

The Influences of Driving Confidence Levels on Traffic Accidents: Research Using Path Analysis*

Soon Chul Lee[†]

Soon Yeol Lee

Sun Jin Park

Chungbuk National University

Road Traffic Safety Authority

Chungbuk National University

We investigated the influences of ‘Circumstance Insensibility’, ‘Unsafe Driving’, ‘Incautious Driving’, and ‘Self-efficacy of Driving’, consisting of driving confidence level, on traffic accidents. 1055 drivers conducted Driving Confidence Level Questionnaire, items about their dangerous driving experience and traffic accidents. Among them, after checking the missing items, we analyzed data of 998 drivers. As a result, we found the relation between driving confidence levels and traffic accidents. Specially, ‘Circumstance Insensibility’ and ‘Unsafe Driving’ influenced traffic accidents. However ‘Circumstance Insensibility’ had negative effects, the other side ‘Unsafe Driving’ had positive effects on traffic accidents. This result means each factor of driving confidence levels have different relation with traffic accidents. ‘Incautious Driving’ and ‘Self-efficacy of Driving’ didn’t have any effects on traffic accidents in this research. In future, it should be investigated ‘Incautious Driving’ and ‘Self-efficacy of Driving’.

Key words : *Diving confidence level, Circumstance Insensibility, Unsafe Driving, Incautious Driving, Self-efficacy of Driving, Traffic accidents*

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† Corresponding Author : Soon Chul Lee, Dept. of Psychology, Chunbuk National University, 410 Seongbong-ro, Heungduk-gu, Cheongju 361-763, South Korea. E-mail : snchul@chungbuk.ac.kr

Driving processes consist of continuous selections of various driving behaviors and options by drivers. There are differences in degrees of confidence in terms of the driving behaviors that drivers select. The differences of the driving confidence levels influence driving behaviors in drivers' ways(Lee, Lee, and Park, 2006a).

To measure the confidence level on driving behaviors of drivers, a driving confidence level questionnaire was developed(Lee, Oh, Park, Lee, and Kim, 2006b). Driving confidence levels consist of 4 factors: 'Circumstance Insensibility', 'Unsafe Driving', 'Incautious Driving' and 'Self-efficacy of Driving'. 'Circumstance Insensibility' is the degree of insensibility of drivers to traffic situations that keep changing and this indicates the degree of confidence that drivers exhibit by not

being influenced unduly by changes in the traffic situation such as congestion, entry to expressways and drive at night, raining, or snowing. 'Unsafe Driving' shows the degree of violation of laws and regulations by drivers and it indicates unsafe driving behaviors. 'Incautious Driving' refers to carelessness in checking right/left, changing lanes and lack of concentration while driving. Finally, 'Self-efficacy of Driving' shows the degree of confidence in the general driving behavior of drivers. Lee, Lee and Park(2006a) investigated the relations between driving confidence and driving behaviors of drivers in main cities and drivers in all age groups by using a driving confidence level questionnaire(Table 1). Driving confidence levels showed correlations with traffic accidents, drunken driving, speeding and others.

Table 1. Correlations of Driving Confidence Levels, dangerous driving, and traffic accidents

	CI	UD	ID	SED	TA	S	DD
CI	1						
UD	.09**	1					
ID	.18***	-.16***	1				
SED	.21***	.13***	.03	1			
TA	-.04	.22***	-.15***	.01	1		
S	.12***	.23***	-.16***	-.02	.11**	1	
DD	.09**	.10**	-.03	.01	.03	.12***	1

* $p < .05$, ** $p < .01$, *** $p < .001$

Note. This is quote from Lee et al(2006a)'s research.

CI is circumstance insensibility, UD is unsafe driving, ID is incautious driving, SED is self-efficacy of driving, TA is traffic accidents, S is speeding, and DD is drunken driving.

The driver groups participating in the research were divided into drunken driving groups and speeding driving groups and the driving confidence levels of the driver groups with no experiences in drunken driving/speeding and driver groups with experiences in drunken driving/speeding and traffic accidents showed significant differences. However, previous research has only investigated the correlations and differences between driving confidence levels and driving behaviors, so this study focused on how driving confidence levels influence on dangerous driving behaviors (speeding, drunken driving) and traffic accidents. Therefore in this research, we investigated that how each factors of driving confidence levels influences on speeding, drunken driving and traffic accidents.

Driving confidence level and speeding

In the research of Lee et al(2006a), the differences in driving confidence levels of speeding drivers and non-speeding drivers were shown in circumstances involving the 'Circumstance Insensibility' and 'Unsafe Driving'. From the correlation analysis, the drivers who speed mainly showed positive significant correlations between the elements of 'Circumstance Insensibility' and 'Unsafe Driving'. This means that the attempts at speeding occur when the drivers recognize that the situation objectively involved less risk

with maintenance of roads or traffic lanes, signals, and indications rather than a confidence in individual ability such as driving confidence. Speeding drivers showed slightly higher confidence in their driving confidence compared to non-speeding drivers, but it was not significant. From this, it was known that with certain experience and over a certain period of time, drivers' confidence in driving was maintained at a certain level and the driving confidence element itself could not directly influence the speeding.

In the research by Lee et al(2006b), the speeding behavior showed negative correlations with 'Incautious Driving', Lee and his colleagues explained the negative correlation of incautious driving as one of the results of speed control. In other words, the drivers who have experienced the being caught speeding once or more do not reduce the speed to prevent being caught speeding, but try to compensate by trying to pay more attention and concentrate on their driving behaviors.

Driving confidence levels and drunken driving

For drunken driving, there are many cases where it is attempted depending on the situation as well as the confidence levels regarding whether the driver believes their drinking influences their driving or not. This

means the underestimation of difficulty in drunken driving in the relation between the amounts of drunken and driving behavior can be one reason behind drink driving. It has been pointed out that drivers have overconfidence regarding their driving ability after drinking(Choi, Son, and Kim, 2001). If drivers attempt to drink drive with a higher degree of confidence in their driving ability, the driving confidence element in driving confidence level will increase. Such a phenomenon also has appeared in the search by Lee, et al(2006a) and even though it was not statistically significant, the driving confidence element of driving confidence level exhibited continuous increases from the driver group under 29 years age to the 40-49 years age group. Such results corresponded to reports that the ratio of young drivers and old drivers who attempt to drink drive is similarly high (Brorsson, Rydgren, and Ifver, 2002).

According to Lee et al(2006a), drunken drivers and non-drunken drivers showed differences in 'Circumstance Insensibility', 'Unsafe Driving' and 'Self-efficacy of Driving'. This shows that the driving confidence level of drivers who attempt to drink drive generally shows high confidence in 'Circumstance Insensibility' and 'unsafe driving' as well as the existence of differences in 'Self-efficacy of Driving'. The drink drivers attempt drunken driving with confidence in

the situation that they are not going to be caught and they exhibit 'driving confidence' after drinking that they can arrive at the destination without any problems(Lee, 2000). Such anticipation could increase the 'Circumstance Insensibility', 'Unsafe Driving' and 'Self-efficacy of Driving' in driving confidence levels.

Driving confidence levels and traffic accidents

For drivers having confidences in relation to specific driving behaviors have a close relationship to the driving experience of drivers(Katila, Keskinen, and Hatakka, 1996). If drivers succeed in certain driving experiences, their confidence increases in similar experiences. However, the increase in such confidence results in overconfidence, so this may in turn might cause traffic accidents. Katila et al(1996) reported that the reason that learners who have completed courses in how to prevent skidding accidents of vehicles are more likely to be involved in such accidents on roads with snow and this is because the training has increased their confidence in dangerous circumstances and they underestimate the dangerous factors of roads with snow or do not take precautions to reduce the danger level. In this way, the driving confidence of drivers has an influence on traffic accidents.

In the research of driving confidence levels, the traffic accidents showed positive correlation with unsafe driving elements. In other words, the drivers with more experience of traffic accidents were people with many violations of laws and regulations. Additionally, even though it was not statistically significant, ‘Circumstance Insensibility’ element had a negative correlation with traffic accidents for all age groups. This suggests that drivers with higher confidence in their ability to adapt to the traffic situation, have a lower possibility of being involved in traffic accidents.

The incautious driving element has shown a negative significant correlation with traffic accidents and Lee et al(2006a) explained the negative correlation of incautious driving element as the result of traffic accidents. In other words, the drivers who have

experienced traffic accidents once or more try to pay more attention and concentrate on driving behaviors as a form of compensation behavior to prevent future traffic accidents.

As seen from the above, the driving confidence level appeared to have an influence as an independent variable of speeding, drunken driving and traffic accidents. However, it is a reality that research on how much influence which element of driving confidence levels actually exert and research which explains speeding, drunken driving and traffic accidents is presently lacking.

Therefore by combining the results of previous research studies, the conceptual basic path model on each element of driving confidence level and speeding, drunken driving and traffic accident is presented as Figure 1. With the basic path model, it was

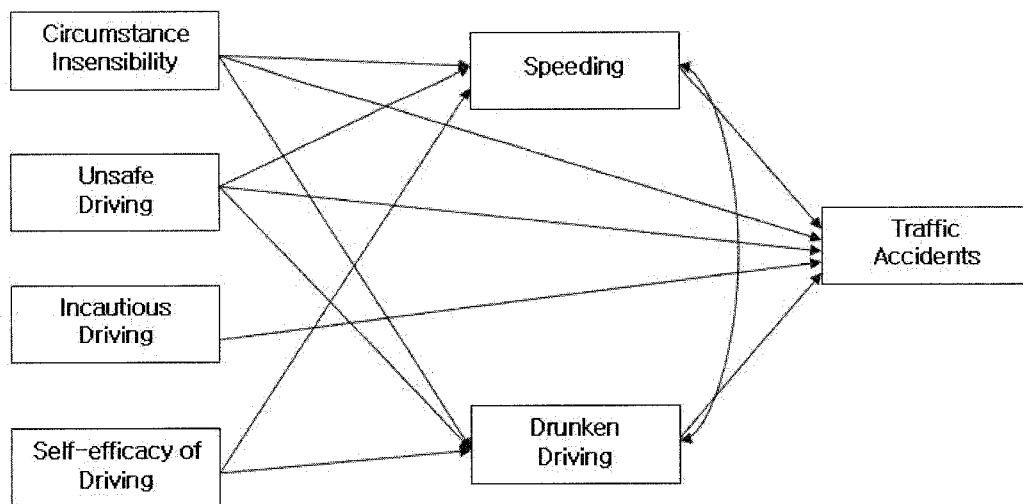


Figure 1. Theoretical model of the influence of Driving Confidence Levels on dangerous driving behavior and traffic accidents

to have a look at in which path the driving confidence level was acting on speeding, drunken driving and traffic accidents.

Method

To verify the process by which driving confidence levels influencing drink driving, speeding and traffic accidents and the degree of the influences that were clarified by Lee et al(2006a), a path analysis was performed. Lee et al(2006a)'s data were used for this study.

Subject

1,055 Korean drivers answered to the driving confidence level questionnaire and their arriving experience. All drivers were disposed of missing values then data of 998 drivers among them were used for the analysis. The ages of participants were from 19 to 79, their average age was 42 years old(SD: 13.8). To help in the understanding of items and to be able to write exact answers, 1:1 interviews were performed for drivers who were aged 65 and over.

Measures

Driving Confidence Level Questionnaire

To measure the confidence levels of driving behavior amongst drivers, a driving confidence

level questionnaire consisting of 33 items was used (Lee et al, 2006a). In the questionnaire, driving confidence level consisted of items related to driving circumstances that drivers avoid and driving behaviors that occur when their confidence is excessive and the degree of agreement of each driver achieved a response ranging from 'Not at all' as 1 point to 'Very likely' as 5 points.

Dangerous Driving Behaviors and Traffic Accidents

The driving behavior survey consisted of questions such as the number of drunken driving experiences, the number of experiences of speeding and the number of traffic accidents. For drink driving and speeding, only the experiences in the last 3 years were asked. Specifically, for drink driving, the number of drink driving experiences unrelated to the control and for speeding, the number of times caught for speeding (speed camera, police control) were stated. For traffic accidents, no matter whether they were reported or not or whether they were fatal or minor, only the experiences in traffic accidents for the last 3 years were asked.

Results

According to the research by Lee et al(2006a), there was a difference in terms of

‘Circumstance Insensibility’ and ‘Unsafe Driving’ element among driving confidence elements between drivers with experiences of speeding and drivers without experiences of speeding. Moreover, speeding behavior has shown a positive significant correlation with ‘Circumstance Insensibility’, ‘Unsafe Driving’ in driving confidence elements and traffic accidents.

For drivers with drink driving experiences and drivers without drink driving experiences, there was a difference in the element of ‘Circumstance Insensibility’, ‘Unsafe Driving’ among driving confidence elements and driving confidence levels and has shown a positive significant correlation with ‘Circumstance Insensibility’ and ‘Unsafe Driving’.

The driving confidence level and traffic accidents have shown positive correlations

with unsafe driving. This fact reflected the way that an increase of unsafe driving in their driving confidence level increases traffic accidents. Additionally, even though the ‘Circumstance Insensibility’ element was not significant to traffic accidents, it has shown a negative correlation for all ages. This showed up if ‘Circumstance Insensibility’ of driving confidence level increases, in other words, if self-confidence in the face of changing traffic situations is higher, the number of traffic accidents decreases (Lee et al, 2006a).

In this research, a basic path model showing how the driving confidence level influences drunken driving behavior, speeding behavior and traffic accidents was set, based on the preceding research and with the path analysis, a final path model was presented as seen in Figure 2.

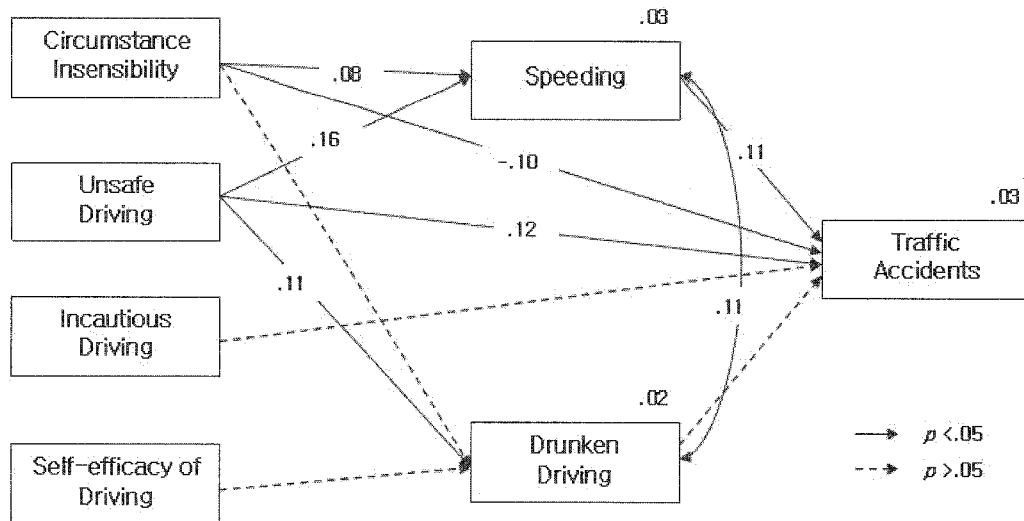


Figure 2. Final model of the influence of Driving Confidence Levels on dangerous driving behavior and traffic accidents

Table 2. Final model fit of Driving Confidence Levels' effects on traffic accidents

X^2	df	p	GFI	AGFI	NFI	RMSEA
4.45	3	.22	.999	.988	.990	.022

For model fit, X^2 was 4.45($p=.22$, $df=3$), GFI was .999, AGFI was .988, NFI was .990 and RMSEA was .022 and these corresponded to the standard of appropriateness of fit(Table 2).

In regards to the final model, 'Circumstance Insensibility' element influenced the speeding behavior($\beta=.08$, $p<.05$) positive significantly and the traffic accidents($\beta=-.10$, $p<.01$) negative significantly. 'Unsafe Driving' element influenced speeding behavior($\beta=.16$, $p<.001$) and drunken driving experience($\beta=.11$, $p<.001$) and traffic accidents($\beta=.12$, $p<.001$)

positively in a significant manner. However, for the path from 'Circumstance Insensibility' to drink driving behavior and the paths from incautious driving and driving confidence elements to speeding, drink driving and traffic accidents didn't show significant influences.

Speeding influenced traffic accidents($\beta=.11$, $p<.001$) positive significantly, but drink driving experience to traffic accidents didn't show significant influences.

If the causal effects of independent variables on traffic accidents were examined,

Table 3. Effects of Driving Confidence Levels and dangerous driving on traffic accidents

	Direct Effects	Indirect Effects	Total Effects
Circumstance Insensibility	-.10	1. Circumstance Insensibility → Speeding → Traffic Accidents	-.09
		2. Circumstance Insensibility → Drunken Driving → Traffic Accidents	
		$1+2=\{(.08) \times (.11)\}=.01$	
Unsafe Driving	.12	1. Unsafe Driving → Speeding → Traffic Accidents	.14
		2. Unsafe Driving → Drunken Driving → Traffic Accidents	
		$1+2=\{(.16) \times (.11)\}=.02$	
Incautious Driving	IS	IS	IS
Self-efficacy of Driving	IS	IS	IS
Speeding	.11	IS	.11
Drunken Driving	IS	none	IS

Note. Every number in Effects means β of represented variables, and IS means insignificant.

for indirect effect, 'Circumstance Insensibility' had a value of .01 in the path to traffic accident via speeding. 'Unsafe Driving' to traffic accident via speeding had a value of .02. The indirect effects of 'Incautious Driving', 'Self-efficacy of Driving', speeding and drink driving were not significant.

If the direct effects of independent variables towards traffic accidents were to be examined, the element of 'Circumstance Insensibility' showed a negative influence of -.10. For unsafe driving and speeding a positive direct influence relation with .12 and .11 was shown. There were no direct influences for incautious driving, driving confidence and drink driving behavior towards traffic accidents. Among these influences, the unsafe driving element showed the biggest positive influence in relation to traffic accidents with a value of .14. This means that the increase of confidence in relation to unsafe driving influences on traffic accidents the most (Table 3).

The explanation values for speeding, drink driving and traffic accidents by driving confidence level were 3%, 2% and 3%.

Discussion

The purpose of this research was to find out in which path the driving confidence level was influencing the drink driving

behavior and traffic accidents and in which level this was occurring.

From the analysis of fit model, the basic model (Fig. 1) based on previous research was corresponding to appropriate model standards. However, some path appeared that did not have a significant influence in relation to the basic model. Therefore the basic path model was selected as a path model for traffic accidents, but by indicating those insignificant paths with dotted lines, it was selected as a final path model (Fig. 2).

In our research results, some paths that didn't appear in previous research have occurred. For instance, 'Circumstance Insensibility' that had shown an insignificant correlation to traffic accidents in previous research. In this study, 'Circumstance Insensibility' appeared to have a negatively significant influence relationship. This means the drivers who adapt to changing traffic situations well, have less difficulties cause fewer traffic accidents.

As for the causes of such results, attention should be paid to the fact that the circumstance insensibility element item was mainly asking for the confidence level in terms of dealing with changing traffic situations. In other words, if the word of 'Circumstance Insensibility' was re-translated affirmatively, it could be considered as 'circumstance adaptability' to traffic situations that keep changing from moment to

moment. This means drivers with high confidence in their ability to deal with changes in the traffic situation, occur more less traffic accidents. There are research studies that correspond to the 'circumstance adaptability' of drivers.

According to Hakamies-Blomqvist and Henriksson(1999), older drivers have high confidence level in their own ability, however, they avoid driving in poor driving conditions such as driving in rain or in darkness and drive shorter distance than young drivers. However, they drive at relatively lower speeds, try not to change traffic lane often and try to avoid driving at rush hour. This shows that their inadequacy of confidence in their ability to deal with potential problems and changes in traffic situations restricts their driving behaviors. However, even with such compensation behavior in evidence, older drivers are classified into the group with high accident probability and this fact points out the way in which a higher possibility of traffic accidents corresponds to a lack of confidence in circumstances or problems with circumstance adaptability. This shows that when drivers have adequate confidence that they can cope with changing situations, they can perform proper driving maneuvers and do so with confidence, and that, as a result, traffic accidents can be decreased as well.

In this research, it was also shown that the element of circumstance insensibility had

a negative influence and effect on traffic accidents and this pointed out the fact that drivers with difficulties in adapting to traffic situations due to excessive avoidances or fears of specific traffic situations could increase the risk of traffic accidents.

In this research, the paths linking driving confidence levels to traffic accidents through speeding and drunken driving behavior were examined. However, for explaining traffic accidents, elements inserted as independent variables had somewhat fewer available explanations. In future research, it would be desirable for a path model to be developed that can better explain these phenomena. It would also be desirable that this research can help advance comprehensive research into the behavior and decision making processes of drivers that are most responsible for causing traffic accidents.

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운전확신수준이 교통사고에 미치는 영향: 경로분석을 이용한 연구

이 순 철

충북대학교

이 순 열

도로교통안전관리공단

박 선 진

충북대학교

본 연구는 운전확신수준을 구성하는 '상황둔감성', '불안전운전', '주의집중소홀', '운전자신감'이 교통사고에 미치는 영향을 살펴보았다. 총 1055명의 운전자를 대상으로 운전확신수준 질문지를 실시하였으며, 이들의 과속·음주 운전과 같은 위험한 운전행동 및 교통사고 경험을 조사하였다. 이 가운데 결측치를 확인하여 998명의 자료가 분석에 사용되었다. 그 결과, 운전확신수준의 구성요소가 교통사고에 이르는 경로를 통해 운전확신수준과 교통사고가 유의한 관련이 있음을 알 수 있었다. 운전확신수준 가운데 '상황둔감성'과 '불안전운전'이 교통사고에 유의한 영향을 미치고 있는 것으로 나타났는데 '상황둔감성'이 교통사고에 부적인 영향을 미치고 있는데 반해, '불안전운전'은 교통사고에 정적인 영향을 미치는 것으로 나타났다. 이러한 결과 운전확신수준을 구성하는 각각의 요인에 따라서 교통사고에 미치는 영향에 차이가 있음을 의미한다. 비록 본 연구에서 '주의집중소홀'과 '운전자신감'은 교통사고와 유의한 관계를 가지고 있음을 밝혀낼 수는 없었지만, 추후 이 두 요인이 운전에서 어떤 영향을 미치는지 살펴보아야 할 것이다.

주요어 : 운전확신수준, 상황둔감성, 불안전운전, 주의집중소홀, 운전자신감, 교통사고