The Influence of Daily Stress on Impaired Control through Emotion Dysregulation and Drinking Motives

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Alcohol use disorder (AUD) can be explained by some emotion-based hypotheses such as the self-medication hypothesis and negative reinforcement model. Accordingly, the aim of this study was to explore the dynamic relationships between daily stress, emotion dysregulation and drinking motives in the prediction of impaired control to drink alcohol in a clinical male sample. Male patients with AUD ($n = 193$) were recruited from alcohol centers of four psychiatric hospitals in South Korea. All participants completed a questionnaire that included the Hassles and Uplifts Scale, the Difficulties in Emotion Regulation Scale (DERS), the Drinking Motives Questionnaire (DMQ), and the Impaired Control Scale (ICS). The serial multiple mediation model analyses showed that daily stress resulted in impaired control through emotional dysregulation and drinking motives in order. Specifically, both emotional dysregulation and drinking motives in turn had partial mediation effects on the relationship between daily stress and impaired control on alcohol. Moreover, when drinking motives were entered as a mediator individually, the size of the indirect effect for coping motives was larger than that of enhancement motives was, suggesting that there might be no gender difference related to drinking motives. These results suggest that daily stress as a precursor indirectly influences impaired control through emotion dysregulation and drinking motives among patients with AUD. Considering the connection between stress and impaired control on alcohol via emotion dysregulation and drinking motives, future interventions need to focus on providing an individualized intervention that includes stress management and adaptive emotion regulation strategies.

Keywords: alcohol use disorder, impaired control, emotion dysregulation, drinking motives

Alcohol Use Disorder (AUD) has a very high relapse rate. For example, the recurrence of AUD occurred mostly within 3 to 4 months after treatment, with only 14.5% and 12.4% of patients remained abstinent from alcohol more than one and two years, respectively (Kim et al., 2007). It seems to be similar to results of adults in U.S (only 18.2% kept going abstinent in the past 12 months) (Dawson, Grant, & Ruan, 2005).

The notion that addictive behavior is difficult to control is fundamental to descriptions of substance-related and addictive disorders (American Psychiatric Association, 2013; Baumeister & Heatherton, 1996; Marsh, Saunders, & Piek, 2002; Wills & Stool-

miller, 2002). Accordingly, AUD is also conceptualized as a chronic failure of self-regulation (Hull & Slone, 2004; Sayette & Griffin, 2011). Given that AUD is one of many chronic and relapsing mental disorders (Kim et al., 2007; Meyerhoff, Durazzo, & Ende, 2011), a scrutiny of psychosocial ground of relapse into drinking alcohol is needed.

According to the relapse prevention model (Marlatt & George, 1984), relapse to AUD can be defined as the act of back-sliding, worsening, or subsiding. It may imply that relapse is not a symptom of deterioration, 'loss of control' or total indulgence, but rather a mistake or an indication of total failure (Marlatt & George, 1984). Similar to the studies of Marlatt and George (1984), Heather and his colleagues (Heather, Booth, & Luce, 1998; Heather, Tebbutt, Mattick, & Zamir, 1993) introduces "impaired control" which is distinguished from "loss of control" on the basis of the

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Alcohol Dependence Syndrome (ADS) (Edwards & Gross, 1976). Although impaired control consists of three componets, including Attempted Control (AC), Failed Control (FC), and Predicted Control (PC), several studies showed that FC might be a robust predictor of the severity of AUD (Claus, Ewing, Filbey, Sabbineni, & Hutchison, 2011;Heather & Dawe, 2005; Leeman, Fenton, & Volpicelli, 2007). Indeed, AUD peaked among persons who exceeded the daily limits twice a week (Dawson, Grant, & Li, 2005).

Meanwhile, AUD and major depressive disorder (MDD) are often comorbid (Brière, Rohde, Seeley, Klein, & Lewinsohn, 2014; Hasin & Grant, 2002; Torvik et al., 2017). Specifically, Brière et al. (2014) reported that rates of cumulative comorbidity from adolescence to adulthood increased up to 21%. Moreover, a large-scale epidemiologic survey found that there were significant associations between negative mood and AUD (Hasin, Stinson, Ogburn, & Grant, 2007). As such, impaired control in AUD can be explained by negative emotionality (Khantzian, 1997; Smith & Cyders, 2016). To better understand mechanisms by which negative emotions imparts impaired control of AUD, this study sought to investigate the effect of daily stress as an environmental variable, and emotion dysregulation and drinking motives as individual difference variables on impaired control.

Typically, there is an association between daily stress and drinking in the general population (Dawson, Grant, & Ruan, 2005). However, it has been well-established that both physical and psychological stressors facilitate the acquisition of drug self-administration in chronic patients with AUD (Piazza & Le Moal, 1998). Specifically, stress is considered a major contributor to the initiation and continuation of addiction to alcohol as well as to relapse (Brady & Sonne, 1999).

In addition, patients with AUD are more likely to experience relapse or recurrence when they face a wide range of stressful events provoking negative emotions (e.g., anger or depression) after discharge from clinics (Fox, Hong, & Sinha, 2008; Ilgen, McKellar, & Tiet, 2005). An experimental study found that high stress has an association with coping motives to consume alcohol (Colder, 2001). In contrast, a study (Pilowsky, Keyes, Geier, Grant, & Hasin, 2013) showed that relapse onto AUD has no direct association with other stressful life events except divorce/separation. Thus, it is necessary to examine whether there is a direct effect between self-reported stressful events and impaired control or an indirect effect through other variables as suggested below.

Emotion dysregulation (ED) has been known to be related to externalizing symptomatology (Wills, Simons, Sussman, & Knight, 2016). ED has also been suggested as a contributing factor to substance abuse among adults (Miller & Brown, 1991). According to the self-medication hypothesis (SMH) (Khantzian, 1997), impaired control could primarily occur in context of difficulties in regulating affects. In particular, individuals with AUD suffer in the extreme with their feeling, being overwhelmed with negative affects, such as anger and depression. It can be consistent with a concept called 'misregulation' of substance use, which refers to an ability to exert control in a way that fails to produce the desired result (Baumeister & Heatherton, 1996; Sayette & Griffin, 2011).

Emotion regulation can be conceived as a process whereby people regulate any type of affective or emotionally charged response including attention, cognitive representations, and physical or behavioural responses (Koole, Van Dillen, & Sheppes, 2011). According to the *process model of emotion regulation* (Gross, 2001; McRae, Ochsner, & Gross, 2011), emotions are generated in a sequence of stages, including situation selection, situation modification, attention deployment, cognitive changes, and response modulation. On the other hand, emotion dysregulation is defined as a multidimensional construct, including nonacceptance of emotional responses, lack of emotional awareness, limited access to emotion regulation strategies, difficulties in engaging in goal-directed behavior when distressed, difficulties in refraining from impulsive behavior when upset, and lack of emotional clarity (Gratz & Roemer, 2004). Integrating both approaches described above, impaired control among patients with AUD might be caused by emotion dysregulation of negative or positive affect states.

Recently, emotion dysregulation has been found to be a transdiagnostic factor that contribute to drinking behavior (Holzhauer & Gamble, 2017). Moreover, it may promote the abstinence violation effect (Baumeister & Heatherton, 1996; Marlatt & George, 1984) or can act as a trigger for relapse after a period of sustained sobriety (Walitzer & Dearing, 2006).

Many people believe that alcohol consumption is helpful to relieve their anger or other forms of emotional distress (Baumeister & Heatherton, 1996). However, a number of studies have shown

that people drink alcohol for different social and psychologcial goals and drinking motives (Fernandes-Jesus et al., 2016). Typical drinking motives include coping motives, enhancement motives, conformity motives, and social motivation (Cox & Klinger, 1988). In particular, it was reported that both coping and enhancement motives were the strongest predictors of alcohol consumption and drinking frequency among adolescents (Cooper, 1994). In addition, these motives may be related to an inability to limit drinking (Neal & Carey, 2007).

Several studies (Karpyak et al., 2016; Lehavot, Stappenbeck, Luterek, Kaysen, & Simpson, 2014) showed that the average drink per day among male patients with AUD was not related to coping motives but to enhancement motives, suggesting that there is a gender difference. However, study subjects were limited to AUD patients with posttraumatic stress disorder and therefore it may be difficult to generalize these results to all patients with AUD.

A recent study found that coping motives to drink were most commonly expressed in adult patients seeking treatment for problematic alcohol use (Hammarberg, Öster, & Nehlin, 2017). Furthermore, some studies showed that coping motives to drink mediate the relationship between the emotion dysregulation and problematic drinking in college samples (Aurora & Klanecky, 2016; Messman-Moore & Ward, 2014), suggesting that emotion dysregulation can contribute to drinking motives.

However, few researches focus on more comprehensive relationships between daily stress, emotion dysregulation and drinking motives (especially, coping and enhancement motives) in the prediction of recurring impaired control in a clinical sample. Based on the self-medication hypothesis (Crum et al., 2013; Khantzian, 1997) as well as the process model of emotion regulation (Gross, 1998; Gross & Thompson, 2007), this study hypothesized that the relationship between daily stress and impaired control would be mediated by emotion dysregulation and motives to drink in order to cope with stress.

Methods

Participants
Participants were 193 male patients with AUD, who were recruited from alcohol centers of four psychiatric hospitals. Participants were the patients who met the AUD diagnostic criteria in the Diagnostic Statistical Manual of Mental Disorders, 5th edition (DSM-5) and were receiving specialized treatment for AUD. However, despite showing their willingness to participate, patients who (1) showed serious aggression and hostility, (2) were illiterate, (3) could not fill in a self-report questionnaire due to visual impairment, or (4) were difficult to participate in this study because their judgment was deteriorated or their decision-making had a problem were excluded from the study. Though a total of 216 patients wanted to take part in the research, 20 patients were excluded according to the exclusion criteria. Three of 196 patients who voluntarily signed the informed consent forms and filled out the questionnaires were excluded from final analyses due to unreliable or incomplete responses.

This study was conducted with the approval of the Ajou University Institute Review Board. Informed consent was obtained from all individual participants included in the study.

Measures
Hassles and Uplifts Scale (DeLongis, Folkman, & Lazarus, 1988; Kanner, Coyne, Schaefer, & Lazarus, 1981). It was used to measure the magnitude of daily stress of the participants. In this study, 44 daily hassles (e.g., problems with their children, legal problems, financial security, and so on) were extracted from the original version. Respondents were asked to rate the subjective distress from each event on a 4-point scale ranging from 0 ("not bothered at all") to 3 ("bothered a lot") for the last 12 months. This scale has one structure. Internal consistency was good (Cronbach's α = .94).

Difficulties in Emotion Regulation Scale (DERS) (Gratz & Roemer, 2004). It was used to assess emotion dysregulation. Although the DERS consists of six factors, the Korean version of the DERS (Cho & Hong, 2013) has adapted an alternative five-factor model. Considering the scope of the current study, however, this study used the total scores instead of five subfactor scores. The instrument had good internal consistency (α = .91).

Drinking Motives Questionnaire (Cooper, 1994). It was used to assess different motives to drink enhancement, coping, conformity and social motives. The Korean version of DMQ (K-DMQ) consists of 16 items where participants respond using a 5-point Likert scale ranging from 1 (almost never/never) to 5 (almost al-

ways/always). This study used scores of each subactors as well as the total scores. The instrument had good internal consistency (α = .95 for full scale, α = .85–.91 for the subscale).

Impaired Control Scale (ICS) (Heather, Booth, & Luce, 1998). It was used to measure the degree of impaired control on alcohol, which is a 10-item scale called "failed control (FC)". It asks respondents to rate the frequency of the failure in controlling drinking over the past 6 months on a 5-point scale ranging from 0 ("never") to 4 ("always"). FC which is essentially unidimensional was only used after translating into the Korean language. The reliability of this scale was good (α = .99).

Statistical analysis

All statistical analyses were performed using the Statistical Package for Social Science 23.0 (SPSS Inc., Chicago, IL, USA). Pearson's correlation analysis was used to determine the relationships between daily stress, emotion dysregulation, drinking motives and impaired control. The hypothesis that daily stress impacts impaired control through emotion dysregulation and drinking motives were examined with the serial multiple mediation model in SPSS PROCESS macro (Hayes, 2012, 2013). The serial multiple mediated effect analysis was conducted along with 5,000 times of bootstrapping. Confidence intervals that do not include 0 are considered significant.

Results

Descriptive statistics

Table 1 shows the demographic and clinical data. All participants were males of an average age of 49.99 (SD = 9.16). The mean education of participants was 12.30 years (SD = 2.66), ranging from 1 to 19 years. The mean age of first alcohol drinking was 18.62 years (SD = 5.97), ranging from 8 to 69 years. Additionally, the mean number of admissions was 5.77 times (SD = 6.43), ranging from 1 to 40 times. As shown in Table 2, interestingly, coping motive was found to be higher than other motives among male inpatients with AUD.

Correlations

Table 2 displays the bivariate correlations among the variables of interest. Correlations of daily stress with emotion dysregulation and impaired control were significant. In contrast to expectations, daily stress was not significantly related to a total score of drinking motives. In fact, it was only correlated with coping motives, but not with enhancement, conformity, and social motives. Meanwhile, a total score as well as subscales of drinking motives was positively associated with emotion dysregulation and impaired control, respectively, but not associated with daily stress. In addition, emotion dysregulation was significantly related to impaired control.

Table 1. *Demographic and Clinical Characteristics of Participants*

Variables	Mean	SD	Range
Age (year)	49.99	9.16	27–69
Education (year)	12.30	2.66	1–19
Age of first alcohol drinking (year)	18.62	5.97	8–69
Number of admissions	5.77	6.43	1–40

Table 2. *Descriptive Data and Correlations among Variables*

Variables	M	SD	1	2	3	4	5	6	7	8
1. Life stress	27.98	20.92	-							
2. Drinking motives	50.49	12.91	.13	-						
3. EN motives	12.19	3.59	.14	.90***	-					
4. CO motives	14.05	3.72	.16*	.83***	.69***	-				
5. CN motives	11.24	3.76	.12	.87***	.74***	.55***	-			
6. SO motives	13.02	3.79	.03	.88***	.70***	.64***	.72***	-		
7. DER	66.76	15.79	.33***	.33***	.32***	.32***	.33***	.18*	-	
8. ICS	25.86	8.18	.24**	.37***	.30***	.39***	.33***	.29***	.27***	-

Note. M = mean; SD = standard deviation; EN = enhancement; CO = coping; CN = conformity; SO = Social; DER = Difficulties in Emotion Regulation; ICS = Impaired Control Scale.
*p < .05. **p < .01. ***p < .001.

Table 3. *The Bootstrap Results for the Indirect Effect of Emotion Dysregulation and Drinking Motives on the Relationship between Daily Stress and Impaired Control*

	B	SE	95% CI (BC)	
			Lower	Upper
Direct effects				
Daily stress → Emotion Dysregulation	0.248***	0.052	0.146	0.350
Emotion Dysregulation → Drinking Motives	0.264***	0.059	0.147	0.381
Daily Stress → Drinking Motives	0.015	0.045	-0.073	0.104
Emotion Dysregulation → Impaired Control	0.058	0.038	-0.016	0.133
Drinking Motives → Impaired Control	0.200***	0.044	0.114	0.287
Daily Stress → Impaired Control	0.062*	0.027	0.008	0.115
Indirect effects				
Path 1: Daily Stress → Emotion Dysregulation → Impaired Control	0.014[b]	0.013	-0.007	0.042
Path 2: Daily Stress → Emotion Dysregulation → Drinking Motives → Impaired Control	0.013[a]	0.006	0.005	0.029
Path 3: Daily Stress → Drinking Motives → Impaired Control	0.003[b]	0.011	-0.017	0.025

Note. CI (BC) = bias corrected confidence interval; a = significant; b = not significant.
*$p < .05$. ***$p < .001$.
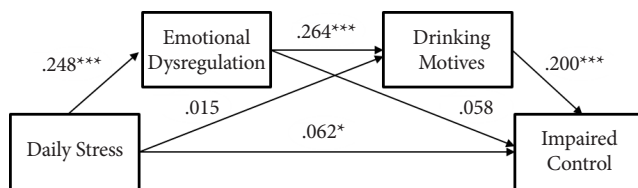
Figure 1. *Model depicting the effects of daily stress, emotion dysregulation and drinking motives on impaired control. *$p < .05$. ***$p < .001$.*

Serial multiple mediation models

The Serial multiple mediation model which includes daily stress, emotion dysregulation and drinking motives was found to account for 19% of the variance in impaired control, $R^2 = .19$, F (3, 189) = 14.396, $p < .001$. As shown in Table 3, daily stress was associated with emotion dysregulation (B = 0.248, $SE = 0.052$, $p < .001$) and impaired control (B = 0.062, $SE = 0.027$, $p < .05$.), but not with drinking motives (B = 0.015, $SE = 0.045$, $p > .05$).

Moreover, emotion dysregulation was associated with drinking motives, B = 0.264, $SE = 0.059$, $p < .001$), but not with impaired control, B = 0.058, $SE = 0.038$, $p > .05$. On the other hand, drinking motives were associated with impaired control, B = 0.200, $SE = 0.044$, $p < .001$. Furthermore, the results indicated that both emotional dysregulation and drinking motives partially mediated the relationship between daily stress and impaired control (Figure 1).

Moreover, bootstrap analysis found that positive indirect effects of daily stress on impaired control through emotion dysregulation and drinking motives was only significant, B = 0.013, $SE = 0.006$,

95% confidence Interval = 0.005 to 0.029 in Table 3. However, both path 1 and 3 were not significant. In additional analyses, when entering each drinking motive as a mediator individually, the size of the indirect effect for coping motives was higher in magnitude than the indirect effect of enhancement motives, $R^2 = .20$, F (3, 189) = 15.229, $p < .001$, $R^2 = .14$, F (3, 189) = 10.533, $p < .001$, respectively. Also, both conformity and social motives partially mediated the relationship between life stress and impaired control on alcohol, $R^2 = .16$, F (3, 189) = 11.926, $p < .001$, $R^2 = .16$, F (3, 189) = 11.790, $p < .001$, respectively.

Discussion

In line with the process model of emotion regulation (Gross, 1998; Gross & Thompson, 2007), many studies suggested that the self-medication hypothesis (Khantzian, 1997) are valid and feasible in college populations. However, there was a paucity of studies that examined the hypothesis in clinical sample such as patients with AUD. Accordingly, the aim of the present study was to determine whether the effect of daily stress as an environment factor, on impaired control can be attributed to emotion dysregulation and drinking motives.

However, daily stress had no direct effect on drinking motives. Moreover, emotion dysregulation had no direct effect on impaired control. On the other hand, confirming the core hypothesis of the current study, however, results showed that daily stress had not

only the direct effect on impaired control, but also indirectly affected on it via emotion dysregulation and drinking motives in serial. Consistent with recent studies (Aurora & Klanecky, 2016; Messman-Moore & Ward, 2014), these results showed that emotion dysregulation can be precursor to drinking motives.

Interestingly, coping motives were found to be higher than three other motives among male patients with AUD. It is consistent with results of Hammarberg et al. (2017), who reported that coping motives were the most commonly expressed motive among adult patients seeking treatment for problematic alcohol use. In extra analyses, the mediation model including the coping motives as a mediator on impaired control had a greater explanatory power than the model including enhance motives. That is, it suggested that males might be also attributed to coping motives in contrast to previously reported findings (Karpyak et al., 2016; Lehavot et al., 2014). Like females, thus, males can be also suffering from impaired control as emotion dysregulation increase drinking to cope, when they are experiencing unusually strong negative emotions due to daily stress.

On the other hand, the association between emotion dysregulation and coping motives was already confirmed in nonclinical samples such as college students (Messman-Moore & Ward, 2014; Veilleux, Skinner, Reese, & Shaver, 2014) and adolescents (Cooper, 1994). Despite some support for self-medication models of alcohol use, the effects of stress and negative emotionality on alcohol use have been inconsistent (Greeley & Oei, 1999). Like the SMH, the negative reinforcement model of drug addiction assume that addicted individuals take drugs to escape or avoid aversive states such as withdrawal or stress (Baker, Piper, McCarthy, Majeskie, & Fiore, 2004). Although all four drinking motives can be related to alcohol use in nonclinical sample (Kuntsche, Knibbe, Gmel, & Engels, 2005), this study documented that coping motives are more common among males with AUD.

According to the *neurobehavioral decision systems hypothesis of addiction* (Bickel, Yi, Kowal, & Gatchalian, 2008), AUD can be explained by which it results from a hyperactive impulsive system and a hypoactive executive decision system (Bickel, Yi, Landes, Hill, & Baxter, 2011), which is also in line with a number of dual mode models (Epstein, 1994; Metcalfe & Mischel, 1999; Rothbart, Ellis, Rosario Rueda, & Posner, 2003; Strack & Deutsch, 2004).

Therefore, many researches tend to have focused more upon the neurobiological substrates underlying addiction than on its affective components, emphasising how the dysregulation of brain reward and stress systems bias addicted individuals towards continued substance use (Cheetham, Allen, Yücel, & Lubman, 2010; Kalivas & Volkow, 2005).

Considering the research trend above, the importance of emotion regulation can be overlooked. Many of the processes associated with substance abuse and addiction appear to be congruent with those underlying more naturally occurring affective experiences (Cheetham et al., 2010). Thus, the results of the current study support that emotion regulation needs to take account as a necessary part in the treatment and prevention of AUD.

Meanwhile, this study employed impaired control of last 6 months as a dependent variable instead of the quantity or frequency of alcohol use and alcohol-related consequences. In this case, these results could show more clearly that emotion dysregulation after stressful events play a stronger role in repetitive relapse of AUD, supporting the self-medication hypothesis or negative reinforcement model of drug addiction.

The study's limitations are as follows. First, because the cross-sectional design was applied in this study, longitudinal design study would be needed in order to verify causality. Second, this study used self-report questionnaires, which their reliability could be lowered due to the respondents' social desirability. Especially in the case of the DERS, there may be an enormous difference between the respondents' perception of emotional regulation ability and their actual ability (Aurora & Klanecky, 2016). Finally, considering findings that the self-medication hypothesis was supported in cross-sectional than in prospective analyses (Read, Merrill, Griffin, Bachrach, & Khan, 2014), it needs to confirm whether the present results can also be replicated in the longitudinal study.

Conclusions

Daily stress could have a direct effect on impaired control. In addition, daily stress could predict emotion dysregulation and drinking motives, and drinking motives in turn could predict impaired control. Accordingly, to deliver an individualized intervention including stress management strategies for those patients in

whom a clear linking between stress and relapse occurs might be particularly imperative. Thanks to these interventions, emotional dysregulation and drinking motives could be lessened and help the impaired control to alleviate. In addition, it is important to consider an emotion regulation module to overcome several limitations of specialized treatments for AUD which focus on abstinence. In other words, interventions might provide information on the process of using alcohol as a means of emotion regulation and offer adaptive emotion regulation strategies such as cognitive reappraisal, acceptance, and problem solving (Aldao & Nolen-Hoeksema, 2012).

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