

An Examination of the Perceived Countermeasure of Breath Alcohol Ignition Interlock Device and Behavioral Intention of Drunk Driving in South Korea: An Application of the Theory of Planned Behavior

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Abstracts: In regulating drunk drivers, car-centered prevention seems to be more effective than driver-centered one. Breath Alcohol Ignition Interlock Device (BAIID) seems to be particularly promising countermeasure to drunk driving. However, the tool has not been adopted in South Korea yet. This study examines effect of perceived countermeasure of BAIID on intention to behave drunk driving. This study predicts the behavioral intention to engage in drunk driving through the planned behavior theory. Subjects (N=286) are adults between the ages of 19 and 60 years. We constructed 20 items to measure the composition of the extended model of TPB. Demographic variables include gender and age. Results from hierarchical multiple regression indicate that (1) the model explains 28.2% of the total variance in intention and (2) attitude, subjective norm, and perceived BAIID are significant independent predictors of behavioral intention

Keywords: drunk driving; breath alcohol ignition interlock device (BAIID); behavioral intention; theory of planned behavior; TPB

1. INTRODUCTION

Drinking and driving usually leads to serious large traffic accidents and consequently great societal costs (Cheng & Pien, 2018). Drunk driving in South Korea is a particularly serious problem. For example, A Global Status Report on Road Safety indicates that 14% of fatalities occurred in 2015 involved alcohol. It has a lower percentage of fatalities due to alcohol when compared to other countries, for example, US with 31%, Canada with 34% or Australia with 30% of car fatalities. In the last five years in South Korea, however, 132,585 cases of drunk driving accidents occurred, resulting in 3,450 deaths and 240,000 injuries. Furthermore, the economic costs of traffic accident casualties related to alcohol consumption accounted for 15.6% of the total accidents with casualties, at a cost of about 4.381 trillion won. (The Korea Road Traffic Authority, 2017). While breath alcohol testing (BAT) is now the key method of legal enforcement in South Korea, stricter countermeasures against drunk driving should be considered.

In the work by Fulkerson (2003), the author performed a three-year study where ignition interlock group reported 17.5% recidivism rates compared to 25.3% recidivism rates for the non-interlock group. Although the BAIID seems to be presumable for the prevention of drunk driving, however, the tool has not been adopted yet in South Korea.

This study investigated the effect of BAIID's perceived response to drunk driving behavioral intention. This study is very informative as a study on drunk driving along with the planned behavioral theory (TPB). This study supplements TPB by adding BAIID's countermeasures to predict the behavioral intention of a person who intends to drink and drive

2. LITERATURE REVIEW

2.1. Punishment and drunk driving prevention

Using a questionnaire about the relationship between punishment and drunk driving, Lanza-Kaduce and

alyzed the degree of awareness of the severity of the arrest and punishment by drunk driving in two items. (Lanza-Kaduce, 1988). The analysis revealed that the effect of inhibiting drunk driving was not significant. (Lanza-Kaduce, 1988). In addition, the imposition of stricter punishments on drunk driving by Judge Farrell of the New Philadelphia area of the United States did not result in a significant decline in the number of drunk driving incidents compared to other regions. (Ross & Voas, 1990). This may be because strengthening punishments for drunk driving does not necessarily have a deterrent effect if enforcement efforts are not also strengthened. In other words, people who tend to drink and drive may understand that they are not likely to be arrested even if they drive while drunk. (Grasmick, Bursi, & Arneklev, 1993). From this perspective, it cannot be said that strengthening punishment is the one and only revolutionary crime prevention measure against drunk driving.

BAIID has been found effective in preventing drunk driving in past literature. If Korea introduced an ignition lock, it may be possible to effectively control drunk driving in advance. However, it is important to actively introduce it rather than just discuss it. It is meaningful to conduct a pilot test for some drunk drivers or drivers of commercial vehicles, given that these do not all have to be introduced for all drivers at once. It is also important to establish a system to anticipate and resolve problems that may arise during operation.

2.2. The Theory of Planned Behavior (TPB)

The model of TPB is an effective means of identifying antecedents to engaging in a particular behavior. According to the TPB model, it assumes that whether an individual actually engages in a particular behavior is directly determined by their intention to do so. The theory further hypothesizes that three conceptual components – attitude toward the behavior, subjective norm, and perceived behavioral control (PBC) – provide an independent basis for predicting whether the individual intends to engage in the behavior. In the model of TPB, attitude toward the behavior refers to the degree to which an individual perceives a behavior as favorable or unfavorable. Subjective norm reflects perceived social pressure from significant referents to perform or desist from the behavior. PBC represents the perceived ease or difficulty of performing the behavior.

The results of this study provide the basis for adding one external variable. – perceived countermeasure of BAIID – to predict behavioral continuance intention to engage in drunk driving behavior.

3. HYPOTHESES OF THE STUDY

This study defines behavioral intention as the driver's intention to drink and drive. In the three components of the TPB model, attitude, subjective norm, and PBC are important factors in predicting behavioral intention to participate in antisocial activities. (Kiriakidis 2008; Pee, Suksaard, Kuenpetch, & Nokkaew, 2022; Woon, and Kankanhalli 2008). Previous studies hypothesized that consistent attitudes, subjective norms, and PBC would be important factors in predicting drunk driving behavioral intention. (Hypothesis 1). This study is important in that it has received a lot of help from the TPB mechanism, in which an additional variable of perceived countermeasure of BAIID was expected to account for more variance in behavioral intention after the standard TPB constructs have been collectively considered (Ajzen 1991). It is thus hypothesized that the construct of perceived countermeasure of BAIID will significantly improve the prediction of intentions to commit drunk driving (Hypothesis 2).

4. HYPOTHESES OF THE STUDY

This study collected sample data and conducted a questionnaire to test the two hypotheses presented. This section describes the study methodologies including development of a measurement instrument, a sampling procedure, and the respondents that participated.

4.1 Development of measurement instrument

This questionnaire is related to demographic information and composition, which are the measurement tools of the expanded TPB model. Several items were reverse-worded to minimize response biases.

4.2. Survey questionnaire

A fixed nominal scale including gender and age was used to collect respondents' demographic information. The structure of TPB is based on the sample provided by Ajzen. Ajzen (1991). Items were carefully modified to reflect the characteristics of drunk driving. Intention to engage in the behavior was assessed by the mean of four items on the seven-point semantic differential scale. Higher scores for intention indicate less willingness to commit drunk driving. Attitude toward the drunk driving behavior was assessed by the mean of six items on bipolar adjectives of the seven-point semantic differential scale. Higher scores for attitude indicate unfavorable attitudes toward drunk driving. For the assessment of subjective norm, three items were scored on the seven-point semantic differential scale, while one item was measured by rating one statement on a seven-point Likert scale ranging from 1 (= 'approve') to 7 (= 'disapprove'). Less scores for subjective norm indicate greater social pressure not to commit drunk driving. Behavior control was evaluated as the average of 3 items at 7 points. The higher the perceived control score, the higher the control over drunk driving. Lastly, an additional construct of the extended TPB model – perceived BAIID – were scored on the seven-point Likert scale, ranging from 1 (= 'strongly disagree') to 7 (= 'strongly agree').

4.3 Sampling procedure and respondents

The target respondents were chosen from among a non-random convenience sample of (1) gender-balanced groups and (2) legal age groups of 19 to 60 years. The sample size was set to N = 250 respondents as a minimum. All materials are in Korean. The main part of the questionnaire was written as follows N = 300 samples from a paneled inventory. The confidentiality of the participants was assured and the survey was designed to ensure that they know what counts as drunk driving. N = 286 respondents returned their questionnaires. All completed materials were usable, yielding a response rate of 95.3%. Respondents in the final sample had an average age of 46.5 years (S.D. = 6.70). They consisted of 144 males (50.3%) vs. 142 females (49.7%), indicating a fairly representative quota sample of gender. Table 1 describes the demographic characteristics of N = 286 respondents including gender and age.

Table 1. Demographic Characteristics of N = 286 Respondents: Gender and Age.

Demographic characteristics	Frequency	Percentage
<i>Gender</i>		
Male	144	50.3%
Female	142	49.7%
<i>Age</i>		
19-29	68	23.8%
30-39	71	24.8%
40-49	73	25.5%
50-60	74	25.9%
Total	N = 286	100.0%

5. DATA ANALYSIS OF HYPOTHESIS TEST

Data analysis was performed using statistical packages of SPSS 22.0 and Microsoft Excel 2016 where appropriate. The scale validation from sample data is followed by a hypotheses test.

5.1. Descriptive statistics

Descriptive statistics of the mean and standard deviation for the measured constructs and items are p

resented in Table 2. The mean of PBC (M = 4.323, S.D. = 1.9912) was rated lowest among the five antecedents for the extended TPB model, while the mean of subjective norm was rated the highest (M = 5.590, S.D. = 1.3121). The mean of perceived BAIID was rated above the midpoint on the seven-scale (M = 5.291, S.D. = 1.8401).

Table 2. Descriptive Statistics and Cronbach's Alpha Coefficients for Each Variable.

Construct	Item	Item mean (S.D)	Cronbach's α
Intention (M = 5.168, S.D. = 1.8301)	INT1	5.212 (1.7429)	0.812
	INT2	5.372 (1.3455)	
	INT3	5.174 (1.6337)	
	INT4	4.915 (1.4232)	
Attitude (M = 5.417, S.D. = 1.3773)	ATT1	5.215 (1.3367)	0.921
	ATT2	5.460 (1.2123)	
	ATT3	5.631 (1.1445)	
	ATT4	5.307 (1.1002)	
	ATT5	5.559 (1.2339)	
	ATT6	5.332 (1.2737)	
Subjective norm (M = 5.590, S.D. = 1.3121)	SN1	5.449 (1.1363)	0.854
	SN2	5.426 (1.3440)	
	SN3	5.602 (1.2805)	
	SN4	5.883 (0.9706)	
PBC (M = 4.323, S.D. = 1.9912)	PBC1	4.340 (1.8031)	0.842
	PBC2	4.265 (1.9203)	
	PBC3	4.363 (1.8683)	
Perceived BAIID (M = 5.291, S.D. = 1.8401)	PB1	5.172 (1.7065)	0.836
	PB2	5.378 (1.7710)	
	PB3	5.324 (1.7831)	

5.2. Scale validation

The measurement instrument for the present study was substantiated by a series of scale refinement processes (Gerbing and Anderson 1988). The alpha coefficient is calculated to evaluate whether constituent items make consistent measurements with the same concept. An exploratory factor analysis (EFA) was then performed to identify the underlying factorial structures of the items. Discriminant validity was tested using the guideline suggested by Fornell and Larcker (1981).

5.2.1. Internal consistency

Internally consistent evaluations were made to ensure accuracy for each configuration. The value of the calculated alpha coefficient is as follows. 0.812 to 0.921, which exceed the lower cut-off of the satisfactory y range (Nunnally and Bernstein 1994) (Table 2).

5.2.2. Exploratory factor analysis

The appropriateness of factor analysis was examined through the calculation of the KMO measure of sampling adequacy (= 0.831) and Bartlett's test of sphericity (p = 0.000) (Hair et al. 1998; Hutcheson and Sofroniou 1999). An exploratory factor analysis (EFA) was performed on twenty items using Varimax rotation with Kaiser Normalization. The extraction method selected was principal component analysis. The result indicates that five distinctive factors with eigenvalues that exceed 1.0 were extracted, corresponding to the five constructs of interest in the present study. The seven factors accounted for 72.3% of the total variance of items. Table 3 shows that all factor loadings exceed the recommended threshold of 0.6 (Carmines and Zeller 1979), ranging from 0.624 to 0.739 (p < 0.001 for all cases). The results indicate that EFA identified five latent factors of attitude, subjective norm, PBC, perceived BAIID, and intention.

Table 3. Exploratory Factor Analysis (EFA): Rotated Component Matrix.

Item	Component				
	1	2	3	4	5
INT1			0.739		
INT2			0.721		
INT3			0.704		
INT4			0.632		

ATT1	0.734				
ATT2	0.729				
ATT3	0.713				
ATT4	0.637				
ATT5	0.724				
ATT6	0.664				
SN1		0.624			
SN2		0.658			
SN3		0.731			
SN4		0.724			
PBC1				0.730	
PBC2				0.719	
PBC3				0.763	
PB1					0.707
PB2					0.712
PB3					0.725

INT = intention; ATT = attitude; SN = social norm;
 PBC = perceived behavioral control; PB = perceived BAIDD
 Factor loadings below 0.5 are not shown.

5.3. Hypotheses test

A hierarchical multiple regression was performed to evaluate the extended TPB model in predicting intention to commit drunk behavior. A key assumption of normality for regression analysis was checked through the examination of skewness and kurtosis for each variable (Chung and Zhao 2004). The result indicates that skewness and kurtosis values vary from -.881 to 1.832, from -.993 to 1.754, respectively. As a rule of thumb, data can be considered normal if skewness and kurtosis values vary between -1 and +1 (Hair et al. 1998). However, several studies suggest that less stringent criterion is to use a range of -2 to +2 for skewness and kurtosis (George and Mallery 2009; Pallant 2001). The sample data were thus judged to be adequate for regression analysis on the basis of less stringent distributional assumption.

Table 4 presents the predictors of intention included in each step, the corresponding adjusted squared changes, and the betas and standard errors for each variable. At step 1, demographic variables including age and gender were entered. The three constructs of the standard TPB model of attitude, PBC and subjective norm were entered at step 2. Perceived BAIDD were entered last.

Table 4. Hierarchical Multiple Regression of Intention.

Predictor	B	Std. error	β	β_{final}	Adj. R^2	F
Prediction of intention						
Step 1					0.020	F = 3.331*
Age	-0.021	0.047	-0.028	-0.004		
Gender	-0.342	0.139	-0.146*	-0.030		
Step 2					0.231	F = 26.212***
Attitude	0.429	0.083	0.336***	0.289***		
SN	0.232	0.080	0.172**	0.136*		
PBC	0.022	0.038	0.031	0.004		
Step 3					0.282	F = 7.315***
PB	0.121	0.052	0.139**	0.148**		

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

At step 1, inclusion of age and gender for 2.0% of the variance in intention (F = 3.331, $p < 0.05$). Gender was the only significant predictor of intention ($\beta = -0.146$, $p < 0.01$). A close inspection of the beta weights in the final regression equation, however, indicates that none of the two demographic variables were significant.

The second step tested the standard TPB model and its power to predict intention to engage in the behavior. Inclusion of attitude, PBC, and subjective norm accounted for a further 21.1% of the variance in intention (F = 26.212, $p < 0.001$). Attitude ($\beta = 0.289$, $p < 0.001$) and subjective norm ($\beta = 0.136$, $p < 0.01$) were significant in the prediction of intention, but PBC was not ($\beta = 0.004$, $p > 0.05$). An independent effect for PBC was not statistically significant in the final regression equation ($p > 0.05$). The results partially s

upport hypothesis 1.

The addition of perceived BAID at step 3 significantly increased the proportion of total variance explained to 28.2% ($F = 7.315$, $p < 0.001$). Perceived BAID ($\beta = 0.148$, $p < 0.01$) scored well after age, gender and the TPB variables were controlled. The results provide a support for hypothesis 2.

5.4. Discussion

In line with the TBP, and in line with modest support for hypothesis 1, the findings confirm the significant role of attitudinal and normative influence on behavioral intention of drunk driving. Respondents with unfavorable attitudes had less intention to commit drunk driving or those with favorable attitude had stronger intention; and increasing or decreasing levels of approval for engaging in drunk driving were significantly associated with increasing or decreasing intention, respectively. It is notable that the beta coefficient for attitude is over twice that of the social norm. The finding directly indicates that attitude had more influence on intention than social norm. One plausible explanation is based on the idea that significant gaps might exist between respondents' perceived attitudes and the absence of a corresponding level of social enforcement or efforts from their peers or superiors.

When perception of BAID were included in the final regression model, it increased the overall explained variance in intention by 5.1%. Consistent with prediction, individuals who had greater perception of preventing drunk driving reported less intention to commit drunk driving. The result is in line with several studies, where BAID program should be able to prevent drunk driving (Beirness and Marques, 2004).

6. CONCLUSION AND LIMITATIONS

This study is a motivating factor study that can help understand the intention of an individual drunk driving. The results of this study show that intentions of drunk driving behavior can be governed by attitudes and normative beliefs about the behavior, as well as the extent to which individuals feel confident that car-centered tool of BAID should be helpful in preventing drunk driving.

A major limitation of the current study is the fact that individual differences in personality traits were not taken into consideration. Research has indicated that certain personality traits including amount of daily drinking or intoxicated level provide the basis for the understanding of drunk driving behaviors. This research needs to be formalized by incorporating more sophisticated subjects. Also, a limitation of this study is the use of a random sample. Therefore, these results cannot be generalized to other countries. Future research should extend the design to conduct cross-cultural comparisons of BAID policy.

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