Naturalistic Driving Study for Understanding Causes & Effects in Major Crash Types in Japan

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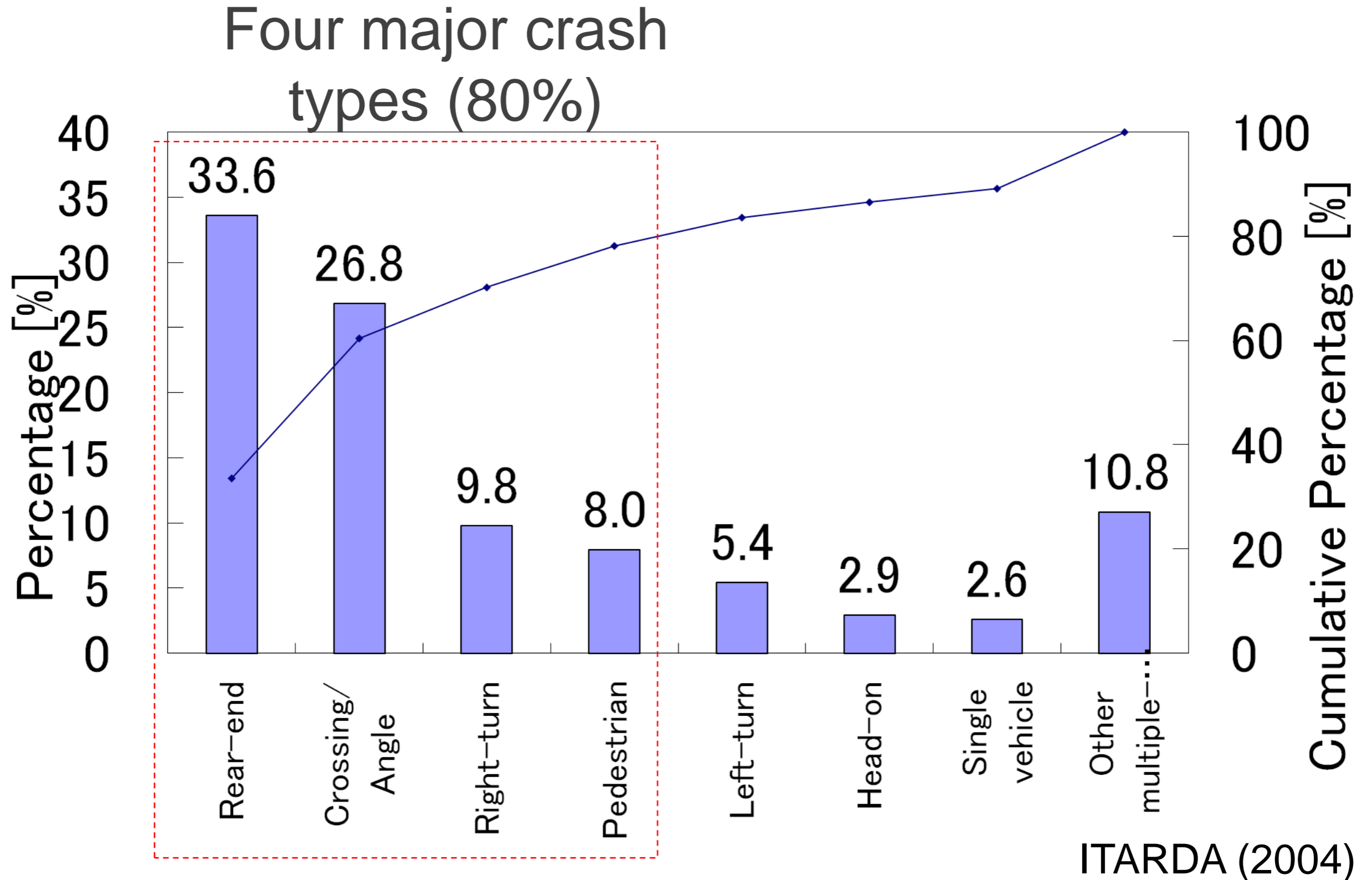Japan Automobile Research Institute (JARI)

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Police reported statistics in Japan
(Relative proportion of collision types, vehicle as a primary party)

Four major crash types (80%)

ITARDA (2004)

Contents

1. Overview of Naturalistic Driving Study
   - Preceding project in Japan
   - Data acquisition system
   - Result of 2 years field study

2. Reproduction of conflicting situations

Preceding project in Japan

Ministry of Land, Infrastructure, Transport and Tourism
(2004 - 2006)

- Purpose: Driver education

- Vehicle: Taxi (200 vehicles)

- DATA: 1ch video & vehicle data

Five channels of video data

Forward view

Pedal/Foot

Driver Face
(mirror image)

Horizontal Angle: 53 deg

Left side
forward view

Right side
forward view

Horizontal Angle: 85 deg

Horizontal Angle: 85 deg

Numerical data

Sensor	Parameter	Unit	Frequency	Notes
GPS*	Position	Latitude, Longitude	4Hz	N13434.256, E04523.236
	Speed	0.1km/h	4Hz	65.2
	Date	Year, Month, Day	4Hz	20060129
	Time	Hour, Min., Sec.	4Hz	124535 (12h 45m 35s)
	Direction	Deg.	4Hz	035 (clockwise 35 deg)
	Angular Velocity	Deg/sec	4Hz	025 (25 deg/sec)
G Sensor	XY Acceleration	0.01G	10Hz	Max 2.0G
OBD**	Throttle	%	10Hz	Full Throttle 100%
Steering Sensor	Steering Angle	Deg.	10Hz	If Available
Digital Switch	Brake	On/Off	10Hz	Lamp On/Off
	Turn Signal (L)	On/Off	10Hz	Lamp On/Off
	Turn Signal (R)	On/Off	10Hz	Lamp On/Off

Data Acquisition System (DAS)

Duration: 40s (Pre-30s, Post-10s)
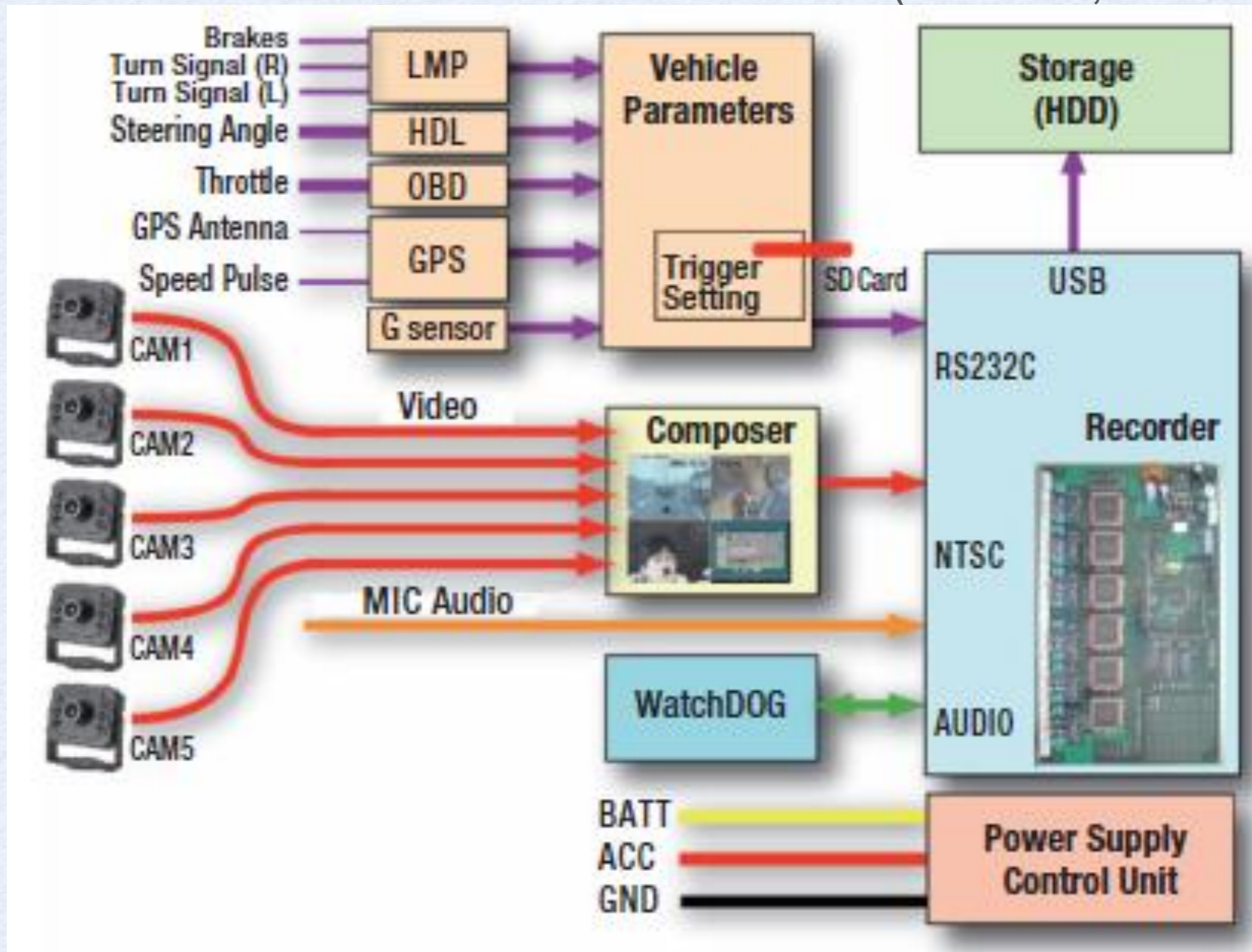
Trigger methods

1. Deceleration of 0.35G or more AND brake ON

2. Deceleration of 1.00G or more AND brake OFF

3. Acceleration of 0.50G or more AND brake ON

4. Acceleration of 0.80G or more AND brake OFF

5. Lateral acceleration of 0.50G or more

Naturalistic driving data collection

1. Drivers & Vehicles

- Non-professional drivers
- Daily business activity
- Passenger car (1500cc)

2. Field study (subject vehicles)

- 3 vehicles : Oct. 2006 - Dec. 2006   (3 months)
- 20 vehicles: Jan. 2007 - Jun. 2007 (6 months)
- 60 vehicles: Jul. 2007 - Dec. 2008 (18 months)

Data sampling and classification diagram

11 regions

Driver replaced HDD

Contracted Company

Sent every 2 weeks

DATA HDD × 60

- *Stored in network storage*
- *Screened and classified by manual inspection*

JARI

DATA HDD × 60

Sent back every 2 weeks

Result of data classification

Event Classification	Trigger type			Total Frequency
	Deceleration G	Acceleration G	Lateral acceleration G	
Crash	5	1	1	7
Incident	**1,110**	**3**	**11**	**1,124**
Traffic event	2,848	3	29	2,880
Normal driving	101,945	3,137	39,086	143,718
Others (private area)	7,953	266	1,854	10,073
Total Frequency	113,861	2,960	40,981	157,802

Incidents corresponding to crash types

(1,124 incidents)
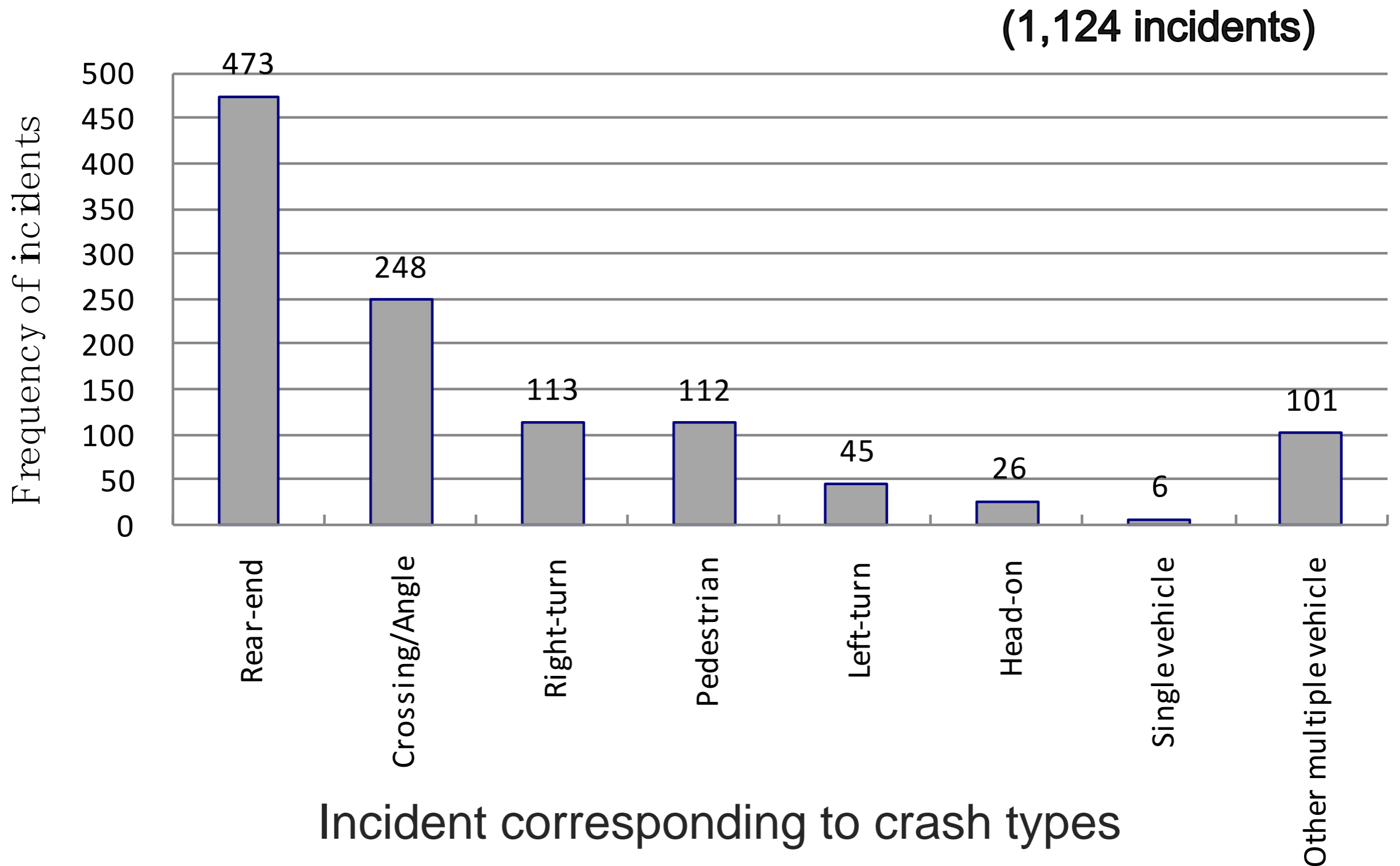
Event cording and database

◆ **Event cording variables (80 variables)**

- Event description (10 var.)
- Traffic environment (21 var.)
- V1/D1, Naturalistic driving subject (22 var.)
- V2/D2, The other participant (12 var.)
- Other information (5 var.)

◆ **Database contains 500 incidents**

- Rear-end (205 cases)
- Angle/Crossing (105 cases)
- Right-turn (95 cases)
- Pedestrian (95 cases)

Delivered by
copy protected CD-R

2. Reproduction of conflicting situation

Purpose

・ Understand contributing factors in major crash

types in Japan

・ Learn possible preventive approaches

Research steps

① Scenario identification (hypothetical causes)

② Reproduction experiments

① Characteristic conflict scenario
Half of Right-turn (LTAP/OD) incidents

1. Waiting to make right turn (Brake ON, -2.3 sec.)

2. Initiating right turn (Accelerator ON, -0.7 sec.)

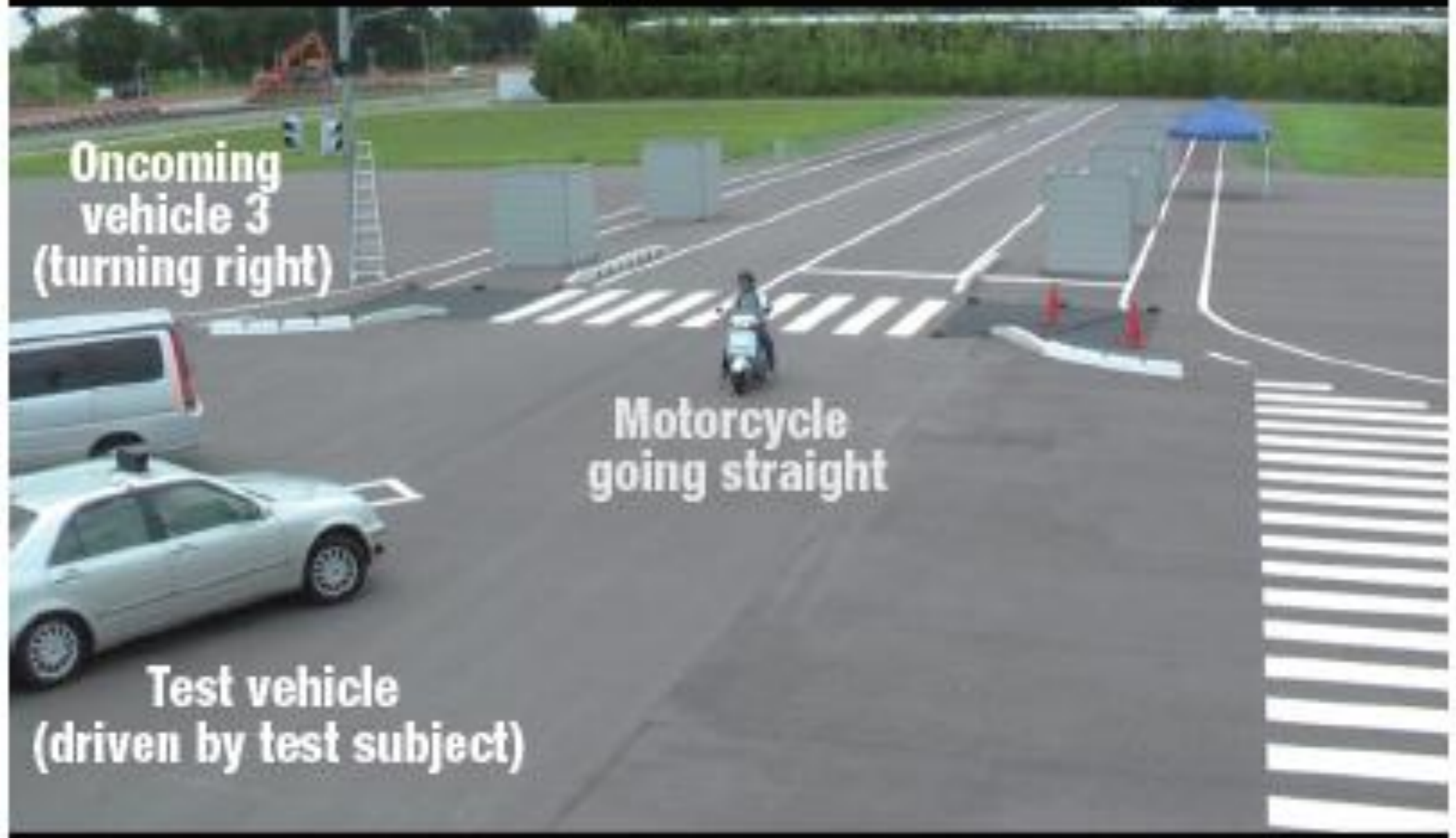3. Emergence of motorcycle going straight (Accelerator ON, 0 sec.)

4. Initiating braking (Brake ON, 0.63 sec.)

② Conflict scenario reproduction
(Test course experiment)

Near miss (sudden braking)

Oncoming vehicle 3 (turning right)

Motorcycle going straight

Test vehicle (driven by test subject)

Future research

- Incident data analysis
  Typical scenario and causes identification
  Aggregation method (DREAM)

- Reproduction of experimental methods
  More applicable and *realistic* instruments

Thank you for your attention