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The Effectiveness of the Training Curriculum by Enhancing Perceived Behavioral Control, Feedback Past Behavior and Using Motorcycle Simulator to Mitigate Unawareness Risky Riding Behavior in Thai Adolescent Motorcyclists

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Abstract: Adolescent related motorcycle accident is a majority problem worldwide and the investigations indicated causes relation to unawareness of their riding behavior. The psychological mediating factors investigation suggested significant predictors as perceived behavioral control and past behavior. For modifying these factors, the video based training; demonstration behavior and feedback behavior were suggested. However, the HRT is a new apparatus to assist and helpfully for effective of riders awareness in the both training processes and assessment. Then for mitigation unawareness behavior in adolescent Thais' motorcyclists, the training curriculum was developed by enhancing their perceived behavioral control, feedback their past behavior and using motorcycle simulator (HRT). Two communities were randomly assigned and 54 Thai's adolescent motorcyclists who inclusive criteria were randomly to training group and 50 were set into control group. The training group was trained by the training curriculum. The effectiveness was assessed by self report questionnaires and test riding by HRT in control group was assessed with the same methods only. The analytical statistics were analyzed by ANCOVA, dependent t-test and independent t-test and the comparative outcomes in pre-post training and intergroup were performed by justification significant level at 0.05 (α = 0.05). The study showed the effectiveness of training by the curriculum in training group was significant mitigated unawareness riding behavior by measurement of self report questionnaires and test riding with HRT >60% from baseline ($p<0.05$) and mitigation in the both of its significant mediating factors ($p<0.05$). The mitigation was changed significant means different from control group in the both of unawareness riding behaviors and its mediating factors ($p<0.05$). The training curriculum could mitigate unawareness riding behavior in adolescent motorcyclists and could adapt using in other widely areas and can effect to mitigate incident of motorcycle accident later.

Key words: Unawareness riding behavior mitigation, motorcycle rider training, HRT, Thai population, Thailand

INTRODUCTION

Motorcycle accident is a common health problem which has threatened to Thai population and other all developing countries and has raised consistency with the convenient demand on road trafficable use. Each year about 13,000 Thais died and nearly 90,000 were injured and cause related road traffic accident. About 73-82% of cases were related motorcycle accident (Wibulpolprasert, 2007; Thanaboriboon, 2006). Moreover, Adolescent (age 15-29 years old) is presented to prominent group of motorcycle accident for 44.9% (Royal Thai Police). Normally adolescent motorcyclist is novice riders, less experiences to confronting on road hazards. Evident based report from MAIDS study suggested causes related motorcycle crashes are human error for 37.4%, riders' perception failure for 31.9%, decision failure for 35.7%, reaction failure for 14.8% and related to failure of road traffic scan and detections for 27.7% (AEMM, 2004). The findings related to previous investigation in Thailand by Kasantikul (2001) and found 48.8% of cases had no braking before crashing, cases broke alone for 22.8%, only swerved for 14.6% and in the both of braked and swerved for 11.2%. The results summarized the half of cases could not detect precipitate events before crashing and related to unawareness riding behavior. Normally, adolescent is

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presented a prominent group of motorcycle accident because of they are novice riders, immature and usually face to lack of riding abilities, poor identify and anticipate to hazardous events on road riding environments. Sometime, they imperfect to vehicle control skills; especially, lacked safety riding skills, deficit on riding attentions or willingness to risky performing and sensitively by peer influencing (Lee, 2007). These results and summaries related to finding from qualitative exploring types of risky riding behaviors' Thai adolescent motorcyclists in Mahasarakham province, Thailand. Many of participants are mentioned to not being awareness on road through motorcycling periods and as the main cause related to motorcycle crashes by in-depth interviewing injured cases (Armartpundit *et al*., 2009).

Additional supported by study in Australia which found riders' awareness is the main of six keys that aspect to risky riding behavior. The components of unawareness riding behavior are not prier interpretations and have not been suggested into the traditional motorcyclist training curriculums worldwide. However, the previous unawareness riding behavior studies could be defined as human lose in maintain road rout, hazard perceptual skills and management abilities.

The unawareness motorcyclist usually lose of alertness to road rout and road hazards by using visual perception, not being to maintenance to keep safe lane positioning and not being to maintain safety speed or safe gap, not being to maintain rapid search and hazards expectation, addition by not being to accurate hazard responding while riding. Whenever they lack of maintenance to perform these behaviors, they usually confront to road riding hazards and face to high risk riding into crashing. Moreover unawareness is humane behavior, it can be influenced by their cognitive loading and mind attention captures (Endsly, 1995) but evident based finding from 792 Thai adolescent motorcyclist studies by using the theory of planned behavior and extension for predicting unawareness riding behavior.

The best predictors are perceived behavioral control and past behavior. Not enough supported data to explain intention which could be predicted unawareness riding behavior (Armartpundit *et al*., 2010). This finding related to studying in Australia which found unawareness intention riding not influenced by attitudes. Then, these significant mediating factors should be mitigated and can effect to unawareness riding behavior mitigation.

The suitable motorcyclist training curriculum is developed for the aims of mitigation unawareness riding behavior in Thai adolescent motorcyclists. The core of curriculum consisted of risk perception modules, hazards on road riding modules and enhancing adolescent perceived behavioral control to awareness performances, exercise and practices on safe lane and positioning, maintain safe gap, expectation and rapid scan, effective responding and added by unawareness riding habit feedback modules.

The trainings could enhance riders' perceived behavioral control to awareness riding and modifying their unaware riding habit. However, perceived behavioral control refers to persons' perception in their won capability to perform behavior. Then, this confident are based on their experiences and past behaviors which they used to do or informs by others (Ajzen, 1991) and likely increasing by reflexes or feedback by others information. The video, computer based and demonstration have been suggested for usefulness and more effectiveness to enhancing perceived behavioral control such as in dietary control (Waleekhachonlert, 2007; Himberg, 1996). Addition, past behavioral feedback correspondent by experiences in driver distraction mitigated intervention (Donmez *et al*., 2008). However, the new suitable apparatus for assisting training methods, the platform motorcycle simulator has been suggested to enhancing effectiveness in training process and evaluation because motorcycle simulator is a platform and computer based assistances in riders training and assists riders for encountering, confronting and responding to hazard events on road riding.

It can enhance hazard perception of riders. The findings from previous study indicating motorcycle riders have improved in being aware and encounter hazard performances in the last tracts riding more than the initial tracts (Miceli *et al*., 2008). Then, the effectiveness of the training curriculum to mitigate unawareness risky riding behavior in Thai adolescent motorcyclists (under training modules for enhancing perceived behavioral control and feedback past behavior and assisted with using motorcycle simulator) is the aimed of this research.

MATERIALS AND METHODS

Subjects: Sample sizes calculated by repeated measure equation (Frison and Pocock, 1992) for detecting mean different between group for 10 mean scores measured before training and 1 week and repeated measures after training at week 1, 4 and 8 and multiplied by design effect = 2. The 54 participants were selected into training group and 50 participants in control. The inclusions criteria were age between 15-19 years old, motorcycle riding abilities, use Thai language and consent to participations. A four stages stratified random sampling was employed for community and sample selection. The group socio-

demographic characteristics comparison for in training and control group were sex (male: 28 and 26, female: 26 and 24), ages means (17.25 (SD = 1.60) and 17.30 (SD = 2.03), occupation (students: 50 and 37), riding experiences (years): 5.11 (SD = 2.27) and 6.56 (SD = 1.74), motorcycle riding trained by their households (44 and 23) and all of them got provisional licenses of Thailand licensing system for motorcyclist at least 1 year. All of participants were completed participation all of training and follow up periods.

Apparatus: The experimental was conducted a fidelity fixed based motorcycle simulator as Honda Riding Trainer simulator (HRT) developed by Honda company, the simulator uses for improving riders' hazard awareness, coordinating and perception skills by allowing them to safe riding experiences. The hazard situations are set in vary road riding location such as in a pass road, motorway, urban road, hills and breach road. The setting mode of riding are set for variety demanding of riders such as manual gear and automatic system or difference riding environments.

The HRT has been set to propose twelfth tracts, each tract consisted of eight hazard scenarios. Program can be automatic replay and final summary results of riding. The first tract is located to non residual hazard areas for exercises. The main road consisted of six tracts as riding in a city and confronts to eight hazards scenarios in each tract. And the pass road is riding in narrow streets and consisted of eight hazards scenarios for each tract. All of hazard scenarios got evident based support from motorcycle accidents study in Europe (AEMM, 2004).

Experimental curriculum: The training curriculum to mitigate unawareness riding behavior of adolescent motorcyclists was developed indicating to unawareness riding mitigation. The psychological statistically significant mediating factors were employed into curriculum's training modules, the training techniques was conducted video hazards based training in slide presentations, feedback information and exercise awareness performance with HRT motorcycle simulators by controlling, assessment and feedback by qualified instructors and assistants. The curriculum was qualified assessment by 3 experts by Delphi techniques and Internal Observation Corresponding (IOC) 0.76.

Experimental procedure: The experimental used a community randomized control trial design, the training group was received in class training for 6 h in 4 modules for perception about characteristic hazards situation on road riding, defined and important of awareness behavior, dangerous of past unawareness riding behavior and feedback and increasing perceived behavior control to mitigate unawareness riding. These modules are lectured in class and mixed with demonstrate riding with HRT in tract 1 and 2 in each set of tracts.

The day 2 was demonstrated with simulator for awareness riding in the details of mitigating unawareness riding such as maintenance and keeping in safe lane positioning, safely speed management (maintain safe gap), safely scan, rapid search techniques and expectation and accurate hazard responding. The participants in training group were exercised by assessing and feedback when their incorrectly one by one until their can accurate practices and confident. The participants in control group were not exercised but they would be tested with simulator and answered self report questionnaires.

Data collection: The self report questionnaires are used for assessing unawareness risky riding behavior by report of confronting hazard situations while riding within measured periods and consisted of 12 questions (possible range 12-84). Additional its statistically significant mediating factors (perceived behavioral control was perceived to their unaware riding control 20 questions and possible range 20-140 and past behavior of unaware riding performance 12 questions and possible range 12-84). The evaluations were assessed in the both of training and control group, at 1 week before training procedures and at week 1, 4 and 8 after training. For HRT test riding collected data for each participant during the testing sessions.

Data obtained from 2 sources as observation test riding form recorded, this method observed by instructors and assistants. The gain for keeping scores were set for awareness practices before confront to each hazards scenarios in each testing tract, the backup riding replayed were used correspond with external video recorders. The results would summary consistency with awareness riding and gave scores for each tester such as in maintenance and keeping safe lane positioning when they kept lane correctly while confront hazard and safety they got score 1, kept lane correct and be careful got score 2 and incorrect lane and accident got score 3 (possible range score 8-24 per tract/participant). This assessment was performed for 8 hazard scenarios in each testing tract. For other riding tracts were set scores and assessment the same way such as maintenance safely speed or maintain safe gap before confront hazards if they used heavy braking and accident got score 3, used heavy braking got score 2 and used rarely brake and safely got score 1. For

expectation and scanning behaviors if they used heavy braking or accident got score 3, using rarely brake got score 2 and using rarely brake and safely got score 1. Correctly responding hazards, pushing to avoidance hazards or accident got score 3, reducing speed and using heavy brake got score 2, reducing speed, rarely brake or stop got score 1. And internal HRT program back up files and setting variable for four grads of testing as A for good sufficient, B for excellent performance, C for sufficient and D accident.

The setting scores for assess riders was A = 1, B = 2, C = 3 and D = 4 (Range 1-32). For each participant, the testing was employed 1 tract except exercise tracts by randomly in each evaluated periods.

Statistical analysis: Data sets were analyzed by using STATA software version 10. Descriptive variables analyzed by numbers, percentage, means and standard deviation. Detected means of risky riding behavior performance scores and mediating factor scores changed before-after training and follow up periods by using ANCOVA and dependent paired t-test. For detect mean changed different between training and control group, ANCOVA and independent t-test were employed by statistically significant level at 0.05 (α = 0.05). The interpretations of risky riding behaviors mitigation were used percentage means score changes and percentage of means scores changed different graphics plotted presenting trend of unawareness and relative factors mitigation.

RESULTS AND DISCUSSION

The main outcomes of this study were unawareness risky riding behavior and its psychologically mediating factors (Perceived behavioral control and past behavior). For baseline of variables, the actual unawareness riding behavior from self report questionnaires was actual performed for 59.0% (means 49.59, 95% CI 46.92-52.2) in training group and 58.8% (means 49.42, 95% CI 48.18-50.65) in control group and none statistically significant between group ($p<0.05$). The results of test riding behavior with test riding with HRT. The participants were performed unawareness riding for 58.01% (means 18.59, 95% CI 17.56-19.62) in training group and 59.01% (means 18.88, 95% CI 18.26-19.49) in control group and none statistically significant between group ($p<0.05$). Other details showed in Table 1.

Comparisons of actual unawareness riding performances among training and control group by self report questionnaires and HRT test riding: The changing of unawareness riding behavioral scores by self report questionnaires at week 1 after training were mitigated from baseline 60.9-72.2% (mean changed -33.01, 95% CI -35.21 to -30.21) and trended to slowly mitigate in follow up periods. The maximum changed from baseline was mitigated 67.2-78.0% at month 4 after training. The changing mitigation in training group were statistically significant changed different to control group and changing mitigation was differenced for 66.3% at week 1 after training (mean changes diff. -32.8, 95% CI -36.01 to -29.77). The changing different were correspondence mitigated of unawareness reporting. These results were consistencies with test riding scores with HRT for actual unawareness riding scores. For unsafe riding score was mitigated for 34.3-45.8% from baseline at 1 after training (mean changed -7.25; 95% CI = -8.52 to -0.36) and slightly changes after training at week 4 and 8 later. The means changed difference between groups was statistically significant changed from control group for 29.19% (mean changed different -7.47; 95% CI -8.32 to -6.54). The other details shown in Table 1.

Comparisons of actual unawareness riding performances of participants among training and control group by test riding with HRT: For training group, unsafe lane positioning was mitigated from baseline 48.2-52.6% (mean changed -8.88; 95% CI = -9.35 to -8.42) and slightly changed in follow up periods. The means changes statistically significant different from control group for 43.4% (mean changed different -8.50; 95% CI = -9.40 to-

Table 1: Changes in the results of actual risky riding behavior by test riding motorcycle simulator before-after training periods and between groups (N_1 = 54, N_2 = 50)

		Mean score changes from baselines after training periods (Mean diff., SD)		
	Baselines			
Risky riding behaviors	1 week	1week	4 weeks	8 weeks
Simulator test riding for actual unsafe riding behavior Program summarized; Range score 8-32)				
Training group	18.59(3.81)	-7.25(3.33)**	-8.81(4.32)**	-9.22(3.83)**
Control group	18.16(2.90)	-1.78(2.54)*	-1.88(3.79)*	-1.98(4.38)*
Mean changes diff. (S.E.)	-	-7.47(1.65)††	-10.69(2.42)††	-11.20 (1.75)†
Unawareness motorcycle riding scores (Mean at study I = 43.90, SD = 8.31 (Range12-84)				
Training group	49.59(9.72)	-33.01(10.27)**	-36.03(9.83)**	-35.61(1.310)**
Control group	48.42(4.41)	-0.12(4.40)	0.94(3.33)	-0.04 (3.88)
Mean changes diff. (S.E.)	-	-32.89(1.57)††	-36.97(1.64)††	-35.57(1.46)††

Between group of mean score at point comparisons: *$p<0.05$ and **$p<0.001$ were analyzed by independent t-test and ANCOVA. Within group comparisons with baseline levels of after training: †$p<0.05$ and ††$p<0.001$ were analyzed by paired t-test. N_1 = Number of participants in training group, N_2 = Number of participants in control group

Table 2: Changes in actual risky riding behavioral scores of participants by test riding with HRT before-after training periods and between groups(N_1 = 54, N_2 = 50)

		Mean score changes from baselines after training periods (Mean diff., SD)		
	Baselines			
Risky riding behaviors	1 week	1 week	4 weeks	8 weeks
Riding unsafe lane positioning (Range score 8-24)				
Training group	17.44(1.62)	-8.88(1.70)**	-7.56(2.68)**	-8.94(1.96)**
Control group	18.40(2.26)	-0.38(2.82)	-0.86(1.89)	-0.54(3.10)
Mean changes diff. (S.E.)		-8.50(1.45)††	-8.42(0.49)††	-8.40(0.48)††
Not maintain safe gap and safety speed riding (Range scores 8-24)				
Training group	18.15(2.33)	-9.59(2.35)**	-8.43(2.86)**	-10.96 (3.14)**
Control group	19.14(2.65)	0.9694.13)	-1.38 (3.37)*	-3.39(4.61)*
Mean changes diff. (S.E.)		-10.55 (1.48)††	-9.18(1.65)††	-14.35(4.94)††
Unexpectation and ineffective scan (Range scores 8-24)				
Training group	16.35(2.19)	-5.55(2.66)**	-7.22(2.31)**	-7.75(1.34)**
Control group	15.05(2.87)	0.78(3.37)	-2.44(2.85)*	-2.95(2.85)*
Mean changes diff. (S.E.)		-6.33(0.59)††	-9.66(1.56)††	-10.70(2.56)††
Riding by inaccuracy respond (Range scores 8-32)				
Training group	16.89(3.20)	-6.44(3.96)**	-8.23(3.33)**	-7.85(3.41)**
Control group	18.16(2.90)	0.72(4.57)	1.56 (4.60)*	1.66(4.09)*
Mean changes diff. (S.E.)		-7.16(0.83)††	-9.79 (2.78)††	-9.51(1.72)††

Between group of mean score at point comparisons: *p<0.05 and **p<0.001 were analyzed by independent t-test and ANCOVA. Within group comparisons with baseline levels of after training: †p<0.05 and ††p<0.001 were analyzed by paired t-test. N_1 = Number of participants in training group, N_2 = Number of participants in control group

7.61). Not maintain safely speed or unsafe gap while riding, the score in training group was statistically significant mitigated from baseline at week 1 for 49.0-56.7% (mean changed -9.59; 95% CI = -10.23 to -8.95) and slightly changed after training for 4 and 8 weeks later.

The mean changed different between groups at week 1 was statistically significant changed different from control group for 46.0% (mean changed different -10.55; 95% CI = -11.84 to -9.25) and slightly mitigated at 4 and week 8 after training. Unexpectation or ineffective scanning score was mitigated for 26.2-38.4% from baseline (mean changes -5.52; 95% CI = -6.28 to -4.82) and slightly changes after training at week 4 and 8 later. The means changed difference between groups was statistically significant changed from control group for 28.7% (mean changed different -6.33; 95% CI = -7.51 to -5.15) and slightly changed to mitigate after training later. The means changes different between groups was statistically significant changed from control group for 34.2% for ineffective responding behavioral scores (mean changed different -7.16; 95% CI = -8.82 to -5.50) and the mean score was statistically significant changed different from baseline for 38.1% (mean score changed -6.44; 95% CI = -7.52 to -5.36). The details are shown in Table 2.

Comparisons of perceived behavioral control and past behavior into unawareness riding behavior: Perceived behavioral control into unawareness riding behavioral score was statistically significant mitigated at 1 week after training for 60.9-72.2% from baseline scores (mean changes -33.01; 95% CI = -35.21 to -30.21). The maximum changing scores from based line was occurred in month 4 after training for 67.2-78.0% (mean changes -36.03; 95% CI = -38.72 to -33.35). The mean changes difference between groups at 1 week was 66.32% (mean changed difference -32.89 (95% CI = -36.01 to -29.77). The magnitudes scores of past unawareness riding behavioral score in a training group at 1 week after training was statistically significant changed from baseline score for 38.10-55.84% (mean changed -8.92; 95% CI = -10.61 to -7.247).

The difference scores were slightly increased after 1st week of training. The means scores in training group was statistically significant changed different from control group for 39.86% (mean changed difference -7.46; 95% CI = -9.63 to -5.29). And found significant changed of perceived behavioral control and past behavior means score in control group (PBC mean changed -1.62; 95% CI = -4.03 to -0.89) at week 4 and -1.22 (95% CI = -3.38 to -1.39) at week 8; PB mean score changed -3.38 (95% CI = -4.34 to -2.41) at week 4 and -1.72 (95% CI = -2.25 to -0.88) at week 8. Other details are shown in Table 3.

Comparison percentage of residual variables mean score after mitigation: The variable means score changes consistency between the scores from self report questionnaires and test riding on HRT. The comparison percentage of residual variables mean score after mitigation were showed and the trends of residual means' percentages in training group were <50% and trended to stable at this level at 8 weeks periods. The detail of trends are shown in Fig. 1.

Correlations between unawareness riding behavior's variable scores in training group at week 1 after training by test riding with simulators and self report questionnaires: Correlation between statistically significant mediating psychological factors mean scores and actual risky riding behavior in training group found strongly statistically significant correlated between set score of mediating factors (Perceived behavioral control toward unawareness riding behaviors (PBC; r_1), past

Table 3: Changes of psychological mediating variable scores of unawareness riding behavior of motorcyclists by self report questionnaires before-after training and between groups (N_1 = 54, N_2 = 50)

		Mean score changes from baselines After training periods (Mean diff., SD)		
	Baselines			
Psychological variables	1 week	1 week	4 weeks	8 weeks
PBC into unawareness riding behaviors (Mean at study I= 82.50, SD=13.4 (Range20-140)				
Training group	84.72(11.65)	-65.81(11.40)**	-64.81(12.50)**	-62.25(9.12)**
Control group	83.60(6.68)	-0.58(9.44)	-1.62(8.84)*	-1.22(9.21)*
Mean changes diff.(S.E.)	-	-64.88(2.06)††	-63.19(2.07)††	-61.03(2.14)††
PB of unawareness riding behaviors. (Mean at study I= 28.50, SD=4.71 (Range7-49)				
Training group	26.06(6.08)	-12.96(6.070**	-12.44(6.83)**	-12.07(6.35)**
Control group	29.02(2.48)	-1.78(3.51)	-3.38(3.37)*	-1.72(2.92)*
Mean changes diff.(S.E.)	-	-11.18(0.98)††	-9.06(1.07)††	-10.35(0.98)††

Between group of mean score at point comparisons: *p<0.05 and **p<0.001 were analyzed by independent t- test and ANCOVA. Within group comparisons with baseline levels of after training:; † p<0.05 and ††p<0.001 were analyzed by paired t-test. N_1 = Number of participants in training group, N_2 = Number of participants in control group

Table 4: Correlations between scores of perceived behavioral control, past behavior and unawareness riding behavioral scores in training group at week 1 after training (N = 54)

	Beh							
PBC	0.85**	PBC						
PB	0.88**	0.86**	PB					
S_LAN	0.58*	0.83**	0.86**	S_LAN				
S_SAFG	0.69**	0.92**	0.85**	0.86**	S_SAFG			
S_EXP	0.79**	0.77**	0.73**	0.83**	0.75**	S_EXP		
S_RESP	0.83**	0.78**	0.73**	0.78**	0.66**	0.466**	S_RESP	
S_RESU	0.77**	0.74**	0.78*	0.70**	0.71**	0.62**	0.65**	S_RESU

Beh = Unawareness riding behavioral scores, PBC = perceived behavioral control into unaware, PB= past unawareness riding, S_LAN = Simulator riding by unsafe lane positioning behavior, S_SAFG = Simulator riding by unsafe gap or unsafe speeding behavior, S_EXP = Simulator riding by un-expectation and unsafe speeding, S_RESP Simulator riding by unsafe responding, S_RESU = Simulator riding unsafe results *p<0.05, **p<0.001

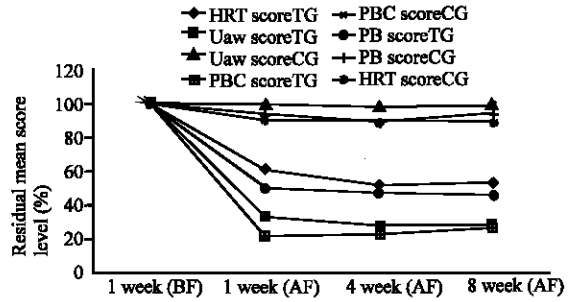

Fig. 1: Percentage of adjusted residual means score after mitigation from baseline at measurement periods and comparison between group HRT score TG: Test riding with Hrt in Training group, HRT score CG: Test riding score with HRT in control gr Uaw score TG: Unawarencs siding by self report in Teaining group, Uaw score CG: Unawarencs riding by self req in control group, PBC score TG: Perceived behavioural control score in traning group PBC score CG: percevied behaviral control score in control group, PB score TG: Past unawarencs behavioral score in traning group, PB score CG: Past unawarences behavioral score in in control group

unawareness riding behavior (PB; r_2) and actual unawareness riding behavioral mean scores (r_1 = 0.85, p<0.001; r_2 = 0.88, p<0.001). Addition by finding stronger correlated between these variables and actual risky motorcycle riding behavioral scores mitigated by test riding motorcycle simulators (r_3 = 0.85, p<0.001; r_4 = 0.88, p<0.001). There meant the changed mitigation of mediating factors could be effected to risky riding behaviors of adolescent motorcyclist mitigation. Details are shown in Table 4. The hazard situations are dangerous situations which are occurred in every road scenes riding if motorcycle rider not being awareness (not being to ride by safe lane position, not maintain speed and safe gap, not expectation and rapid visual search and ineffectiveness responding) they cannot maintain safe riding, detecting hazard and accurate responding to hazard avoidance. The unawareness and inattention riding behavior of riders have induced to lack of maintenance hazard perception. These components usually lack of interesting from the traditional motorcyclist training curriculums and related finding by Kasantikul (2001) and exploring risky behavioral studied (Armartpundit *et al*., 2009) and were found most of adolescent motorcyclists in Thailand were trained by their family members and themselves. The riders training of the traditional motorcycle riders training curriculum was qualified gain by Division of Land Transport, Minister of Transport, Thailand. There have set into riders training in rider and driver training schools and are indicated gain for qualified riders by only basic riding skills. There are causes of Thais adolescent riders lacking experiences to face road hazards and accurate responding. The Thai riders usually ride by lacking of riding plan or unintentional to face hazards and let them into riding by deficient confident in awareness and attention riding.

Normally, the permanent performance of human's health behavioral should be influenced by their volitional control; it likely performs behavior by their plans.

But for some of behavior, persons have loose deficits of behavioral perceptions and seem too been not volitional control then these behaviors may be influenced by experiences and past behavior (Amitage and Conner, 2001).

The results form Phase I study indicated to unawareness riding not depends on rider intention while perceived behavioral control and past behavior were strong predictors. Because perceived behavioral control refers to persons' perception about their won capability to perform behavior. Then, the behavioral perception and control are based on their experiences and past behaviors which they used to do or informs by others (Ajzen, 1991) and likely increasing by reflexes or feedback by others information.

The modules' training are more effectiveness in the curriculum because in training process of using the motorcycle simulator for demonstrating and individual feedback of riding performances. These methods are clearly for enhancing PBC in trainees like increasing their awareness riding behavior and experiences in seeing visualized hazards and dangerous scenarios. Trainees have encountered corresponding with hazard situation and could be practiced awareness behavior following demonstrates, advices and feedbacks from instructors whenever they have performed incorrectly, the feedback information with new rounds of practices would be started again. This finding related to results of studies by using video based hazard perception training worldwide.

In visual search studied by using video based road and commentary to training novice drivers in New Zealand and found that the training significant improved hazard detection skills and related to increasing of visual search and their riding attention (Williamson, 2008). Moreover, this finding related to studying by using video simulation techniques for 4 h training could be improved risk taking behavior in novice drivers and could be improved the level of trainees experienced (McKenna *et al*., 2006), addition the using film based clips training by Underwood (2007) was found the training could be encouraged driver scanning and anticipated hazards by significant different between trained and untrained group and Fisher, Pollatsek and Pradhan found a significant improving hazard perception skills in younger driver in using a computer based training technique more than untrained group.

For doubts about the translation of these skills or experiences in laboratory trained could be transferred on road performances. Chapman *et al*. (2002) investigated effective of visual search training in laboratory by video based intervention and found positively improvement in the both of laboratory findings and on road riding and stated that these skills of drivers are able to transfer from laboratory training into on road actual driving behavior. These findings showed correlation of using video and computer based training to improve hazard perception as being awareness and attention behaviors of novice drivers. And findings related to results of parental feedback an event-triggered video in rural teen drivers and found this combination technology with parental weekly review was significant decreased in events for more at risk teen driver (McGeehee *et al*., 2007).

These findings of videos and computer based trainings are simply to explains and re-focusing awareness and attention on road riding situation then road maintenance and detecting hazards are better following improve on awareness behavior by visual scenes driving which could be individually feedbacks and recommended at a moment.

For effective training modules and increasing perceived behavioral control or modifying unawareness riding habits, the motorcycle simulators are useful and more effectiveness to enhancing and feedbacks information about these behaviors. Whenever motorcyclists perform riding with simulator they would be tended to improve effective of unawareness behaviors in confronting of hazard situations.

The participants in training group have performed riding with simulator and reflected their riding abilities by instructors and practiced riding by at least 5 rounds per participants. But control group are ride for test riding only and they unknown awareness behavioral and attention to hazard perception performing or information feedback by instructors. Then, the results of test riding in training group were significant mitigated than control group. However for the last point of test riding, the control group was statistically significant risky riding mitigated from baseline that may be affected from simulator riding performances. The finding related to studying by Miceli *et al*. (2008) which suggested to motorcyclists who are trained and encountered to the first hazard scenes, trainee has learned how to use correctly the simulator control.

They have improved in awareness and encounter hazard performances in the last tracts more than the initial tracts. This suggestion related to finding in the both of training and control group which were significant mean scores changes different from baseline levels at follow up periods but in training group was significant mitigated of risky riding means score changes more than control group.

CONCLUSION

The results found statistically significant mitigated for unaware riding behavior this consistency between the results from self report questionnaires and test riding by motorcycle simulator and different between training and control group. Unawareness riding behavior in a training group was statistically significant mitigated from baseline >67.6% after training periods and statistically significant mean changed different between group for 29.0-33.6% at all follow up periods.

The results consistency with test riding with HRT motorcycle simulator and the summary results from HRT program was statistically significant mitigated from baseline at week 1 after training for 54.2-65.7%. The changing of mediating factors, perceived behavioral control toward unawareness riding behavior was changed to mitigate for 73.5-77.7% from baseline and past behavior was changed from baseline for 49.3-54.0%. All of variables were statistically significant changed different between groups ($p<0.05$). The mitigation of unawareness riding in a training group are impacted from enhancing and modifying perceived behavioral control toward unaware riding, additional by feedback to modify their previous unawareness riding behavior. Then, for motorcycle accident preventive researchers, policy makers and organizations should be implemented this curriculum into adolescent which are high risk groups.

RECOMMENDATIONS

For improving this curriculum into more effectiveness, researcher could add real riding situations on road driving by more safely vehicles such as van or bus, after their get accuracy with test riding with HRT. This module can teach them cognitive confronting to hazard experiences in safer situations and recommendations by instructors. Moreover, one by one on road riding with instructors could be used for adding accurate for safe riding in the end of this curriculum development. However, this behavior likes to be performed by not volitional control; normally, Thai's adolescent motorcyclists have been less cognitive learning for hazard perception by initially real riding or in educational system. It likely increased by their riding experiences and following their riding times. It is dangerously for this neglecting because it is likely to permit immature riders going to dangerously roads and they can ride on road by none control for riders' quality. Finally, they should to learn confronting hazards and accurate responding by themselves in real dangerous road riding. There are reasons why we cannot save life of novice's motorcyclists in Thailand. The road traffic accident preventive practitioners and researchers could study in this points and give the efficiency ways for adding safety riding skills and hazard perception to their initially riding and experiences. It may be more valuable to save more life of motorcyclists in the future.

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