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FACTORS RELATED TO MOTORCYCLING PERFORMANCE OF THE ELDERLY: A CASE STUDY OF KHI LEK SUBDISTRICT, UBON RATCHATHANI PROVINCE, THAILAND

Summary. Thailand had a decline in traffic fatalities even though the estimate is only approximate. This study aims to examine the factors related to the motorcycling riding performance of 69 motorcyclists aged 60 and older in Khi Lek Subdistrict, Muang District, Ubon Ratchathani Province. Data were collected from

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interviews on driving behavior with the participants and their driving performance from the tests modeled on the Thai driving license test. Fisher's Exact Test was used to analyze the data. The results showed that the elderly exhibited good motorcycle driving behavior (91.30 %); however, their riding ability was at the level of "need to be improved" (85.51%). They showed poor performance on the reflex test (72.46%) and the depth perception test (69.57%). The tests the participants passed were the color blindness test (100%) and the peripheral vision test (61.82%). This study also found that the average daily motorcycle driving distance (p-value = 0.045) and motorcycle driving experience (p-value = 0.036) of the older motorcycle riders were determined to be statistically significant factors. The findings are useful for responsible organizations to decide on road safety policies to lower the risks of accidents involving elderly motorcycle riders in Thailand. They could consider revoking lifetime driver's licenses, providing training to promote safe driving techniques, and taking into account how the elderly's riding performance is correlated to their average daily driving distance and driving experience.

Keywords: motorcycling performance, elderly, driving, behavior, Thailand

1.   INTRODUCTION

Life expectancy and the number of older people have typically increased in parallel with the development of human societies. Road Traffic Injuries (RTIs) cause a large number of fatalities and injuries among people of all ages. Elderly individuals are one of the most significant age groups in this regard [1-4]. As the study by Cox and Cicchino showed, drivers over the age of 70 have greater crash death rates per 1,000 crashes than those aged 35-54 [5], and elderly motorcycle riders frequently have more severe injuries, worse outcomes, and different patterns of physical harm than do adult riders [6]. Moreover, according to the studies by Champahom et al. and Vajari et al., motorcycle accidents were significantly influenced by parameters of age [7,8].

Thailand had the highest rate of traffic fatalities in ASEAN at 32.7 per 100,000 people, placing it ninth globally in the World Health Organization's 2018 Global Status Report on Road Safety. Additionally, it was reported to have an estimate of over 22,000 deaths per year, or 61 deaths per day, and an estimated mortality rate of 85%, 74% of whom are motorcyclists [9]. According to the Department of Land Transportation, there were 21,222,053 motorcycles registered, making up 53.87% of all vehicles [10]. Vehicles (e.g., cars and lorries) and motorcycles share the same lanes of the road. They directly travel to the country's major cities and urbanized areas, and the total statistics aforementioned on registered vehicles show that the majority of Thais commute on motorcycles. It was revealed that, in comparison to other vehicle categories, motorcyclists have the highest accident rate. According to data on traffic accidents in Ubon Ratchathani Province, there were more than 1,000 traffic injuries every year: 1,655, 1,465, 1,620, and 1,000 in 2016, 2017, 2018, and 2019, respectively. The number of traffic accidents is on the rise every year, and Muang Ubon Ratchathani and Warin Chamrap districts almost always have a record number of fatalities. Statistics show that accidents involving the elderly are common; between January 2020 and December 2020, 370 accidents occurred in Muang Ubon Ratchathani District; between January 2021 and August 2021, there were 251 accidents in Muang Ubon Ratchathani District, and there were 78 incidences involving the elderly (those 60 years of age and older), or 21.08 percent of all accidents [11].

There are 11 villages in Khi Lek Subdistrict, Muang District, Ubon Ratchathani Province, with a total population of 6,805 people, 1,034 of whom are older people, making up 15.19% of the total population. The number of elderly population has increased annually. Khi Lek Subdistrict is a region close to Highway No. 212, which cuts across Muang Ubon Ratchathani District, Amnat Charoen Province, Mukdahan Province, and Roi Et Province. As a result, the road is crowded with different types of vehicles, such as cars, trucks, or motorcycles. According to statistics, in the past three years, there has been an increase in the total number of accidents involving older people. The ratios of total accidents to accidents involving the elderly were 43 : 7, 53 : 14, and 42 : 23 in 2019, 2020, and 2021, respectively. The accidents involving older drivers were caused, for example, by driving against the traffic, changing lanes abruptly, failing to look behind the vehicle while driving, and failing to use turn signals. It is evident that Village 3 would experience the highest number of elderly individuals injured in vehicle accidents in 2021. Three accidents involving elderly people resulted in five injuries. In Village 6, there were 5 occurrences of accidents, 3 of which included the elderly, and all of them involved motorcycles, resulting in 4 injuries and 1 fatality [12]. It is clear from the data that the risk that elderly people may be involved in motorcycle accidents will rise if such issues are not resolved. This study aims to examine the factors related to the motorcycling performance of the elderly in Khi Lek Subdistrict, Muang District, Ubon Ratchathani Province, where statistics on accidents involving the elderly have consistently shown to be high.

2. METHODS

2.1. Population and sample

Sixty-nine elderly motorcycle riders in Villages 3 and 6 who were at least 60 years old made up the study's sample. The researchers used a total of 69 motorcycle riders from both villages as samples.

2.2. Research tools

1. The questionnaire included general characteristics and the riding behaviors of the sample group. The driving behaviors of the sample group were divided into three categories: good, moderate, and need to be improved.
2. The four tests that compose the elderly motorcycle driving performance test following the Thai driving license test are as follows:
    1) The reflex test,
    2) The peripheral vision test,
    3) The depth perception test, and
    4) The color blindness test.

The evaluation of the elderly's driving ability was divided into two categories:
1) Pass (indicating that the participants have passed all four tests and their driving performance was marked as "good").
2) Fail (indicating that the participants have failed only one test and their driving performance was marked as "need to be improved.")

2.3. Research tool quality assessment

1) The content validity was examined by three experts, and the Item Objective Congruence (IOC) Index ranged from 0.67 to 1.00.
2) The redesigned questionnaire was then used by the researcher to conduct an experiment (Try Out) on people in Nong Tokaew Village. The reliability of the questionnaire on the motorcycle riding behavior of older people was assessed using a Cronbach's Alpha Coefficient on 15 sets, and it was revealed to be 0.727. The alpha coefficient must be 0.70 or over to be considered acceptable [13].

2.4. Data collection

1) Interviews were conducted with elderly people in Villages 3 and 6 of Khi Lek Subdistrict, Muang District, and Ubon Ratchathani Province to gather general information and study their driving behaviors.
2) Measurement tools were used to determine how well the elderly perform when driving motorcycles following the standard tests of the Department of Land Transport [14].
    1. In the reflex test, the ability to control the pedal brake was evaluated three times. If the participants could successfully hit the brake pedal within 0.75 seconds when the red light appeared two out of the three times, they would pass the test.
    2. To pass the peripheral vision test, the participants must be able to correctly identify the colored lights at 75 degrees on the left and the right two out of three times on each side.
    3. In the depth perception test, if the participants could see the target within a distance of 2.50-3.50 meters two out of three times without going beyond 1 inch from the target point, they would pass the test.
    4. To pass the color blindness test, the participants needed to identify the green, red, and yellow lights flashing from the test box or from the color blindness test plate approved by the Department of Land Transport, which was placed 2.50-3.50 meters away from them. They had to say each of the three colors three times (9 in total). They would pass if they could correctly tell the colors right 6 times out of 9.

2.5. Data Analysis

1) Quantitative data were evaluated using mean and standard deviation, whereas qualitative analysis was conducted using the descriptive statistics such as frequency and percentage distribution.
2) Behavior levels were presented using frequency and percentage descriptive statistics.
3) The factors related to the motorcycling performance of the elderly were examined using Fisher's Exact Test.

2.6. Ethics approval of research

This study was approved by the Human Research Ethics Committee of Ubon Ratchathani University (code UBU-REC-133/2565).

3. RESULTS

The findings revealed that the majority of the participants (71.01%) were men with an average age of 68.76 years (S.D.=6.22). Most of them had a primary education degree (89.86%) and currently worked as farmers (65.21%). In regard to their health conditions, more than half of the elderly had a congenital disease (62.32%), high blood pressure (50.00%), and vision problems (59.42%), the majority of which were blurred vision (53.66%). Most of them had never experienced a motorcycle accident in the past two years (85.51%), while more than half of them did not have a driver's license (66.67%) and those who had one were lifetime driver's license holders (39.14%) (Tab.1).

The motorcycling behavior of the elderly was good (91.30%) (Tab.2). The elderly displayed some safe driving behaviors, such as slowing down when entering an intersection (98.55%) and never changing lanes without signaling (95.65%). The behaviors that were still inappropriate included not having a motorcycle driver's license when driving (66.67%), overtaking on the left (33.33%), and riding with more than one passenger (17.39 %) (Tab.3).

Tab. 1

General information of the elderly in Khi Lek Subdistrict, Muang District,
Ubon Ratchathani Province (n=69)

ID	Characteristics	Frequency	Percentage
1	Gender		
	Male	49	71.01
	Female	20	28.99
2	Age (year)		
	60-69	41	59.42
	70-79	23	33.33
	≥80	5	7.25
	Mean=68.76 S.D.=6.22 Min=60 Max=85		
3	Education level		
	Primary education	62	89.86
	Secondary education or higher	7	10.14
4	Occupation		
	Farmer	45	65.21
	Others	6	8.70
	No job	18	26.09
5	Underlying congenital diseases		
	No	26	37.68
	Yes	43	62.32
6	Congenital disease type (n=43)		
	High blood pressure	22	50.00
	Heart disease	1	2.27
	Diabetes mellitus	10	22.73
	Asthma	2	4.55
	Atherosclerosis	1	2.27
	Rheumatoid arthritis	1	2.27
	Allergy	1	2.27
	Prostate disease	1	2.27

	Hemiplegia	2	4.55
	Gout	2	4.55
	Pneumonia	1	2.27
7	Eye diseases or vision problems		
	No	28	40.58
	Yes	41	59.42
8	Eye disease or vision problem type (n=41)		
	Myopia	8	19.51
	Farsightedness	7	17.07
	Astigmatism	2	4.88
	Cataract	1	2.44
	Pterygium	1	2.44
	Blurred vision	22	53.66
9	Average daily motorcycle driving distance (km)		
	1-5	47	68.12
	6-10	15	21.74
	11-15	2	2.90
	$\geq$16	5	7.24
	Median = 4, P_{25} = 2, P_{75} = 10, Min = 1, Max = 50		
10	Motorcycle driving experience (year)		
	<20	6	8.70
	$\geq$20	63	91.30
	Mean=33.78 S.D.=12.84 Min=1 Max=60		
11	Motorcycle ownership		
	Yes	61	88.41
	No	8	11.59
12	Motorcycle accident experience in the past two years		
	No	59	85.51
	Yes	10	14.49
	Number of accidents (n=10)		
	Mean=1.33 S.D.=0.48 Min=1.00 Max=2.00		
13	Accident severity level (n=10)		
	Accident requiring hospitalization	6	60.00
	Accident with minor injuries	4	40.00
12	Having a motorcycle driver's license		
	Yes	23	33.33
	No	46	66.67
13	Validity of driver's license (year)		
	Lifetime	9	39.14
	Temporary	14	60.86

Tab. 2

Levels of motorcycle driving behavior (n=69)

Behavior levels	Percentage
Good	91.30
Moderate	7.25
Need to be improved	1.45
Mean=34.03 S.D.=5.41 Min=12 Max=40	

Tab. 3

Motorcycle riding behaviors of the elderly in Khi Lek Subdistrict, Muang District,
Ubon Ratchathani Province (n=69)

Driving behaviors	Practices (Percentage)		
	Regularly	Sometimes	Never
1. Wear a helmet	84.06	14.49	1.45
2. Ride at 30km/h speed	78.26	15.94	5.80
3. Ride on the left in the assigned lane	89.86	7.25	2.90
4. Run a red light*	4.35	5.80	89.86
5. Give a signal when changing lanes	95.65	0.00	4.35
6. Slow down when reaching an intersection	98.55	0.00	1.45
7. Carry more than one passenger*	17.39	11.59	71.01
8. Overtake other vehicles on the right side	49.28	17.39	33.33
9. Overtake other vehicles in a no-overtaking zone*	1.45	2.90	95.65
10. Cut another vehicle off*	1.45	8.70	89.86
11. Keep the vehicle registration book handy at all times	59.42	24.64	15.94
12. Carry a motorcycle driver's license	31.88	1.45	66.67
13. Show a hand signal or a light signal	84.06	10.14	5.80
14. Check the brakes and gears before and after riding	82.61	13.04	4.35
15. Check the tires and tire pressure before and after riding	81.16	14.49	4.35
16. Check the signal system before and after riding	79.71	14.49	5.80
17. Check and adjust the rearview mirror properly before and after riding	84.06	13.04	2.90
18. Check the engine's lubricant and condition every 1,2–500,000 kms	85.51	11.59	2.90
19. Ensure that the horn functions properly	76.81	17.39	5.80
20. Have the motorcycle inspected and fixed immediately by a professional when experiencing a problem	86.96	8.70	4.35

Note: * indicates a negative question

The majority of the participants passed the color blindness test (100.00%) and the peripheral vision test (82.61%) while they were poor in the reflex test (72.46%) and the depth perception test (69.57%) (Tab. 4). The motorcycle driving performance of the elderly was determined to be at a level that needed to be improved (85.51%) (Tab. 5).

Tab. 4

Motorcycle riders' competence (n=69)

Motorcycle riding competence	Percentage	
	Pass	Fail
Color blindness test	100.00	0.00
Peripheral vision test	82.61	17.39
Depth perception test	30.43	69.57
Reflex test	27.54	72.46

Tab. 5

Levels of the elderly's motorcycle riding performance (n=69)

Motorcycle riding performance level	Percentage
Good	14.49
Need to be improved	85.51
Mean=2.41 S.D.=0.88 Min=1 Max=4	

The average daily motorcycle driving distance (p-value = 0.045) and motorcycle driving experience (p-value = 0.036) were found to be statistically significant factors in relation to the elderly's riding performances. There was no statistically significant correlation between elderly motorcycle performance and factors such as sex, age, education level, occupation, congenital disease, eye issues, motorcycle ownership, motorcycle accident experience in the past two years, having a motorcycle license, and level of motorcycle driving behavior (Tab. 6).

Tab. 6

Factors related to the motorcycling riding performance of older people in Khi Lek Subdistrict, Muang District, Ubon Ratchathani Province

Factors	Motorcycle riding performance level		Fisher's Exact Test	p-value
	Good (n=10)	Should be improved (n=59)		
Gender			0.46	0.712
male	8 (16.33)	41 (83.67)		
female	2 (10.00)	18 (90.00)		
Age (year)			0.93	0.649
60-69	5 (12.20)	36 (87.80)		
70-79	4 (17.39)	19 (82.61)		
≥80	1 (20.00)	4 (80.00)		
Education level			0.01	1.000
Primary education	9 (14.52)	53 (85.48)		
Secondary education or higher	1 (14.29)	6 (85.71)		
Occupation			2.05	0.347
No job	2 (11.11)	16 (88.89)		
Farmer	6 (13.33)	39 (86.67)		
Others	2 (33.33)	4 (66.67)		
Underlying congenital diseases			0.29	0.732
No	3 (11.54)	23 (88.46)		
Yes	7 (16.28)	36 (83.72)		
Eye diseases or vision problems			0.01	1.000
No	4 (14.29)	24 (85.71)		
Yes	6 (14.63)	35 (85.37)		
Average daily motorcycle driving distance (km)			7.32	0.045
1-5	7 (14.89)	40 (85.11)		
6-10	0 (0.00)	15 (100.00)		

11-15	1 (50.00)	1 (50.00)		
≥16	2 (40.00)	3 (60.00)		
Motorcycle driving experience (year)			6.68	0.036
<20	3 (50.00)	3 (50.00)		
≥20	7 (11.11)	56 (88.89)		
Motorcycle ownership			0.03	1.000
Yes	1 (12.50)	7 (87.50)		
No	9 (14.75)	52 (85.25)		
Motorcycle accident experience in the past two years			0.29	0.630
No	8 (13.56)	51 (86.44)		
Yes	2 (20.00)	8 (80.00)		
Having a motorcycle driver's license			1.46	0.283
Yes	5 (21.74)	18 (78.26)		
No	5 (10.87)	41 (89.13)		
Behavior levels			0.94	1.000
Good	10 (15.87)	53 (84.13)		
Moderate	0 (0.00)	5 (100.00)		
Need to be improved	0 (0.00)	1 (100.00)		

4. DISCUSSION

According to data on traffic accidents, the elderly with limited health issues are often involved. This study examined the factors affecting the riding performance of motorcycle riders with the ages of 60 and older through interviews on driving behavior and tests based on the Thai driving license test for driving performance, which has never been studied.

The result indicated that the elderly (91.30%) showed good motorcycle driving behavior. The elderly demonstrated some defensive driving behaviors, such as slowing down when entering an intersection and never changing lanes without signaling. This is in contrast to research by Antin et al., who found that elderly drivers commonly failed to switch on their turn signal before starting a lane change [15] but these are consistent with safe driving practices as studies found that the usage of sensors on the steering wheel raises drivers' attention span [16] and high speed was significantly associated with motorcycle accidents [17]. However, this study revealed that older people still had inappropriate behaviors, including not having a motorcycle driver's license when driving, overtaking on the wrong side (the left), and riding a motorcycle with more than one passenger. These behaviors could potentially result in a motorcycle accident. In the study by Wankie et al., riders who frequently transported more than two passengers had increased lifetime crash involvement chances (AOR = 3.57; 95% CI = 1.18-10.84) [18]. Furthermore, according to the research by Richter et al., accidents caused by overtaking were the worst accidents on German rural roads [19].

The majority of the participants had no motorcycle driver's licenses, indicating that they lacked training in safe motorcycle operation and did not have to take a physical fitness exam. Issuing only a temporary driver's license to the elderly may be appropriate to allow them to take a physical fitness test more often, which could lower traffic accident risks [20]. Training

and educating elderly drivers may also help them in appropriately assessing and controlling their driving [21] and poor knowledge of traffic regulations was related to road traffic accidents [22]. In addition to possessing a driver's license, a physical exam or additional training is not required for 39.14% of the older motorcycle riders because they hold lifetime driver's licenses.

Most elderly riders need to enhance their riding performance. Their poor abilities were caused by the fact that they failed the reflex and depth perception tests (72.46% and 69.57%). This finding is crucial in light of other researchers' findings, which have revealed that older drivers frequently exhibit poorer handling of the steering wheel, accelerator, and brake, which raises the chance of accidents [23,24]. This study shows that the eyesight of the elderly was poor. Their nearsightedness (19.51%) and blurred vision (53.66%) especially made it more difficult for them to see objects and warning signals, which may cause an accident. These vision problems cause a problem when they need to estimate the distance to overtake other vehicles safely. This is in line with the findings of a study that some elderly persons' driving abilities may be impacted by age-related impairments in vision, physical function, mental acuity, and memory, as well as certain diseases and medications [25]. The study by Anstey et al. also showed that cognitive and visual characteristics accounted for 83%–95% of the age-related variability in driving safety [26], and the study by Ortiz-Peregrina et al., revealed that older drivers have had significantly poorer results in a number of visual function tests as well as performance issues in driving simulators [27].

In terms of the older riders' riding performances, the average daily motorcycle driving distance and motorcycle driving experience were revealed to be statistically significant factors. According to the study of Crundall and Saikayasit, experienced motorcyclists exhibit different behaviors that can be regarded as potentially improving road safety [28]. Zhao and Yamamoto (2021) also found that inexperienced driving influences driving stress [29].

5. CONCLUSIONS

Older people can be seen riding motorcycles in Khi Lek Subdistrict, Muang District, Ubon Ratchathani Province. The average daily motorcycle driving distance and driving experience were found to be statistically significant factors impacting the motorcycle riding ability of older people. Although their motorcycle driving behavior was found to be good, it needed to be improved. Accidents involving elderly motorcyclists are very likely to occur due to their declining physical health, decreased muscular strength, shorter reaction times to unexpected events, poorer coordination between their organs' functions, and shortened attention spans.

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