Pedal Errors Among Younger and Older Individuals During Different Pedal Operating Conditions

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Objective: The objective of this study was to investigate the characteristics of pedal errors by younger and older drivers that relate to sudden unintended acceleration (SUA) accidents.

Background: SUA during an accident is a serious issue that causes numerous critical injuries and deaths every year. Previous studies have indicated that the major factor in these accidents is pedal error; however, the characteristics that relate to SUA accidents in older drivers remain unclear.

Method: Twenty younger drivers (YDs; 23.1 ± 0.22 years) and 20 older drivers (ODs; 68.9 ± 1.16 years) used either one or both feet to participate in six tasks that involved pressing accelerator or brake pedals in response to various visual stimuli.

Results: Both the reaction times (RTs) and the pedal error rates of the YD and OD groups significantly increased with the difficulty of the task. Other than the simple reaction condition, we found that the pedal error rates were significantly higher for the OD group than for the YD group; the OD group also demonstrated longer RTs. Moreover, the rates of accelerator error were consistently two or three times higher than the rates of brake error in both the YD and OD groups.

Conclusion: For the older population, the use of the left foot to operate the brake pedal and the right foot to operate the accelerator could decrease the accelerator error rate and may reduce the rate of SUA-related accidents that are caused by pedal error.

Keywords: pedal error, sudden unintended acceleration, aging effect, motor vehicle accident

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INTRODUCTION

Among nonintentional injuries in Japan, motor vehicle accidents are one of the most important causes of deaths, hospitalizations, medical treatments, and disabilities. Sudden unintended acceleration (SUA) during an accident is a serious issue that leads to numerous critical injuries and deaths every year. In 2008, more than 6,500 accidents involving SUA occurred in Japan, resulting in the death or injury of approximately 10,000 individuals (Ministry of Land, Infrastructure, Transport and Tourism, Japan [MLIT], 2009). Moreover, MLIT (2009) data also indicate that the incidence of SUA in accidents that result in injury or death increases sharply after age 60. Although it is possible that electrical or mechanical defects could be the cause of SUA events, previous studies (Schmidt & Young, 2010) have indicated that the major contributor to SUA in motor vehicle accidents is pedal error.

In the 1980s, the U.S. National Highway Traffic Safety Administration (NHTSA) first defined the concept of SUA, which had attracted considerable attention at that time. In particular, SUA is an unintended, unexpected, and high-powered acceleration from a stationary position or a very low initial speed that is accompanied by an apparent loss of braking effectiveness. To reduce the incidence of SUA, automakers began equipping vehicles with a shift-interlock system in the 1980s. This system prevented vehicles from moving into a forward or reverse gear after the engine was started unless the driver's foot was depressing the brake pedal. This device can effectively reduce the incidence of an SUA when a vehicle is first started. However, drivers may sometimes confuse the brake and accelerator pedals of a moving vehicle (Schmidt & Young, 2010), and the shift-interlock system cannot reduce the chances of an SUA at this time.