

**Empirical Research on the Prevention of
Health-related Accidents and Research on
the Public Awareness Activities for
Preventive Measures**

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Table of Contents

I. Background of the Study Project	1
1. Background and purpose of this study project - Why are health-related accidents focused now?-	1
2. Sleep Apnea Syndrome and Traffic Accidents.....	3
3. Abnormal Visual Field and Traffic Accidents.....	6
4. Hay Fever-induced Sleepiness and Traffic Accidents	9
5. Project Outline	10
II. 《Research for FY2017》 Development of a questionnaire and establishment and validation of a survey method using a clock chart	11
1. Background and Objectives	11
2. Method.....	12
2-1. Target	12
2-2. Questionnaire.....	12
2-3. Clock Chart.....	13
3. Results	15
4. Conclusion.....	30
III. 《Research for FY2018》 Conducting Epidemiological Research Studies on Occupational Drivers.....	32
1. Background and Objectives	32
2. Method.....	32
2-1. Target	32
2-2. Questionnaire	32
2-3. Clock Chart.....	33
2-4. Statistical Analysis.....	33
3. Results	35
3-1. Characteristics of Target.....	35
3-2. Relationship between Daytime Sleepiness and Traffic Accidents	36
3-3. Relationship between Knowledge of Hay Fever Medication and Medication Behavior.....	37
3-4. Relationship between Abnormal Visual Fields and Traffic Accidents ...	39
4. Conclusion.....	44
4-1. Relationship between Daytime Sleepiness and Traffic Accidents	44

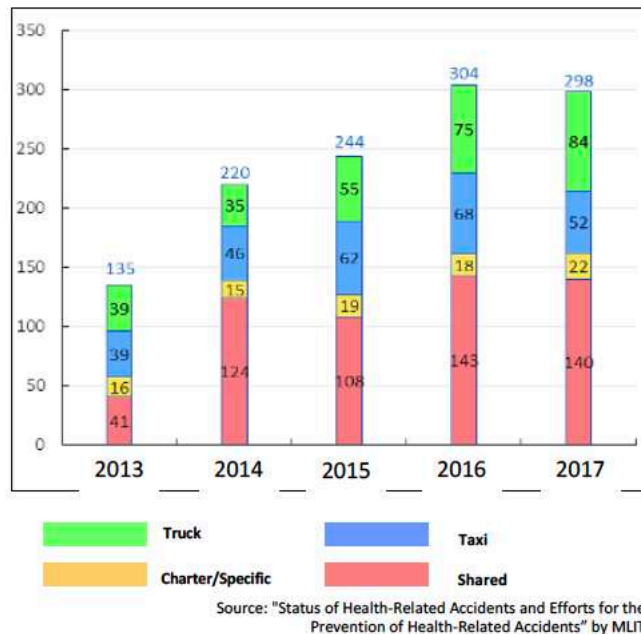
4-2. Relationship between Knowledge of Hay Fever Medication and Medication Taking Behavior.....	44
4-3. Relationship between Abnormal Visual Fields and Traffic Accidents ...	45
IV. 《Research for FY2019》 Conducting Follow-up surveys for those with Findings on Clock Chart.....	47
1. Background and Objectives	47
2. Method.....	47
3. Results	48
4. Conclusion.....	49
V. 《Implementation in FY2019》 Raising Awareness of the Prevention of Health-related Accidents by Holding Symposiums and Lectures	50
1. Holding Symposiums	50
1-1. Traffic Safety Symposium.....	50
1-2. Special Lecture	53
2. Results of Promotion Activities-Results of the Symposium Questionnaire-. 54	
2-1. Traffic Safety Symposium.....	54
2-2. Special Lecture	59
3. Conclusion.....	61
VI. Conclusion and Issues	62
1. Summary of this Study	62
2. Aiming to reduce health-related accidents	63
References.....	65
Appendix 1 Questionnaire	69
Appendix 2 Clock Chart Implementation Manual	73
Appendix 3 Clock Chart Result Sheet (Front)	78
Appendix 4 Medical Checkup Status Survey Form.....	80
Appendix 5 Reminder to Those with Severe Findings	81
Appendix 6 Flyer for the Citizen's Symposium on Traffic Safety.....	81
Appendix 7 Flyer on Special Lecture.....	83

I. Background of the Study Project

1. Background and purpose of this study project - Why are health-related accidents focused now?-

In Article 2 of the Automobile Accident Reporting Regulations of the Ministry of Land, Infrastructure, Transport, and Tourism, health-related accidents are defined as “those in which the driver is unable to continue driving a commercial vehicle due to illness.¹⁾ In recent years, the number of traffic accidents, injuries, and fatalities has been on a downward trend in Japan. However, on the other hand, the number of reported health-related accidents has been on an upward trend (Fig. 1).²⁾ One possible reason for this is that the number of reports is increasing, reflecting the growing awareness of business operators of health-related accidents, etc. However, another possible reason is that, as the entire Japanese society is aging, many occupational drivers are also aging. The percentage of those with lifestyle-related diseases, etc., that pose a risk of health-related accidents is increasing.

According to the Ministry of Land, Infrastructure, Transport and Tourism announcement, cerebrovascular disease and heart disease accounted for 16% and 14%, respectively, of the drivers who caused health-related accidents between 2012 and 2016. Of these, the breakdown by disease of the drivers who died is reported to be 50% for heart disease and 15% for brain disease²⁾. Under these circumstances, the Ministry of Land, Infrastructure, Transport, and Tourism has begun to take measures to prevent and reduce health-related accidents, including the creation of the “Guidelines for Measures against Cerebrovascular Disease in the Automobile Transport Industry” in 2008.³⁾



**Figure 1: Number of Reports of Health-related Accidents
(Number of Cases per Business Category)**

However, in addition to cerebrovascular diseases and heart diseases, various other diseases such as digestive diseases, respiratory diseases, and side effects of medications have been reported to cause health-related accidents.²⁾ Furthermore, previous reports on the causes of health-related accidents did not include health-related accidents caused by drivers who were unaware of their diseases. In other words, cerebrovascular disease and heart disease are just the tip of the iceberg regarding the causes of health-related accidents (Fig. 2). With the aging of occupational drivers, it is possible that various lifestyle-related diseases could be the cause of health-related accidents. Comprehensive measures to deal with health-related accidents, including diseases the driver is unaware of, will be necessary.

In this project, we focused on the following causes of health-related accidents: loss of concentration during the day due to sleep disordered breathing, abnormal visual fields due to glaucoma, and drowsiness due to hay fever. This project aimed to clarify the relationship between these health problems and traffic accidents and establish and promote awareness of countermeasures against health-related accidents.

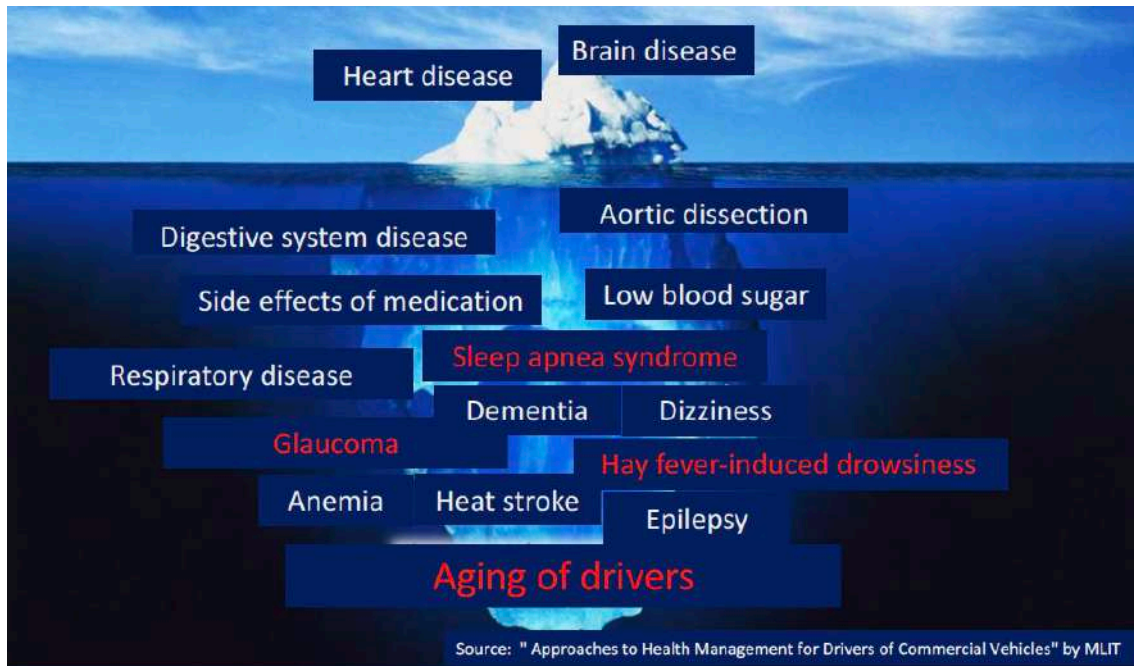


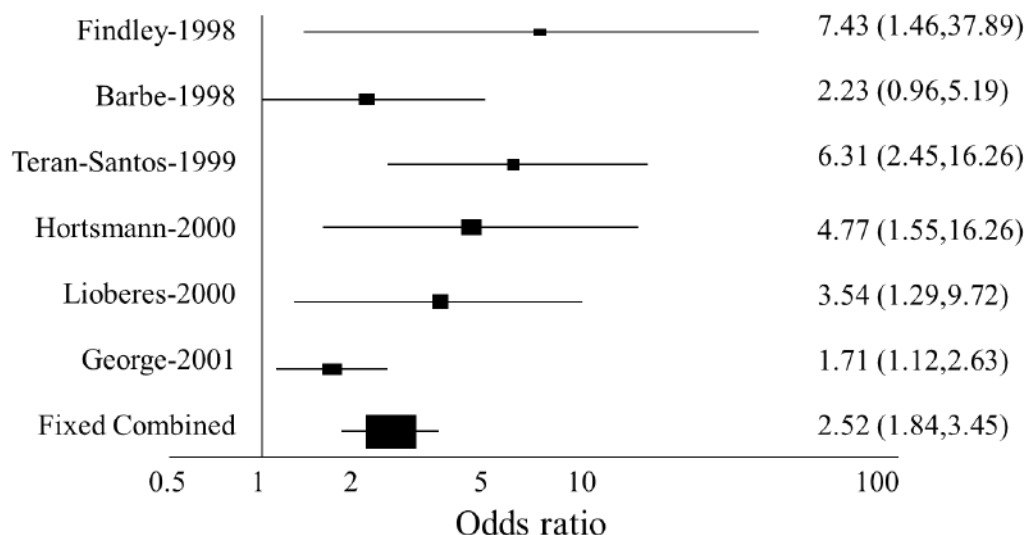
Figure 2: Causes of Health-related Accidents

2. Sleep Apnea Syndrome and Traffic Accidents

Sleep apnea syndrome (SAS) is a syndrome associated with sleep disordered breathing (SDB), an abnormal condition related to breathing during sleep, such as respiratory arrest and hypoventilation, and subjective symptoms such as daytime sleepiness, poor concentration, and fatigue. The number of SAS patients in Japan is estimated to be 4 to 5 million. In contrast, the number of patients currently undergoing treatment is only about 400,000, equivalent to about one-tenth of the total number of SAS patients. This is because 1) symptoms of SAS gradually become more severe and the decline in sleep quality follows a chronic course, so sleepiness caused by SAS is easily misinterpreted as age-related chronic fatigue symptoms, 2) potential SAS patients are often unaware of excessive daytime sleepiness, and 3) the spread of screening tests for SAS and linkage to treatment are insufficient.⁴⁾

In recent years, it has become clear that SAS has an impact on patients' health, such as cardiovascular diseases including diabetes, hypertension, and cerebrovascular diseases, and has a significant social impact, including traffic accidents, because it causes drowsiness during the day.⁵⁾ According to the results of a meta-analysis conducted by Sassani et al. on the association between SDB and road traffic accidents, the risk of road traffic accidents was reported to be about 2.5 times higher in drivers with SDB (Fig. 3).⁶⁾ In addition, according to a study on therapeutic intervention for

SAS using continuous positive airway pressure (CPAP), it was found that therapeutic intervention can reduce the number of traffic accidents.⁷⁾ An estimate in the U.S. suggests that the cost of CPAP intervention is greater than the economic loss from traffic accidents and could save 980 lives.⁶⁾ This suggests that therapeutic intervention



Sassani A, et al., 2004

for sleep apnea in occupational drivers is significant.

Figure 3: Increased Risk of Traffic Accidents Due To Obstructive Sleep Apnea Syndrome

While the impact of SAS-induced drowsiness while driving on traffic accidents has been clarified, we conducted a questionnaire survey on traffic accidents and near-misses among SAS patients. We found that there were many cases of falling asleep at the wheel without warning, such as “I fell asleep at the wheel 12 times in one year, and when I noticed, I collided with the car in front of me that was stopped at a red light.”⁸⁾ In fact, a simple SAS screening test using the flow sensor method and a questionnaire to determine subjective daytime sleepiness (ESS; Epworth sleepiness scale) were conducted simultaneously on approximately 5,000 truck drivers nationwide. As a result, as many as 86% of the patients with moderate to severe SDB were judged to have subjective sleepiness in the normal range, as shown in Table 1.⁹⁾ Based on these results, we have proposed the concept of sleep apnea without subjective daytime sleepiness (NoSSA; non-sleepy sleep apnea) and have called for attention to it.⁴⁾

		Sleep Apnea				Total
		Normal Range (Less than RDI 5)	Slight Degree (RDI 5 to 19.9)	Medium Degree (RDI 20 to 39.9)	Severe (RDI 40 or more)	
Weak ↑ Perceived Sleepiness ↓ Strong	ESS 0 to 5	1,457 (60%)	1,391 (60%)	201 (53%)	46 (36%)	3,095 (100%)
	ESS 6 to 10	774 (32%)	725 (31%)	138 (37%)	52 (40%)	1,689 (100%)
	ESS 11 to 15	142 (6%)	170 (7%)	34 (9%)	23 (18%)	369 (100%)
	ESS 16 to 20	37 (2%)	44 (2%)	5 (1%)	8 (6%)	94 (100%)
Total		2,410 (100%)	2,330 (100%)	378 (100%)	129 (100%)	5,247 (100%)

Table 1: Relationship between Perceived Sleepiness and Prevalence of Sleep Apnea Syndrome

Thus, since SAS is upstream of various lifestyle-related diseases, and falling asleep due to SAS may directly lead to serious accidents, it is considered that SAS medical checkups for the entire society, especially for people engaged in driving, are important in preventing health-related accidents. In addition, since SAS, like NoSSA, is a disease that lacks subjective findings, it is considered necessary to introduce a simple objective test for primary screening.

3. Abnormal Visual Field and Traffic Accidents

The visual field is the size of the field of vision that can be seen when gazing at a single point in front of the eyes. A partial loss or narrowing of this field of vision is called an abnormal visual field. In Japan, glaucoma is the most common cause of visual field abnormalities at 28.6%, followed by retinitis pigmentosa at 14.0% and diabetic retinopathy at 12.8%.¹⁰⁾ Of these, the number of glaucoma patients in Japan was estimated to be approximately 4.6 million in 2015, and 5.0% (1 in 20) of people who are 40 years or older and 10.0% (1 in 10) of people who are 70 years or older are considered to have glaucoma.¹¹⁾ Glaucoma is also the most frequently occurring disease, accounting for about 30% of all cases of blindness in Japan. Glaucoma is a disease in which the optic nerve is damaged for some reason, resulting in a narrowing of the visual field, and increased intraocular pressure is thought to be one of the causes. Once glaucoma has progressed, it is difficult to recover from it, but intraocular pressure lowering therapy can reduce its progression, so early detection and treatment are essential. Another characteristic of glaucoma is that its symptoms progress gradually, making it difficult to notice on one's own, and there are no subjective symptoms until the condition is quite advanced. Another reason for the lack of subjective symptoms is that glaucoma begins with narrowing of the peripheral visual field. The central visual field is maintained even after the symptoms have progressed considerably. Glaucoma often progresses in one eye at a time so that the defective portion of the visual field is compensated for when viewed with both eyes (Fig. 4).

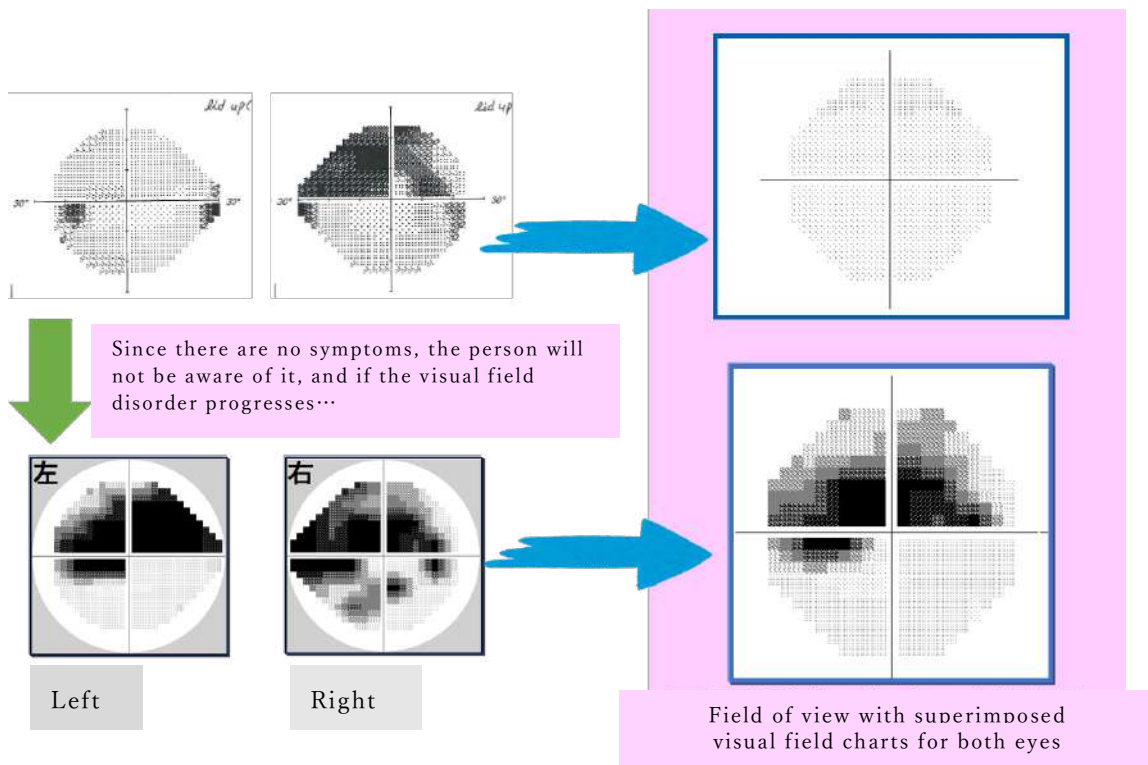


Figure 4: Visual Field Progression in Glaucoma Patients

It has been reported that about 90% of glaucoma patients have no subjective symptoms and remain untreated, regardless of the degree of symptoms (Table 2).¹²⁾ In addition, most cases of glaucoma are discovered by chance during a complete medical checkup or eye examination when purchasing eyeglasses or contact lenses. It is reported that only 5% of glaucoma patients have subjective symptoms.

	Unaware (Untreated)	Glaucoma diagnosed and under treatment	Glaucoma diagnosed but untreated	Total
Early Stage to -6dB	140/149 (94.0%)	3/149 (2.0%)	6/149 (4.0%)	149
Middle Stage to 12dB-6dB	51/56 (91.1%)	4/56 (7.1%)	1/56 (1.8%)	56
Late Stage to -12dB	41/45 (91.1%)	3/45 (6.7%)	1/45 (2.2%)	45

Table 2: Ratio of Glaucoma Unawareness and Untreated Patients by Stage among 250 Glaucoma Patients

Regarding the impact of abnormal visual fields caused by glaucoma on driving, it has been found that glaucoma patients experience what is commonly called the “Jack-in-the-Box Phenomenon” while driving, such as “a car, bicycle, or pedestrian suddenly has jumped out in front of me (or has disappeared from in front of me)”, “a stop sign that should normally be there has been missing,” and “a traffic light that should be there at an intersection has been missing.¹³⁾ It has been clearly shown that such reduced visibility while driving due to abnormal fields of vision can cause traffic accidents. Previous studies showed that abnormal peripheral vision in both eyes doubled the rate of car accidents,¹⁴⁾ that the incidence of glaucoma in elderly people who caused car accidents was 3.6 times higher than in elderly people who did not cause car accidents,¹⁵⁾ and that glaucoma patients had a 6.6 times higher risk of causing a car accident in the past five years than normal people.¹⁶⁾ In Japan, as a result of a study by Aoki et al. on the relationship between the progression of glaucoma and a history of traffic accidents in the past five years in 29 glaucoma patients, they reported that the percentage of those with a history of traffic accidents was 6.9% and 0% in the early and middle glaucoma groups, respectively, while it was significantly higher at 34.5% in the late group.¹⁷⁾ On the other hand, it has also been reported that glaucoma patients tend to avoid driving at night, in fog, or in the rain, which makes them more cautious drivers and less likely to cause accidents.¹⁸⁾ Furthermore, it is suggested that glaucoma has specific characteristics for traffic accidents depending on the location of the abnormal

visual field.¹⁹⁾ In other words, early detection and early treatment of glaucoma is important to prevent the progression of the disease and prevent traffic accidents by making glaucoma patients aware of their symptoms.

In Japan, however, few systematic measures have been taken to prevent health-related accidents due to abnormal visual fields caused by glaucoma. In our aging society, the number of symptomless glaucoma patients is likely to increase further in the future. In particular, since traffic accidents by occupational drivers have a significant social impact, the development and expansion of a screening system for occupational drivers for early detection and early treatment of abnormal fields of vision are considered to be essential issues in preventing traffic accidents.

4. Hay Fever-induced Sleepiness and Traffic Accidents

In recent years, the number of hay fever patients has been increasing, and the prevalence in Japan has been reported to have reached more than 25%.²⁰⁾ The prevalence of cedar pollen allergy, in particular, is reported to be more than 30% among people in their teens to 50s, and the prevalence is high among the working-age population.²¹⁾ Hay fever induces sleepiness during the daytime because the main symptoms, such as nasal obstruction, runny nose, sneezing, and itchy eyes, reduce sleep quality.²⁰⁾ On the other hand, second-generation antihistamines, which are the mainstay of drug therapy, can induce daytime sleepiness when taken.²²⁾ According to an Internet survey of about 1,200 hay fever patients conducted in Japan, about 80% of hay fever patients complained of sleep disturbance due to their symptoms, and about 60% of patients felt more sleepy during the daytime during the pollen dispersal season than during the pollen non-dispersal season.²³⁾ About 40% of the respondents said that the cause of this was sleepiness caused by therapeutic medication, but more than 50% said that the cause of this was sleepiness caused by disturbed sleep at night due to hay fever symptoms or conditions.²³⁾ In the cedar pollen dispersal season, more than 90% of patients reported that their work/study was affected by hay fever symptoms. In comparison, about 80% of hay fever medication patients reported that the treatment improved their work/study efficiency. About 80% reported that they did not feel sleepiness that affected their work/study due to hay fever medication (Table 3).²³⁾ Since some second-generation antihistamines are non-sedating agents with less central nervous system depressant effects,²⁴⁾ appropriate medication behavior is expected to improve QOL (quality of life) during the day. However, it has been reported that about one in four hay fever patients did not visit a medical institution even though they had

the intention to do so, and that about half of those who did not visit a medical institution ended up purchasing OTC drugs at a pharmacy.²³⁾ 花 There are two types of hay fever medicines: prescription medicines prescribed by medical institutions and over-the-counter medicines available at pharmacies. Since patients can take these medicines according to their drug selection, their knowledge of the medicines, drug selection, and medication-taking behavior may affect their daytime activities such as driving. In the “Survey on Drivers and ‘Hay Fever’ (2007)” conducted by the Forum for the Promotion of Healthy Japan 21, about 30% of the respondents answered that “hay fever symptoms greatly or considerably affect driving a car “. ²²⁾ As for therapeutic medication, there are some second-generation antihistamines indicated in their package inserts with cautions or prohibitions for driving, etc., and it has been reported that these drugs are prescribed to about 70% of hay fever patients.²⁵⁾ In recent years, in addition to sleepiness and fatigue that are perceived as side effects of antihistamines, unperceived “impaired performance” (a decrease in concentration, judgment, and work efficiency that the patient him/herself is not even aware of) has become a problem.²⁵⁾ From the viewpoint of preventing automobile accidents, drivers need to know how to alleviate hay fever symptoms and have knowledge about medicines, selection of therapeutic drugs, and medication-taking behavior.

Thus, not only do hay fever symptoms cause a decrease in driving performance, but the antihistamines used to treat hay fever may also lead to a decrease in consciousness level and concentration due to sleepiness, a decrease in cognitive and operational abilities, and poor driving maneuvers.²⁶⁾ Therefore, hay fever is considered a potential cause of health-related accidents. In particular, since occupational drivers spend many hours driving, symptoms of hay fever and sleepiness caused by medication may affect their driving operation and cause traffic accidents due to these symptoms. Therefore, Awareness-raising on appropriate medication use is considered to be necessary.

5. Project Outline

This research project was carried out as a three-year project from FY 2017 to FY 2019. The outline of each year’s research is shown below. (Fig. 5)

Fiscal Year 2017

-Development of a questionnaire and establishment and validation of a survey method using a clock chart

Fiscal year 2018

-Implementation and analysis of a survey on health-related accidents targeting approximately 2,000 employees of transportation companies

FY2019

-Conduct follow-up surveys of employees with findings on clock charts

-Raise awareness of the prevention of health-related accidents by holding symposiums and lectures

The details of each year's implementation will be described in Chapters II-V.

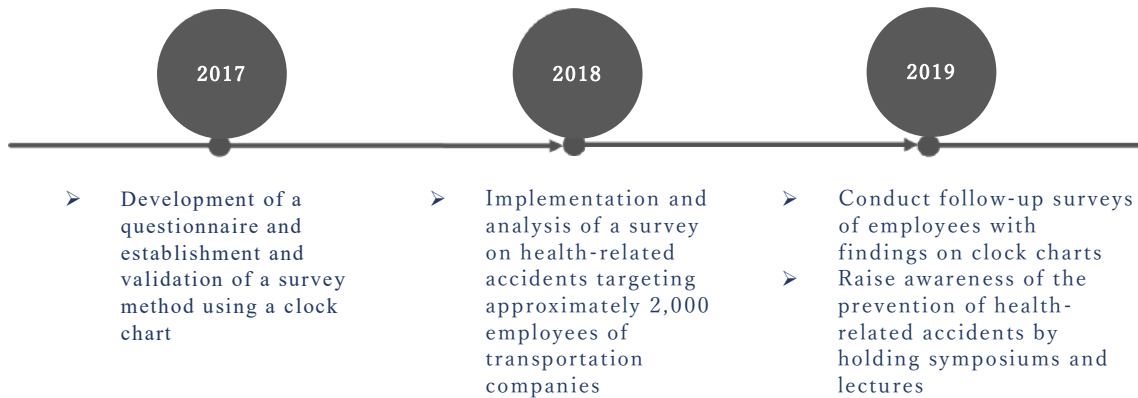


Figure 5: The Research Project Outline

II. 《Research for FY2017》

Development of a questionnaire and establishment and validation of a survey method using a clock chart

1. Background and Objectives

In FY 2019, we first developed a questionnaire to conduct a survey and study to clarify the relationship between sleep apnea, glaucoma, and sleepiness caused by hay fever and traffic accidents. We used the clock chart to examine the survey method, a simple screening tool for abnormal visual fields. Then, we aimed to verify the usefulness of these research methods by conducting a pilot study on actual glaucoma patients.

2. Method

2-1. Target

In this study, subjects were six outpatients (3 males and three females) who visited the Department of Ophthalmology at Juntendo University Hospital and nine outpatients (four males and five females) who visited Tetsumoto Eye Clinic between February and March 2018. Of these, this report describes 14 patients with the Humphrey automated visual field test (Figure 6). This study was conducted with the approval of the Juntendo University Hospital Ethics Committee (Acceptance Number: 17-270) and the Juntendo University School of Medicine Ethics Committee (Approval Number: Jun Dai I Rin No. 2017204).



Figure 6: Humphrey Automated Field

2-2. Questionnaire

Regarding driving a car or motorcycle, respondents were asked, “Do you currently drive a car or motorcycle?” Respondents answered “yes” or “no” to the question, and if they answered “yes,” they were asked, “Have you ever had any of the following experiences while driving a car or motorcycle within the past five years?” Nine items related to the jack-in-the-box phenomenon were asked (all questions were answered with two choices, “yes” or “no”) (Table 3). In addition, respondents were asked “Have you ever caused a traffic accident in the past five years?” Respondents answered “yes” or “no.” If the answer is “Yes,” the respondents were asked to indicate the number of times they had been involved in the following situations: “You damaged your own vehicle. (single car accident),” “You were hit by another car or motorcycle. (property damage),” “You hit another car or motorcycle. (property damage),” “The other party’s negligence resulted in personal injury.”, “Both the other party and your negligence resulted in personal injury,” and “Your negligence resulted in personal injury.”

While driving a car or motorcycle, have you had any of the following experiences in the past five years?	
There were times when traffic lights that were supposed to be at intersections were missing.	Yes No
There were times when the stop signs that should usually be there	Yes No

were missing.	
There were times when a car or bicycle suddenly jumped out in front of you or disappeared right in front of you.	Yes No
There were times when a pedestrian suddenly jumped out in front of you or disappeared right in front of you.	Yes No
You may find yourself slowing down or speeding up before you know it compared to the flow of cars in the vicinity.	Yes No
Sometimes you think you are driving in the proper lane, but before you know it, you end up driving onto the sidewalk or into the oncoming lane.	Yes No
Sometimes it is difficult to see road signs clearly and to drive according to the signs.	Yes No
Sometimes you get confused because you don't know where you are driving on the road.	Yes No
You have been pointed out by a passenger, such as a family member, that you were driving dangerously.	Yes No

Table 3: Questions and Answers on Jack-in-the-box Phenomenon

2-3. Clock Chart

In this study, we used the clock chart, a simple screening tool for abnormal visual fields developed by Professor Chota Matsumoto of Kinki University, which is performed with one eye.²⁷⁾ The clock chart is made of a circular piece of paper with a diameter of 40 cm. A grid and petals are drawn within a viewing angle of 5° from the center, a ladybug at 10°, a caterpillar at 15°, a butterfly at 20°, and a cat at 25° (Fig. 7). Although the clock chart was created for self-checking, in this study, to improve the accuracy of the test, the clock chart was placed on a base with a large clock face on it, and the test was conducted under the guidance of an examiner (Fig. 8). First, with the subject gazing at the center of the clock chart with one eye from a distance of about 35 cm, it was confirmed that a caterpillar located in the Marriott blind spot would not be visible. In this state, the clock chart was rotated slowly in a clockwise direction, stopped every 30°, and the visibility of the illustration of the creature was recorded. In this study, we tested the following viewing angles in order: ladybug (10°), caterpillar (15°), butterfly (20°), and cat (25°). In addition, we confirmed the Marriott blind spot for each viewing angle tested and confirmed the solid viewpoint for each 90° rotation.

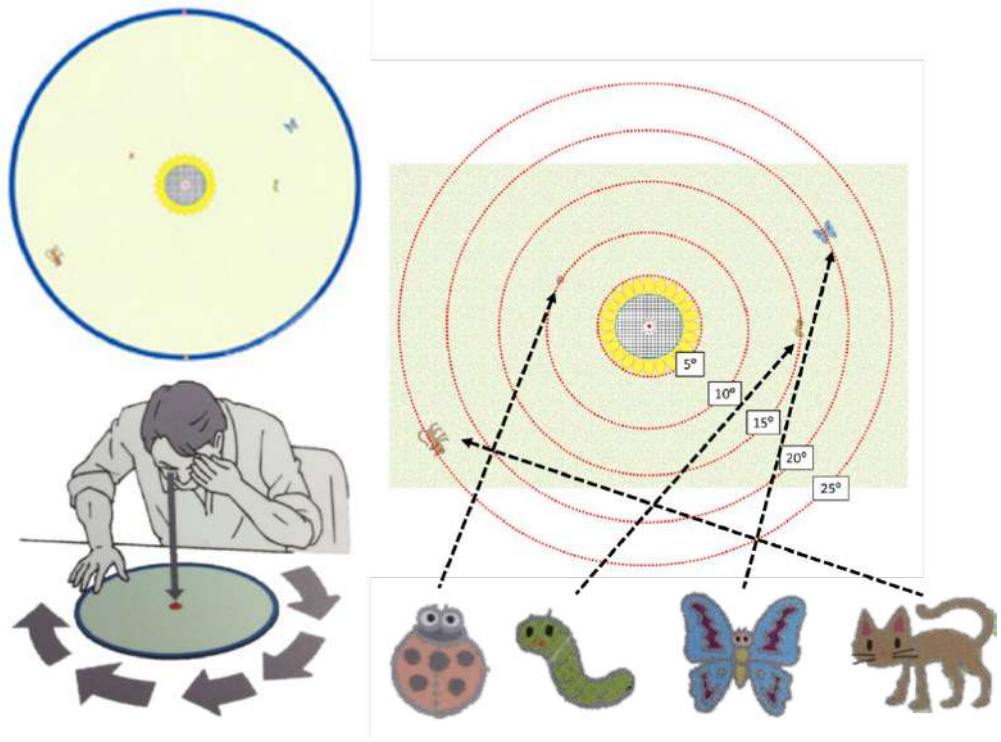


Figure 7: Clock Chart

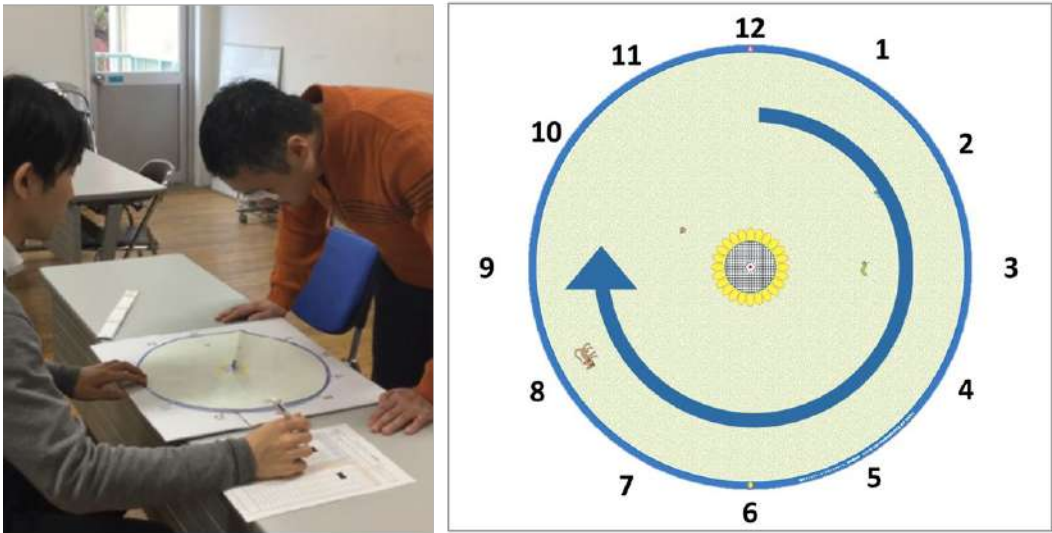


Figure 8: Clock Chart Inspection Scene

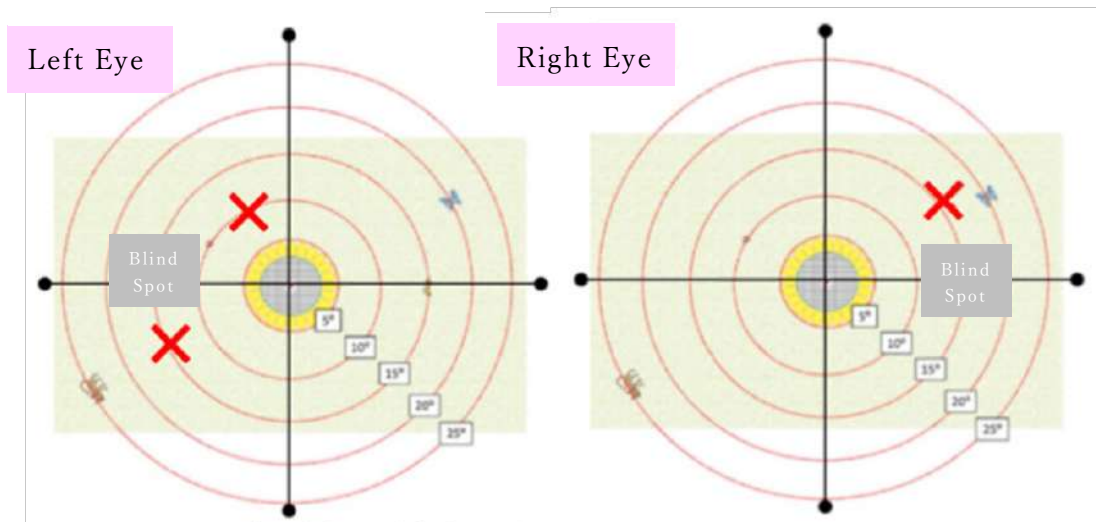
3. Results

The following is a comparison of the results of the clock chart and the results of the Humphrey automated visual field test for the 14 cases in this study, as well as a description of the driving conditions, the presence or absence of the Jack-in-the-box phenomenon, and the experience of traffic accidents.

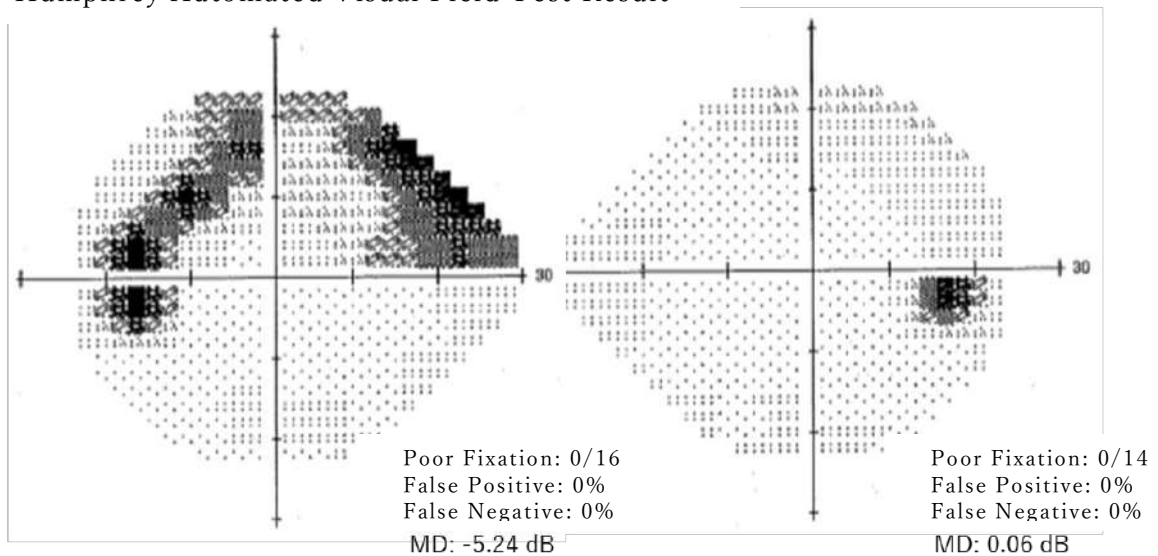
Case (1)

- 48-year-old male
- Non-motor-vehicle operator

Clock Chart Result



Humphrey Automated Visual Field Test Result

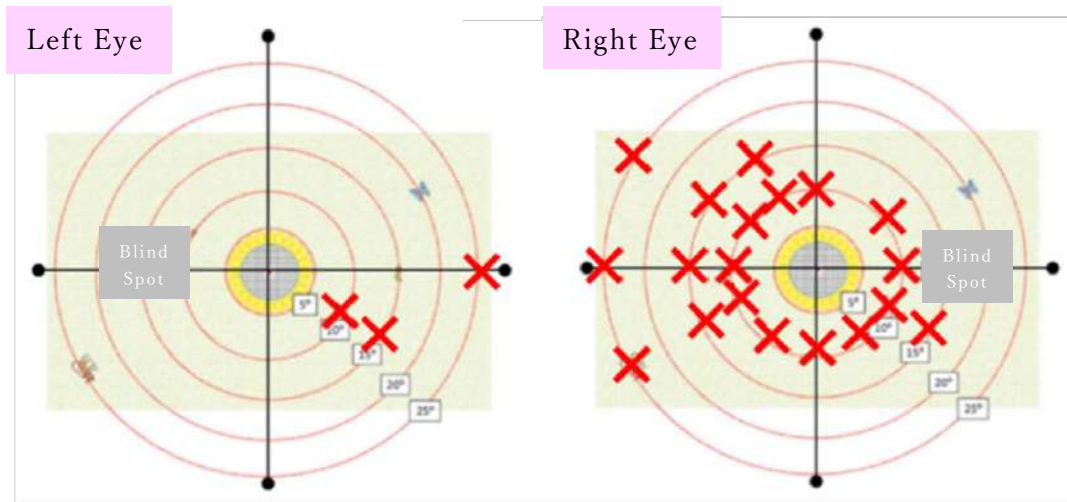


Case (2)

■68-year-old female

■Non-motor-vehicle operator

Clock Chart Result



Humphrey Automated Visual Field Test Result

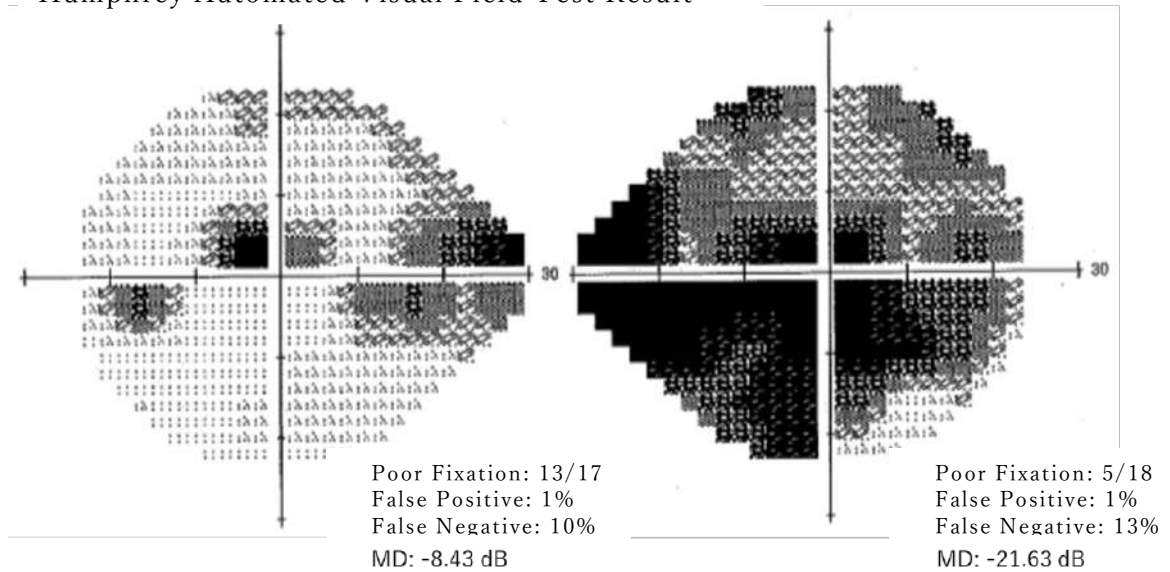


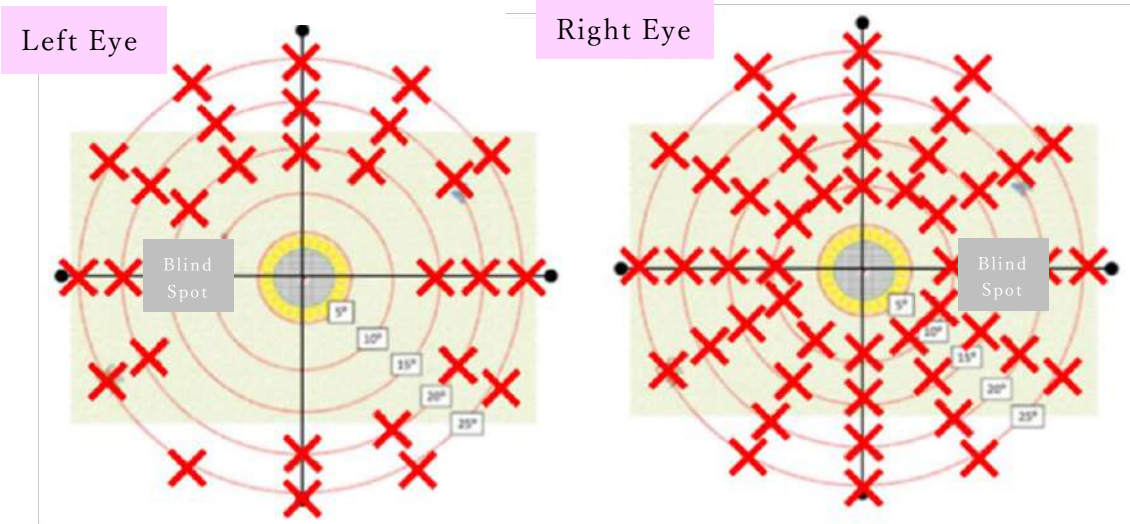
Figure 10: Results of Clock Chart and Humphrey Automated Visual Field Test for Case 2

Case (3)

■82-year-old male (The right eye has almost lost its field of vision, so only 10° from the center is shown in the test results.)

■Non-motor-vehicle operator

Clock Chart Result



Humphrey Automated Visual Field Test Result

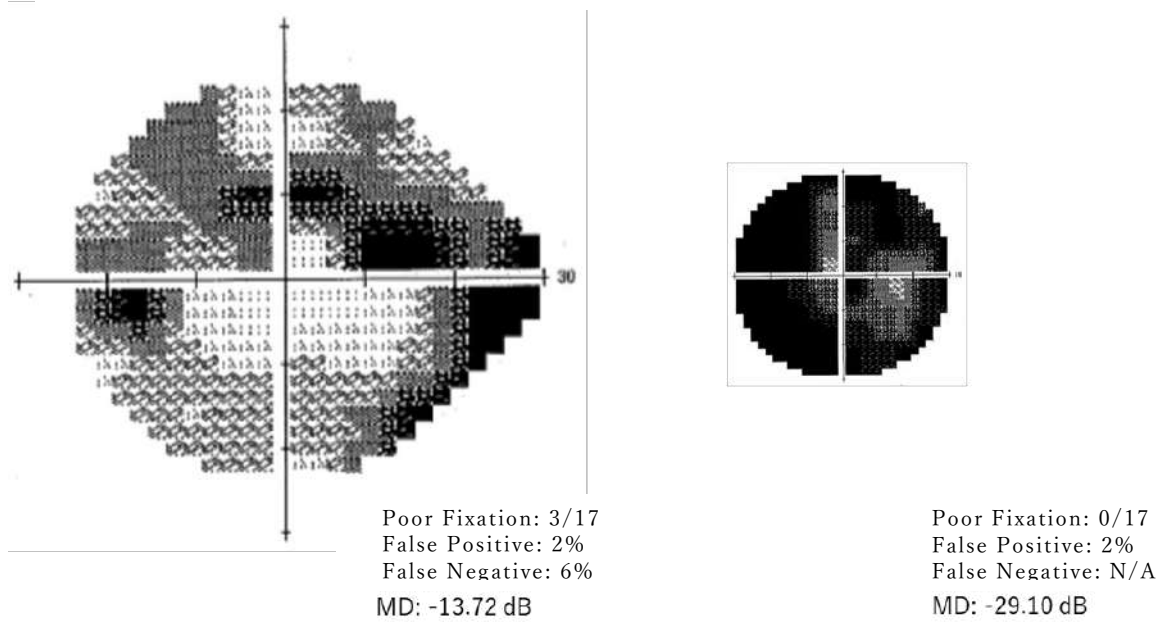
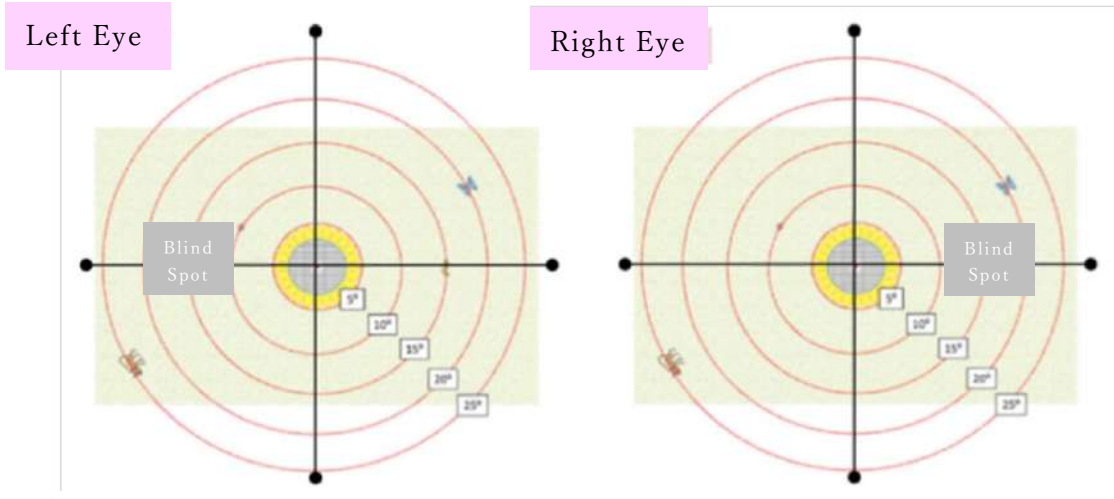


Figure 11: Results of Clock Chart and Humphrey Automated Visual Field Test for Case 3

Case (4)

- 74-year-old female
- Motor-vehicle operator
- Jack-in-the-box Phenomenon in the past five years: None
- Traffic accident experience in the past five years: None

Clock Chart Result



Humphrey Automated Visual Field Test Result

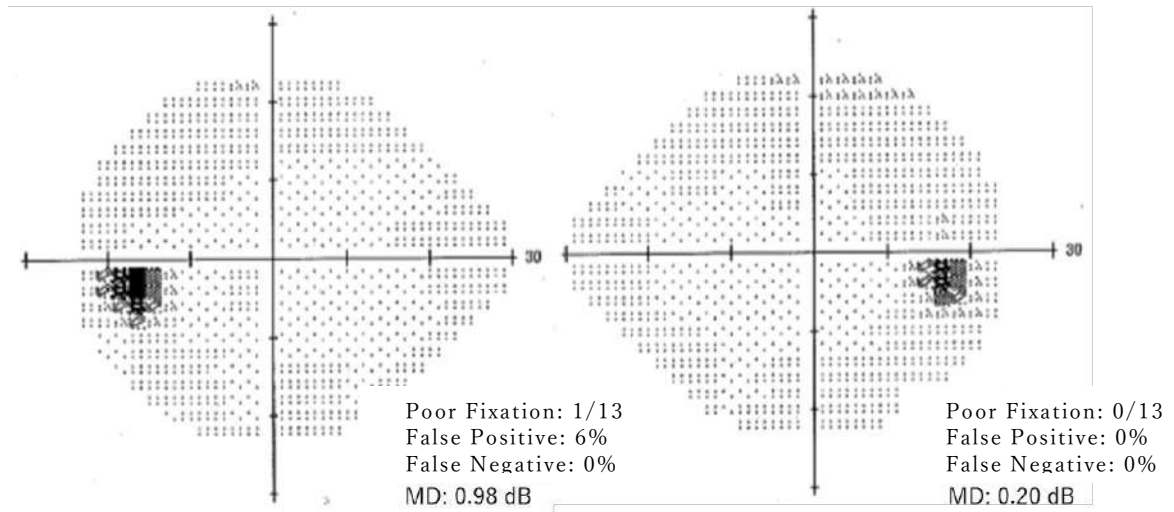
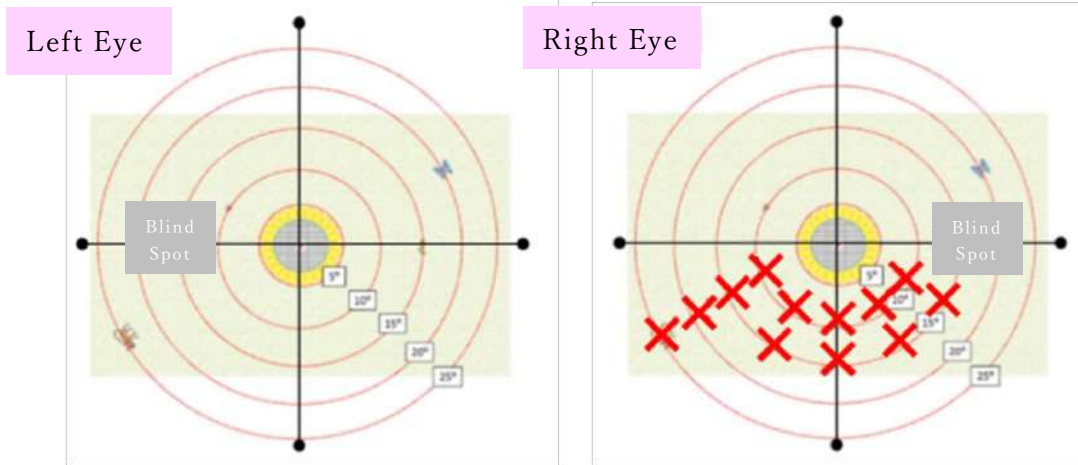


Figure 12: Results of Clock Chart and Humphrey Automated Visual Field Test for Case 4

Case 5

- 63-year-old male
- Motor-vehicle operator
- Jack-in-the-box Phenomenon in the past five years: None
- Traffic accident experience in the past five years: None

Clock Chart Result



Humphrey Automated Visual Field Test Result

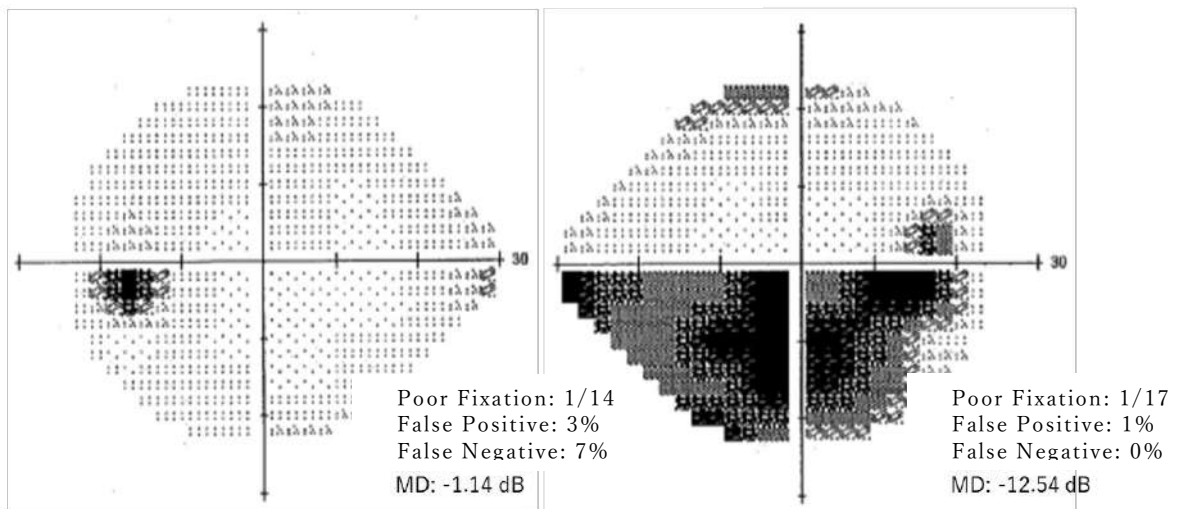


Figure 13: Results of Clock Chart and Humphrey Automated Visual Field Test for Case 5

Case 6

■70-year-old female

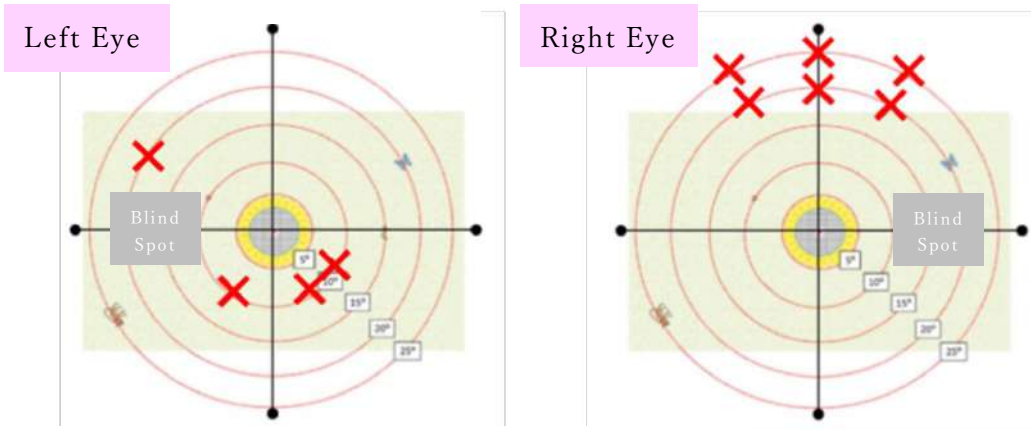
■Motor-vehicle operator

■Jack-in-the-box Phenomenon in the past five years: Yes

- You may find yourself slowing down or speeding up before you know it compared to the flow of cars in the vicinity.

■ Traffic accident experience in the past five years: None

Clock Chart Result



Humphrey Automated Visual Field Test Result

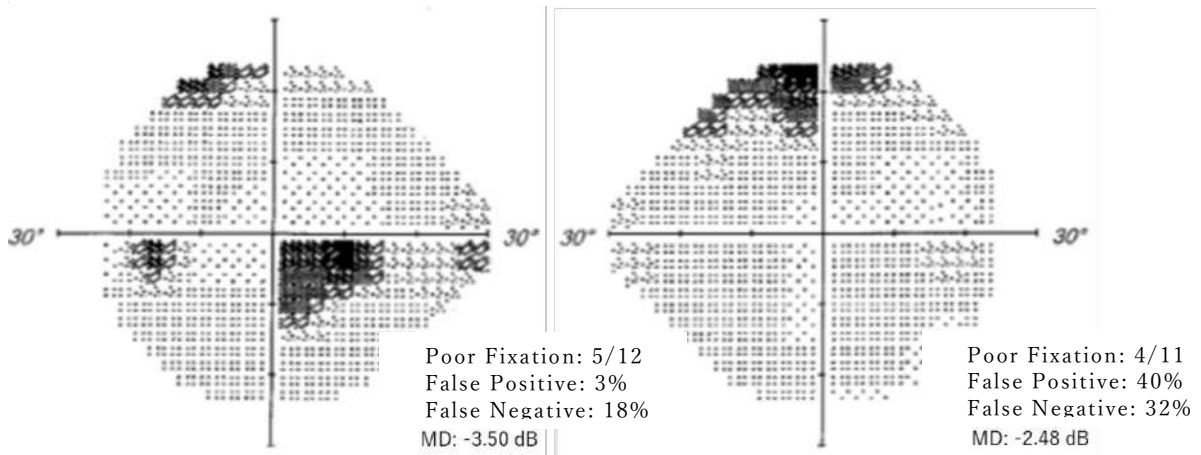


Figure 14: Results of Clock Chart and Humphrey Automated Visual Field Test for Case 6

Case 7

■72-year-old female

■Motor-vehicle operator

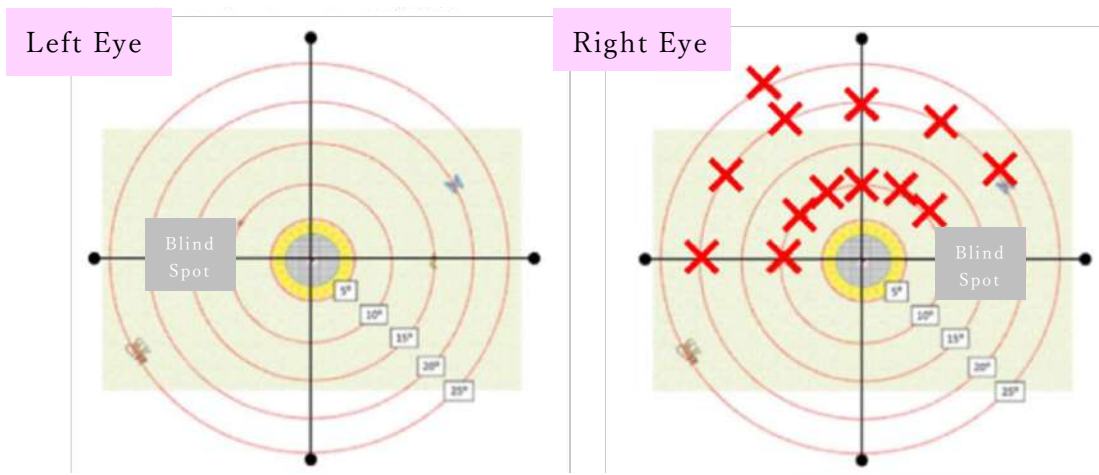
■Jack-in-the-box Phenomenon in the past five years: Yes

- You may find yourself slowing down or speeding up before you know it compared to the flow of cars in the vicinity.

■Traffic accident experience in the past five years: Yes

- Property damage (hit by another car or motorcycle) 10 times

Clock Chart Result



Humphrey Automated Visual Field Test Result

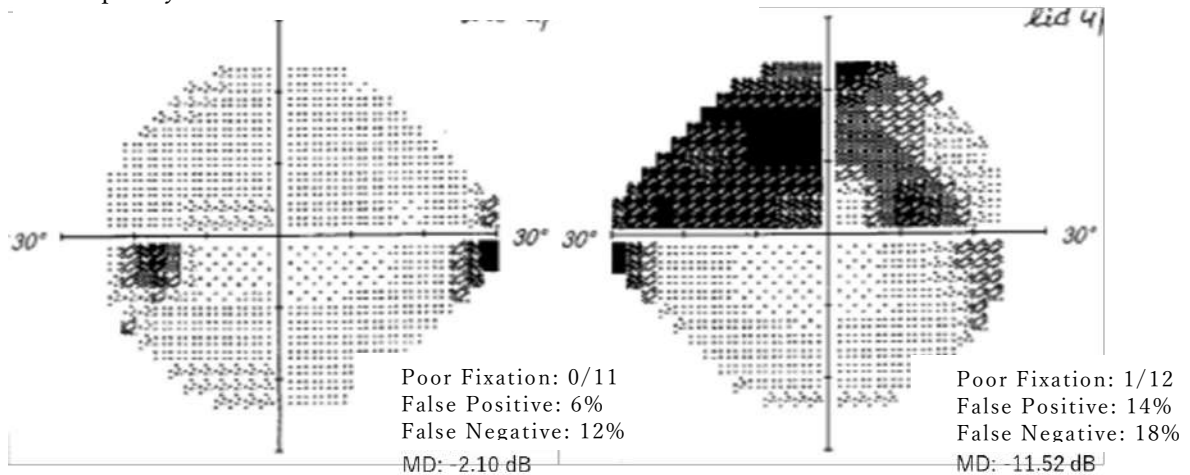


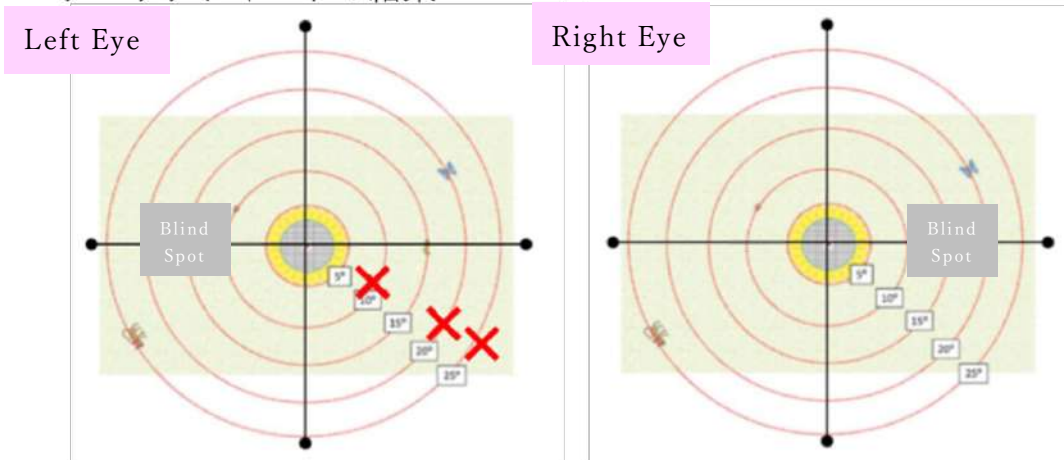
Figure 15: Results of Clock Chart and Humphrey Automated Visual Field Test for Case 7

Case 8

- 74-year-old male
- Motor-vehicle operator
- Jack-in-the-box Phenomenon in the past five years: None
- Traffic accident experience in the past five years: Yes
 - Property damage (hit by another car or motorcycle) 2 times

Clock Chart Result

クロックチャートの結果



Humphrey Automated Visual Field Test Result

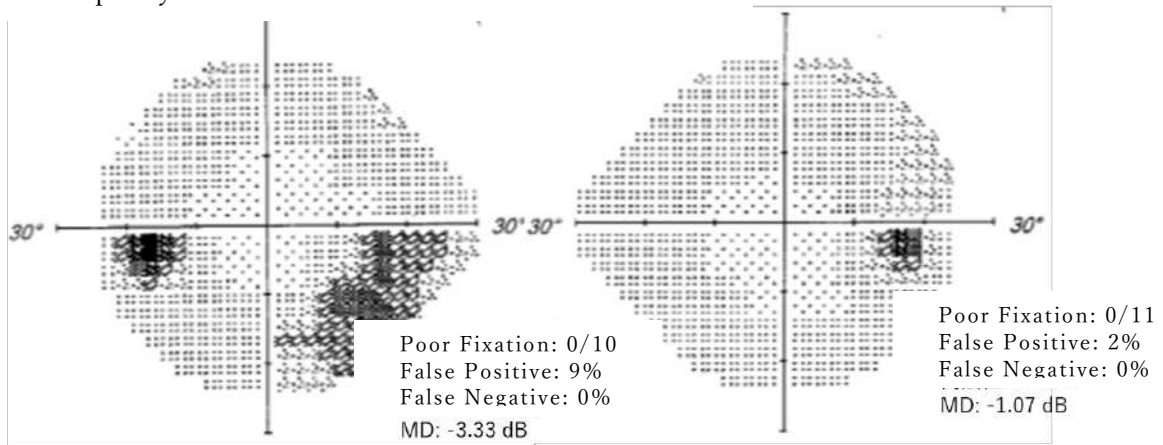


Figure 16: Results of Clock Chart and Humphrey Automated Visual Field Test for Case 8

Case 9

■78-year-old male

■Motor-vehicle operator

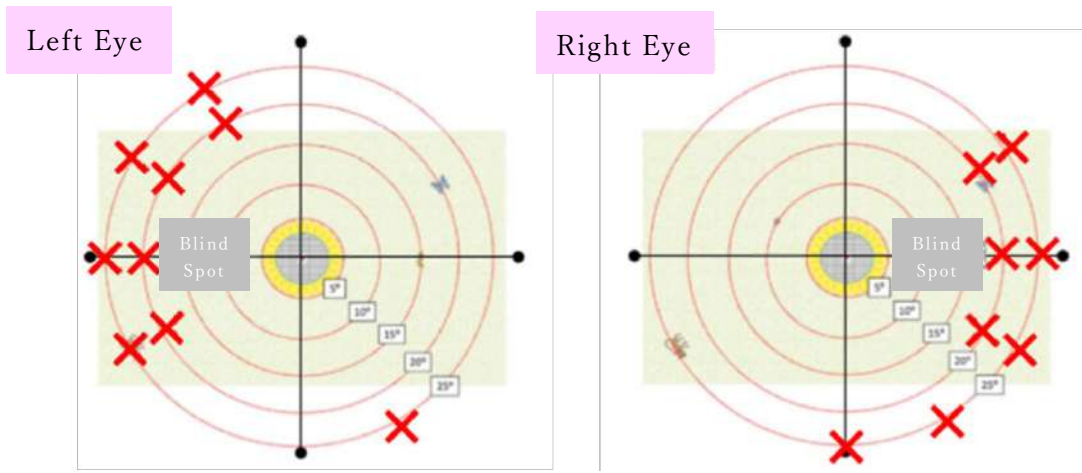
■Jack-in-the-box Phenomenon in the past five years: Yes

- There were times when the stop signs that should usually be there were missing.
- There were times when a car or bicycle suddenly jumped out in front of you or disappeared right in front of you.

■Traffic accident experience in the past five years: Yes

- Property damage (hit by another car or motorcycle) 3 times
- Another driver's negligence resulted in personal injury. 2 times

Clock Chart Result



Humphrey Automated Visual Field Test Result

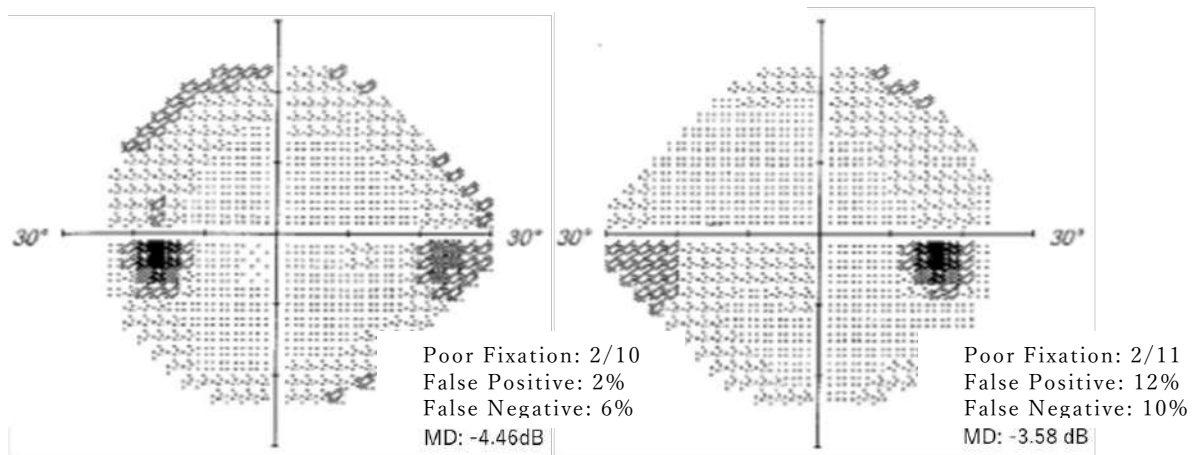


Figure 17: Results of Clock Chart and Humphrey Automated Visual Field Test for Case 9

Case 10

■78-year-old male(The left eye has lost its field of vision, so the clock chart test was not conducted.)

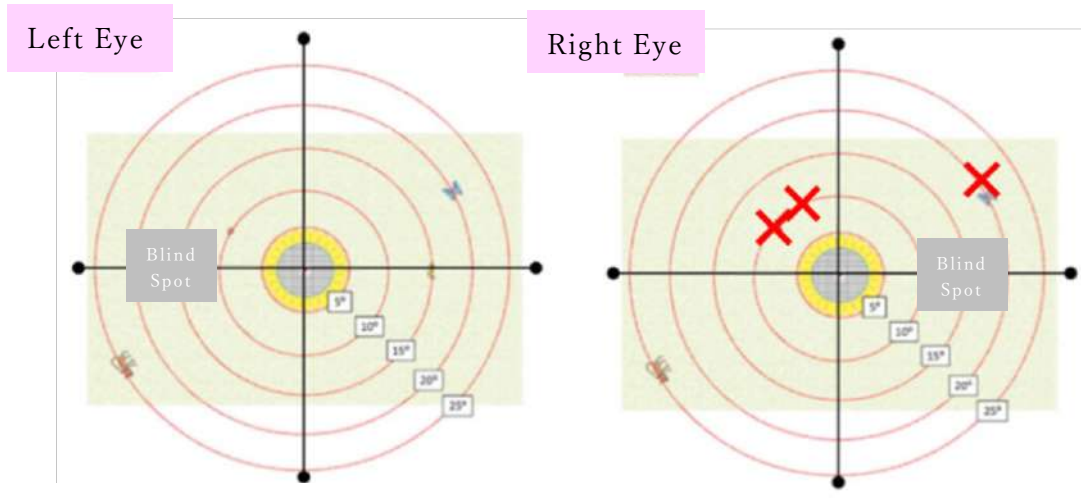
■Motor-vehicle operator

■Jack-in-the-box Phenomenon in the past five years: Yes

- There were times when a car or bicycle suddenly jumped out in front of you or disappeared right in front of you.
- There were times when a pedestrian suddenly jumped out in front of you or disappeared right in front of you.
- You may find yourself slowing down or speeding up before you know it compared to the flow of cars in the vicinity.
- You have been pointed out by a passenger, such as a family member, that you were driving dangerously.

■Traffic accident experience in the past five years: None

Clock Chart Result



Humphrey Automated Visual Field Test Result

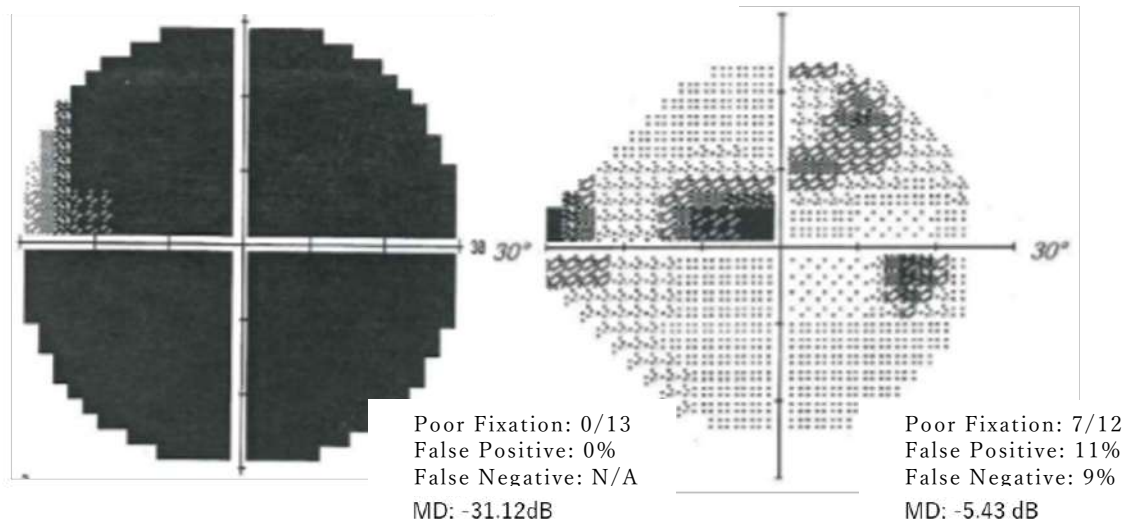
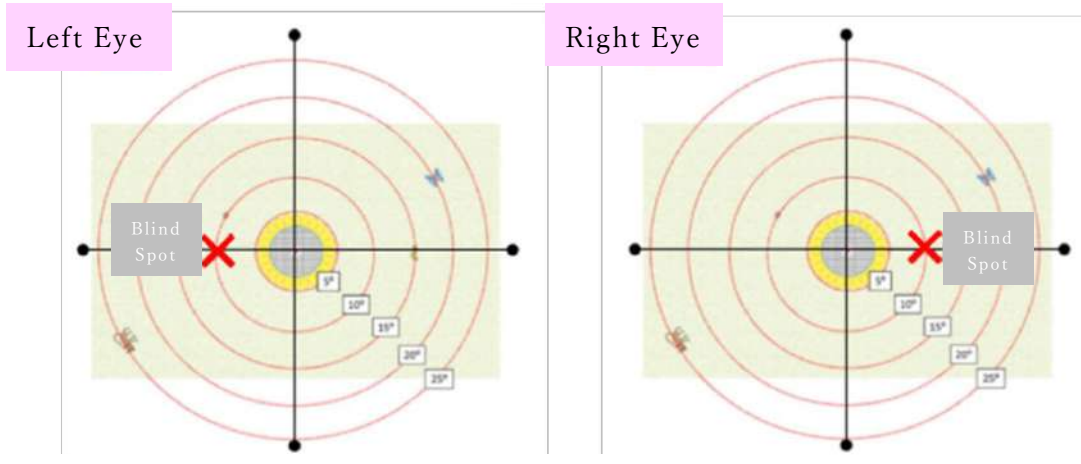


Figure 18: Results of Clock Chart and Humphrey Automated Visual Field Test for Case 10

Case 11

- 52-year-old male
- Motor-vehicle operator
- Jack-in-the-box Phenomenon in the past five years: None
- Traffic accident experience in the past five years: None

Clock Chart Result



Humphrey Automated Visual Field Test Result

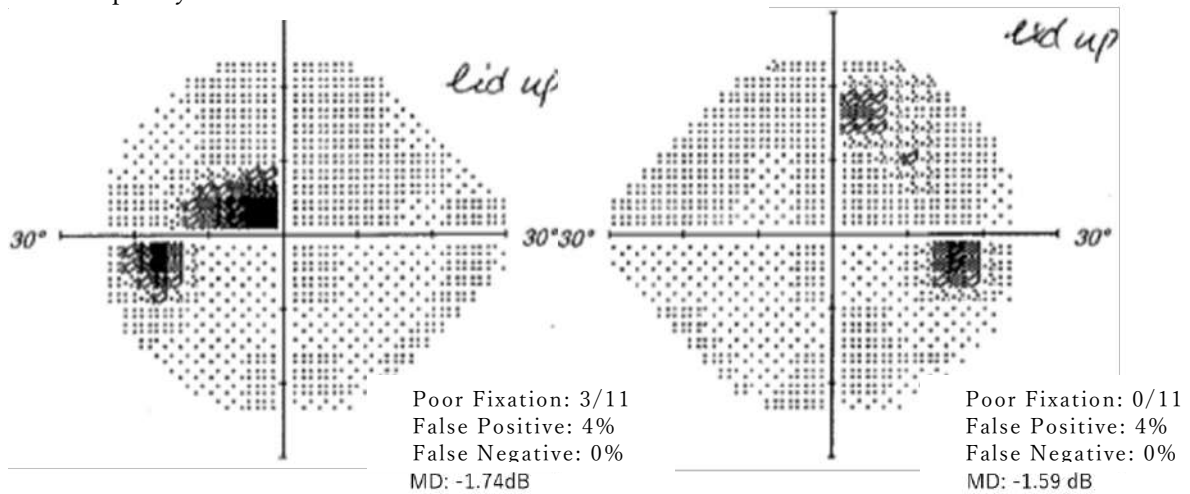
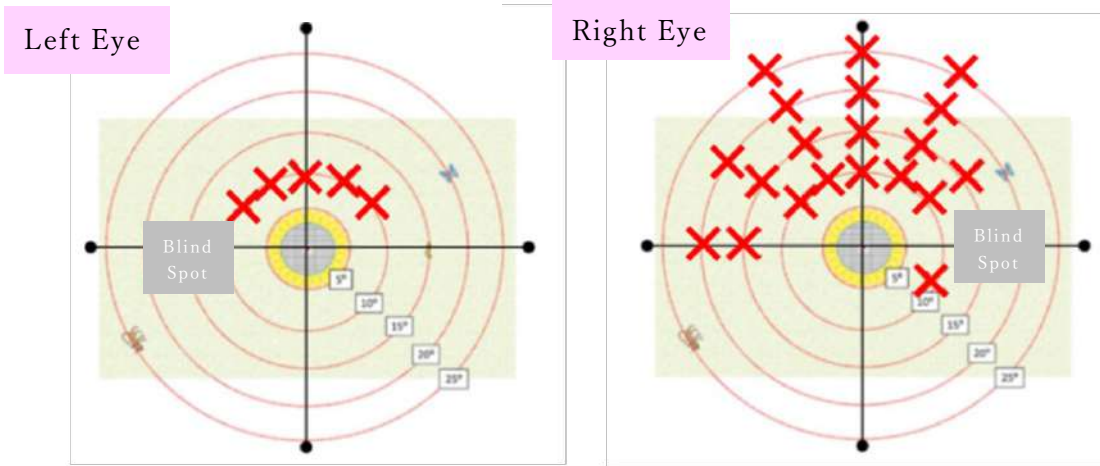


Figure 19: Results of Clock Chart and Humphrey Automated Visual Field Test for Case 11

Case 12

- 71-year-old female
- Motor-vehicle operator
- Jack-in-the-box Phenomenon in the past five years: None
- Traffic accident experience in the past five years: None

Clock Chart Result



Humphrey Automated Visual Field Test Result

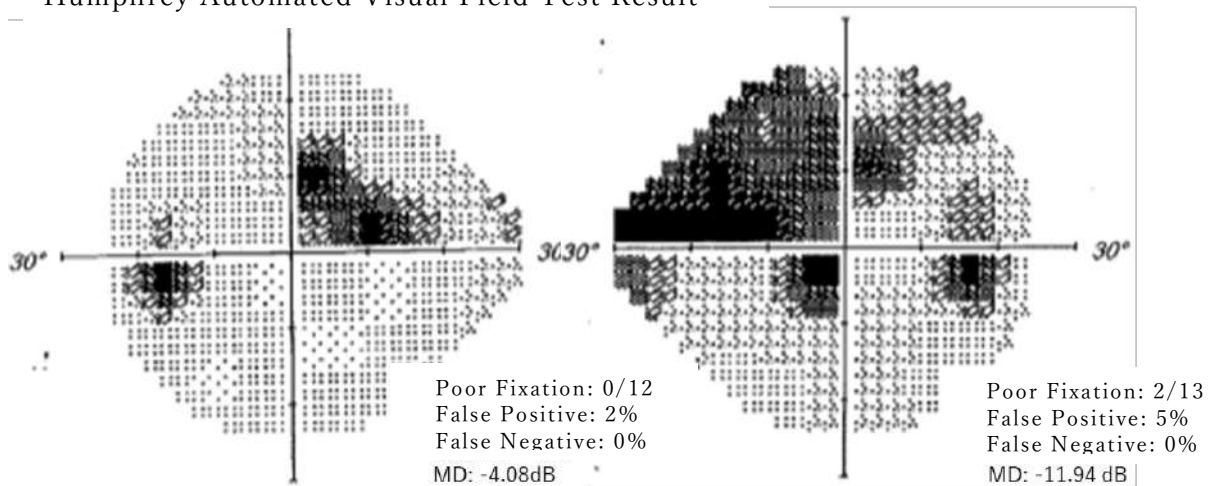


Figure 20: Results of Clock Chart and Humphrey Automated Visual Field Test for Case 12

Case 13

■78-year-old male

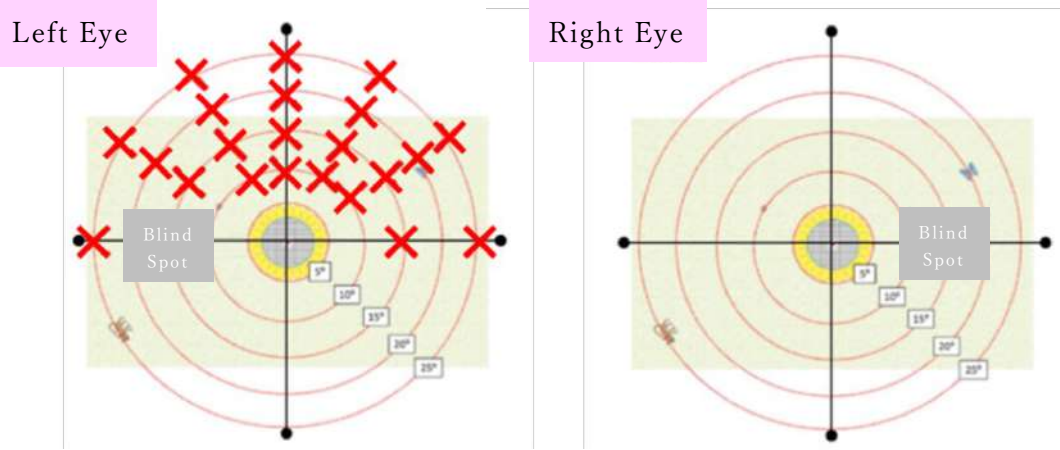
■Motor-vehicle operator

■Jack-in-the-box Phenomenon in the past five years: Yes

- You may find yourself slowing down or speeding up before you know it compared to the flow of cars in the vicinity.

■ Traffic accident experience in the past five years: None

Clock Chart Result



Humphrey Automated Visual Field Test Result

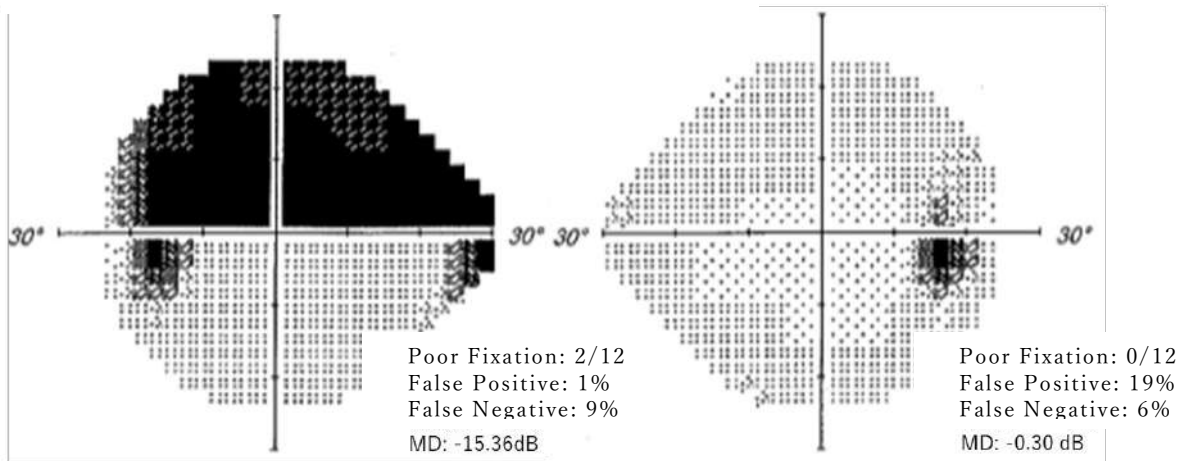


Figure 21: Results of Clock Chart and Humphrey Automated Visual Field Test for Case 13

Case 14

■68-year-old female

■Motor-vehicle operator

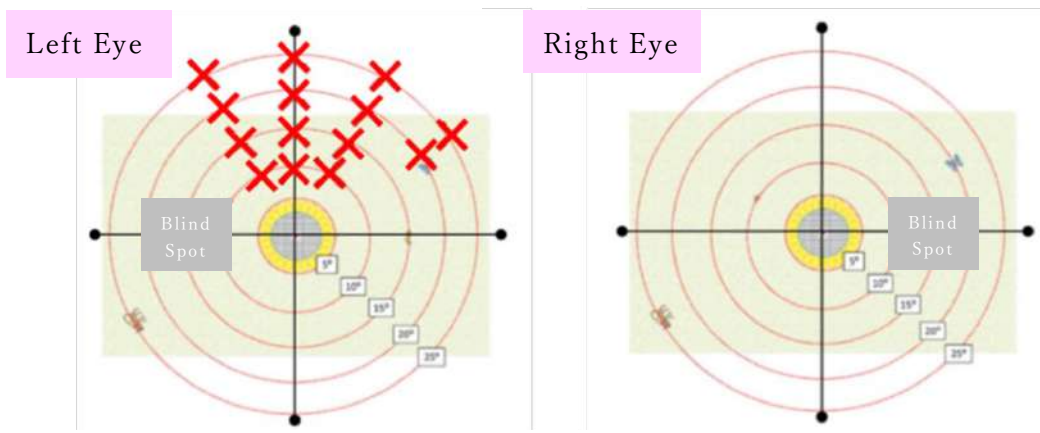
■Jack-in-the-box Phenomenon in the past five years: Yes

- Sometimes you get confused because you don't know where you are driving on the road.

■Traffic accident experience in the past five years: Yes

- Property damage (hit by another car or motorcycle) 2 times

Clock Chart Result



Humphrey Automated Visual Field Test Result

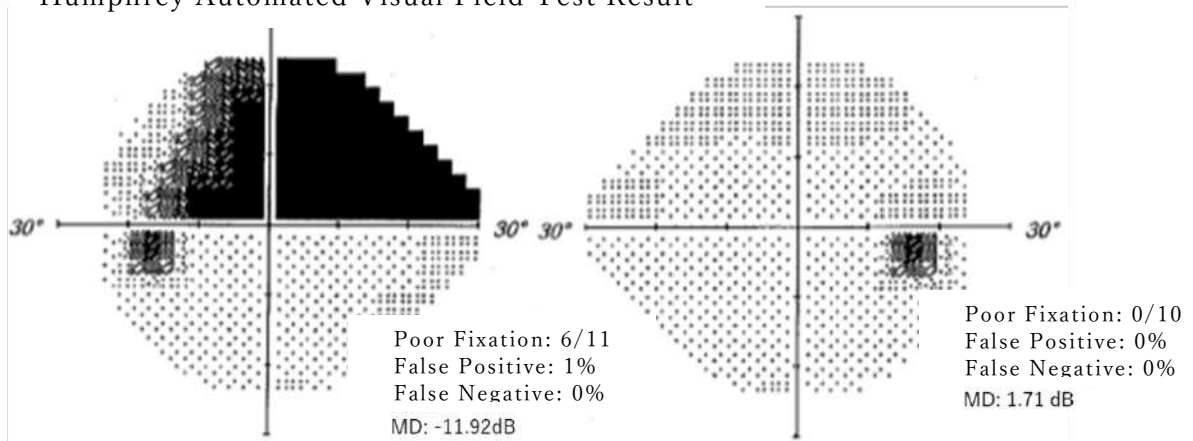


Figure 22: Results of Clock Chart and Humphrey Automated Visual Field Test for Case 14

4. Conclusion

This study conducted clock chart tests on 14 glaucoma patients and compared the results with those of the Humphrey automated visual field test. In almost all cases, the abnormalities found in the visual field by the clock chart and those by the Humphrey automated visual field test were generally consistent. In a previous study that validated the validity of the clock chart, the concordance rate when classified by the Allhom classification modified Greve method was 85% for stages 0 to 1 and 100% for stages 2 to 4, reporting high validity.²⁷⁾ Of the 11 patients in this study who answered that they drove a car or motorcycle, 6 had experienced the Jack-in-the-box Phenomenon in the past 5 years. Specifically, one respondent answered, “There was a time when a stop sign that should normally be there was missing. 2 respondents answered, “Suddenly, a car or bicycle jumped out in front of me, or disappeared from in front of me,” 1 respondent answered, “Suddenly, a pedestrian jumped out in front of me, or disappeared from in front of me,” and 1 respondent answered, “Sometimes, the speed of my car slows down or becomes faster than the flow of cars around me.” One respondent said, “Sometimes I feel confused because I don’t know where on the road I am driving.” One respondent answered, “A family member or other passenger has pointed out to me that I was driving dangerously.” Similarly, of the 11 patients who answered that they drove a car or motorcycle, 4 had experienced a traffic accident within the past 5 years. The patients with traffic accident experience had repeated accidents two or more times. Three out of four patients with traffic accident experience had experienced the Jack-in-the-box Phenomenon. These results suggest that the combination of screening for abnormal visual fields using a clock chart and the presence or absence of the Jack-in-the-box Phenomenon may be useful for the early detection of traffic accidents caused by abnormal visual fields.

Once abnormal visual fields caused by glaucoma, etc. have progressed, it is difficult to recover from them, so early detection and treatment are essential. However, since the abnormal visual field progresses one eye at a time, it is challenging to recognize abnormalities in the visual field of both eyes, making early detection difficult. Since the clock chart detects abnormal visual fields in one eye, it is possible to detect and treat them early. Even if abnormal fields of vision are found in both eyes, if it is only a mild case, the driver can continue to drive by paying attention to places that are easily overlooked while driving. Therefore, to prevent traffic accidents caused by

abnormal visual fields, it was considered important first to know the state of one's visual field.

In addition, in the course of examining the implementation method of the clock chart in this study, it became clear that there are individual differences in the way the Marriott blind spot appears in different subjects and that the accuracy of the test varies greatly depending on the instruction provided by the examiner. Therefore, it was considered necessary to standardize the implementation method of the clock chart in a manual, etc., as well as to calibrate the method through prior training, etc., if multiple examiners are to conduct it.

These results suggest that the clock chart may be helpful as a screening tool for abnormal visual fields. In addition, since many of those who had experienced traffic accidents also experienced the "Jack-in-the-box Phenomenon," it was considered necessary to increase the number of subjects and conduct further studies to clarify the relationship between these phenomena and traffic accidents in the future.

III. 《Research for FY2018》

Conducting Epidemiological Research Studies on Occupational Drivers

1. Background and Objectives

In fiscal year 2018, based on the pilot study results conducted in fiscal year 2017, a survey study using questionnaires and clock charts was conducted on approximately 2,000 occupational drivers. The purpose of this study was to clarify (1) the relationship between daytime sleepiness and traffic accidents, (2) the relationship between knowledge of hay fever medication and medication-taking behavior, and (3) the relationship between abnormal visual fields and traffic accidents.

2. Method

2-1. Target

This study was conducted from June to January FY 2018 on 1,921 employees of cab companies and 89 employees of tanker companies in the Tokyo metropolitan area. However, because the working conditions and traffic accident rates differ significantly between employees at cab companies and employees at tanker companies, only employees at cab companies, for whom we were able to secure a large number of subjects, were included in the analysis in this report. This study was conducted with the approval of a Medical Ethics Committee for Research at Juntendo University School of Medicine (approval number: Jun Dai I Rin No. 2018053).

2-2. Questionnaire

In addition to general items (age (years old), gender, height (cm), weight (kg), sleeping hours, and working hours), the questionnaire also assessed the following: daytime sleepiness, symptoms of hay fever, whether or not they were taking hay fever medication, whether or not they had knowledge of the side effects of the medication, whether or not they had stopped taking the medication, whether or not they were driving a car or motorcycle, whether or not they had experienced the Jack-in-the-box Phenomenon and the number of times they had been in a traffic accident. The same questionnaire items for the Jack-in-the-box Phenomenon and traffic accident experience were used as in the FY 2017 study. For the assessment of daytime sleepiness, the Japanese version of the Epworth Sleepiness Scale (JESS) was used, and a score of 11 or higher was defined as a person with excessive daytime sleepiness.²⁸⁾

The details of the questionnaire survey items are shown in Appendix 1.

2-3. Clock Chart

The clock chart test was conducted under the examiner's instruction in the same way as the survey method of the pilot study in FY 2017. Based on the survey conducted in FY 2017, a clock chart implementation manual (Appendix 2) was prepared to improve the accuracy of the test, and the test was conducted following the manual procedures. In addition, a clock chart recording sheet (Fig. 23) was used during the test, and detailed records were made of the presence or absence of abnormal visual fields.

2-4. Statistical Analysis

JESS's association between daytime sleepiness and traffic accident experience was analyzed using multivariate adjustment logistic regression analysis adjusted for gender and age. The association between knowledge of hay fever medication and medication-taking behavior was examined using the χ^2 test. Multivariate adjustment logistic regression analysis adjusted for gender and age was used to analyze the relationship between the Jack-in-the-box Phenomenon and the clock chart, the combination of the Jack-in-the-box Phenomenon and the clock chart, and the experience of traffic accidents. The statistical significance level was set at $p < 0.05$. SAS Ver9.4.(SAS Institute Inc., Cary, NC, USA) was used as the statistical software.

クロックチャート記録シート

事業所名		氏名		検査日	2018年 月 日				
<ul style="list-style-type: none"> ・開始時に必ず中心●を見つめた状態でイモムシが消える（マリオット盲点）ことを必ず確認してから行う。 ・各位置で中心の●を見つめた状態で生き物が見えていたら○、見えなければ×を記載する。 ・各生き物について行う際も、必ず最初にイモムシが消えている状態を確認し、盲点の欄に☑をする。 									
	右目					左目			
Aの位置	テントウムシ	イモムシ	チョウ	ネコ	Bの位置	テントウムシ	イモムシ	チョウ	ネコ
固視点①	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	固視点①	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
盲点	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	盲点	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12時					12時				
1時					1時				
2時					2時				
3時					3時				
固視点②	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	固視点②	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4時					4時				
5時					5時				
6時					6時				
固視点③	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	固視点③	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7時					7時				
8時					8時				
9時					9時				
固視点④	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	固視点④	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10時					10時				
11時					11時				
格子の ゆがみ	ある なし			格子の ゆがみ	ある なし				
花びらの 欠け	ある なし			花びらの 欠け	ある なし				
備考					備考				

Figure 23: Clock Chart Recording Sheet

3. Results

3-1. Characteristics of Target

Of the 1,921 cab company employees included in this study, 1,813 (94.5%) were male, and the mean age (standard deviation) was 50.7 years old (± 12.1 years). 757 (39.8%) were obese, 1,360 (71.5%) were habitual drinkers, and 752 (39.8%) were habitual smokers. The number of occupational drivers was 1,568 (81.6%), and 1,030 (55.4%) had been involved in a traffic accident within the past five years. Of the nine questions related to the Jack-in-the-box Phenomenon, 663 (36.2%) answered “Yes” to at least one question, and 303 (15.8%) had at least one abnormal visual field on either eye. (Table 4)

	Number of People	(%)
Total	1,921	(100)
Male	1,813	(94.5)
Obese (BMI 25 kg/m ² or more)	757	(39.8)
Habitual drinker	1,360	(71.5)
Habitual smoker	752	(39.8)
Glaucoma under treatment	16	(0.9)
People who snore	888	(46.6)
Those with excessive daytime sleepiness (JESS score of 11 or higher)	105	(5.6)
Occupational driver	1,568	(81.6)
Those who experienced a traffic accident in the past 5 years	1,030	(55.4)
Those who experienced one or more Jack-in-the-box Phenomenon.	663	(36.2)
Those who have one or more abnormal visual field findings by clock chart on either left or right eye.	303	(15.8)

Table 4: Characteristics of Target

3-2. Relationship between Daytime Sleepiness and Traffic Accidents

To examine the relationship between daytime sleepiness and traffic accidents, people without complete data on gender, age, previous traffic accidents, sleep duration, JESS scores, and non-occupational drivers were excluded from the analysis, and a total of 1,433 were subject to analysis. The gender-age adjusted odds ratio (95% confidence interval) of experiencing a traffic accident among those with excessive daytime sleepiness was 1.55 (0.92-2.61), and there was no significant increase in the odds ratio.

However, since the rate of those with excessive daytime sleepiness was as low as 5.6% in this study, we examined the relationship between the JESS scores in quartiles and the experience of traffic accidents. The results showed that the gender and age-adjusted odds ratios (95% confidence intervals) for having been in a traffic accident relative to the first quartile of JESS scores were 1.07 (0.80-1.42) for the second quartile, 1.44 (1.06-1.96) for the third quartile, and 1.59 (1.17-2.15) for the fourth quartile. As the JESS score increased, there was a significant increase in the odds ratio of having experienced a traffic accident (Fig. 24).

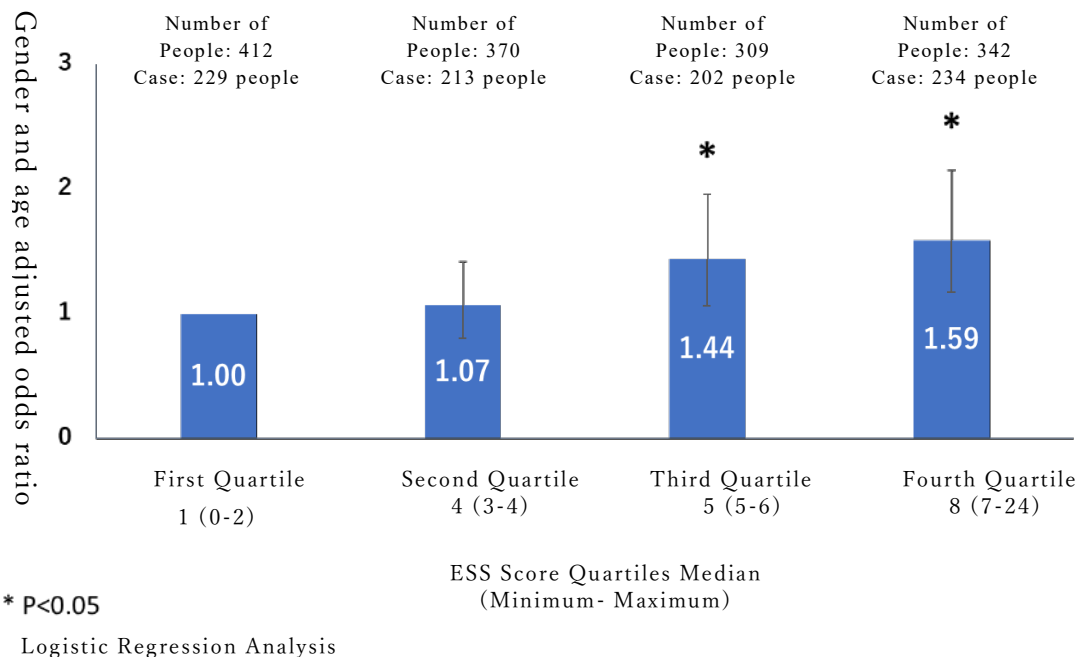


Figure 24: Relationship between Daytime Sleepiness and Traffic Accidents

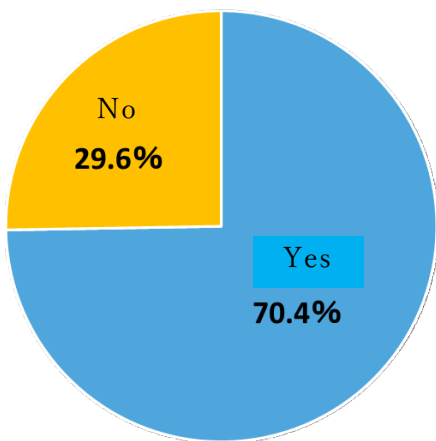
3-3. Relationship between Knowledge of Hay Fever Medication and Medication Behavior

To examine the relationship between knowledge of hay fever medication and medication taking behavior, people without complete data on gender, age, sleepiness caused by hay fever, information on hay fever medication, and knowledge of hay fever medication were excluded from the analysis, and a total of 1,694 were subject to analysis.

3-3-1. Presence or Absence of Knowledge of Hay Fever Medications

Regarding the knowledge of hay fever medicines, in response to the question “Do you know that hay fever and allergic rhinitis medicines can cause sleepiness as a side effect?” 1,193 respondents (70.4%) answered “Yes. Also, in response to the question, “Do you know that there are medicines for hay fever and allergic rhinitis that do not easily cause sleepiness as a side effect?” 850 respondents (50.2%) answered “Yes.” (Fig. 25).

Do you know that hay fever and allergic rhinitis medicines can cause sleepiness as a side effect?



Do you know that there are medicines for hay fever and allergic rhinitis that do not easily cause sleepiness as a

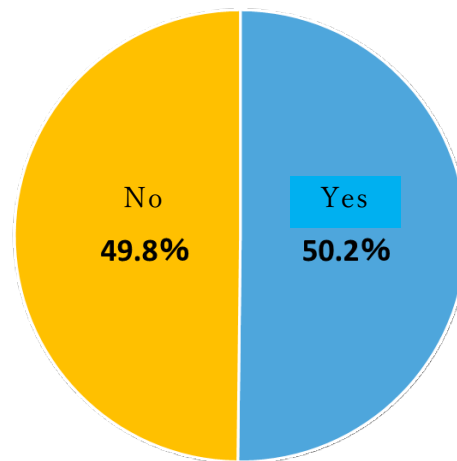


Figure 25: Presence or Absence of Knowledge of Hay Fever Medications

3-3-2. Relationship between Knowledge of Hay Fever Medication and Taking Medicine

In this study, 428 complainants who answered, “I sometimes have trouble with sleepiness or dullness when I have symptoms of seasonal hay fever or allergic rhinitis,” were surveyed about the relationship between their knowledge of drugs that

do not easily cause side effects of sleepiness and the rate of taking hay fever medication. The percentage of hay fever sufferers taking medication was 59.1% among those who answered: “yes” to the question “Do you know that there are medications for hay fever and allergic rhinitis that do not easily cause sleepiness as a side effect?”. In comparison, that of those who answered “no” was 39.4%, significantly lower than that of those who answered “yes” ($P < 0.01$) (Fig. 26).

People with sleepiness due to hay fever: 428 people

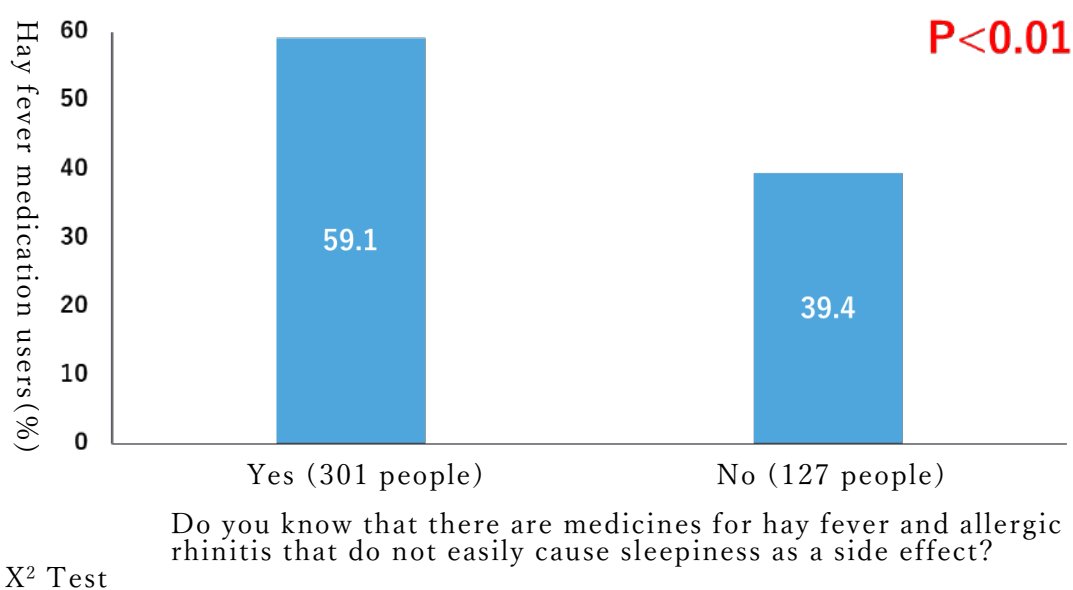


Figure 26: Relationship between Knowledge of Hay Fever Medication and Taking Medicine

3-3-3. Relationship between Knowledge of Hay Fever Medication and Those Who Stopped Taking Medication

In this study, 364 respondents taking hay fever medication were examined for the relationship between their knowledge of drugs that do not easily cause sleepiness as a side effect and those who stopped taking it. Respondents who had taken hay fever medication and had stopped taking their medication due to “sleepiness that interferes with work” were asked, “Do you know that there are medications for hay fever and allergic rhinitis that do not easily cause sleepiness as a side effect?” 15.9% of the respondents answered “yes” while 25.7% of the respondents answered “no.” The percentage of discontinuers was significantly higher in the group with no medication knowledge. ($P = 0.04$) (Fig. 27)

People taking hay fever medication: 364 people

花粉症治療薬服薬者: 364名

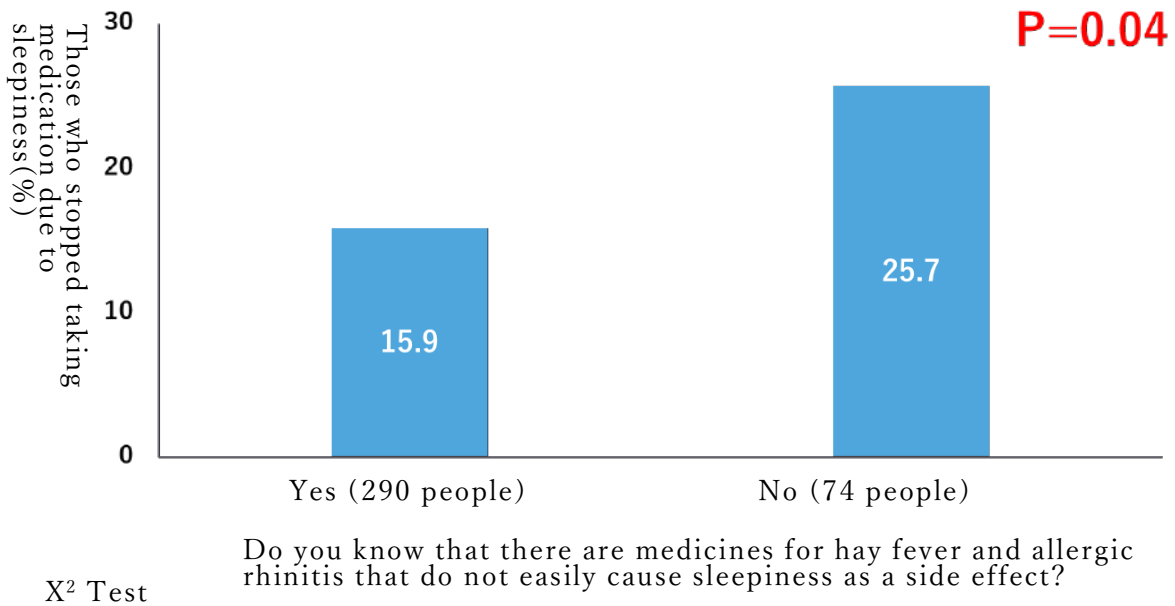


Figure 27: Relationship between Knowledge of Hay Fever Medication and Those Who Stopped Taking Medication

3-4. Relationship between Abnormal Visual Fields and Traffic Accidents

To analyze the relationship between abnormal visual fields and traffic accidents, people without complete data on gender, age, experience of traffic accidents, Jack-in-the-box Phenomenon, and non-occupational drivers were excluded from the analysis, and a total 1,475 were subject to analysis.

3-4-1. Relationship between the Jack-in-the-box Phenomenon and Traffic Accidents

The number of respondents who answered “Yes” to the questions about the “Jack-in-the-box Phenomenon” within the past five years was divided into three groups: those who answered zero yes, those who answered one or two yes, and those who answered three or more yes. The relationship between the number of responses and the experience of traffic accidents was examined using gender and age-adjusted logistic regression analysis. As a result, the gender and age-adjusted odds rate (95% confidence interval) for traffic accident experience in the group with one or two Jack-in-the-box Phenomenon and the group with three or more Jack-in-the-box Phenomenon was 1.61 (1.26-2.06) and 2.25 (1.53-3.30), respectively, compared to the group with zero Jack-in-the-box Phenomenon. A significant increase in the odds rate for traffic

accident experience was observed as the number of Jack-in-the-box Phenomenon increased (Fig. 28).

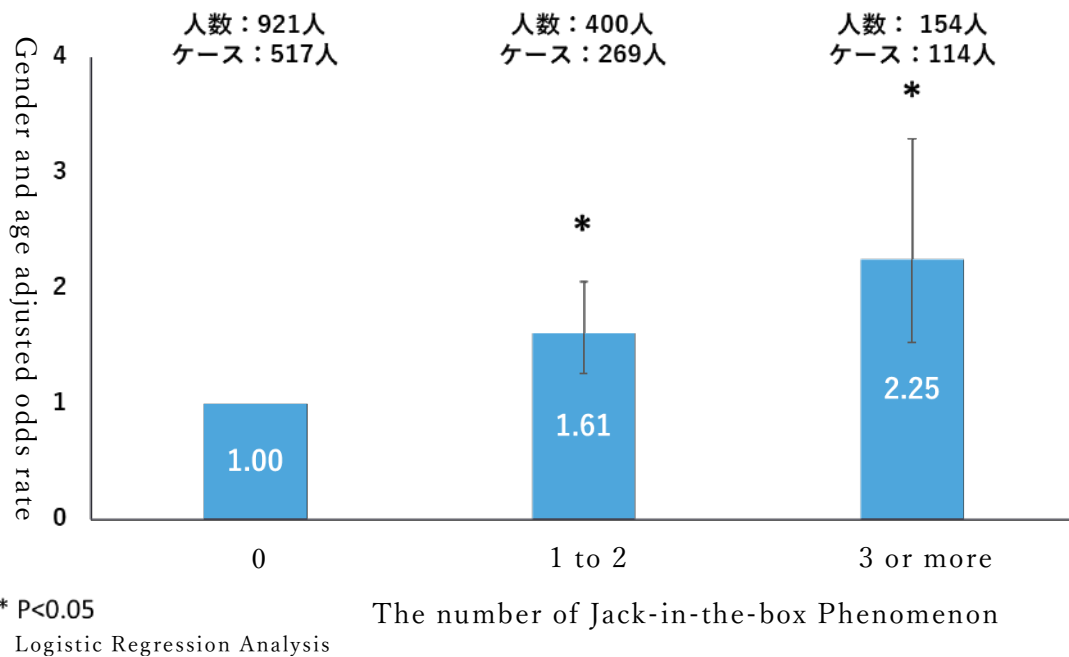


Figure 28: Relationship between the Jack-in-the box Phenomenon and Traffic Accidents

3-4-2. Relationship between Clock Chart and Traffic Accidents

A clock chart was used to classify the presence or absence of at least one abnormal visual field in either the left or right visual field, and gender- and age-adjusted logistic regression analysis was used to examine the association with traffic accident experience. The results showed that the gender-age adjusted odds ratio (95% confidence interval) of experiencing a traffic accident in those with abnormal visual fields compared to those without abnormal visual fields was 1.07 (0.8-1.42), and there was no significant association between abnormal visual fields measured by the clock chart and traffic accidents (Fig. 29).

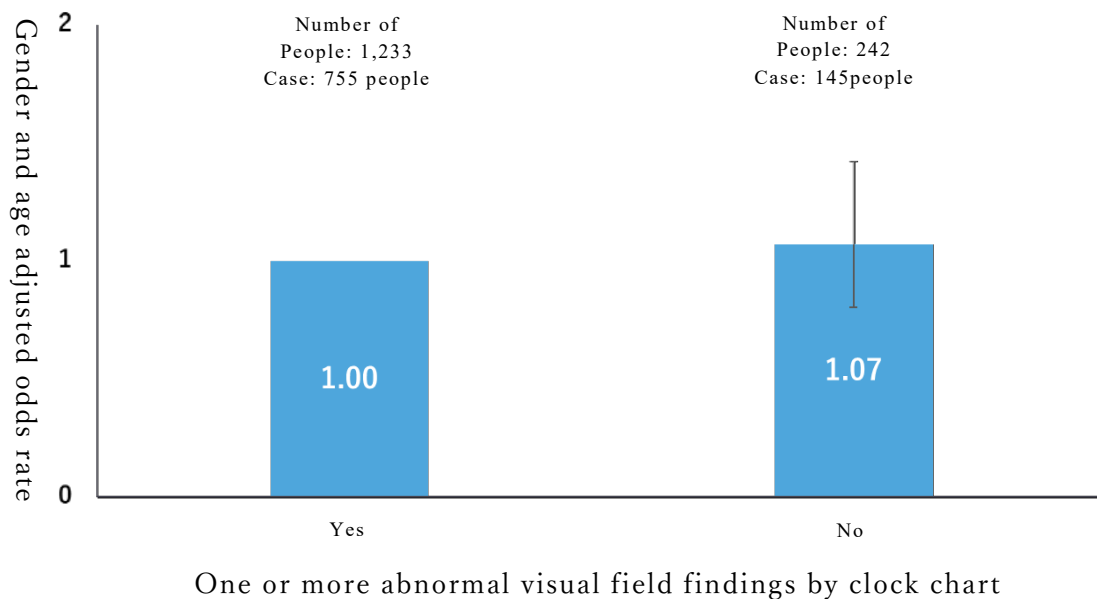


Figure 29: Clock Chart and Traffic Accidents

3-4-3. Combination of Jack-in-the-box Phenomenon and Clock Chart and its Relation to Traffic Accidents

Those who answered “Yes” to at least one question about the Jack-in-the-box Phenomenon within the past five years were defined as having the “Jack-in-the-box Phenomenon, and those who showed at least one abnormal visual field in either the left or right visual field measured by the clock chart were defined as having abnormal visual field. The relationship between the combination of these factors and the experience of traffic accidents was examined using gender and age-adjusted logistic regression analysis. The results showed that the gender and age-adjusted odds ratios (95% confidence intervals) of having been in a traffic accident in the group with only the Jack-in-the-box Phenomenon, the group with only abnormal visual fields, and the group with both the Jack-in-the-Box Phenomenon and abnormal visual fields were 1.72 (1.35-2.21), 1.00 (0.69-1.44), and 1.88 (1.20-2.95), compared to the group with neither the Jack-in-the-Box Phenomenon nor abnormal visual fields. There was a significant increase in the odds ratio of having been in a traffic accident when there was only the Jack-in-the-box Phenomenon or both the Jack-in-the-box Phenomenon and abnormal visual field. (Fig. 30)

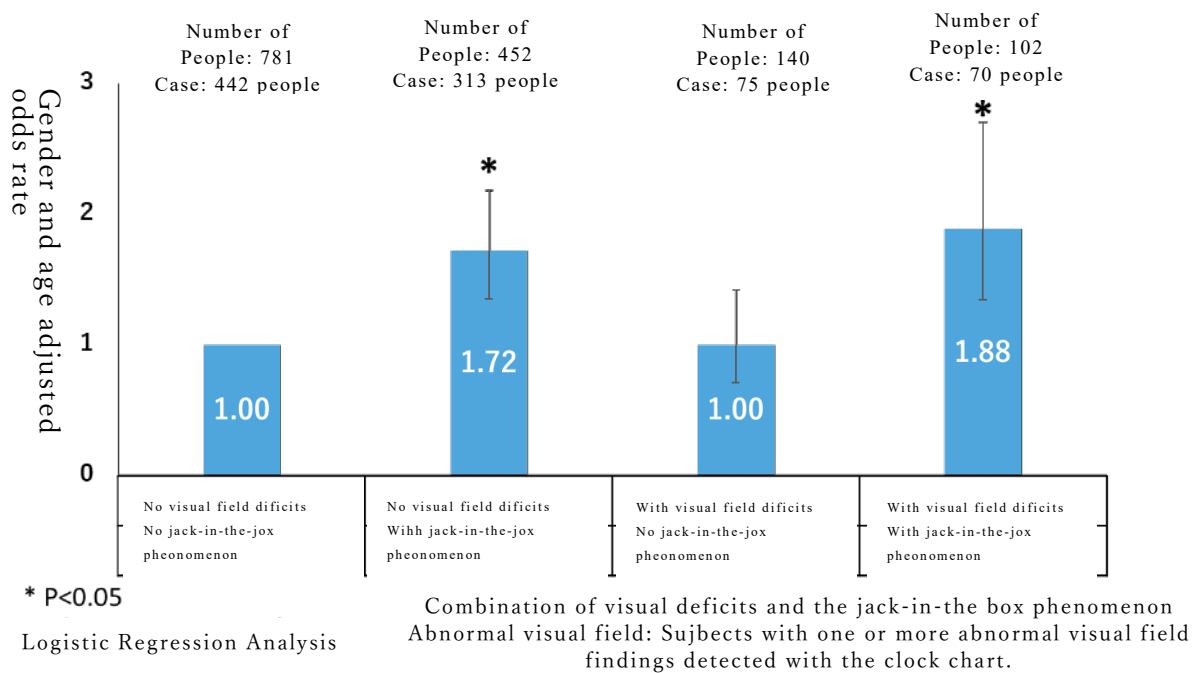
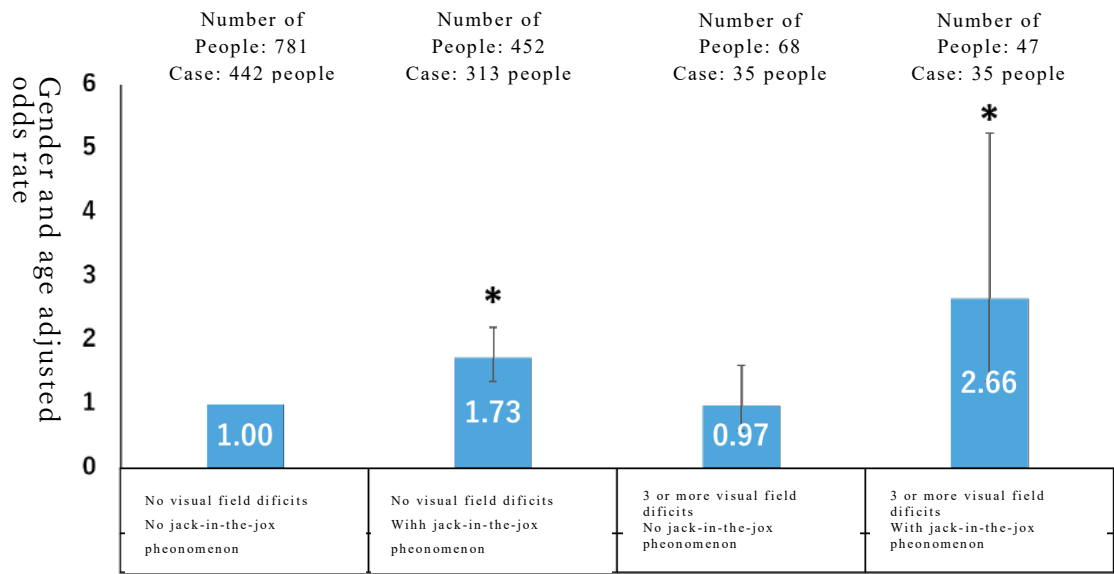


Figure 30: Combination of One or More Visual Field Deficit Findings detected with Clock Chart and the Jack-in-the-box Phenomenon and Its Association with Traffic Accidents

In addition, those who answered “yes” to at least one of the questions regarding the Jack-in-the-box Phenomenon within the past five years were defined as having a Jack-in-the-box Phenomenon, and those who showed three or more abnormal visual fields in either the left or right visual field on the clock chart were defined as having abnormal visual fields. The relationship between the combination of these factors and the experience of traffic accidents was examined using gender and age-adjusted logistic regression analysis (those with one or two abnormal visual field findings on the clock chart were excluded). The results showed that the gender and age-adjusted odds ratios (95% confidence intervals) of having been in a traffic accident in the group with only the Jack-in-the-box Phenomenon, the group with only abnormal visual fields, and the group with both the Jack-in-the-box Phenomenon and abnormal visual fields were 1.73 (1.35-2.21), 0.97 (0.58-1.61), and 2.66 (1.35-5.25), respectively, compared to the group with neither the Jack-in-the-box Phenomenon nor abnormal visual fields. There was a significant increase in the odds ratio of having been in a traffic accident when there was a Jack-in-the-box Phenomenon alone or when there was both a Jack-in-the-box Phenomenon and an abnormal visual field, and the risk increased more when there was an abnormal visual field than when there was a Jack-in-the-box Phenomenon alone (Fig. 31).



* P<0.05

Combination of 3 or more visual deficits and the jack-in-the box pheonomenondetected with the clock chart.

Logistic Regression Analysis

*Subjects with one or two abnormal visual field findings detected with the clock chart were excluded.

Figure 31: Combination of Three or More Abnormal Visual Field Findings detected with Clock Chart and Jack-in-the-box Phenomenon and Its Association with Traffic Accidents

4. Conclusion

4-1. Relationship between Daytime Sleepiness and Traffic Accidents

Daytime sleepiness is one of the major risk factors for traffic accidents, and the percentage of accidents caused by driver sleepiness is said to account for 10-30% of all accidents.²⁹⁻³¹⁾ In the report by Sakurai et al., ESS scores were higher in those who had a history of serious accidents than in those who had not, among those who had visited a sleep medicine specialist with a principal complaint of sleep apnea.³²⁾ In addition, the study reported that the ratio of serious accidents was 11.4 times higher in the obese, severe SAS, and severe daytime sleepiness groups than in the group without these factors.³²⁾ In this study, the association between daytime sleepiness assessed by the JESS and experience of traffic accidents was examined. In the association between JESS score quartiles and experience of traffic accidents, a significant increase in the odds ratio of traffic accident experience was observed in the third quartile and above, where the median (minimum-maximum) score was 5 (5-6) points. In the target group of this study, the mean score (standard deviation) of the JESS was 4.7 (\pm 3.4) points, and the percentage of those with excessive daytime sleepiness was 5.6%. In the previous study that examined the prevalence of excessive daytime sleepiness in Japanese community residents, the percentage of men in their 20s to 60s who had excessive daytime sleepiness was reported to be 9.1%,³³⁾ suggesting that the prevalence in this study group is relatively low. One possible reason for this was that the JESS and other questionnaires were not anonymized in this study and thus may have been underestimated due to reporting bias. These results suggest that JESS assessment may be helpful for traffic accident prevention. On the other hand, it is necessary to carefully consider the cutoff of JESS when conducting JESS assessment in a non-anonymous manner at transportation companies, as in this study.

4-2. Relationship between Knowledge of Hay Fever Medication and Medication Taking Behavior

In this study, the relationship between knowledge of hay fever medication and medication-taking behavior was examined. The results showed that among those who complained of sleepiness and dullness due to hay fever, the percentage of taking medication was significantly lower among those who did not know about hay fever medication, which does not easily cause sleepiness, and the percentage of discontinuing medication was significantly higher among those who did not have knowledge of the medication. Also, the high percentage of those who did not know

about drugs that were particularly difficult to cause sleepiness suggests that the amount of information about non-sedating drugs is not sufficient for those working in transportation companies, and their impressions of the side effects of therapeutic drugs may precede them, leading to lost opportunities for drug selection and decreased adherence to medication. Since hay fever has a high prevalence among working-age people, and the decline in QOL during the daytime affects work productivity, it was considered necessary to provide appropriate treatment for symptom relief when hay fever symptoms are present and promote appropriate medication behavior for this purpose. It was considered necessary to promote and raise awareness of appropriate medication knowledge, especially for occupational drivers, because discontinuation of medication without choosing appropriate treatment may affect driving without reducing symptoms.

4-3. Relationship between Abnormal Visual Fields and Traffic Accidents

In an aging society, abnormal visual fields are a risk factor for traffic accidents. Previous studies have shown that glaucoma patients have a higher risk of traffic accidents.¹⁴⁻¹⁶⁾ Therefore, early detection of abnormal visual fields is important in preventing traffic accidents. In this study, the relationship between the Jack-in-the-box Phenomenon and traffic accident experience was examined, and the percentage of those who had experienced traffic accidents was significantly higher among those who had experienced the Jack-in-the-box Phenomenon more frequently. This suggests that the evaluation of the Jack-in-the-box Phenomenon may be a useful tool for traffic accident countermeasures in the transportation industry. On the other hand, there was no significant association between abnormal visual fields detected with clock charts and experience of traffic accidents in this study. The possibility that the abnormal visual fields assessed by the clock chart are overestimated is a possible reason for this. Specifically, this clock chart test took about 10 minutes. The subject complained that it was difficult to maintain posture and eye opening. The eyelids drooped due to fatigue, which may have led to overestimating the upper abnormal field of vision. 15.8% of the subjects in this study had abnormal visual fields detected with the clock chart. However, the prevalence of glaucoma, the leading cause of abnormal visual fields, was reported to be about 5% in people over 40 years old in a previous study.¹¹⁾ Therefore, it is possible that many false-positive subjects were included in the evaluation of abnormal visual fields with the clock chart. In this study, however, the combination of the presence or absence of the Jack-in-the-box Phenomenon and the presence or absence of abnormal visual field detected with the clock chart was

examined. The percentage of subjects with the Jack-in-the-Box Phenomenon and at least one abnormal visual field detected with the clock chart was 6.9%, similar to the prevalence of glaucoma. As a result of examining the relationship between the combination of these factors and the experience of traffic accidents, a significant increase in the risk of experiencing traffic accidents was observed in those who had experienced Jack-in-the-box Phenomenon and traffic accidents. These results indicate that the combination of the Jack-in-the-box Phenomenon and the clock chart test may be useful as a preventive measure against traffic accidents caused by abnormal visual fields. In particular, the clock chart test can detect abnormal visual field in one eye at an early stage, before the abnormal visual field in both eyes occurs, making it possible to start treatment before the abnormal visual field progresses. Even if an abnormal visual field is found in both eyes, if the abnormality is mild, it is possible to prevent traffic accidents by giving instructions such as, “You may miss a traffic light or a stop sign. Be careful on the roads you often take and avoid going on unfamiliar roads if possible.” In order to prevent traffic accidents caused by abnormal visual fields, it is first and foremost essential to be aware of one’s visual field abnormalities.

IV. 《Research for FY2019》

Conducting Follow-up surveys for those with Findings on Clock Chart

1. Background and Objectives

In the survey on health-related accidents conducted in FY 2018 on approximately 2,000 occupational drivers, the test results were reported to those with findings on the clock chart, a simple screening system for abnormal visual fields and recommendations were made to them to visit an ophthalmologist (see Appendix 3). In FY2019, research was conducted to investigate the status of visits to ophthalmologists by subjects with clock chart findings and examine the usefulness of screening for abnormal visual fields using clock charts.

2. Method

In this study, of the 1,921 employees of cab companies and 89 employees of tanker companies who were surveyed on health-related accidents in FY2018, 326 employees who were employed by those companies at the time of the survey in FY2019 and who had abnormal visual fields detected by the clock chart test were surveyed. In the survey items of the Medical Checkup Status Survey Form, it was confirmed whether or not the subjects had received ophthalmological checkups when they had received checkups, the name of the diagnosis, the reason for not receiving checkups, and the intention of those who had not received checkups to receive checkups in the future (see Appendix 4 for details).

This survey started in July of 2019, and a reminder of the survey was sent out in September. In November, a promotional flyer (see Appendix 5) was distributed to those who had abnormal visual fields and the Jack-in-the-box Phenomenon to remind them further to seek medical attention. From December, individual interviews were held at each office for those who had not responded to the medical checkup survey form, and the survey was finally conducted up to February 2020. This study was conducted with the approval of a Medical Ethics Committee for Research at Juntendo University School of Medicine (approval number: Jun Dai I Rin No. 2019059).

3. Results

Of the 326 subjects of this survey, questionnaires were collected from 216 people (66.3%). Of these, 71 (32.9% of the questionnaire respondents) had visited the ophthalmologist, and of these, 14 (19.7% of visitors to the ophthalmologist) had been diagnosed with glaucoma. (Fig. 32)

On the other hand, 91 people (27.9%) did not respond to this survey, and 19 people (5.8%) dropped out of the follow-up survey due to retirement or other reasons during the survey period.

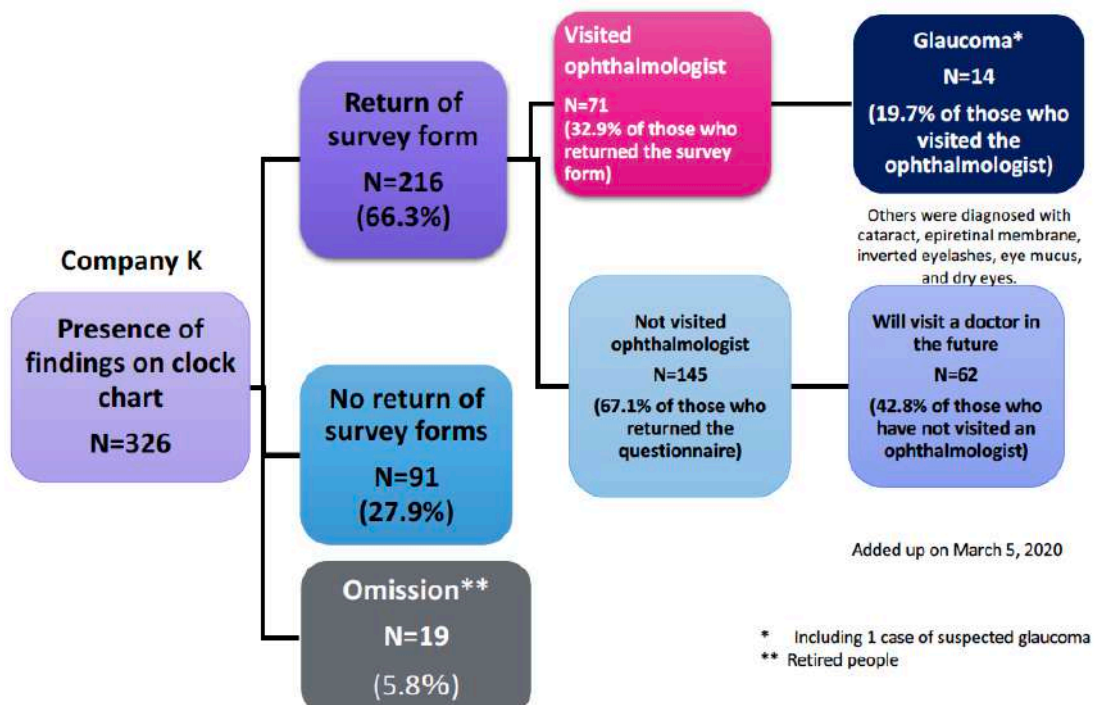


Figure 32: A Breakdown of Follow-up Survey Questionnaire Replies and Responses

When those who returned the questionnaire in this survey but did not visit the ophthalmologist (145 people) were asked the reason, the most common answer was “Too much trouble” (52 people), followed by “No time” (50 people) and “Others” (49 people). (Fig. 33) Other free comments included “I didn’t understand the explanation at the time of the clock chart test,” “I have doubts about the method and results of the clock chart test,” “I didn’t think my condition was bad enough to see a doctor/ I do not see the need based on the results of the test,” “I am not aware of it/ I don’t feel any abnormality in my vision,” “I don’t consider it to be subject to treatment/ I didn’t know about it,” and “I think I have another disease, not glaucoma.”

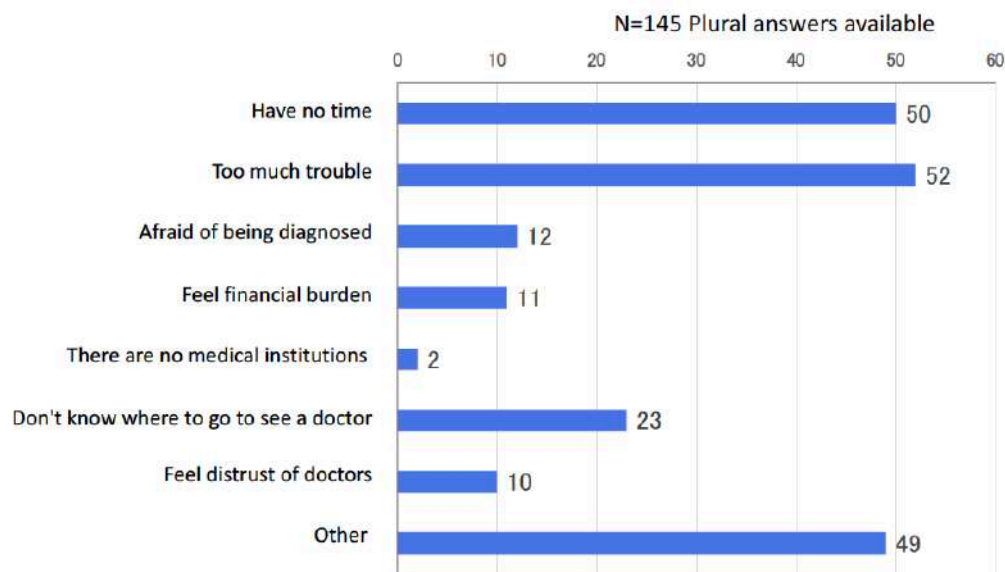


Figure 33: Reasons for not receiving medical examination

4. Conclusion

In this study, 326 of the 2,010 employees of the transportation companies surveyed in FY 2018 were found to have abnormal visual fields detected by the clock chart test. Of these, 14 out of 71 (19.7%) who visited the ophthalmologist were actually diagnosed with glaucoma. Therefore, it could be estimated that if all of the 326 subjects with abnormal visual fields detected using the clock chart were to visit the ophthalmologist, the number of those who would be diagnosed with glaucoma would be approximately 64. In addition, it could be estimated that about 3% of the 2,010 employees of the transportation companies targeted in this study were potential glaucoma patients. The prevalence of glaucoma in Japan is reported to be 5% in people over 40 years of age,¹¹⁾. The results of this study approximated the prevalence of previous studies, indicating the possibility that a screening test for glaucoma uses a screening test using a clock chart for occupational drivers may be helpful.

One of the subjects who visited an ophthalmologist as a result of this study and was diagnosed with glaucoma said, “Although it was a simple test, I had signs of glaucoma and decided to visit an ophthalmologist. I am glad that I was able to be detected at an early stage,” and “I would like this test to be included in the annual health checkup because it does not take much time. The significance of this study was considered to be great in that it provided an opportunity for early detection and treatment of glaucoma, which is a disease that is difficult to be aware of. However, only about 20%

of those with clock chart findings actually visited ophthalmologists in this survey, and even among those who responded to the medical checkup status questionnaire, about 60% did not visit ophthalmologists due to reasons such as “lack of time” or “too much trouble. Since there are few subjective symptoms of abnormal visual fields caused by glaucoma, it is difficult for individuals to recognize the disease's effects. Since the impact on driving is not sufficiently known, it may be difficult for them to seek medical attention. In the future, promoting awareness of the effects of glaucoma on traffic accidents and preventive measures, especially at transportation companies, was considered necessary.

V. 《Implementation in FY2019》

Raising Awareness of the Prevention of Health-related Accidents by Holding Symposiums and Lectures

1. Holding Symposiums

In FY2019, a traffic safety symposium (Appendix 6) and a special lecture (Appendix 7) were held to spread awareness of the prevention of health-related accidents, based on the knowledge obtained in this research project so far. The details of each activity are outlined below.

1-1. Traffic Safety Symposium

- Theme: “Prevention and Countermeasures for Health-related Accidents
- Time and Date: 2 p.m. to 4:40 p.m. on Tuesday, December 10, 2019
- Place: Ehime Prefectural Medical Practitioners Hall, 4F Conference Room 1
- Number of Participants: 81
- Contents of the symposium

Speaker (Affiliation): Takeshi Tanigawa (Professor, Course of Public Health, Juntendo University Graduate School of Medicine)

Topic: Sleep Apnea and Health-Related Accidents

Main Content:

Sleep apnea and health-caused accidents: Sleep apnea is a risk factor for traffic accidents, and the risk is even higher if untreated. However, since sleep apnea is not subjective, the importance of screening with objective indicators was pointed out.

Speaker (Affiliation): Shiho Kunimatsu (Vice President of Inoue Eye Hospital in Nishikasai)

Topic: Narrowed Visual Field and Health-related Accidents

Main Content:

The current status of abnormal visual fields and health-related accidents in Japan: While the prevalence of glaucoma, which causes abnormal visual fields, is high, many patients are unaware and untreated due to lack of subjective symptoms. Therefore, it was pointed out that early detection and treatment are important. In addition, cases and judicial precedents of traffic accidents caused by abnormal visual fields were introduced, and the first outpatient driving clinic in Japan was also introduced.

Speaker (Affiliation) : Kazuko Okamura (Director, Research Office, National Research Institute of Police Science)

Topic: Health factors inferred from traffic autopsy cases

Main Content:

The results of autopsies on traffic accident fatalities in Chiba Prefecture were reported. The report showed a high percentage of pedestrians and bicyclists involved in traffic accidents, a high percentage of victims living alone or with lifestyle-related diseases or mental illness, and a high percentage of offenders using alcohol or drugs.

Speaker (Affiliation) : Migiwa Asano (Professor, Department of Forensic Medicine, Ehime University Graduate School of Medicine)

Topic: Health-related Accidents from the Perspective of Forensic Medicine

Main Content:

The causes of sudden death while driving in Japan were reported. In addition, actual cases that were determined by autopsy to be deaths due to illness or accidents were reported. Also, examples of the use of forensic medicine for traffic accident countermeasures were reported.

Speaker (Affiliation) : Katsutoshi Ishida (Manager, Safety Policy Division, Automobile Bureau, Ministry of Land, Infrastructure, Transport, and Tourism)

Topic: Prevention of Health-Related Accidents

Main Content:

A report was given on the outline of measures to prevent health-related accidents in Japan. It was reported that while the overall number of traffic accidents has been decreasing in recent years, the number of health-related accidents continues to increase due to the increase in the number of elderly drivers. In addition, a report was made on the efforts of the Ministry of Land, Infrastructure, Transport, and Tourism to develop a health management manual for drivers of commercial vehicles and on the status of screening for sleep apnea and brain diseases.



From left, Mr. Ishida, Dr. Kunimatsu, Dr. Tanigawa, Dr. Asano, Ms. Okamura

1-2. Special Lecture

• Topic: “Prevention of and Countermeasures for Health-Related Accidents -Abnormal Visual Field and Traffic Accidents-”

• Time and Date: 6 p.m. to 8:05 p.m. on Wednesday, February 19, 2020

• Place: Juntendo University, Century Tower 8F, Large Classroom

• Number of Participants: 74

• Content of the Lecture

Speaker (Affiliation): Kiyohide Tomooka (Associate Professor, Course of Public Health, Juntendo University School of Medicine)

Topic: Visual Field Defect and Daytime Sleepiness on Motor Vehicle Crashes

Main Content:

Findings from this research project suggested that having both abnormal visual fields and daytime sleepiness significantly increased the risk of traffic accidents compared to those who did not have them.

Speaker (Affiliation): Shiho Kunimatsu (Vice President of Inoue Eye Hospital in Nishikasai)

Topic: Narrowed Visual Field and Health-related Accidents

Main Content:

Concerning the relationship between narrowed visual field and health-caused accidents, cases of driving performance of glaucoma patients using a driving simulator in Japan’s first outpatient driving clinic were reported.

Speaker (Affiliation): David Crabb (Professor, Statistics and Vision Research, City, University of London)

Topic: Glaucoma and age-related macular degeneration —through the eyes and steering wheel of the patient—

Main Content

A study on the relationship between abnormal visual fields caused by glaucoma or age-related macular degeneration and driving performance was reported. Since glaucoma patients are considered to be affected by abnormal visual fields in various aspects of their daily lives, quantitative performance measurements were taken for various daily tasks such as driving a car. It was reported that abnormal visual fields affect their performance and that the location of the abnormal visual field has a specific impact on driving performance. Since the population of patients with abnormal visual fields is expected to increase in an aging society, the importance of developing new technologies such as autopilot was pointed out.



2. Results of Promotion Activities-Results of the Symposium

Questionnaire-

2-1. Traffic Safety Symposium

A questionnaire survey was conducted among the participants of this symposium, and 62 people responded. In response to the question, “Before participating in this symposium, did you know that sleep apnea can cause traffic accidents?”, 69% of the respondents answered, “I knew a lot about it.” or “I knew a little about it” (Fig. 34).

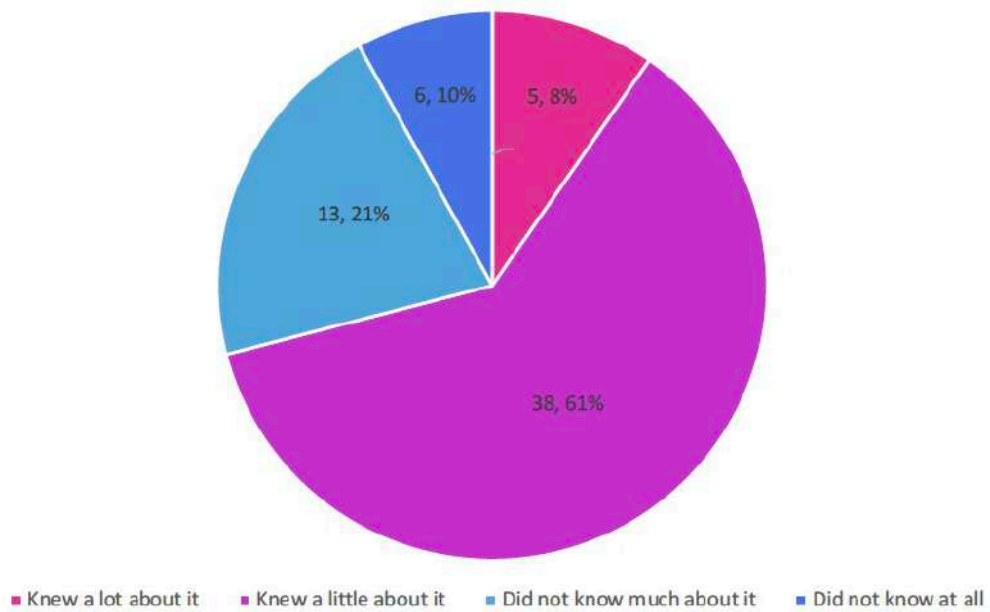


Figure 34: Before participating in this symposium, did you know that sleep apnea can cause traffic accidents?

In addition, the percentage of respondents who answered “very necessary” and “somewhat necessary” to the question, “Do you think that the screening tests for sleep apnea are necessary to prevent traffic accidents?” was 69% before the symposium and 95% after the symposium, showing a significant increase. (Fig. 35)

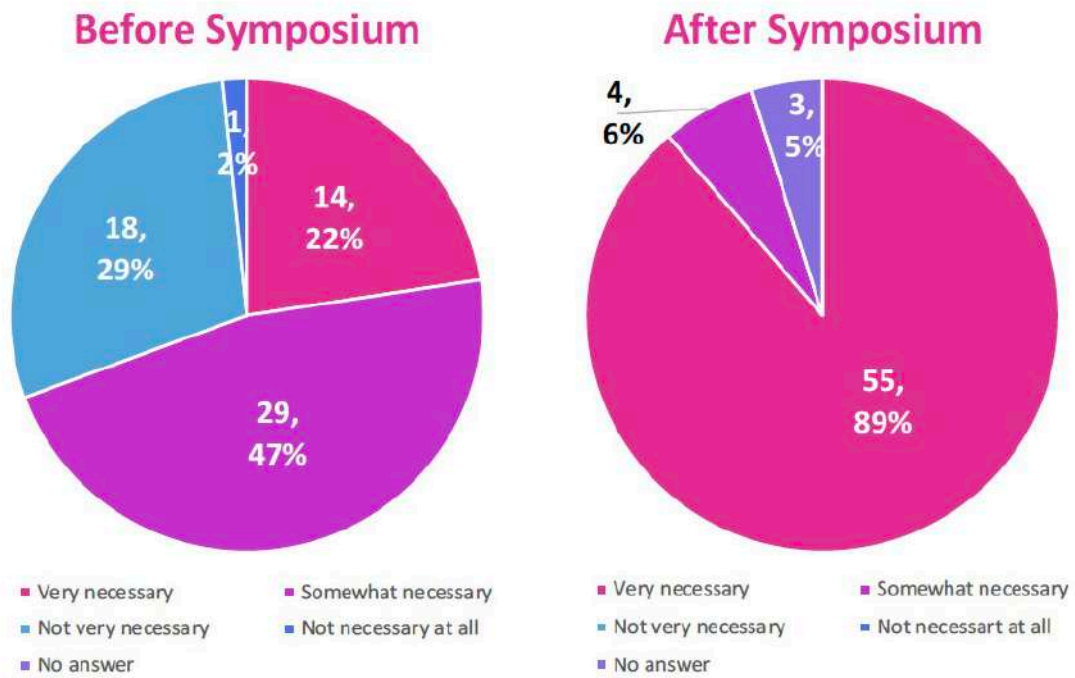


Figure 35: Do you think that screening tests for sleep apnea are necessary to prevent traffic accidents?

In response to the question “Before participating in the symposium, did you know that glaucoma can cause traffic accidents?”, 34% of the respondents answered, “I knew a lot about it.” or “I knew a little about it.” (Fig. 36).

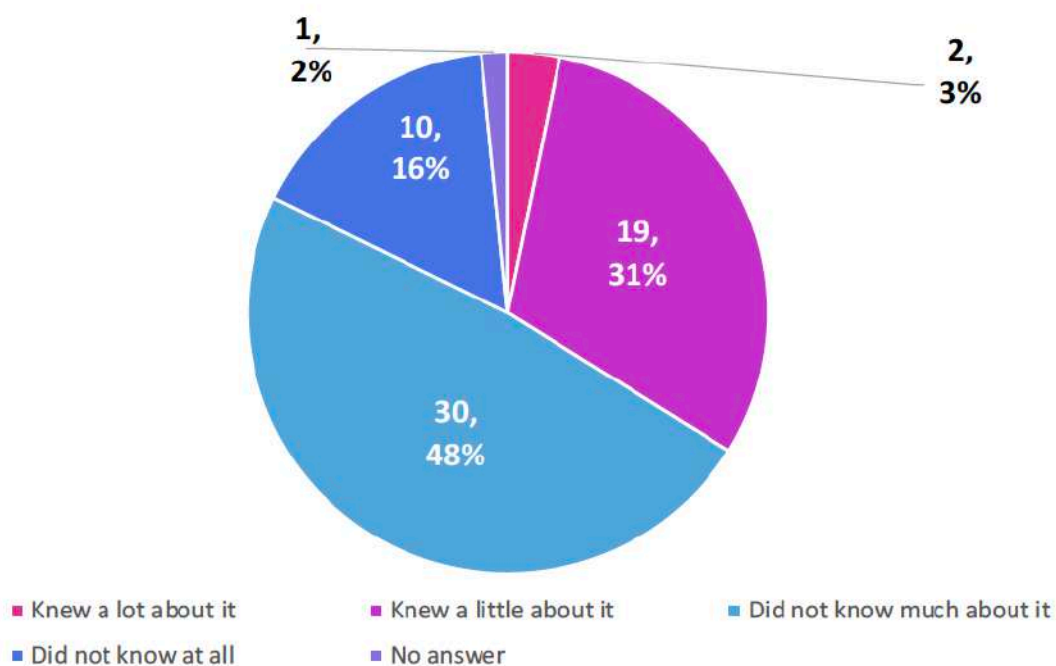


Figure 36: Before participating in the symposium, did you know that glaucoma can cause traffic accidents?

The percentage of respondents who answered “Very necessary” and “Somewhat necessary” to the question “Do you think that screening tests for glaucoma are necessary to prevent traffic accidents?”, 60% of the respondents answered “very necessary” or “somewhat necessary” before the symposium, but the percentage increased significantly to 95% after the symposium. (Fig. 37)

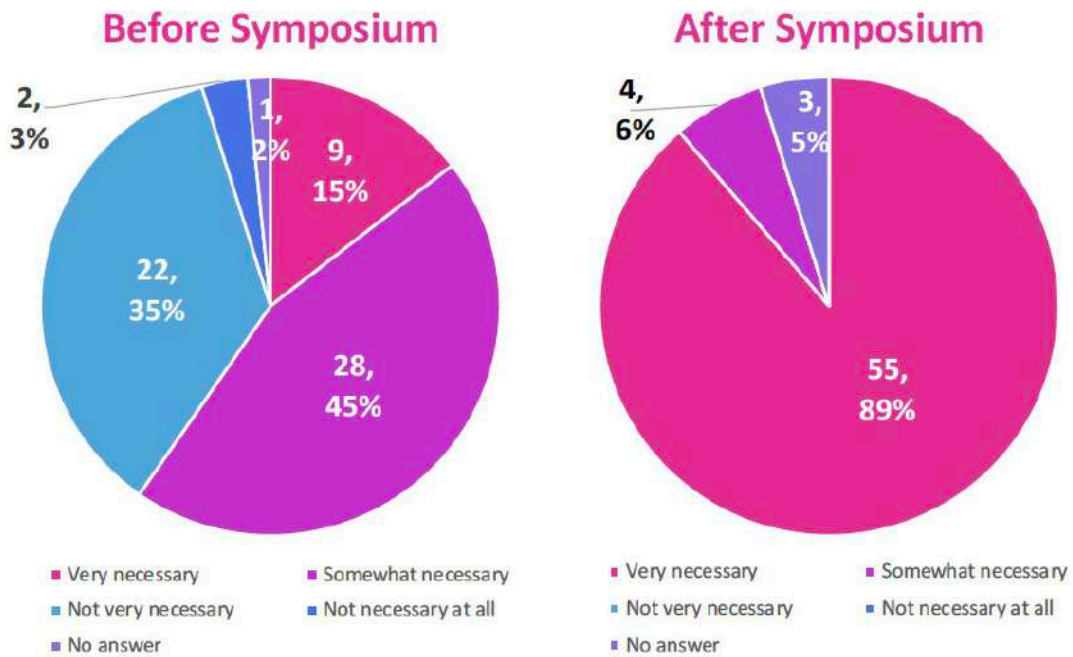


Figure 37: Do you think that screening tests for glaucoma are necessary to prevent traffic accidents?

To the question, “Did you find this symposium useful?”, 89% of the participants answered, “very useful” or “somewhat useful” (Fig. 38).

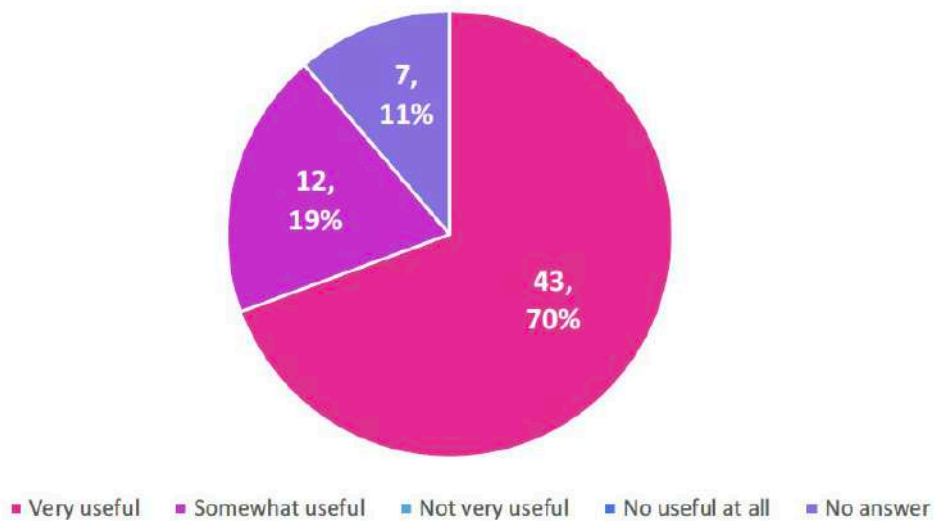


Figure 38: Do you find this symposium useful?

2-2. Special Lecture

A questionnaire survey was conducted among the participants of this special lecture, and 53 people responded. In response to the question, “Before attending the lecture, did you know that glaucoma can cause traffic accidents? 79% of the respondents answered that they “I knew a lot about it” or “I knew a little about it.” (Fig. 39).

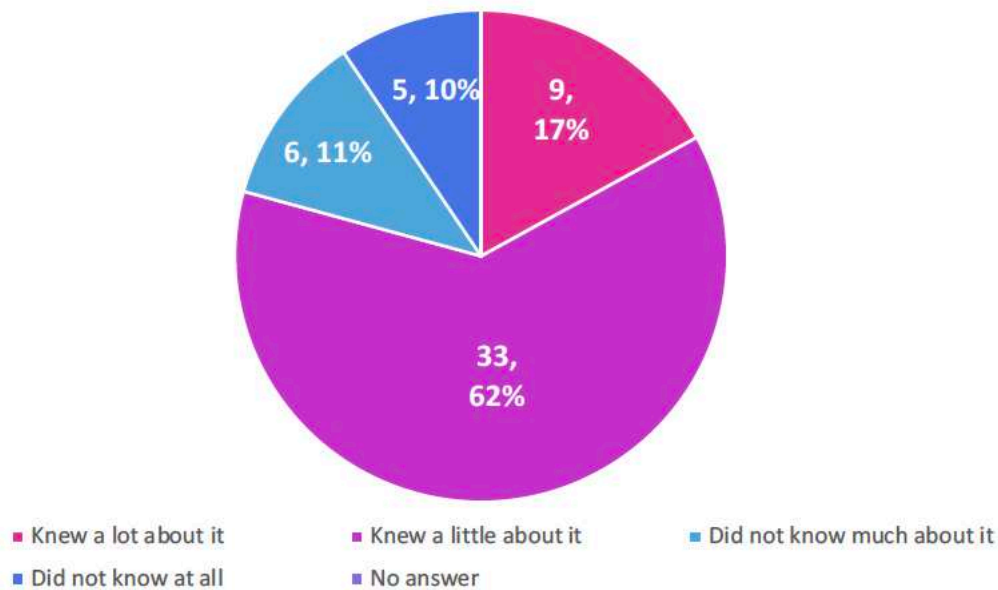


Figure 39: Before participating in the symposium, did you know that glaucoma can cause traffic accidents?

In addition, the percentage of respondents who answered “Very necessary” or “Somewhat necessary” to the question “Do you think that screening tests for glaucoma are necessary to prevent traffic accidents? increased significantly from 79% before the lecture to 96% after the lecture. (Fig. 40)

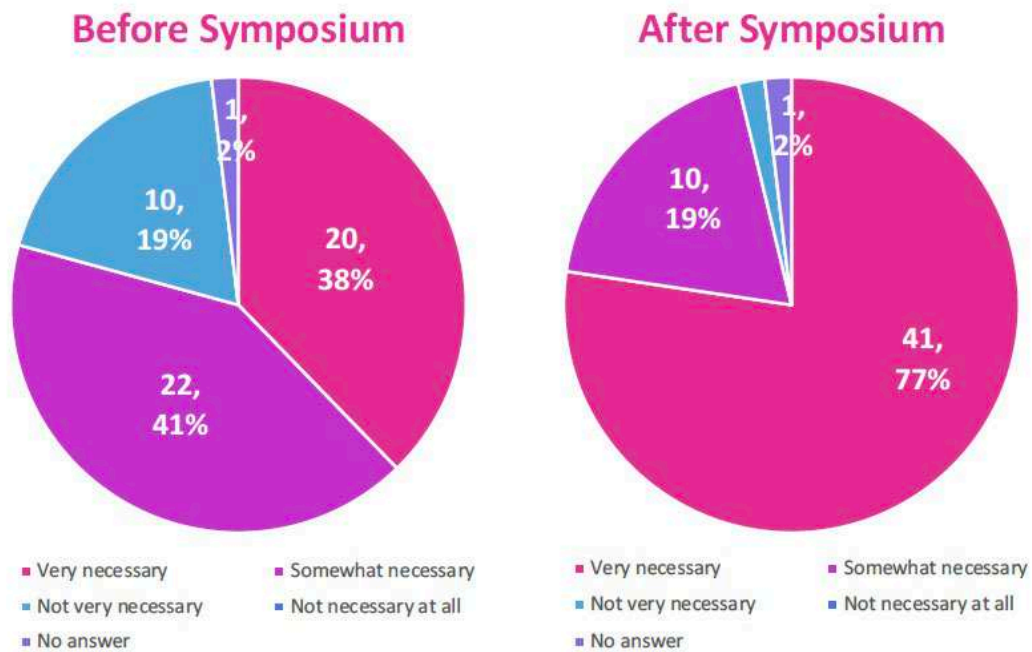


Figure 40: Do you think that screening tests for glaucoma are necessary to prevent traffic accidents?

To the question “Did you find this symposium useful?”, 100% of the participants answered, “very useful” or “somewhat useful.” (Fig. 41)

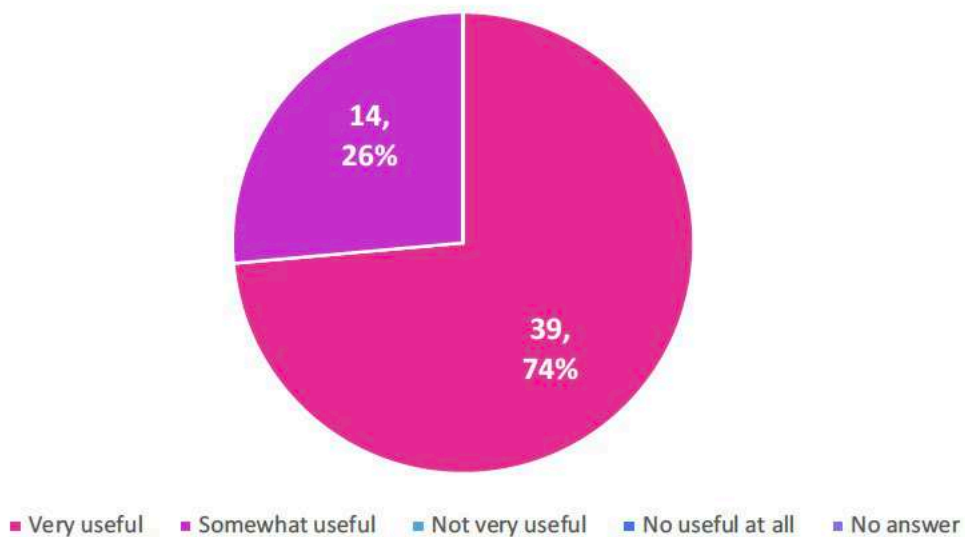


Figure 41: Did you find this symposium useful?

3. Conclusion

The results of the symposium questionnaire showed that about 70% of the participants knew that sleep apnea could be a cause of health-caused accidents. In comparison, only about 30% knew that glaucoma could be a cause of health-caused accidents. In the special lecture, about 80% of the participants answered that they knew about it to the same question, which may be because most of the participants were ophthalmologists and researchers. Therefore, it is necessary to raise awareness among the general public, especially operation managers in the transportation industry, of the possibility of these diseases causing health-related accidents further. Furthermore, a further empirical study for the social implementation of screening to prevent health-related accidents caused by sleep apnea, abnormal visual fields, etc., was considered necessary. In addition, since sufficient measures have not been taken for health-related accidents, not only in Japan but also in other countries, especially in Asia, it was considered necessary to develop international public awareness activities based on the findings of this study.

VI. Conclusion and Issues

1. Summary of this Study

In this project, focusing on sleep-apnea, glaucoma, and sleepiness caused by hay fever as causes of health-related accidents, we have been conducting research to clarify the relationship between these health disorders and traffic accidents and to establish and promote awareness of countermeasures against health-related accidents.

In FY 2017, a pilot study was conducted on 14 ophthalmology outpatients to examine the method using the clock chart, a simple screening tool for abnormal visual fields. As a result, in almost all cases, the findings of an abnormal visual field found by using the clock chart and the abnormal areas found by using the Humphrey automated visual field test were generally matched. In addition, three out of four patients who had experienced a traffic accident within the past five years experienced the Jack-in-the-box Phenomenon. This indicates that the clock chart may be useful as a screening tool for detecting abnormal visual fields. Combining the clock chart test with experience of the Jack-in-the-box Phenomenon may be helpful for early detection of traffic accidents caused by abnormal visual fields.

In FY 2018, based on the pilot study results in FY 2017, a questionnaire on health-related accidents and a survey study using a clock chart were conducted on approximately 2,000 employees of transportation companies. As a result, the relationship between daytime sleepiness assessed by the JESS and the experience of traffic accidents was examined. Those with higher JESS scores had a significantly increased risk of experiencing traffic accidents, suggesting that those with high daytime sleepiness need to exercise caution against traffic accidents. As a result of examining the relationship between knowledge of hay fever medication and medication-taking behavior, it was discovered that among those who complained of sleepiness and dullness due to hay fever, the percentage of taking medication was significantly lower among those who did not know hay fever medication, which is difficult to cause sleepiness; among those who were taking therapeutic medication, the percentage of discontinuing medication was significantly higher among those who did not know therapeutic medication. This suggests that promoting the correct knowledge of hay fever remedies is necessary for appropriate treatment of hay fever. The results showed that the risk of experiencing a traffic accident increased significantly for those who had the Jack-in-the-box Phenomenon and abnormal visual fields as assessed by

the clock chart test, compared to those who did not have both. This suggests that the combination of the clock chart test and the questionnaire on the Jack-in-the-box Phenomenon may be useful in preventing traffic accidents caused by abnormal visual fields.

In FY2019, we surveyed the status of ophthalmological checkups for 326 subjects with findings on the clock chart test among the subjects surveyed in FY 2018. As a result, 14 (19.7%) of the 71 subjects who visited the ophthalmologist were diagnosed with glaucoma. From this, it could be inferred that 64 (about 3%) of the 1,921 employees of the transportation companies subject to this study were considered potential glaucoma patients. The results of this study are similar to the prevalence of glaucoma in Japan (about 5% of people over 40 years old), suggesting the usefulness of the clock chart test for screening glaucoma.

As a result of the empirical research for the prevention of health-related accidents conducted by this research project over three years, the following relationships were identified: the relationship between daytime sleepiness and traffic accidents, the relationship between knowledge of hay fever medication and medication-taking behavior, and the relationship between abnormal visual fields and traffic accidents. In particular, there have been no large-scale epidemiological studies on the relationship between abnormal visual fields and traffic accidents using the clock chart test, a simple screening tool for abnormal visual fields. In addition, the clock chart is simpler, cheaper, and quicker to use than standard visual field tests, making it easier to implement at transportation companies. This research project is considered a meaningful study in the prevention of health-related accidents.

Additionally, based on the results of the three-year research project, a traffic symposium and a special lecture were held in FY2019 with the aim of raising awareness of the prevention of health-related accidents. While it was revealed that the general public was not very familiar with the fact that glaucoma can cause traffic accidents in contrast to sleep apnea, the percentage of respondents who answered that screening for sleep apnea and glaucoma was necessary to prevent traffic accidents increased significantly before and after the symposium and the special lecture. This suggests that this research project effectively raised awareness of preventing health-related accidents.

2. Aiming to reduce health-related accidents

Needless to say, prevention of health-related accidents is essential not only for

individual efforts but also for the support and efforts of families and workplaces and the establishment of a social system that supports these efforts. Sleep apnea syndrome, the subject of this study, has been increasingly recognized as a causative disease of health-related accidents. Screening using objective indicators has become widespread at transportation companies in recent years. However, it is still not fully developed in society as a whole. Although the cab companies surveyed in this study were aware of the importance of screening for sleep apnea, they had not yet implemented it.

Furthermore, few countermeasures are currently taken for glaucoma, and it is hardly recognized as a causative disease of health-related accidents. Moreover, as for hay fever, which is regarded as a national disease, proper knowledge about taking hay fever medication was not sufficiently widespread. Therefore, in the future, it will be essential to promote and raise awareness of the actual situation and knowledge about these diseases by providing such information to workplaces and the entire community and developing and expanding screening systems for early detection and treatment, especially for occupational drivers.

In recent years, lifestyle-related diseases, which are the cause of health-related accidents, have become more prevalent in developed countries and developing countries in Asia and other regions, making countermeasures against health-related accidents an important public health issue in these regions as well. In order to understand the current status of health-related accidents in China, the world's largest car manufacturing country, and Thailand, which has the highest traffic accident rate in the world, we exchanged opinions with experts in these countries at the end of FY2019. As a result, it became clear that measures to prevent health-related accidents in these countries were almost completely untouched. In the future, it is necessary to conduct joint empirical research in each country based on the knowledge of health-related accident countermeasures obtained in this research project and develop international dissemination and awareness.

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Appendix 1 Questionnaire

2018年6月
順天堂大学医学部公衆衛生学講座
公益財団法人 国際交通安全学会

整理番号※

※整理番号はスタッフが記入します。

健康起因事故防止のためのアンケート

本アンケート調査について

本アンケートは、皆さまの生活習慣や、睡眠の状態、花粉症による眠気、車やオートバイの運転などの状況にご回答をいただくことで、視野の異常や眠気による交通事故（健康起因事故）の防止対策に役立てることを目的としています。本調査への参加は皆様の自由意思によりお決めいただきます。参加に同意されない場合でも一切の不利益を受けることはなく、いつでも参加を撤回できます。また、本アンケートによって得られた個人情報は匿名化された状態で解析を行うとともに、集団として解析した結果のみ公益財団法人 国際交通安全学会の調査研究プロジェクトの結果として公表させていただきます。本調査でご提供いただいた皆様の情報は、厳重に保護・管理されるため、情報漏洩の危険性はなく、本調査以外の目的でも用いられることはありません。本調査への参加にご同意いただける場合は、下記のチェックボックス（□）に✓をつけて、本アンケートにご回答ください。本アンケートは表紙を含め4ページあります。次ページからの質問について、数値又は当てはまる項目に○をご記入ください。全ての質問項目にお答えいただく所要時間は約15分です。ご記入いただく際は、黒の鉛筆、またはボールペンをお使いください。本調査の参加後に同意撤回を希望される場合は、順天堂大学医学部公衆衛生学講座までご連絡ください。

上記内容を確認した上で本調査に参加することに同意します。

氏名※		性別	男・女	年齢	歳
自宅住所※	〒				

※検査結果の返却をご希望の方は、上記に氏名と自宅住所を必ずご記入ください。

生活習慣などについてお尋ねします。

(1)	現在の身長と体重を教えてください。	身長	cm	体重	kg
(2)	最近の血圧の値を教えてください。(記入例 最大 125/最小 75 mmHg)	最大	/	最小	mmHg
(3)	現在、お酒を飲みますか? 「飲む」「やめた」と答えた方は、飲む(飲んでいた)頻度をお答えください。	① 飲む ② やめた ③ 飲まない			
	頻度	① 毎日 ② 週5~6日 ③ 週3~4日 ④ 週1~2日 ⑤ 月2~3日 ⑥ 月1日以下(ほとんど飲まない)			
(4)	現在、たばこを吸いますか? 「吸う」「やめた」と答えた方は、吸っている(吸っていた)期間と、1日の本数をお答えください。	① 吸う ② やめた ③ 吸わない			
	期間	歳から	歳まで	年間	本数 1日に 本
(5)	最近1カ月間における、1日当たりの勤務時間はどれくらいですか?	約	時間	分	
(6)	これまでに、あなたは医師から以下の病気を指摘されたことがありますか? また、「ある」の場合は、現在の状況で該当するものに○をつけてください。				
	(6-1)	高血圧	① ない ② ある	-	放置 ・ 過去に治療 ・ 経過観察中 ・ 治療中
	(6-2)	糖尿病	① ない ② ある	-	放置 ・ 過去に治療 ・ 経過観察中 ・ 治療中
	(6-3)	緑内障	① ない ② ある	-	放置 ・ 過去に治療 ・ 経過観察中 ・ 治療中
	(6-4)	網膜色素変性	① ない ② ある	-	放置 ・ 過去に治療 ・ 経過観察中 ・ 治療中
	(6-5)	黄斑変性	① ない ② ある	-	放置 ・ 過去に治療 ・ 経過観察中 ・ 治療中
	(6-6)	その他()		-	放置 ・ 過去に治療 ・ 経過観察中 ・ 治療中

睡眠やいびき、日中の眠気についてお聞きします。

(1)	最近1週間の平均的な睡眠時間はどれくらいの長さですか?	約	時間	分
(2)	この1か月に、起きているべき時間帯に眠気が強く眠ってしまいそうになったり居眠りをしたことがありますか?	① ほとんど毎日 ② ときどき ③ 全くなかった		
(3)	(3-1) いびきをかきますか? 「はい」と答えた方は、(3-2)から(3-5)にお答えください。	① はい ② いいえ ③ わからない		
	(3-2) いびきの大きさはどうですか?	① 息をする程度 ② 話し声程度 ③ 話すよりも大きい ④ とてもうるさい		
	(3-3) いびきはどの程度の頻度でかきますか?	① ほぼ毎日 ② 週3~4回 ③ 週1~2回 ④ 月1~2回 ⑤ ほとんどない、もしくはない		
	(3-4) あなたのいびきは他人に迷惑をかけますか?	① はい ② いいえ		

(3)	(3-5)	何回ぐらい呼吸が止まることを指摘されたことがありますか？					
つづき			① ほぼ毎日	② 週3~4回	③ 週1~2回	④ 月1~2回	⑤ ほとんどない、もしくはない
(4)	もし、以下の状況になったとしたら、どのくらいとうとする（数秒～数分眠ってしまう）と思いますか。最近の日常生活を思い浮かべてお答えください。以下の状況になったことが実際になくても、その状況になればどうなるかを想像してお答えください（(4-1)～(4-8)の各項目で、○は一つだけ）。						
	すべての項目にお答えしていただくことが大切です。すべての項目にお答えください。		ほとんどない	うとうとする可能性は 少しある	半々くらいある	高い	
(4-1)	座って何かを読んでいるとき（新聞、雑誌、本、書類等）		①	②	③	④	
(4-2)	座ってテレビを見ているとき		①	②	③	④	
(4-3)	会議、映画館、劇場などで静かに座っているとき		①	②	③	④	
(4-4)	乗客として1時間続けて自動車に乗っているとき		①	②	③	④	
(4-5)	午後に横になって、休息をとっているとき		①	②	③	④	
(4-6)	座って人と話しているとき		①	②	③	④	
(4-7)	昼食を取った後（飲酒なし）、静かに座っているとき		①	②	③	④	
(4-8)	座って手紙や書類などを書いているとき		①	②	③	④	

花粉症や花粉症治療薬による眠気についておたずねします。

(1)	季節性の花粉症やアレルギー性鼻炎の症状がある時期に、眠気やだるさで困ることがありますか？「はい」と答えた方は、以下から該当する理由を全てお選びください。		① はい	② いいえ
	理由	① 花粉症、アレルギー性鼻炎の症状として昼の眠気やだるさを生じるから ② 花粉症、アレルギー性鼻炎のために夜よく眠れず、結果として昼間の眠気やだるさを生じるから ③ 治療薬の副作用として眠気やだるさが生じるから ④ その他（ ）		
(2)	(2-1)	季節により、あるいは1年を通して花粉症やアレルギー性鼻炎の治療薬を服用していますか？「はい」と答えた方は、(2-2)から(2-4)にお答えください。	① はい	② いいえ
	(2-2)	治療薬の服用を以下の理由で中止したことはありますか？該当する全てに○をつけてください。 ① 薬が有効でなかった ② 眠気が出て、仕事に支障が出る ③ その他（理由： ）		
	(2-3)	治療薬を選んだ理由を教えてください。該当する全てに○をつけてください。 ① 効果があるから ② 副作用の眠気が少ないから ③ 医師から処方されたから ④ 安いから ⑤ 昔から服用しているから ⑥ その他（理由： ）		
	(2-4)	(2-3)で③「医師から処方されたから」と答えた方にうかがいます。その治療薬を医師から処方される際、車やオートバイの利用頻度について質問を受けましたか？	① はい	② いいえ
(3)	花粉症やアレルギー性鼻炎の治療薬の副作用として、眠気が起こることを知っていますか？		① はい	② いいえ
(4)	花粉症やアレルギー性鼻炎の治療薬の中で、副作用の眠気がおこりづらい薬があることを知っていますか？		① はい	② いいえ

車やオートバイの運転についてお聞きします。

(1)	現在、車やオートバイを運転していますか？ 「はい」と答えた方は、(2)～(3)にお答えください。	① はい ② いいえ
(2)	車やオートバイを運転していて、過去5年以内に次のような経験をしたことがありますか？	
(2-1)	交差点にあるはずの信号機がなくなっていたことがある。	① ある ② ない
(2-2)	普段あるはずの一時停止の標識がなくなっていたことがある。	① ある ② ない
(2-3)	突然、車や自転車が目の前に飛び出してきた、または目の前から消えたことがある。	① ある ② ない
(2-4)	突然、歩行者が目の前に飛び出してきた、または目の前から消えたことがある。	① ある ② ない
(2-5)	周辺の車の流れに比べ、いつの間にかスピードが落ちている、または速くなっていることがある。	① ある ② ない
(2-6)	車線を守って走っているつもりなのに、いつの間にか歩道側又は対向車線側にはみ出してしまっていることがある。	① ある ② ない
(2-7)	道路標識がよく見えず、標識内容に従った運転をすることが難しいときがある。	① ある ② ない
(2-8)	時々、自分が道路上のどこの位置を走っているのかわからなくなり混乱する時がある。	① ある ② ない
(2-9)	家族などの同乗者から、危ない運転だった等と指摘されたことがある。	① ある ② ない
(3)	過去5年以内に、交通事故を起こしてしまったことがありますか？ 「ある」と答えた方は、事故の内容と回数を教えてください。	① ある ② ない
(6-1)	自分で自分の車体に傷をつけた。(単独物損)	<input type="checkbox"/>
(6-2)	他の車やオートバイなどにぶつけられた。(物損)	<input type="checkbox"/>
(6-3)	他の車やオートバイなどにぶつかった。(物損)	<input type="checkbox"/>
(6-4)	相手の過失のせいで、人身事故となった。	<input type="checkbox"/>
(6-5)	相手と自分の双方に過失があり、人身事故となった。	<input type="checkbox"/>
(6-6)	自分の過失のせいで、人身事故となった。	<input type="checkbox"/>

以下の質問は職業運転手の方のみお答えください。

(1)	職業運転手として、これまで延べ何年間働いていますか？	年間
(2)	昨年、業務車両(トラック等)を運転した総距離はおおよそどのくらいですか？	Km
(3)	過去1カ月に、連続して働いた最も長い労働時間は何時間でしたか？(勤務と勤務の間が4時間までなら、連続した勤務とし、勤務には往復の通勤時間及び任務間の移動時間も含まれます。)	時間

アンケートは以上で終了です。ご協力ありがとうございました。

Appendix 2 Clock Chart Implementation Manual

Clock Chart Implementation Manual

■Items to be prepared

- (1) Clock Chart Recording Sheet
- (2) Clock Chart
- (3) Underlay for clock chart
- (4) Thumbtack for clock chart
- (5) Reference stick for clock chart (35cm)
- (6) Eye patch to be applied (eye patch)
- (7) Writing utensils
- (viii) Masking tape (used to fix the clock chart stand to the desk)
- (9) Trash bag

■Method of Implementing Clock Chart Test

- First, check the name of the office, name, and date of test.

- (1) “Now, we are going to do a simple test of your visual field called Clock Chart.
(Have the subject look at the clock chart at a height of about 35 cm.) Can you see these four creatures: ladybug, caterpillar, butterfly, and cat?”

- (2) (Handing an eye patch to be applied to the subject) “Let’s start with the test of the right eye. Peel off the sticker on the back and put this eye patch on your left eye.”
*If the subject is wearing glasses, remove them once and apply the eye patch, then have the subject put on the glasses again. (Note, however, that the frame may overlap the illustration during the test, making it difficult to see.)

- (3) “(Place A at 12 o’clock position on the clock chart.) “First, look at the clock chart from right above the center of the chart ● at this height with your right eye. (Use a 35 cm stick and have the subject look at the clock chart.)
*When conducting the clock chart test on a desk, have the subject place both hands on the desk to support the subject’s body.
*At that time, be sure to place a 35 cm stick near his/her eyes to keep a distance.

- (4) “Can you see the picture of the caterpillar while staring at the center? If you can, make sure the caterpillar is in your field of vision while staring firmly at the center ●.” (Confirming that the picture of the caterpillar is no longer visible.) You don’t see the caterpillar anymore. This is called a blind spot, and everyone has one. This test is performed at the position of the eye where the blind spot appears, so please maintain this position during the test. Also, we will check to see if you can see the

pictures of the creatures one by one, but please make sure you keep looking at the center ● during the test.”

*If the eye follows the caterpillar, the caterpillar will not enter the blind spot, so point to the center with a finger or other object and make sure to check if the caterpillar disappears while looking at the center.

*If there is a range in the height of the eye at which the caterpillar disappears, it should be closest to the height of 35 cm.

*Since the appearance of blind spots varies from person to person, if the subject cannot find a blind spot, he or she should try looking for it by slightly raising or lowering the height of the eyes.

*The key point of the clock chart test is to emphasize the need to maintain a height of 35 cm and to keep looking at the center.

(5) “Let’s start with the ladybug.” " Is the picture of caterpillar disappeared with your eyes looking at the center ●?"

➡Put a ✓ in the fixation point (1), and if the picture of the caterpillar disappears, put a ✓ in the blind spot in the ladybug column.

(6) "Do you see a picture of the ladybug?"

➡If visible, put a circle in 12 o'clock in the ladybug column; if not, put an X.

(7) Slowly turn A to the 1 o'clock position. Check in the same way as (7). In the same way, check at the 2 o'clock to 11 o'clock positions. Also at 3 o'clock, 6 o'clock and 9 o'clock positions, check the fixation points and put a ✓ in each of Fixation Points (2) to (4). (To confirm gazing at fixation point)

After finishing the ladybug, repeat steps (5) to (8) in the same order for the caterpillar, butterfly, and cat. However, when testing of the caterpillar, it is normal not to be able to see the caterpillar when A is at the 12 o'clock position because it is a blind spot, so the corresponding box in the clock chart recording sheet is blacked out.

(8) " Then, looking at the center ● from directly above at the height where the caterpillar disappears, does the center grid appear distorted? Also, does any of the petals appear to be missing?" ➡Fill in the items for "distortion of the grid" and "missing petals" (If there is distortion or missing petals, put a circle in "Yes"; if

not, put a circle in "No").

After completing the test for the right eye, perform the test for the left eye. Cover the right eye with an eye patch, place B at 12 o'clock position on the clock chart, and perform steps (3) through (8) for each creature, and then perform step (9).

Notes on the Implementation of Clock Chart

- Fix the clock chart base to the desk with tape. Also, use rubber gloves or finger sacks to make it easier to rotate.
- At the start of the clock chart test (right eye A, left eye B at 12 o'clock position), stare at the center • from right above and make sure that the caterpillar disappears (Marriott blind spot) before starting the test.
- It is also necessary to keep looking at the center at all times during the test. For this reason, always check the fixation point.
- The test should be performed on each creature in the following order for both the right and left eyes, according to the recording sheet.
Ladybug → caterpillar → butterfly → cat
- Stop rotating the clock chart every hour on the dial and make sure that the illustration of each creature is in view.
- Always make sure that the caterpillar is out of sight first when working with each creature.
- Make sure to turn the clock chart to the right (clockwise) slowly.
- At the start (12 o'clock), when A for the right eye and B for the left eye are at the 3 o'clock, 6 o'clock, and 9 o'clock positions, ask the subject to "look at the • in the center." to confirm the fixation point.
- The same eye patch may be used for both the left and right eye, but if the eye has an infectious disease such as sty, be sure to use a new patch for each eye.
- If the picture appears blurred or disappears due to the frame of the glasses, ask the subject to shift the glasses in that position slightly by hand and check again if the picture can be seen without overlapping the frame.
- If there are many findings at the top of the clock chart (1,2,1,0,11,12 o'clock), the eyelids may be lowered, and the subject may not be able to see. If this is the case, perform the test again with the eyelids properly opened.
- There are individual differences in the height of the blind spot (some people find the blind spot at a position that is more upward or downward than the 35 cm index, or left or right of the center). However, basically, the measurement is performed with the blind spot as the reference point. the entire clock chart should be in the field of view.
- If the butterfly is not visible at the 3 o'clock position (for the right eye; 9 o'clock for the left eye), the distance between the caterpillar and the butterfly is so close, making the appearance of the blind spot different for each individual. In such a case, if the cat in the periphery can be confirmed when it comes to the same

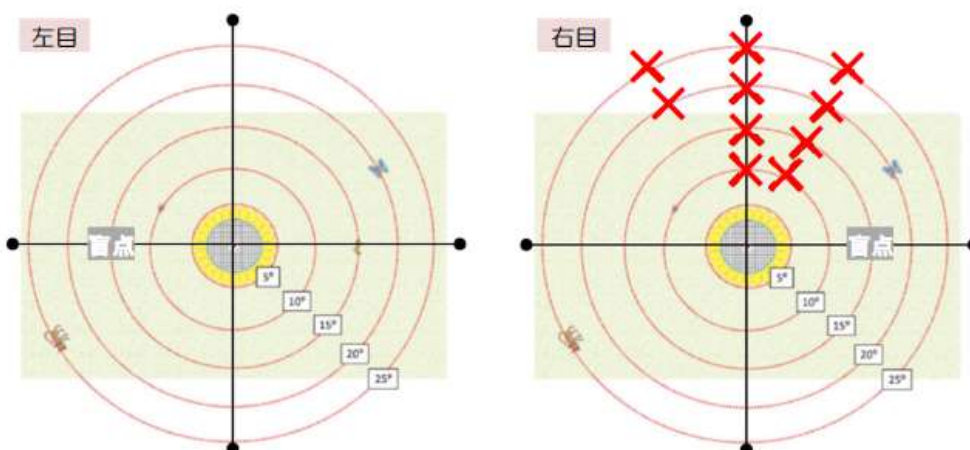
position, the butterfly is considered to have entered the blind spot. Mark with X.

Appendix 3 Clock Chart Result Sheet (Front)

「健康起因事故防止のためのアンケート調査」結果票

氏名	Sample D 判定 様	検査日	2018 年 7 月 28 日
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● **クロックチャートの結果** 視野の欠損が認められた場合、その場所を×で示しています。



● **アンケートの結果** 視野欠損が疑われる運転中の経験についての質問

質問項目	回答
交差点にあるはずの信号機がなくなっていたことがある。	—
普段あるはずの一時停止の標識がなくなっていたことがある。	—
突然、車や自転車が目の前に飛び出してきた、または目の前から消えたことがある。	○
突然、歩行者が目の前に飛び出してきた、または目の前から消えたことがある。	—
周辺の車の流れに比べ、いつの間にかスピードが落ちている、または速くなっていることがある。	—
車線を守って走っているつもりなのに、いつの間にか歩道側又は対向車線側にはみ出してしまうことがある。	—
道路標識がよく見えず、標識内容に従った運転をすることが難しいときがある。	—
時々、自分が道路上のどこの位置を走っているのかわからなくなり混乱する時がある。	—
家族などの同乗者から、危ない運転だった等と指摘されたことがある。	—

回答結果を あり：「○」、なし：「—」で示しています。

■ 総合判定

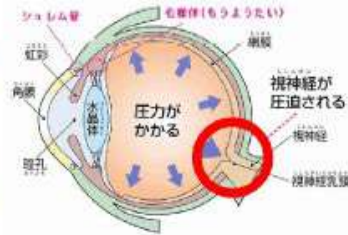
今回の簡易視野検査の結果、視野欠損が認められ、また、視野欠損が疑われる運転中の経験がありました。必ず眼科へ受診してください（既に治療中の方は、今後も治療を継続してください）。

Appendix 3 Clock Chart Result Sheet (Back)

緑内障は早期発見・早期治療が大切です

● 緑内障とは？

視野欠損の原因には様々な病気がありますが、その中でも最も多いのは緑内障です。緑内障とは、何らかの原因で視神経が障害され、視野が狭くなったり部分的に見えなくなったりする病気で、ゆっくりと進行します。緑内障は治療せずに放っておくと失明につながるおそれがあり、日本人の失明の原因の第1位でもあります。



視野障害の進行例

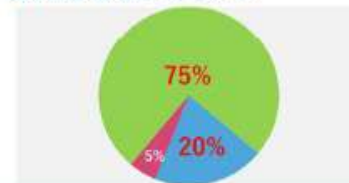


(写真：警察庁)

● 緑内障患者の9割は無自覚

40歳以上の日本人の5%（20人に1人）が緑内障と推定されていますが、自覚症状がほとんどないため、9割の人が無自覚のまま生活していると考えられています。しかし、緑内障による視野障害が高度であったり、また視野異常の自覚のないままに運転を続けた場合、左右の飛び出しの見落としや、信号の見落としなどにつながりかねません。

緑内障発見のきっかけ



自覚症状のあった緑内障患者はわずか5%

2001年 自治医科大学緑内障患者調査

● 早期発見や自身の症状の自覚は交通事故予防につながります



緑内障は初期の段階では自覚症状がほとんどないため、40歳を過ぎたら定期的に眼科で検査を受けることが重要です。緑内障を早期に発見し適切な治療を開始すれば多くの場合、進行を緩やかにすることができます。また、視野欠損を自覚し注意することは、交通事故等の危険回避にもつながります。

Appendix 4 Medical Checkup Status Survey Form

整理番号	
------	--

「健康起因事故防止のためのアンケート調査」 受診状況調査票

↓↓本調査票の回答に同意される方は、必ず下記のチェックボックスにをつけてください。↓↓

<input type="checkbox"/> 本調査票の回答に同意します。

記入日	2	0	1	9	年			月			日
-----	---	---	---	---	---	--	--	---	--	--	---

以下の質問について当てはまる回答にをつけてください。

1. あなたは、クロックチャートの検査結果を受けて、眼科を受診しましたか？
(「はい」の方は、2、3の質問に、「いいえ」の方は1-2の質問に回答の後、4の質問に進んでください。)

<input type="checkbox"/> はい

2. 眼科を受診したのはいつですか？

2	0			年				月			日
---	---	--	--	---	--	--	--	---	--	--	---

3. 眼科で診断された病名を教えてください。

(当てはまるものすべてにをつけてください。)

<input type="checkbox"/> 異常なし	<input type="checkbox"/> 緑内障
<input type="checkbox"/> 網膜色素変性症	<input type="checkbox"/> 黄斑変性症
<input type="checkbox"/> その他 ()	

<input type="checkbox"/> いいえ

- 1-2. 受診しなかった理由は何故ですか？

(当てはまるものすべてにをつけてください。)

- 時間がない
- 面倒である
- 診断を受けるのが怖い
- 経済的に負担に感じる
- 医療機関が近くにない
- どこを受診してよいかわからない
- 医療に不信感がある
- その他

[]
---	--	---

- 1-3. 今後、受診を考えていますか？

- はい
- いいえ

4. 今回の検査を受けてのご意見・ご感想など、ご自由にお書きください。

--

調査は以上となります。
ご協力頂き、誠にありがとうございました。



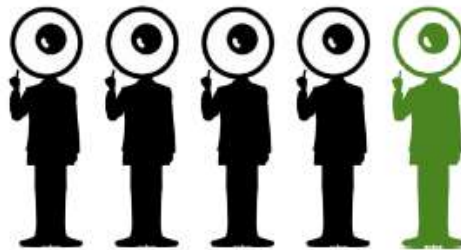
Appendix 5 Reminder to Those with Severe Findings

Appendix 6 Flyer for the Citizen's Symposium on Traffic Safety

ドライバーとして長く・健康に働き続ける ためにも、是非、眼科を受診しましょう！

このお知らせは視野異常の簡易検査である「クロックチャート」を受けていただいた方の中で、特に視野異常の疑いが強く認められた方々にお送りしております。緑内障は無自覚で進行するため、多くの場合、自分では気づくことができません。緑内障と診断されても、きちんと自覚をして運転を気を付ければ交通事故を防ぐことができます。

クロックチャート有所見者の内、
眼科を受診した人の**5人**に**1人**が
緑内障と診断されました。

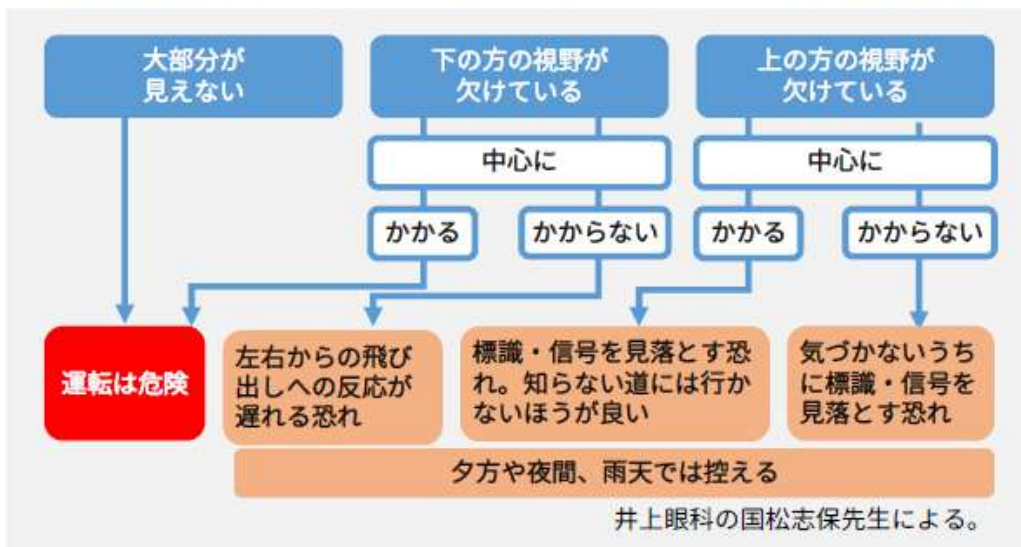


緑内障を早期発見・早期治療することで・・・

自覚をすることで、運転を気を付けることができ、事故防止につながります。

早期治療により、緑内障の進行を緩やかにすることができます。

◆◆◆視野に異常がある場合の運転の注意点◆◆◆



『健康起因事故の予防と対策』

主催：公益財団法人 国際交通安全学会



病気の予防は事故の予防！

健康あつての交通安全！
早期発見と早期治療が
事故を防ぎます。



医師会館の駐車場はご利用できません。ご来場の際は公共交通機関をご利用頂くか、近隣の有料駐車場をご利用ください。

■ 日時：令和元年 12月10日(火)

14:00～16:40 (13:30開場)

■ 場所：愛媛県医師会館 4階第1会議室

〒790-8585 愛媛県松山市三番町4丁目5-3

■ 定員：70名 (入場無料、申し込み先着順)

■ 申込方法：

下記の申込書に必要事項をご記入の上、E-mailまたはFAXにてお申し込みください。

■ 締切日：令和元年11月29日(金) 参加証などの発行はありません。当日直接会場までお越し下さい。

■ お問い合わせ先：公益財団法人 国際交通安全学会 担当：石原(イシハラ)、廣谷(ヒロヤ)

電話番号：03-3273-7884 E-mail：project@iatss.or.jp

シンポジウムスケジュール

- 開会の挨拶 14:00-14:05 鎌田 聡 公益財団法人 国際交通安全学会 専務理事
- プロジェクト概要 14:05-14:10 谷川 武 順天堂大学医学部公衆衛生学 教授 国際交通安全学会 会員
- 基調講演 14:10-14:40 谷川 武 「睡眠時無呼吸と健康起因事故」
- 14:40-15:10 国松 志保 西葛西井上眼科病院 副院長
「視野狭窄と健康起因事故」
- 話題提供 15:10-15:25 岡村 和子 科学警察研究所 研究室長 国際交通安全学会 会員
「交通司法解剖例から推測される健康要因」
- 15:25-15:40 浅野 水辺 愛媛大学大学院医学系研究科法医学講座 教授
「法医学の立場から考える健康起因事故」
- 15:40-15:55 石田 勝利 国土交通省 自動車局安全政策課 課長
「健康起因による事故防止について」
- 休憩 15:55-16:05
- パネルディスカッション 16:05-16:35 進行：谷川 武
パネリスト：石田 勝利、国松 志保、浅野 水辺、岡村 和子
- 閉会の挨拶 16:35-16:40 吉原 徹 公益財団法人 国際交通安全学会 事業部長

※シンポジウムスケジュールは一部変更される場合がございます。

お申込み：下記をご記入の上、E-mailまたはFAXにてお申し込みください。

E-mail：project@iatss.or.jp

FAX：03-3272-7054 (担当：石原・廣谷)

参加申込書

交通安全 市民シンポジウム『健康起因事故の予防と対策』

お名前(フリガナ)	会社(ご所属)
住所	電話番号

E-mailでお申し込みの際は、メール課題を「健康起因事故の予防と防止」参加申し込み とし、上記項目をお書きの上お申し込みください。

※ 本申込にて取得した個人情報の取扱いに関し、個人情報の保護に関する法律、個人情報保護に関するガイドライン等の指針、その他個人情報保護に関する関係法令を遵守します。公益財団法人 国際交通安全学会

Appendix 7 Flyer on Special Lecture




主催：公益財団法人 国際交通安全学会
後援：順天堂大学大学院 医学研究科

公益財団法人 国際交通安全学会 1907C研究プロジェクト 特別講演会

『健康起因事故の予防と対策』

～視野障害と交通事故～

参加無料
定員80名



特別講演（同時通訳付き）

“Glaucoma and age-related macular degeneration – through the eyes and steering wheel of the patient“

David Crabb, PhD

(Professor of Statistics and Vision Research, City, University of London)

【略歴】1996年、PhD in Visual Science取得。University College London, University of Nottinghamを経て、2005年現職。王立統計学会フェロー、ムーアフィールドズ眼科病院名誉顧問。専門は、視野、イメージング、視機能、医療統計。緑内障に関して数多くの論文を執筆。



「視野狭窄と健康起因事故」
国松 志保
(西葛西・井上眼科病院 副院長)
【略歴】千葉大学卒。東京大学医学部附属病院、自治医科大学附属病院、東北大学病院を経て、2019年より西葛西・井上眼科病院。



「Visual Field Defect and Daytime Sleepiness on Motor Vehicle Crashes」
友岡 清秀
(順天堂大学医学部公衆衛生学 助教)
【略歴】2017年、順天堂大学大学院医学研究科博士課程修了。同年より順天堂大学大学院医学研究科公衆衛生学講座助教。

219

■ 日時：令和2年 2月 19日（水）
18：00～20：05（17：30開場）

■ 場所：順天堂大学センチュリータワー
8階大教室
(東京都文京区本郷2丁目1-1)

■ 申込方法：下記の申込書に必要事項をご記入の上、EmailまたはFAXにてお申込みください。

■ 締切日：令和2年2月5日（水）
※参加証などの発行はありません。
当日直接会場までお越し下さい。

【お問い合わせ先】
公益財団法人 国際交通安全学会
担当：石原（イシハラ）、廣谷（ヒロヤ）
☎ 03-3273-7884 ✉ project@iatss.or.jp

下記をご記入の上、E-mailまたはFAXにてお申し込みください。
Email: project@iatss.or.jp FAX: 03-3272-7054 (担当：石原・廣谷)

参加申込書

特別講演会『健康起因事故の予防と対策』～視野障害と交通事故～

お名前（フリガナ）	会社（ご所属）
住所	電話番号

E-mailでお申し込みの際は、メール標題を「健康起因事故の予防と対策」参加申し込みとし、上記項目をお書きの上お申し込みください。
※本申込にて取得した個人情報の取扱いに関し、個人情報の保護に関する法律、個人情報保護に関するガイドライン等の指針、その他個人情報保護に関する関係法令を遵守します。公益財団法人 国際交通安全学会