THE METHODOLOGY FOR IDENTIFYING AGGRESSIVE DRIVING USING DRIVING BEHAVIOR PATTERNS

Kiyong Kim, Ph.D.
Korea Transportation Safety Authority
17, Hyeoksin 6-ro, Gimcheon-si, Gyeongsangbuk-do, 39660, Korea
Phone: +82-54-459-7426 E-mail: kky@ts2020.kr

Co-authors(s): Sungmin Hong, Ph.D., Korea Transportation Safety Authority; Byonho Choe, Dr. Dipl.-Psych., Korea Transportation Safety Authority; Cheol Oh, Ph.D., Hanyang University

1. INTRODUCTION
Aggressive driving behaviors, such as reckless driving and driving for revenge (It is common called “Road Rage”), are a major factor affecting the traffic safety by threatening other drivers on the roads. An Aggressive Driver is defined as “Operates a motor vehicle in a selfish, bold or pushy manner, without regard for the rights or safety of the other users of the streets and highways” by the New York State Police (The official website of New York State, 2017). Fatal or big traffic accidents can be caused by driving behaviors of these drivers. Aggressive driving drivers, however, are very hard to control because the events occur randomly. Therefore, researches are needed to effectively manage for aggressive driving behaviors by understanding and analyzing the behaviors.

Precht et al. (2017) identified the effect of driving anger on driving behavior based on naturalistic driving data. The results of their study showed that anger was related to aggressive driving behaviors, but was not related to driving error frequencies. Consequently, they mentioned the dangerous driving behaviors were significantly affected by anger. According to AAA Foundation for Traffic Safety (1997, 2016), more than 78% of U.S. drivers had driven at least one aggressive driving behavior at once in the past year. The most common aggressive behaviors were to drive tailgating another vehicle to show their anger or irritation. The majority of aggressive drivers were young male drivers between the ages of 19 and 39. Many researchers have studied the aggressive or anger driving and have warned the danger of aggressive driving. However, the methodology for managing road rage based on the driving behavior data of aggressive drivers have been studied rarely. Therefore, the objective of the present study is to develop the methodology for identifying aggressive driving behavior patterns based on driving simulator experiments that by comparing behaviors between general driving and aggressive driving.

2. METHODS
The present study is consisted of four steps. First step is to define the aggressive driving behaviors based on reviewing literatures. According to the Governor’s Traffic Safety Committee (GTSC)’s Police Traffic Service (The official website of New York State, 2017), aggressive driving behaviors were defined as following:

- Following improperly / tailgating
- Improper or erratic lane changing
- Operating the vehicle in an erratic, reckless, careless, or negligent manner or suddenly changing speeds without changing lanes
- Failure to yield right of way
- Driving too fast for conditions
- Making an improper turn
- etc.

In the aggressive driving behaviors from GTSC, three behaviors which are expected to be identified by driving patterns were selected as aggressive driving behaviors of the present study: following very closely (tailgating), sudden lane changing (erratic lane changing), and sudden decelerating after lane changing (suddenly changing speeds without changing lanes).

Second, the driving simulator experiments were conducted based on the selected three aggressive driving behaviors. The experiments were conducted from 14 to 18 August, 2017 with 32 subjects who have driving experience more than a year. The authors assumed that the aggressive drivers usually drive a car with selected three aggressive driving behaviors sequentially. Three scenarios were developed as following:

- Scenario 1: Overtaking a front car within 2-km road without any other tasks
- Scenario 2: Overtaking a front car within 2-km road during limited time (90sec)
- Scenario 3: Overtaking a front car within 2-km road with aggressive driving behaviors

Third step is to analyze the results of driving simulator experiments using several statistic methods: descriptive statistics analysis, ANOVA-test, distribution character analysis, and binomial logistics regression analysis. And finally, the methodology for detecting aggressive driving behavior using driving behavior patterns was developed.

3. RESULTS & CONCLUSION
The present study develop the methodology for identifying aggressive driving behaviors. To understand the characteristics of aggressive driving is important. The results of the present study can be used as basic data for detecting drivers who drive aggressively to enforce and educate them. To employ the results to actual road system, the digital tachograph (DTG) data can be used. A DTG is a device that records all information about vehicle operations such as running time, running speed, brake operation, acceleration, and steering wheel operation of the vehicles based on the GPS information. Furthermore, all commercial vehicles in Korea have required to install DTG since 2014 based on traffic safety act. Therefore, through developing methodology to relate the simulation based data to the DTG data, the results of the present study can be used to manage and control commercial drivers who drive aggressively.

REFERENCES

