: (1) instructional intervention to instruct children to transition from unknowingly at-risk to knowingly risk, (2) supportive intervention to provide children an opportunity to practice and transition from knowingly risk to knowingly safe, and (3) motivational intervention to encourage children to behave safely in the future. However, the children should attend this kind of RSE program regularly to achieve automatic or habitual behavior

4.2 Road Safety Education for Youngster (15-22 years old)

4.2.1 Encouragement of attitude and behaviour change for youngster

Activities of RSE for Youngster (15-22 years old) for this year include:

1. Training by AP Honda
2. Visiting Safety Hunter at CSIP
3. Visiting TPRO training center
4. Encouraging to wear helmet

The four activities have different contexts and expectations, as presented in Table 4.2.

Table 4.2 Contexts and Expectations of each activity

Activities	Contexts	Expectations
Training by AP Honda	Traffic rules and driving skills	Instructional intervention to knowingly risk
Visiting Safety Hunter at CSIP	Child safety	Instructional intervention to knowingly safe
Visiting TPRO training center	Characteristics and interactions with big vehicles	Supportive intervention to knowingly safe
Providing free helmet with decoration by 3M reflective sticker	Encouraging to wear helmet wearing	Motivational intervention to habitual behavior

Activity 1. Training by AP Honda

A workshop was set for training the safety clubs' members to learn about traffic rules and driving skills by AP Honda. This workshop had some demonstration of driving skills by professionals and allowed students to participate (Figure 4.6).

Figure 4.6 Example of training on traffic rules and driving skills by AP Honda

Activity 2. Visiting Safety Hunter at CSIP

The members of road safety club were taken to visit "Safety Hunter" at Child Safety Promotion and Injury Prevention Research Center (CSIP), Mahidol University (Figure 4.7). 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 4.7 Visiting TPRO training center

Activity 3. Visiting TPRO driving training center

The members of road safety club 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 4.8). This visit was expected that the members can learn about safety skills when using roads.
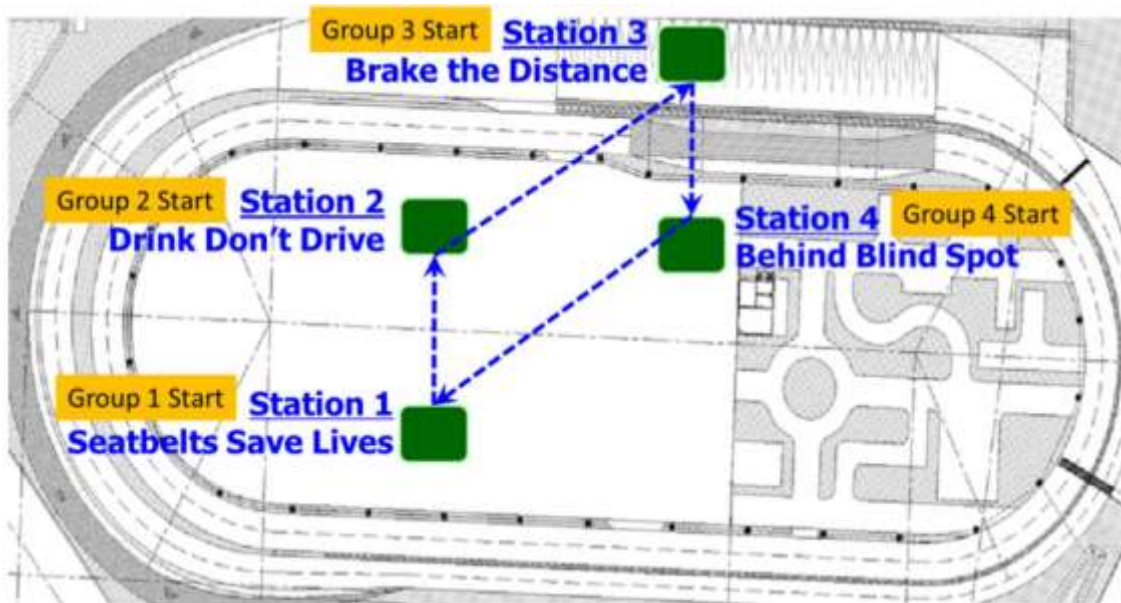

Figure 4.8 Learning activities at TPRO driving training center

Activity 4. Encouraging to wear helmet

A workshop was set 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. A main specific focus of this workshop was to encourage the members to wear helmet (Figure 4.9).

Figure 4.9 Workshop on encouraging to wear helmet

4.2.2 Evaluation of attitude and behaviour change for youngsters

The campaigns for encouraging change of unsafe driving behaviour were evaluated basing on the Transtheoretical Model (TTM) which aims to explain a change in risk behaviour (as presented in Chapter 3). Questionnaire surveys (pre- and post tests) were designed to collect data on attitudes and behaviour change.

4.2.2.1 Data collection and descriptive statistic

Characteristics of samples are presented in Table 4.3. Students age between 15-24 years old. The main transport mode for students is motorcycle. Most students have experiences on road accident at least once. Most of them do not have driving license, and ever have experience in road accidents.

Table 4.3 Number of samples

Activities	1.1 Honda #1		1.2 Honda #2		2. TTRO	3. Safety Hunter		4. Helmet
	G1	G2	G1	G2	G1	G1	G2	G1
No. of samples	93	142	82	155	41	35	78	39
Age	15-17	18-22	15-17	18-22	15-18	15-23	15-21	15-24
Gender • Male • Female	50% 50%	88% 12%	45% 55%	55% 45%	85% 15%	91% 9%	81% 19%	67% 33%
Travelling to school by MC	45%	68%	54%	54%	73%	46%	44%	77%
Involving road accident	73%	80%	80%	74%	73	80%	55%	85%
No driving licence	90%	50%	79%	66%	59%	29%	60%	67%

Rather high proportion did not always wear helmet (as presented in Table 4.4).

Table 4.4 Wearing helmet behaviour (unit: %)

Activities	1.1 Honda #1		1.2 Honda #2		2. TTRO	3. Safety Hunter		4. Helmet
	G1	G2	G1	G2	G1	G1	G2	G1
Always	61%	85%	68%	74%	73%	41%	44%	87%
Often	12%	11%	16%	15%	24%	47%	39%	13%
Sometimes	25%	4%	17%	11%	3%	12%	17%	0%
Never	2%	1%	0%	1%	0%	0%	0%	0%

Most students wear helmet because they think helmet can reduce accident injury, and when there is police enforcement (as presented in Table 4.5). They tend to not wear helmet when travelling for a short distance or on small roads (as presented in Table 4.6).

Table 4.5 Reasons to wear helmet

Reasons	Activities							
	1.1 Honda #1		1.2 Honda #2		2. TTRO	3. Safety Hunter		4. Helmet
	G1	G2	G1	G2	G1	G1	G2	G1
Reducing accident injury	52%	60%	56%	65%	59%	60%	58%	62%
Police enforcement	62%	58%	55%	60%	54%	34%	51%	62%
Families or close friends force to wear	30%	21%	22%	25%	12%	23%	24%	33%
Families or close friends suggest to wear	13%	9%	21%	11%	17%	9%	17%	3%
Others wear	14%	6%	13%	12%	7%	3%	12%	8%

Table 4.6 Reasons not to wear helmet

Reasons	Activities							
	1.1 Honda #1		1.2 Honda #2		2. TTRO	3. Safety Hunter		4. Helmet
	G1	G2	G1	G2	G1	G1	G2	G1
Short distance travelling	52%	60%	56%	65%	59%	60%	58%	62%
Travelling on small roads	62%	58%	55%	60%	54%	34%	51%	62%
No police	30%	21%	22%	25%	12%	23%	24%	33%
In a hurry	13%	9%	21%	11%	17%	9%	17%	3%
Loss of hair style	14%	6%	13%	12%	7%	3%	12%	8%
Difficulty in carrying	14%	11%	13%	11%	12%	17%	17%	10%
Uncomfortable	15%	16%	10%	13%	17%	23%	40%	21%
No helmet	16%	7%	6%	16%	15%	17%	15%	10%
Confidence in riding without accident	6%	9%	1%	8%	2%	6%	12%	5%
Others not wearing	4%	2%	6%	3%	2%	0%	8%	5%

Students were asked how often they involved in risk driving behaviour before attending the workshops and their intentions to take risk behaviour after the workshops. The results present in Figure 4.10. Speeding and no helmet wearing are the most frequent risk driving behaviour. Most of them are sometime taking these behaviours. After the workshops, students significantly reduce intention to take the risk behaviours, particularly no helmet wearing and speeding behaviours (as presented in Figure 4.11).

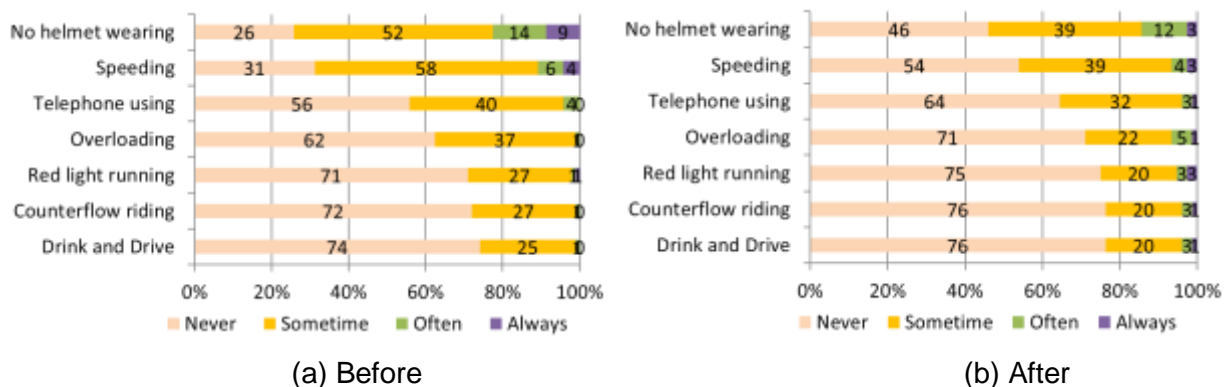(a) Before   (b) After

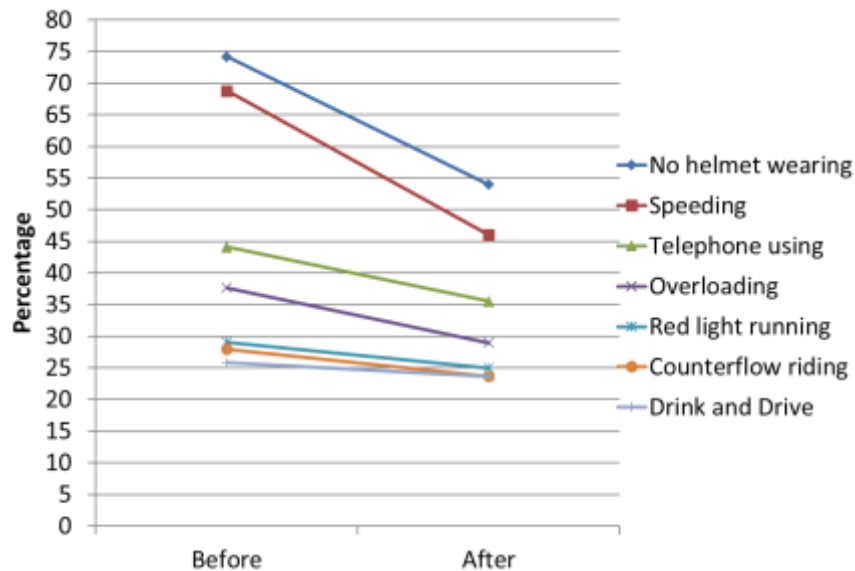Figure 4.10 Risk driving behaviour before and after attending the workshops

Figure 4.5 Percentages of those who have been taking risk driving behaviour – before and
after attending the workshops

4.2.2.2 Analysis of the Transtheoretical Model (TTM)

This study applies TTM to evaluate behaviour change. 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 2. The behaviour change is evaluated through the stage of change. Activities or campaigns could directly influence behaviour change or through the processes of change. The behaviour could be also affected by personal characteristics, experiences and perceptions. The framework for evaluation of the behaviour change is shown in Figure 4.10.
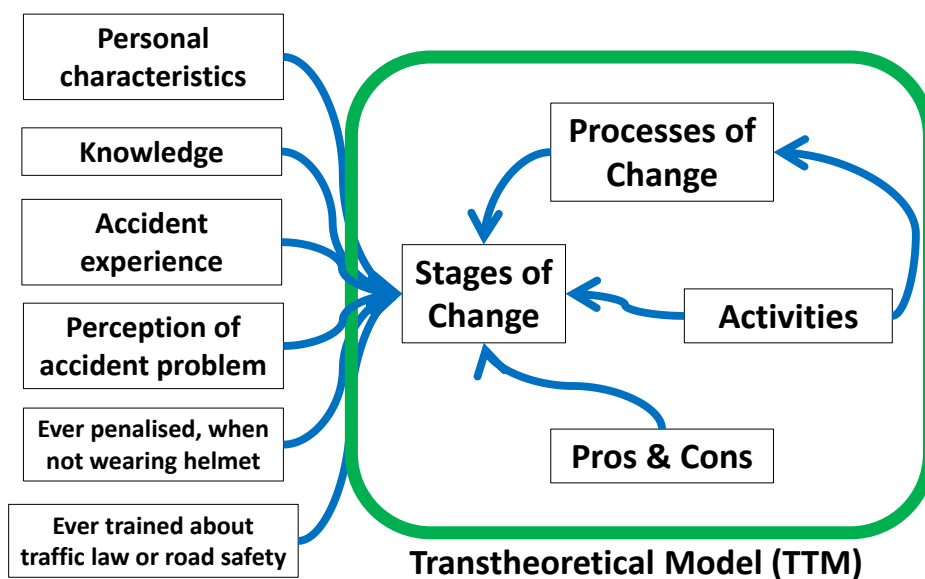

Figure 4.10 Framework for evaluation of the behaviour change

According to Transtheoretical Model (TTM), there are five stages of behavioural change (Chapter 3). In this study, two behaviours were considered: (1) wearing helmet behaviour and (2) obeying traffic behaviour.

The stages of change were divided into five stages and can be seen as three broad groups as: unaware, having intention, and being behaviour, as shown in Tables 4.7 and 4.8 for wearing helmet behaviour and obeying traffic behaviour, respectively.

Table 4.7 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	

Table 4.8 Stages of change for obeying traffic behaviour

Stages of change		Obeying traffic behaviour	
Precontemplation stage	being unaware of the problem behaviour	Obeying traffic laws is not an important behavior	Unaware
Contemplation stage	starting to think about the problem and ambivalence	Obeying traffic laws is an important behavior	Having intention
Preparation stage	being motivated to take action in the immediate future	Obeying traffic laws is an behavior that I should do	
Action stage	investing time and energy in taking the necessary steps toward an actual behavioural change	I often obey traffic laws	Being behaviour
Maintenance stage	working steadily to sustain the achieved change	I always obey traffic laws	

All data collected by the questionnaire was analysed basing on the framework in Figure 4.10. The five stage of change (in Tables 4.7and 4.8) 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 for each behaviour. For helmet wearing, there were helmet wearing as behaviour ("helmet behaviour") and not wearing helmet as behaviour ("others"). For obeying traffic behaviour, there were obeying as behaviour ("obeying behaviour") and not obeying as behaviour ("others").

Independent variables that may affect the behaviours have two groups. One was characteristics of road safety education and characteristics of students. Characteristics of road safety education included: Context of road safety education, Size of group and Allowing students to practice (Having participation). Characteristics of each activity is presented in Table 4.9.

Table 4.9 Characteristics of road safety education for each activity

| Activities | Characteristics of road safety education | | |
	Context	Size of group	Having participation
1. Honda			
G1	Traffic rules and driving skills	Big	No
G2		Big	Yes
2. TTRO	Child safety	Small	Yes
3. Safety Hunter	Characteristics and interactions with big vehicles	Small	Yes
4. Helmet	Encouraging to wear helmet wearing	Small	Yes

Characteristics of students included: Gender, Age, School, Number of years holding driving licence, Numbers of training attention, Accident experience and Punishment experience. These variables were tested whether they significantly affected the behaviours.

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

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[1] to test whether 2 nominal variables are associated.

Cramer's V^2, in order to test which factors significantly associate with the behaviours (dependent variables).

The variables that associated with the behaviour change were included in the logistic regression model for wearing helmet, as follows:

$$ln\left[\frac{\Pr(Helmet\ behaviour)}{\Pr(Others)}\right] = Constant + \ \beta1(DL) + \beta2(TA) + \beta3(Con1) + \beta4(Con2) + \beta5(Con3)$$

Where (Factors that are significant at 0.05 level, other factors not):

     DL   = Holding driving licence

     TA   = Training attention more than 3 times

     Con = Dummy variables of context of road safety education

         Con1   = Traffic rules and driving skills

         Con2   = Characteristics and interactions with big vehicles

         Con3   = Encouraging to wear helmet wearing

         Base: Child safety

The variables that associated with the behaviour change were included in the logistic regression model for obeying traffic rules behaviour, as follows:

$$ln\left[\frac{\Pr(Obaying\ behaviour)}{\Pr(Others)}\right] = Constant + \ \beta1(DL2Y) + \beta2(TA) + \beta3(Con1)$$

Where (Factors that are significant at 0.05 level, other factors not):

     DL2Y = More than 2 years holding driving licence

     TA = Training attention more than 3 times

     Con = Dummy variables of context of road safety education

         Con1 = Traffic rules and driving skills

         Base: Others (including: Child safety, Characteristics and interactions with big vehicles, Encouraging to wear helmet wearing)

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

Results of significant parameters in the models are presented in Tables 4.10 and 4.11.

Table 4.10 Multinomial logistic regression model for wearing helmet behaviour

Variables	Coefficients	P-value
Constant	-2.765	0.00
β_1	0.467	0.02
β_2	0.467	0.05
β_3	1.304	0.04
β_4	1.496	0.05
β_5	1.737	0.01
No. of sample	634	
Nagelkerke R^2_N	0.042	

Table 4.11 Multinomial logistic regression model for obeying behaviour

Variables	Coefficients	P-value
Constant	-3.636	0.00
β_1	1.031	0.00
β_2	0.599	0.03
β_3	1.702	0.00
No. of sample	634	
Nagelkerke R^2_N	0.081	

The variables that significantly influence wearing helmet behaviour include (1) Holding driving licence (DL), (2) Training attention more than 3 times (TA), (3) Dummy variables of context of road safety education which "Child safety" is a base group and other groups including: Con1 is "Traffic rules and driving skills", Con2 is "Characteristics and interactions with big vehicles", and Con3 is "Encouraging to wear helmet wearing".

The variables that significantly influence obeying behaviour include (1) More than 2 years holding driving licence (DL2Y), (2) Training attention more than 3 times (TA), (3) Dummy variables of context of road safety education which Con1 is "Traffic rules and driving skills" and other contexts are combined as a base group.

The significant factors in the two models are rather similar. They show that:
- those who hold a driving licence tend to ware helmet, while those who hold a driving licence more than two years tend to obey traffic rules,
- those who attend road safety training more than three times tend to ware helmet and obey traffic rules,
- contexts of road safety education have different impacts on the behaviours.

In addition, the constants of both models have negative signs, indicating that without any encouragement; students basically are not likely to wear helmet and obeying as behaviour. The goodness of fit is rather low. This indicates that although the variables are significant, still there are unknown various factors that affect the behaviour.

In summary, the analysis shows how RSE activities and personal experiences affect the behaviours. This would be useful for designing RSE interventions to fit with each target group.

CHAPTER 5 Conclusions

This study aimed to manage change in unsafe driving behaviour. It focused on students' wearing helmet behaviour and obeying traffic rule behaviour. A few workshops were organised in technical collages and road safety education center for children. Then evaluation of attitude and behaviour change was done in order to understand what activities and factors could influence wearing helmet behaviour.

Summary of key findings:
- They are less likely to perceive road accident as "my serious problem", so they value the cost of accident less than the convenience of not wearing helmet.
- The most often behaviours for disobeying traffic rule are not wearing helmet and speeding.
  - Not wearing helmet when riding for short distance or on a small road
  - Speeding behaviour (even those who always wear helmet) because of time saving, fun, available road condition and habit
- Factors affecting obeying traffic rules and helmet wearing behaviours
  - Driving experiences – the more years holding driving licence, the less disobeying traffic rules
  - Numbers of training attention – the more numbers of training attention, the less disobeying traffic rules
  - Context of road safety education – specific context of road safety education can influence the specific behaviour. (General safety campaign cannot influence any safe behaviour.)
- The designed safety activities should be combinations of instructional (training), supportive, and motivational interventions.
- Safety education by instructional and supportive interventions can encourage knowingly risky behaviour and knowingly safe behaviour, but cannot influence fluently safe behaviour. Motivational interventions should be carefully designed to encourage habitual safe behaviour.

In conclusions, the study suggests that road safety education (RSE) can effectively start with children at Grade 1 (no need to wait until the age for driving licence). RSE programs need to be carefully designed with specific purposes for each specific target group with multiple interventions and events. Children and youngsters should attend RSE programs regularly to achieve automatic or habitual safe behaviour.

References

Abraham, C., and S. Michie (2008) A taxonomy of behavior change techniques used in interventions. Health Psychology, 27, 379–387.

Assailly, J.P. (2017), Road safety education: What works?, Patient Education and Counseling. 100S, S24–S29.

Blockey, P. N., and L.R. Hartley (1995) Aberrant driving behavior: Errors and violations. Ergonomics, 38(9): 1759–71.

Dragutinovic, N. and D. Twisk (2006) The effectiveness of road safety education, SWOV Institute for Road Safety Research, The Netherlands.

Elliott, B. J. (2003). The psychology of fear appeals re-visited. In Paper presented at 2003 road safety research, policing and education conference, Sydney, Australia.

Ferguson, S. A. (2003) Other high–risk factors for young drivers–how graduated licensing does, doesn't or could address them, Journal of Safety Research, 34, 71−77.

Fylan, F. and S. Stradling (2014) Behavioural Change Techniques used in road safety interventions for young people, Revue européenne de psychologie appliquée, 64, 123–129.

GIZ (2017) Urban Road Safety, Sustainable Urban Transport Project (http://www.sutp.org).

King, K.A. and R.A. Vidourek (2008) Teaching adolescents safe driving and passenger behaviors: effectiveness of the you hold the key teen driving countermeasure, Journal of Safety Research, 39, 19–24.

Lee, J. D. (2006) Driving safety. In R. S. Nickerson, ed. Review of human factors. Santa Monica, CA: Human Factors and Ergonomics Society.

Lewis, I., Watson, B. and White, K.M. (2008) An examination of message-relevant affect in road safety messages: Should road safety advertisements aim to make us feel good or bad? Transportation Research Part F, 11, 403–417.

Lewis, I. M., Watson, B., White, K. M., & Tay, R. (2007). Promoting public health messages: Should we move beyond fear-evoking appeals in road safety? Qualitative Health Research, 17(1), 61–74.

McKenna, F. (2010). Education in road safety-are we getting it right? – Report for RAC foundation. <http://trid.trb.org/view.aspx?id=1099844>.

Moeckli, J. and J.D. Lee (2007) The making of driving cultures, AAA Foundation for Traffic Safety.

OECD (1986) Effectiveness of road safety education programmes. OECD, Paris.

OECD-ECMT (2008) Towards Zero: Ambitious Road Safety Targets and the Safe System Approach, OECD Organisation for Economic Co-operation and Development; ECMT European Conference of Ministers of Transport Paris.

Parker, D., J.T. Reason, A.S.R. Manstead, and S. G. Stradling (1995) Driving errors, driving violations and accident involvement. Ergonomics, 38 (5): 1036–48.

Perkins, H. W. (2003) The emergence and evolution of the social norms approach to substance abuse prevention. In H. W. Perkins (Ed.), The social norms approach to preventing school and college age substance abuse (pp. 3–17). San Francisco: Jossey-Bass.

Perkins, H.W., J.W. Linkenbach and M.A. Lewis (2010) Effectiveness of social norms media marketing in reducing drinking and driving: a statewide campaign, Addictive Behaviors, 35, 866–874.

Preusser, D. F., Ferguson, S. A., and Williams, A. F. (1998) The effect of teenage passengers on fatal crash risk of teenage drivers. Accident Analysis and Prevention, 30, 217–222.

Prochaska, J.O., & DiClemente, C.C. (1984) The transtheoretical approach: Crossing traditional boundaries of therapy. Homewood, IL: Dow Jones Irwin.

Prochaska, J.O., C. C. DiClemente and J. Norcross,(1992) In search of how people change, American Psychologist, 47, 1102–1114.

Prochaska, J.O., and C.C. DiClemente (2005) The transtheoretical approach. In J. C. Norcross, & M. R. Goldfried, (Eds.), Handbook of psychotherapy integration (2nd ed.). New York: Oxford University Press.

Prochaska, J.O., C.A. Redding, and K.E. Evers (2008) The transtheoretical model andstages of change. In K. Glanz, F. M. Lewis, & B. K. Rimer (Eds.), Health behaviourand health education: Theory, research, and practice, 4th Edition, San Francisco: Jossey-Bass.

Rice, T. M., Peek-Asa, C., and Kraus, J. F. (2003) Nighttime driving, passenger transport, and injury crash rates of young drivers. Injury Prevention, 9, 245–250.

ROSE 25 project (2005) Good practice guide on road safety education (Inventory and compiling of a European good practice guide on road safety education targeted at young people), TREN/E3/47-2003 SER-B27020B-E3-2003-Good Practices-S07.28326, ROSE 25 [project funded by the European commission].

Rosenbloom, T., S. Levi, A. Peleg and D. Nemrodov (2009) Effectiveness of road safety workshop for young adults, Safety Science, 47, 608–613.

Shope, J. T., and Bingham, C. R. (2008) Teen driving: Motor vehicle crashes and factors that contribute. American Journal of Preventative Medicine, 35, 261–271.

Siegel, D. J. (2014). Brainstorm: The power and purpose of the teenage brain. New York, NY: The Penguin Group.

Simons-Morton, B.G., M.C. Ouimet, R.F. Catalano (2008) Parenting and the young driver problem, American Journal of Preventive Medicine, 35 (Suppl. (3)), S294–S303.

Wahlberg, A.E. (2011) Re-education of young driving offenders: Effects on recorded offences and self-reported collisions, Transportation Research Part F, 14(4), 291–299.

Weston, L. and H. Hellier (2018) Designing road safety interventions for young drivers – The power of peer influence, Transportation Research Part F, 55, 262–271.

Williams, A. F., & Tefft, B. C. (2014). Characteristics of teens-with-teens fatal crashes in the
     United States, 2005–2010. Journal of Safety Research, 48, 37–42.

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.

References

Prochaska, J. O., & DiClemente, C. C. (1984). The transtheoretical approach: Crossingtraditional boundaries of therapy. Homewood, IL: Dow Jones Irwin.

Prochaska, J. O., DiClemente, C. C., & Norcross, J. (1992). In search of how peoplechange. American Psychologist, 47, 1102–1114.

Prochaska, J. O., Redding, C. A., & Evers, K. E. (2008). The transtheoretical model andstages of change. In K. Glanz, F. M. Lewis, & B. K. Rimer (Eds.), Health behaviourand health education: Theory, research, and practice, 4th Edition, San Francisco: Jossey-Bass.

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