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Functional and Cognitive Status and Driving Cessation among Senior Road Users

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บทคัดย่อ

การขับขี่ยานพาหนะของผู้สูงอายุในสังคมไทยมีความท้าทาย เนื่องจากการก้าวเข้าสู่สังคมผู้สูงอายุมากขึ้น การวิจัยนี้มีวัตถุประสงค์ที่จะประเมินสมรรถนะทางกาย ความคิด และการตัดสินใจยุติการขับขี่ยานพาหนะของผู้สูงอายุ โดยเก็บรวบรวมจากผู้สูงอายุในจังหวัดพะเยา จำนวน 268 คน เครื่องมือวิจัยประกอบด้วย แบบบันทึกข้อมูลส่วนบุคคล แบบสอบถามความตั้งใจที่จะเลิกการขับขี่ยานพาหนะ และแบบประเมินสรรถนะทางกายและความคิด ซึ่งเป็นการประเมินการเคลื่อนไหวของข้อ การทดสอบตาบอดสี การรับรู้ความลึก การมองเห็นทางรอบข้าง เวลาตอบสนองการเบรก การเดินเร็ว และการวาดหน้าปัดนาฬิกา ผู้สูงอายุส่วนใหญ่ มีสถานภาพสมรส มีการศึกษาในระดับประถมศึกษา ร้อยละ 64.8 มีโรคร่วม ส่วนใหญ่ใช้รถจักรยานและจักรยานยนต์ในการเดินทาง ร้อยละ 67.0 มีปัญหาทางการมองเห็น จำนวนมากมีข้อจำกัดในการเคลื่อนไหวของข้อ และยังไม่แสดงเจตนาที่จะเลิกการขับขี่ จากผลการศึกษาจึงมีความจำเป็นในการปรับเปลี่ยนเชิงนโยบาย ควรทำความเข้าใจ และจัดการปัญหาการขับขี่ยานพาหนะของผู้สูงอายุ ที่มีข้อจำกัดทางร่างกายและความคิด มีความบกพร่องทางประสาทสัมผัส ความเสื่อมของสมองและสภาพจิตใจ เพื่อเพิ่มความปลอดภัยในการใช้ถนนและความผาสุกของผู้สูงอายุ

คำสำคัญ: สมรรถนะทางกาย, สมรรถนะทางความคิด, ผู้สูงอายุ, การตัดสินใจยุติการขับขี่ยานพาหนะ

Abstract

Senior road users in Thailand face issues due to the aging population. The study aimed to analyze seniors' physical, cognitive state, and their choices related to driving. Data collected from 268 participants in Phayao province. The tools used included a personal data record form and a form regarding the intention to stop driving vehicles. Additionally, a physical and cognitive performance assessment form was utilized to evaluate the range of motion in the joints, color blindness, depth perception, peripheral vision, brake reaction time, rapid pace walks, and clock drawing test. Most participants were married, primarily educated, and 64.8% had co-morbidities. Bicycles and motorcycles were favored transport modes, primarily used during the morning.

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Sixty-seven percent of participants reported visual problems; many exhibited a limited range of motion and have no intention to stop driving/riding. The study underlined the need for targeted interventions and policies to tackle specific problems faced by elderly road users, such as medical conditions, sensory impairments, and cognitive decline, to improve road safety and well-being.

Keywords: Physical status, Cognitive status, Senior, Driving cessation

Introduction

Senior road users in Thailand face increasing challenges because of the nation's growing aged population. As of 2020, older adults accounted for 17.13% of the population (11.23 million), a figure projected to reach 20% (13.1 million) by 2040, marking Thailand as a fully matured aging society.[1] Also, the aging population in Phayao, a small province in northern Thailand, stood at 24.66% in 2022.[2] The seniors, particularly those in rural and suburban communities in Phayao, often rely on motorcycles, cars, or bicycles for maintaining their independence and societal connections, essential for their overall well-being.

Despite the looming need, seniors' issues receive scant attention, particularly given the prevalent road traffic injuries, primarily affecting young drivers. Statistics indicate males aged 15-24 constitute a third of victims, with motorcyclists involved in up to 70% of fatal crashes. Road accidents' economic toll amounts to 6% of the GDP annually. Although only 5% of accidents involve older adults, the incidence amongst senior drivers, especially motorcyclists, has risen since 2011. In 2018, road accidents claimed 56.79%, 32.24%, and 10.79% of the lives of seniors aged 60–69, 70–79, and 80 or older, respectively. Addressing senior road users' needs is crucial for reducing traffic injuries and securing overall road safety in Thailand.[3,4]

The act of driving or riding, which appears straightforward for physically and mentally robust individuals, may present considerable challenges for seniors grappling with physical and cognitive deterioration. Aging-associated changes such as deteriorating vision, motor power, and cognition can necessitate cessation of driving or riding. To sustain their autonomy and safety, seniors need to recognize their physical and cognitive changes and consider ceasing vehicle operation when safety dictates.[5] the decision can be complicated by mild cognitive impairment, requiring adequate visual and physical capabilities for safe driving. Regrettably, research examining seniors' driving and riding capacities is scant, revealing a knowledge gap concerning their functional and cognitive fitness for operating vehicles, including an understanding of when and why they might choose to stop.

Conceptual framework

This research drew upon the principles of both the Comprehensive Geriatric Assessment (CGA) Framework and the Biopsychosocial Model.[6,7] The CGA Framework emphasizes a well-rounded examination of elderly individuals by addressing their physical, psychological, and social health. On the other hand, the Biopsychosocial Model delves deep into the complex interplay of biological, psychological, and social elements, offering valuable perspectives on the diverse challenges and advantages that senior drivers may exhibit.

Objectives

This study primarily sought to evaluate seniors' physical and cognitive status as drivers or

cyclists and examine their decisions to discontinue these activities.

Methods

Study population and sample

For this cross-sectional study, participants were selected from a population of 889 elderly residents in a specific sub-district within Phayao province. The sample size required for the quantitative analysis was derived from the standard table established by Krejcie & Morgan. Based on the criteria that the desired characteristic in the population has a proportion of 0.5, an acceptable margin of error at 5%, and a confidence interval of 95%, a total of 268 older adults were included in the study sample. These participants, who actively used cars, motorcycles, and bicycles, were chosen to represent a wide range of community backgrounds and vehicle usage experiences.

Data collection

This study targeted active drivers and riders aged 60 years and older. Participants were recruited via pamphlets and local referrals, with the study's purpose and procedures clarified beforehand. During data collection, participants underwent extensive assessments capturing health, vehicle use, sensory status, and functional abilities. Visual tests included assessments for visual acuity, color blindness, depth perception, and peripheral vision. Physical health and abilities were evaluated through functional tests like rapid pace walk, foot brake reaction time, and range of motion tests. Cognitive function was assessed using the clock drawing test. The study also explored participants' future decisions on driving or riding cessation. Each data collection session lasted around an hour.

Research instruments and procedures

The study employed a demographic data form to collect details such as age, gender, education, marital status, health status, and driving habits. This included participants' intentions to cease driving and their accident history. Subsequently, an assessment form designed in a fill-in-the-blank format was used to evaluate the participants' functional and cognitive. The functional assessment covered the range of motion for the neck, shoulder, elbow, wrist, trunk, and hip. Other tests administered were the rapid pace walk and the clock drawing test.

Local land transport authorities backed the study, supplying both personnel and equipment for specific assessments. Vision tests assessed participants' depth perception and ability to estimate distances, while the peripheral vision test gauged their capability to identify objects without moving their eyes. The foot brake reaction time test quantified their reflexes in brake pedal application. All the forms used had undergone content validation and reliability testing before their application in the study. [8-9]

Testing parameters

Using a goniometer, the study measured participants' range of motion in areas including the neck, shoulder, elbow, wrist, trunk, and hip, with established cut-off points for each. The Rapid pace walk cut-off was 7.5 seconds, and the clock drawing test was 5 out of 7. The Department of Land Transport set criteria for the depth perception, peripheral vision, and foot brake reaction tests. Successful pin alignment in at least two attempts was needed to pass the depth perception test, correctly identifying colors on both sides twice for the peripheral vision test, and achieving a reaction time of 0.75 seconds or less in at least two attempts for the brake reaction test. [10-12]

Statistical analyses

Descriptive statistics were used to interpret personal data, functional status, and driving cessation decisions of Thai senior road users, offering insights into participant characteristics and responses through

analysis of distribution patterns and variability.

Ethical considerations and approval

The study adhered to ethical principles, safeguarding participants' rights, and welfare. Participants received thorough briefings about the study, thus ensuring informed consent. Anonymity was upheld through secure data handling and non-identifiable reporting of results. The survey was designed with respect to participants' privacy and safety. Approval on April 7, 2018 from the BCNPY ethics committee (Re-04-61) verified adherence to ethical norms.

Results

Respondents' characteristics

The survey encompassed 268 Thai senior road users, with 44.9% males and 55.1% females, aged 60 to 96, average age 68.56 years (SD = 6.54). Most were married, with primary education, and 64.8% reported co-morbidities, suggesting a potential influence on their health, and driving capabilities. For the vehicles and road usage, bicycles (33.58%) and motorcycles (13.06%) as preferred transport. Many participants travel 2-10 kilometers (48.10%) primarily within their communities (69.77%), mostly in the morning until noon (54.48%). A vast majority has no prior road accident history (89.50%).

The Functional and cognitive status

Functional	number	(%)	number	(%)
Perceived hearing problem			Perceived visual problem	
No	219	(81.90)	No	88 (33.0)
Yes	49	(18.10)	Yes	180 (67.0)
Visual field test			Color blindness test	
Pass	252	(94.00)	Pass	224 (83.50)
Fail	16	(6.00)	Fail	44 (16.50)
Depth perception			Width perception	
Pass	129	(48.10)	Pass	223 (83.10)
Fail	139	(51.90)	Fail	45 (16.90)

Table 1 Hearing and visual status of the sample (n = 268)

For hearing and visual status, the data in Table 1 indicates 18.1% of participants experience hearing issues and 67.0% has visual problems. Most participants have a vision score poorer than 20/20. While 94.00% passed the visual field test, only 48.10% passed depth perception. The pass rates for color blindness and width perception tests were 83.50% and 83.10% respectively.

Functional	Right		Left	
	Number	(%)	Number	(%)
Neck rotation				
< 60 degrees	159	(59.33)	157	(58.58)
60-90 degrees	109	(40.67)	111	(41.42)
Shoulder internal rotation				
< 60 degrees	120	(44.78)	112	(41.79)
60-90 degrees	148	(55.22)	156	(58.21)
Shoulder external rotation				
<80 degrees	70	(26.12)	64	(23.88)
80-90 degrees	198	(73.88)	204	(76.12)
Elbow flexion				
<130 degrees	75	(27.99)	76	(28.36)
130-150 degrees	193	(72.01)	192	(71.64)
Wrist flexion				
<60 degrees	91	(33.96)	95	(35.45)
70-90 degrees	177	(66.04)	173	(64.55)
Wrist extension				
<60 degrees	117	(43.66)	108	(40.30)
70-90 degrees	151	(57.34)	160	(59.70)
Trunk rotation				
<30 degrees	238	(88.81)	230	(85.82)
30-40 degrees	30	(11.19)	38	(14.18)
Hip flexion				
< 100 degrees	59	(22.01)	47	(17.54)
100-120 degrees	209	(77.99)	221	(82.46)
Hip extension				
< 10 degrees	17	(6.34)	14	(5.22)
10-15 degrees	251	(93.66)	254	(94.78)
Hip internal rotation				
Less than 30 degrees	30	(11.19)	63	(23.51)
30-40 degrees	238	(89.81)	205	(76.49)
Hip external rotation				
Less than 30 degrees	24	(8.96)	21	(7.84)
30-60 degrees	244	(91.04)	247	(92.16)

Table 2: Function status of the sample (n = 268)

For the functional status, the findings in Table 2 indicate a significant proportion of participants had limited range of motion. Specifically, 59.33% had neck rotation below 60 degrees, 44.8% demonstrated shoulder internal rotation below 60 degrees, and 23.88% had shoulder external rotation under 80 degrees. Similar trends were observed in elbow flexion and wrist motions. A significant 88.8% had trunk rotation below 30 degrees. Most participants met the specified ranges for hip motions.

Functional and Cognitive Status	number	(%)
Rapid pace walks (Range = 11.35, Mean = 7.03, S.D. = 1.85)		
<7.5 seconds	188	(70.15)
7.5-9 seconds	38	(14.18)
>9 seconds	42	(15.67)
Break reaction time		
Pass (<.75 second)	57	(21.30)
Fail (>.75 second)	211	(78.70)
Clock drawing test (Scores)		
4	10	(3.70)
5	3	(1.30)
6	6	(2.40)
7	248	(92.60)
Giving up driving or riding in next 6 months		
Yes	35	(13.06)
No	233	(86.94)

Table 3: Further functional status, clock drawing test results, and driving/riding cessation (n = 268)

For additional functional and cognitive status, it was found that the quick walk averaged 7.03s, with 70.15% finishing under 7.5s. Most failed the brake test (78.7% over 0.75s). 92.6% scored 7 on the Clock Test, 3.7% got 4. Also, 233 seniors did not aim to giving up driving/riding soon, as shown in Table 3.

Discussion

Survey results echo prior research on elderly road users' capabilities. The significance of demographic data in devising interventions and policies for this group is well-noted, emphasizing interventions based on factors like age, gender, and education.[13] Thai seniors frequently use bicycles and motorcycles due to convenience and cost. Safety interventions include education and improved infrastructure.[14] Seniors prefer nearby travel, matching the "aging in place" concept. Accessibility and safety of community transportation are important.[15] Increased public transportation access reduces driving among older adults.[16] Health conditions such as visual and auditory impairments and restricted motion can affect seniors' driving. This impacts essential movements, challenging safe vehicle operation.[5] Solutions include health assessments, vehicle adaptations, and exercise programs.[17] Sensory issues are common among Thai seniors. Addressing visual impairments like cataract, glaucoma, and pterygium, along with hearing issues,

is essential.1Interventions and collaborations help mitigate these risks.[18,19]

Cognitive decline can affect driving safety.[20] Early detection and interventions promote safer behaviors.[21,22] Older drivers have longer reaction times.[23] Strategies to improve performance include exercise, cognitive training, and medication review.[24,25,26] Retirement from driving poses challenges for Thai seniors. Aging can affect driving safety. Solutions involve alternative transportation, infrastructure improvement, geriatric care, and technology integration.[27] Understanding physiological fatigue's impact on older drivers' reaction times is also a key to developing safe mobility strategies.

Conclusion

The survey reveals key data on older road users in Phayao province, underlining the need for specialized interventions. Future studies should assess how medical conditions impact driving and evaluate targeted interventions' effectiveness. These steps, along with stakeholder collaboration, could enhance safety for elderly road users in similar contexts.

Implications for Nursing

1. Community nurses should focus on evaluating the efficacy of technology-based interventions for older adult safety.

2. Nurses have a key role in observing and monitoring age-related changes in seniors, crucial for care planning and research.

3. Nurse educators should include topics on senior physical and cognitive decline, especially concerning road safety, in their teaching.

Recommendations for Future Research

1. Future research should involve greater collaboration among nurse researchers, other researchers, healthcare professionals, government bodies, and senior advocacy groups. This collaboration aims to improve the quality and impact of research.

2. There is a need for cross-validation of self-reported data with objective measures for reliability.

3. Longitudinal studies are encouraged to observe age-related changes over time, aiding in the development of effective interventions.

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