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The Delay Discounting and Aggression of Patients with Alcohol-Fuelled Violence

Seung-U Lim[1] Young-gun Ko[2†]

[1]Department of Psychiatry, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul; [2]Department of Psychology, Korea University, Seoul, Korea

To determine the factors that differentiate between the violent alcoholic group and non-violent alcoholic group, impulsivity and aggression are examined. In measuring impulsivity, delay discounting—referring to the devaluation of future outcomes—is believed to explain the behavioral tendencies of aggressive alcoholics. Participants consisted of 82 male inpatients in an alcohol abuse clinic, as well as 30 male non-patients as control subjects. To examine the relationship between alcoholism, aggression, and impulsivity, Barratt impulsiveness scale (BIS), Aggression Questionnaire (AQ), and delay discounting task were used. The study's results showed that BIS can be sensitive in differentiating the 'trait' aspect of impulsivity between alcoholics and non-alcoholics. However, the delay discounting task showed an effectiveness in the differentiation of the 'behavioral' aspect of impulsivity, and in this case, the distinction between those who display alcohol-fuelled violence and those who do not. More specifically, the rate of discounting was higher for the violent alcoholic group than the non-violent alcoholic group, suggesting that a further study examining the behavioral aspect of impulsivity could lead to a better understanding and treatment of those who display a more aggressive tendency while under the influence of alcohol.

Keywords: alcohol-fuelled violence, impulsivity, delay discounting, alcohol abuse

Alcohol-fuelled violence has been a long-standing problem throughout the world. The Diagnostic and Statistical Manual of Mental Disorders IV describes alcohol abuse as a "maladaptive pattern of alcohol use which leads to a clinically significant impairment despite recurrent domestic, social, interpersonal, work, and legal problems". In the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; DSM–5; APA, 2013), those with alcohol abuse have "recurrent alcohol use resulting in a failure to fulfil major role obligations at work, school, or home [and/or] is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by alcohol".

Alcohol abuse followed by violent acts, such as assault, rape, theft, and vandalism is not unfamiliar in Korea. In Korea, the term 'ju-pok', which roughly translates into 'alcohol-related violence' is a word created and trademarked by the Seoul Metropolitan Police Agency commissioner. The data provided by the Police Science Institute (2014) of South Korea show that over the past 3 years, roughly 1/3 of murder, rape/sexual assault, and battery cases was due to alcohol-fuelled violence.

However, when examining alcohol-fuelled violence, there is also a tendency to regard alcohol to be the sole proponent of impulsivity, which in turn leads to violence. In other words, there is a popular conception that alcohol consumption leads to impulsive acts, and in some cases violent. For example, alcohol-fuelled violence in Korea received lesser punishment previously, due to the criminal law article 10 clause 2, which states, "those who are not able to differentiate objects due to impairment in mental status are given lesser punishment." This clause was frequently used by those who committed alcohol-fuelled violence, and it was only recently that

†Correspondence to Young-gun Ko, Department of Psychology, Korea University, 145 Anam-ro, Sungbuk-gu, Seoul, Korea; E-mail: elip@korea.ac.kr

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the society addressed alcohol-fuelled violence, with the Seoul Metropolitan Police Agency issuing a 'war against alcohol-fuelled violence' in 2012, enforcing harsher punishment on those who previously received a mere slap on the wrist.

While such enforcement has been generally well received by the public, high amounts of alcohol consumption have not necessarily meant high levels of alcohol-related problems (White & Labouvie, 1989); and this study is on the basis that impulsiveness leads to increased alcohol consumption. Therefore, it is optimal to take into consideration both the quantity or frequency of alcohol use and alcohol-related negative consequences in studies investigating problematic alcohol use (Ham & Hope, 2003). Although the most prevalent idea of the neurological effect the alcohol has on aggression is well known (Giancola, 2000), other explanations such as classical conditioning between alcohol consumption and aggression (Hoaken, et al., 2003), and automatic associations in long-term memory providing aggression (Bartholomow & Heinz, 2006) also provide insight to the relationship between alcohol and violence. Our focus here is mainly on the impact of impulsivity on alcohol-fuelled violence, since impulsive and rash decisions to delayed gratification is not only related with increased consumption of alcohol, but also with deviant and violent behavior (Ayduk et al., 2000; Herndon & Bembenutty, 2014). By its definition, "substance use is continued despite the knowledge of having a persistent or recurring physical or psychological problem that is likely to have been caused or exacerbated by the substance" (APA, 2000). With the knowledge of the negative consequences that will follow, those with alcohol problem shows impulsive acts to consume it. However, the mechanism in which those with alcohol use disorders who display violent act is unclear, and clearer distinction of the differences in impulsive tendencies between non-violent and violent group among patients with alcohol use disorder is needed.

In an attempt to understand impulsivity, numerous researchers have tried to define it in a way that incorporates as many relating factors as they can. Most notable conceptualization comes from behavioral and personality definition. "The behavioral approach defines impulsivity as observable behaviors that an individual engages in… while the personality approach views impulsivity as a trait that one possesses and that influences behavior (Whiteside & Lynam, 2003). Even though impulsivity can certainly be beneficial in specific situations, researchers in general have viewed impulsiveness as counterproductive by defining it as a "range of maladaptive behaviors including an inability to inhibit inappropriate action, insensitivity to delayed or uncertain consequences, perception of time as progressing more slowly than actual time, and the perseverance of negatively reinforced actions." Similarly, Moeller, Barratt, Dougherty, Schmitz, and Swann (2001) have defined impulsivity as "a predisposition toward rapid, unplanned reactions to internal or external stimuli with diminished regard to the negative consequences of these reactions to the impulsive individual or others." Barratt (1994), in a revised BIS-II, has categorized impulsivity into 3 main substrates: ideamotor impulsiveness (acting without thinking), careful planning (inattention to details), and coping stability (lacking future-orientation). Stanford et al. (2009) have reviewed the subscales of Barratt Impulsivity (BIS) as well as other scales used for measuring impulsivity, and stated that "BIS-II is highly correlated with similar self-report measures (convergent validity), but not significantly correlated with behavioral measures of impulsiveness." Such result has been consistent with previous studies (Barratt & Patton, 1983; Lane et al., 2003). It is also believed that "self-report measures like the BIS-II assess personality traits occurring over extended periods of time and reflect an individual's subjective experience, while behavioral procedures assess more state-dependent aspects of impulsivity" (Dougherty et al., 2003).

While numerous theories and their substrates are significant in each way, "emphasis on [failed, maladaptive] consequences is reflected in a commonly used operational definition of impulsivity as being a preference for smaller, more immediate rewards over larger, more delayed rewards". Delay Discounting refers to "the process of devaluing behavioral outcomes, be they rewarding or aversive events that happen in the future" (Madden & Bickel, 2010). In other words, delay discounting explains the behavioral phenomenon of devaluing the reward of future outcome more as the time gap increases. On its use outside the economic construct, "the focal construct of delay discounting is thought to be wide-reaching in its impacts: smoking and other drug use, dieting, procrastination, and other self-control failures have all been posed to be, at heart, delay discounting issues" (Angott, 2010). Mazur (1987) has developed the following hyperbolic model for delay dis-

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counting:

$$(Vd = \frac{A}{1+kD})$$

Where Vd is the discounted value of the future reward, A is the reward amount, D is the delay until reward delivery, and k is the discounting rate. Hyperbolic model states that as the delay increases, the value of rewards decreases. Delay discounting rate (k) is a "quantitative description of a pattern of choices… [and] a high discounting rate does not cause impulsive choice but is rather derived from impulsive choices" (Madden & Bickel, 2010). The equation derived from Mazur has been supported in various studies that focused on behavioral aspect of impulsivity, including human participants (Green, et al., 1994; Kirby, 1997; Ohmura, et al., 2006; Rachlin, et al., 1991; Simpson & Vuchinich, 2011) as well as in relation to drug addiction (Bickel, et al., 1999; Madden, et al., 1999; Odum, et al., 2002). Also, it did not matter whether real or hypothetical reward (Johnson & Bickel, 2002; Madden, et al., 2003), or whether the delayed outcome was loss or gain (Murphy et al., 2001; Odum et al., 2002).

Therefore, in this study, the substrate 'non-planning impulsiveness' is chosen as the key idea in measuring the impulsiveness of an individual, and it can be closely related to the idea of delay discounting. Also, since delay discounting measures the behavioral aspect of impulsivity, the study could lead to an alternative finding which was limited in BIS-II. The current study hypothesizes that those who show violent behavior after alcohol consumption will have higher level of delay discounting. In other words, there will be a difference in delay discounting, or display of behavioral impulsivity, between the patients diagnosed with alcohol use disorders who do or do not show violent behavior.

Methods

Participants

Every participant in the study signed a consent form that outlined the purpose of the experiment, and the association and contact number of the experimenter. A total of 176 participants were recruited to examine the relationship between alcohol use, aggression, and impulsivity. For the alcoholic group, 108 inpatients from an alcohol abuse clinic located in Seoul participated in the study. Out of the 108 participants from the hospital, 26 did not complete the questionnaire, leading to a total number of 82 questionnaires that were used for the analysis. All of the subjects who participated in the study were diagnosed first by a psychiatrist, followed by the experimenter, according to the DSM-IV-TR criteria for alcohol dependence. For the control group, 58 teachers from Gyeonggi based elementary school, 4 male businessmen from Seoul-based clothing company, and 3 apartment guards/janitors in Gyeonggi participated. All the participants in the control group was interviewed by the experimenter, and was not diagnosed with alcohol dependence or alcohol abuse in accordance to the DSM-IV-TR. The analysis of the data involved only the male gender in order to be in accordance with the all-male participants from the hospital, and in order to create a more homogenous sample representation that matches the alcoholic patients. Thirty three teachers whose gender was female and 2 teachers whose age fell below 30 were excluded, leaving a total of 30 individuals for the control group. The distinction between violent alcoholic group and non-violent alcoholic group was made by their history of arrest resulting from their aggressive behavior. The record of their arrests was obtained by the information on their medical record. Each group had been given specific instructions on the purpose and the procedure of the study. To increase participation from the participants, either Korean Won (₩) equivalent of $10 or a small water bottle equivalent to $10 was distributed at the end of the delay discounting task.

Measures

Demographics. A brief demographic survey was used to assess each participant's gender, age, level of education, level of income, number of hospitalization, first date of diagnosis, comorbid mental disorder, and whether they had been arrested for alcohol-fuelled violence before.

The Alcohol Use Disorders Identification Test (AUDIT). AUDIT is a 10-item self-report designed to measure three different alcohol domains: alcohol consumption (items -3), alcohol-dependence (items 4-6) and alcohol-related consequences (items 7-10) (Saunders et al., 1993). A score of 0-7 suggests low risk drinking, 8-15 hazardous drinking, 16-19 harmful drinking, and 20 or higher dependent drinking. The AUDIT was developed by the World Health Organization and has been used widely for measur-

ing alcohol problems (e.g., Hodgson et al., 2002). For this study, an AUDIT version translated into Korean has been used (Lee et al., 2000). AUDIT was assessed to determine whether there was any difference in the tendencies in the ways that violent alcoholic group and non-violent alcoholic group used alcohol.

Barret Impulsivity Scale (BIS). BIS is a 30-item self-report questionnaire with three specific subscales, including attentional impulsivity (concentrating/paying attention), motor impulsivity (fast reactions/restlessness), and non-planning impulsivity (orientation toward the present). Items are rated from 1 (rarely/never) to 4 (almost always/always). Higher scores represent greater impulsivity. Healthy subjects' score in the 50-60 range (Swann et al., 2002). Spinella (2007) has found that Barratt impulsiveness scale correlates well with other measures of impulsivity. For this study, BIS-II translated into Korean has been used (Heo et Al., 2012). BIS was assessed to determine the general impulsivity of the alcoholic groups, as well as in comparison to the normal control group.

Aggression Questionnaire (AQ). AQ is developed by Buss and Perry (1992), and contains four subscales: physical, verbal, anger, and hostility. A five point scale was used: (1) Never or hardly applies to me, (2) Usually does not apply to me, (3) Sometimes applies to me, (4) Often applies to me, and (5) Very often applies to me. In this study, AQ, which was translated into Korean, had been used (Seo & Kwon, 2002), and was assessed by self-report measures in order to determine the difference in aggression between the two groups.

Procedure

Three researchers visited participants in each hospital ward and informed the purpose and procedure for the study. After the explanation, each participant was given a questionnaire to complete. Every participant was given 30 to 45 minutes to complete the survey, and was clarified of any misunderstanding or questions they might have. The delay discounting task was carried out in a private room, and each participant was brought in individually. There the surveys were retrieved, and the participants were informed about the purpose and procedure for the delay discounting task.

The procedure for the delay discounting task was as follows; each participant was told the following in Korean.

"I am going to ask you to make a decision that includes two situations. You will have to choose the situation that you prefer amongst these two situations. I will be presenting two rewards that you can receive on two separate cards. The amount on the left is the possible reward that you can receive right now. The amount on the right is the possible reward that you can receive after certain period of time. You will not receive the rewards that you choose, but I want you to make your decisions as though you were really going to get the rewards you choose. After I have presented the two situations, please point to the reward that you would prefer. The way you decide between the 2 cards is entirely up to you, and there is no right or wrong answer. Please take your time to answer each question carefully."

The experiment started with an example, to see whether or not the subject has understood the process. All experiments were explained and conducted in Korean Won (₩). The subjects were first asked to select between $50 now or $50 1 month from now, in which every subject chose $50 now. After the subjects understood the process of the experiment and completed the example, they were told to select between hypothetical money they could receive today (equivalent of $500) and hypothetical money they could receive 5 years from now (equivalent of $1,000). The delayed period in which the future rewards were presented in either a descending sequence or an ascending sequence, (for example, from 1week up to 5 years). Same procedure was repeated with $3,000 and $5,000, and the ascending or descending order was selected randomly on each of 3 procedures.

Results

Demographic Characteristics and Group Differences

Demographic characteristics appear in Table 1. The number of participants for non-violent alcoholic group was 40, and their mean age was 50.5 (ranging from 29 to 63). For the violent alcoholic group, the total number of participants was 42, with the mean age of 49.2 (ranging from 32 to 65). Finally, the control group consisted of 30 participants, with the mean age of 49.0 (ranging from 33 to 66). Among the groups, there were significant differences in education level, $F(2,110) = 26.8$, $p < .01$; income level, $F(2,110) = 58.3$, $p < .01$; AUDIT score, $F(2,103) = 177$, $p < .01$; BIS score, $F(2,103) = 8.42$, $p < .01$; Motor substrate of BIS, $F(2,103) = 5.11$, $p < .01$; Non-

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Table 1. *Demographic Characteristics and Group Differences*

Variables	Violent alcoholic ($N=42$)		Non-violent alcoholic ($N=40$)		Control group ($N=30$)		*F*	*Tukey*
	M	*SD*	*M*	*SD*	*M*	*SD*		
Age	49.2	1.68	50.5	1.47	49.0	1.71	.261	
Number of hospitalization	2.17	.326	1.75	.199	-	-	1.20	
Alcohol consumption (Month)	28.0	2.05	28.8	2.35	-	-	.54	
Education	1.95	.950	2.25	.927	3.53	.937	26.8**	3 > 1,2
Income	.77	.684	.73	.751	2.33	.606	58.3**	3 > 1,2
AUDIT	23.4	.639	23.8	.582	5.21	1.03	177**	1,2 > 3
BIS	66.5	1.26	63.5	1.46	57.4	1.70	8.54**	1,2 > 3
Attentional	16.4	.486	15.4	.804	14.8	.437	1.40	
Motor	23.3	.638	22.1	.662	20.1	.698	5.11**	1 > 3
Non-Planning	26.8	.592	26.0	.644	22.5	1.08	8.01*	1,2 > 3
AQ	68.7	2.22	52.3	1.84	52.9	11.56	20.3**	1 > 3
Physical	20.9	1.02	13.7	.675	15.2	.981	19.8**	1 > 3
Verbal	11.6	.515	11.0	.537	10.3	.519	1.49	
Anger	18.2	.709	14.2	.768	13.7	.708	11.3**	1 > 2,3
Hostility	18.4	.8181	13.4	.689	13.8	.889	13.0**	1 > 2,3

*$p < .05$. **$p < .01$.

planning substrate of BIS, $F(2,103) = 8.01$, $p < .05$; AQ score, $F(2,102) = 20.3$, $p < .01$; Anger substrate of AQ, $F(2,101) = 11.3$, $p < .01$; and finally, Hostility substrate of AQ, $F(2,100) = 13.0$, $p < .01$. These differences are also shown in Table 1. A post hoc Tukey test showed that the control group had higher level of education and income than the other 2 groups, $p < .01$. The 2 alcoholic group had significantly higher level of AUDIT score, $p < .01$, BIS score, $p < .05$, and Non-Planning subscale of BIS, $p < .05$ than the control group. Violent alcoholic group had higher level of Motor subscale of BIS, $p < .05$, AQ, $p < .01$, and Physical subscale of AQ, $p < .01$, than the control group, but did not show significant difference with the non-violent group. The violent alcoholic group also showed significantly higher level of Anger, $p < .01$, and Hostility, $p < .01$ subscale of AQ than the other 2 groups.

Correlations between Variables

A Pearson correlation was used to determine whether any demographic variables were associated with k values. Each correlation is presented in Table 2. Age, the number of hospitalization, duration of consumption, and IQ were not associated with k values in any of the conditions. Education Level was significantly correlated with all of the \$100, $r = -.21$, $p < .05$, \$300, $r = -.21$, $p < .05$, and \$500, $r = -.20$, $p < .05$, conditions. Income Level was significantly correlated with \$100 condition, $r = -.22$, $p < .05$, and \$300 condition, $r = -.19$, $p < .05$. AUDIT scores, $r = .29$, $p < .05$, and Anger subscale of AQ, $r = .26$, $p < .01$, were significantly correlated with the k value of \$100 condition. The finding from this study suggests a clear relationship between the degree of discounting with both the tendency to consume alcohol and extent of anger.

Difference in Delay Discounting between Non-Violent and Violent Alcoholic Group

In order to determine the difference in delay discounting between the groups, the mean k value is calculated on each of \$100, \$300, and \$500 trials. The k average was derived from the equation Mazur (1987) has suggested; $Vd = A/(1+kD)$. Since the education level was found to be significantly correlated with each of the trials, it was inserted as a covariate. The average k value for each trial as well as the difference in k value of each group is presented in Table 3. A post hoc Tukey test showed significant differences between the violent alcoholic group and each of the other groups across separate discounting trials, $p < .01$.

A plot graph is presented in Figure 1 to illustrate a more visible difference between the groups across the trials. The x-axis in the graph represents the 3 separate delayed rewards, and the y-axis represents the average k value. For each trial, the average k value

Table 2. *Correlation amongst Delay Discounting Rate, Demographic Data, and Questionnaires*

	K$100	K$300	K$500	Age	Education	Income	Hospitalization	Duration of alcohol consumption	AUDIT	BIS	Attentional	Motor	Non-planning	BDI	AQ	Physical	Verbal	Anger	Hostility
K$100	1																		
K$300	.775**	1																	
K$500	.733**	.994**	1																
Age	-0.58	0.140	0.142	1															
Education	-.212*	-.212*	-.204*	-.213*	1														
Income	-.217*	-.191*	-0.18	-0.082	.467**	1													
Number of Hospitalization	0	-0.01	0	0.004	0	0.1	1												
Duration of Alcohol Consumption (Month)	0	-0.12	-0.1	.742**	0	0	0	1											
AUDIT	.219*	0.169	0.17	0.142	-.613**	-.508**	0.2	-0.2	1										
BIS	0.1	0.049	0.03	-0.091	-.265**	-.409**	0.2	-0.1	.355**	1									
Attentional	0.1	-0.04	-0.1	-0.154	0	-.224*	0	-0.1	0.1	.683**	1								
Motor	0.1	0	0	-0.102	0	-.275**	.243*	0	.338**	.767**	.341**	1							
Non-planning	0.1	0.134	0.12	0.036	-.350**	-.390**	0	-0.1	.287**	.754**	.241*	.353**	1						
BDI	0.1	0.113	0.1	.203*	-.271**	-.195*	0	0.1	0.2	.368**	.302**	0.155	.352**	1					
AQ	0.2	0.105	0.09	-0.058	-.234*	0	0.1	0	0.2	.423**	.330**	.346**	.270**	.247*	1				
Physical	0.1	0.053	0.04	-0.165	0	0	0.1	0	0.1	.388**	.229*	.364**	.265**	0.144	.806**	1			
Verbal	0	-0.02	0	-0.049	0	0	0.1	0	0.2	0.2	0.14	0.172	0.111	-0.03	.611**	.367**	1		
Anger	.260**	0.163	0.15	-0.014	0	0	0.1	0	0.2	.407**	.311**	.365**	.237*	0.16	.851**	.579**	.502**	1	
Hostility	0.2	0.078	0.05	0.086	-.250*	0	0.2	0.1	0.2	.322**	.345**	.232*	0.157	.360**	.748**	.437**	.260**	.513**	1

*$p < .05$. **$p < .01$.

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Table 3. *Average k Value and Its Differences amongst $100, $300, and $500 Trials*

Variables	Violent alcoholic ($N=42$)		Non-violent alcoholic ($N=40$)		Control group ($N=30$)		F	Tukey
	M	SD	M	SD	M	SD		
$100 Trial	.0188	.0276	.00628	.0276	.00470	.0143	13.5**	1 > 2,3
$300 Trial	.0105	.0226	.00273	.0226	.00135	.00319	11.7**	1 > 2,3
$500 Trial	.00960	.0228	.00247	.0228	.00077	.00102	12.3**	1 > 2,3

*$p < .05$.

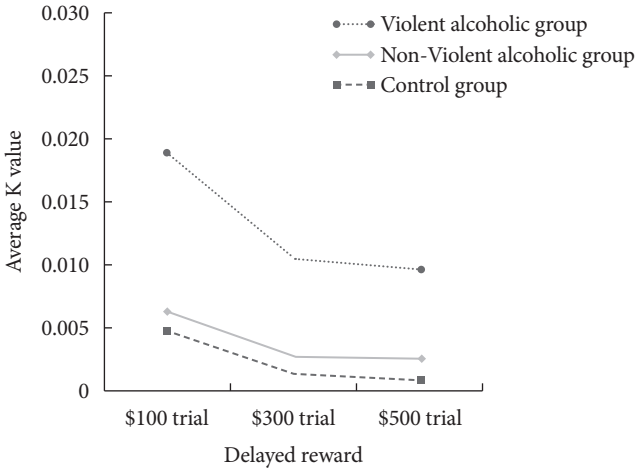

Figure 1. *Difference in K value between the groups.*

has been plotted accordingly.

Discussion

The present study examined the differences in impulsivity between alcoholics who display violent behavior and those who do not. A popular notion of alcohol-fuelled violence was that it is mainly alcohol that makes an individual impulsive, leading to violent acts. However, by examining the differences in impulsivity and aggression amongst violent alcoholics and non-violent alcoholics, the current study aimed to determine how much of predisposed impulsivity and aggression those who commit alcohol-fuelled violence have.

First of all, the violent alcoholic group and non-violent alcoholic group showed higher levels of impulsivity in general, which was consistent with previous studies (Allen et al., 1998; Chalmers et al., 1993; Cookson, 1994; Eisen et al., 1992; McCormick et al., 1987; Patton et al., 1995; Rosenthal et al., 1990; Sher & Trull, 1994). However, while both the non-violent group and violent alcoholic group scored higher on overall score and non-planning substrate of BIS-II, only the violent alcoholic group scored higher in Motor subscale than the control. The results suggest between the violent and non-violent alcoholic groups, there is a difference in how they experience or express their impulsivity. Furthermore, the results are consistent with previous studies showing that BIS is most effective in differentiating trait-features of impulsivity.

The results also showed that while the non-violent alcoholic group and violent alcoholic group did not show a major difference in impulsivity, violent alcoholic group showed higher level of aggression than the other group. This finding betrays the popular idea that those who have aggression committed alcohol-fuelled violence are mainly aggravated by consuming alcohol. It also directly undermines those people who were quick to alleviate the crimes committed by alcohol-fuelled violence under criminal law article 10 clause 2, which states that people who commit alcohol-fuelled violence behave out of lack of judgment caused by consuming alcohol. According to the results of this study, those who have committed alcohol-fuelled violence scored higher level of aggression, even without consuming any alcohol. Therefore, we can conclude that that alcohol is not solely responsible for fuelling violence; rather, it serves as a tipping point for already violent individuals. It also provides the groundwork for the main hypothesis of the study, which states that violent alcoholic group will display more behavioral aspect of impulsivity, specifically violent act, than non-violent alcoholic group in their examination of delay discounting.

The final part of the study compared the impulsivity examined by delay discounting between the 2 alcoholic groups and the control group, as well as the impulsivity of violent alcoholic group and the non-violent alcoholic group. It was hypothesized that, as a measure of impulsivity, the degree in which future outcome is discounted will be higher for the alcoholic group than both the non-violent alcoholic group and the control group. Furthermore, the

rate of discounting will be even higher for the violent alcoholic group than the non-violent alcoholic group. While the impulsivity measured by Barratt impulsiveness scale did not show significant differences between the non-violent and violent alcoholics, further study examining the behavioral aspect of impulsivity could lead to a better understanding of the differences between the two. The results from the study suggested that while the non-violent alcoholic group had higher level of discounting than the control group, the difference was not significant. However, the discounting rate of the violent alcoholic group was greater than the other 2 groups in every trial. Also, the rate in which future reward is discounted is higher for smaller future outcome, as supported by previous studies (Petry, 2001).

It is important to note the degree to which impulsiveness differed between the non-violent alcoholic group and the violent alcoholic group across separate studies. While the BIS was able to successfully differentiate the difference in impulsivity between the alcoholic groups and the control group, delay discounting was able to successfully differentiate the impulsivity between the two alcoholic groups. This may be due to the criteria within impulsivity that delay discounting measures. It has been found in previous studies (Coffey et al., 2003; de Wit et al., 2007) that within the BIS scale, non-planning aspect of impulsivity is most correlated with the degree to which people delay future rewards. However, the low correlation between the non-planning subtest and delay discounting rate indicates that, as stated in previous studies, there is a limitation in measuring the behavioral aspect of impulsivity. Also, in a study using a questionnaire to determine the relationship between aggression, impulsivity, and suicide attempts of alcohol dependents, Koller, Preuss, U., Bottlender, Wenzel, and Soyka (2002) have found that while alcohol-dependent subjects with a history of suicide attempts have more aggressive and impulsive traits, the difference between alcoholics with a history of violent and non-violent suicide attempts did not differ. Such implication from the past studies, as well as the results from this study, suggest that while both the BIS and delay discounting measures impulsivity, BIS can be more effective in differentiating the inherent traits such as alcohol dependence, whereas delay discounting can be more effective in differentiating the behavioral aspect, most notably the act of aggression between the violent and non-violent alcoholic group. In other words, while BIS can effectively differentiate between those who have a biological tendency to depend on substance, Delay Discounting is effective in differentiating amongst those who act upon their impulsiveness.

Unfortunately, several limitations of the current study must be addressed. First, the variations in the current reward instead of adjusting the delayed time period would have been more ideal in determining the accurate delay discounting rate. Previous studies (Petry, 2001; Weller et al., 2008) have either adjusted the current reward in accordance with the response the subjects were given. More importantly, the variation in the current amount was far greater than the one used in this study. For example, the study conducted by Petry (2001) has adjusted the current reward from $1,000 to $999, $995, $900, $960 and so on, thus leading to a wide variation of discount rate for each delayed time period. In future research, this method of measurement must be implemented for easier comparison bewteen the studies. Secondly, factors such as age of onset for alcohol abuse, educaiton and socioeconomic status, type of misdemenor caused by violent alcoholic group, duration of the patient's treatment, nor the type of mediation was not thoroughly examined in the analysis. Such variables could have a drastic effect on the outcome and will need to be addressed in future research. Finally, the sample only consisted of male subjects, mainly due to the lack of availability on female subjects at the hospital. A sample data that proportionately represent the both sexes is desirable for future research.

Nonetheless, the current study provides an important implication on understanding alcohol-fuelled violence. As stated before, it is important that while alcohol may provide an extra push to committing an alcohol-fuelled violence, their predisposed aggression must be addressed beforehand. Such understanding could provide a better treatment and policies for helping those who have and can have an alcohol-fuelled violence. Instead of passively watching the aftermath of alcohol-fuelled violence and placing the perpetrators behind the bars without proper treatment, a more active screening and preventive measure can be implemented in the future.

References

Albein-Urios, N., Martinez-Gonzalez, J. M., Lozano, O., & Verde-

https://doi.org/10.15842/kjcp.2017.36.1.004

jo-Garcia, A. (2014). Monetary delay discounting in gambling and cocaine dependence with personality comorbidities. *Addictive Behaviors, 39*, 1658-1662.

Allen, T. J., Moeller, F. G., Rhoades, H. M., & Cherek, D. R. (1998). Impulsivity and history of drug dependence. *Drug and Alcohol Dependence, 50*, 137-145.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders: DSM-IV-TR*. Washington, DC: American Psychiatric Publishing.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: American Psychiatric Publishing.

Angott, A. M. (2010). *What Causes Delay Discounting?* (Doctoral Dissertation) Retrieved from http://deepblue.lib.umich.edu/bitstream/handle/2027.42/78754/aangott_1.pdf?sequence=1

Ayduk, O., Mendoza-Denton, R., Mischel, W., Downey, G., Peake, P., & Rodriguez, M. (2000). Regulating the interpersonal self: Strategic self-regulation for coping with rejection sensitivity. *Journal of Personality and Social Psychology, 79*, 776-792.

Barratt, E. S., & Patton, J. H. (1983). Impulsivity: Cognitive, behavioral and psychophysiological correlates. In M. Zuckerman (Ed.). *Biological bases of sensation seeking, impulsivity and anxiety* (pp. 77-116). Hillsdale, NJ: Erlbaum.

Bartholomow, B. D., & Heinz, A. (2006). Alcohol and aggression without consumption. *Psychological Science, 17*, 30-37.

Bickel, W. K., Odum, A. L., & Madden, G. J. (1999). Impulsivity and cigarette smoking: Delay discounting in current, never, and ex-smokers. *Psychopharmacology, 146*, 447-454.

Buss, A. H., & Perry, M. (1992). The aggression questionnaire. *Journal of Personality and Social Psychology, 63*, 452-459.

Chalmers, D., Linn Olenick, N., & Stein, W. (1993). Dispositional traits as risk in problem drinking. *Journal of Substance Abuse, 5*, 401-410.

Coffey, S. F., Gudleski, G. D., Saladin, M. E., & Brady, K. T. (2003). Impulsivity and rapid discounting of delayed hypothetical rewards in cocaine-dependent individuals. *Experimental and Clinical Psychopharmacology, 11*, 18-25.

Cookson, H. (1994). Personality variables associated with alcohol use in young offenders. *Personality and Individual Differences, 16*, 179-182.

de Wit, H., Flory, J. D., Acheson, A., McCloskey, M., & Manuck, S. B. (2007). IQ and nonplanning impulsivity are independently associated with delay discounting in middle-aged adults. *Personality and Individual Differences, 42*, 111-121.

Dougherty, D. M., Charles, N. E., Mathias, C. W., Ryan, S. R., Olvera, R. L., Liang, Y., & Acheson, A. (2014). Delay discounting differentiates pre-adolescents at high and low risk for substance use disorders based on family history. *Drug and Alcohol Dependence. 143*, 105-111.

Dougherty, D. M., Mathias, C. W., & Marsh, D. M. (2003). Laboratory measures of impulsivity. In E.F. Coccaro (Ed.). *Aggression: Psychiatric Assessment and Treatment* (Vol. 22, pp. 247-265). New York: Marcel Dekker Publishers.

Giancola, P. R. (2000). Executive functioning: A conceptual framework for alcohol-related aggression. *Experimental and Clinical Psychopharmacology, 8*, 576-597.

Green, L., Fry, A. F., & Myerson, J. (1994). Discounting of delayed rewards: A life-span comparison. *Psychological Science, 5*, 33-36.

Ham, L. S., & Hope, D. A. (2003). College students and problematic drinking: A review of the literature. *Clinical Psychology Review, 23*, 719-759.

Herndon, J. S., & Bembenutty, H. (2014). In-school and social factors influencing learning among students enrolled in a disciplinary alternative school. *Learning and Individual Differences, 35*, 49-55.

Heo, S. Y., Oh, J. Y., & Kim, J. H. (2012). The Korean version of the Barratt Impulsivity Scale, 11th version: Its reliability and validity. *Korean Journal of Psychology: General, 31*, 769-782.

Hoaken, P. N. S., Campbell, T., Stewart, S. H., & Pihl, R. O. (2003). Effects of alcohol on cardiovascular reactivity and the mediation of aggressive behavior in adult men and women. *Alcohol and Alcoholism, 38*, 84-92.

Hodgson, R., Alwyn, T., John, B., Thom, B., & Smith, A. (2002). The fast alcohol screening test. *Alcohol and Alcoholism, 37*, 61-66.

Johnson, M. W., & Bickel, W. K. (2002). Within-subject comparison of real and hypothetical money rewards in delay discounting. *Journal of the Experimental Analysis of Behavior, 77*, 129-146.

Kirby, K. N. (1997). Bidding on the future: Evidence against normative discounting of delayed rewards. *Journal of Experimental Psychology: General, 126*, 54-70.

Koller, G., Preuss, U., Bottlender, M., Wenzel, K., & Soyka, M. (2002). Impulsivity and aggression as predictors of suicide attempts in alcoholics. *European Archives of Psychiatry and Clinical Neuroscience, 252*, 155-160.

Korean National Police Agency. (2016). *Crime Statistics* [Data file]. Retrieved from http://www.police.go.kr/files/infodata/200197/2014/2014_02_4.pdf

Lee, B., Lee, C., Lee, P., Choi, M., & Namkoong, K. (2000). Development of Korean version of alcohol use disorders identification test (AUDIT-K): Its reliability and validity. *Journal of Korean Academy of Addiction Psychiatry, 4*, 83-92.

Madden, G. J., Begotka, A. M., Raiff, B. R., & Kastern, L. L. (2003). Delay discounting of real and hypothetical rewards. *Experimental and Clinical Psychopharmacology, 11*, 139-145.

Madden, G. J., & Bickel, W. K. (2010). *Impulsivity: The behavioral and neurological science of discounting*. Washington, DC : Amer-

ican Psychological Association.
Madden, G. J., Bickel, W. K., & Jacobs, E. A. (1999). Discounting of delayed rewards in opioid-dependent outpatients: Exponential or hyperbolic discounting functions? *Experimental and Clinical Psychopharmacology, 7*, 284-293.
Mazur, J. E. (1987). An adjusting procedure for studying delayed reinforcement. *Quantitative Analyses of Behavior, 5*, 55-73.
McCormick, R. A., Taber, J., Kruedelbach, N., & Russo, A. (1987). Personality profiles of hospitalized pathological gamblers: The California Personality Inventory. *Journal of Clinical Psychology. 43*, 521-527.
McDonald, J., Schleifer, L., Richards, J. B., & de Wit, H. (2003). Effects of THC on behavioral measures of impulsivity in humans. *Neuropsychopharmacology, 28*, 1356-1365.
Moeller, F. G., Barratt, E. S., Dougherty, D. M., Schmitz, J. M., & Swann, A. C. (2001). Psychiatric aspects of impulsivity. *American Journal of Psychiatry, 158*, 1783-1793.
Murphy, J. G., Vuchinich, R. E., & Simpson, C. A. (2001). Delayed reward and cost discounting. *The Psychological Record, 51*, 571-588.
Odum, A. L., Madden, G. J., & Bickel, W. K. (2002). Discounting of delayed health gains and losses by current, never-and ex-smokers of cigarettes. *Nicotine & Tobacco Research, 4*, 295-303.
Ohmura, Y., Takahashi, T., Kitamura, N., & Wehr, P. (2006). Three-month stability of delay and probability discounting measures. *Experimental and Clinical Psychopharmacology, 14*, 318-328.
Patton, J. H., Stanford, M. S., & Barratt, E. S. (1995). Factor structure of the Barratt impulsiveness scale. *Journal of Clininical Psychology, 51*, 768-774.
Petry, N. M. (2001). Delay discounting of money and alcohol in actively using alcoholics, currently abstinent alcoholics, and controls. *Psychopharmacology, 154*, 243-250.
Rachlin, H., Raineri, A., & Cross, D. (1991). Subjective probability and delay. *Journal of the Experimental Analysis of Behavior, 55*, 233-244.
Richards, J. B., Zhang, L., Mitchell, S. H., & Wit, H. (1999). Delay or probability discounting in a model of impulsive behavior: Effect of alcohol. *Journal of the Experimental Analysis of Behavior, 71*, 121-143.
Rosenthal, T. L., Edwards, N. B., Ackerman, B. J., Knott, D. H., & Rosenthal, R. H. (1990). Substance abuse patterns reveal contrasting personal traits. *Journal of Substance Abuse, 2*, 255-263.
Saunders, J. B., Aasland, O. G., Babor, T. F., & Grant, M. (1993). Development of the alcohol use disorders identification test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption-II. *Addiction, 88*, 791-804.
Schumacher, J. A., Coffey, S. F., Leonard, K. E., O'Jile, J. R., & Landy, N. C. (2013). Self-regulation, daily drinking, and partner violence in alcohol treatment-seeking men. *Experimental and Clinical Psychopharmacology, 21*, 17-28.
Seo, S., & Kwon, S. (2002). Validation study of the Korean version of the aggression questionnaire. *Korean Journal of Clinical Psychology, 21*, 487-501.
Sher, K. J., & Trull, T. J. (1994). Personality and disinhibitory psychopathology: Alcoholism and antisocial personality disorder. *Journal of Abnormal Psychology, 103*, 92-102.
Simpson, C. A., & Vuchinich, R. E. (2000). Reliability of a measure of temporal discounting. *The Psychological Record, 50*, 3-16.
Spinella, M. (2007). Normative data and a short form of the Barratt Impulsiveness Scale. *International Journal of Neuroscience, 117*, 359-368.
Stanford, M. S., Mathias, C. W., Dougherty, D. M., Lake, S. L., Anderson, N. E., & Patton, J. H. (2009). Fifty years of the Barratt Impulsiveness Scale: An update and review. *Personality and Individual Differences, 47*, 385-395.
Swann, A. C., Bjork, J. M., Moeller, F. G., & Dougherty, D. M. (2002). Two models of impulsivity: Relationship to personality traits and psychopathology. *Biological Psychiatry, 51*, 988-994.
Weller, R. E., Cook III, E. W., Avsar, K. B., & Cox, J. E. (2008). Obese women show greater delay discounting than healthy-weight women. *Appetite, 51*, 563-569.
White, H. R., & Labouvie, E. W. (1989). Towards the assessment of adolescent problem drinking. *Journal of Studies on Alcohol and Drugs, 50*, 30.
Whiteside, S. P., & Lynam, D. R. (2003). Understanding the role of impulsivity and externalizing psychopathology in alcohol abuse: application of the UPPS impulsive behavior scale. *Experimental and Clinical Psychopharmacology, 11*, 210-217.

https://doi.org/10.15842/kjcp.2017.36.1.004