**Abstract**

**Objective**: Considering the importance of identifying the factors effective in substance use in the design of some interventions on addiction prevention and treatment, the present study aimed at examining the mediating role of emotional dysregulation in the association between impulsivity personality trait and consumption & multiple consumption of drugs, alcohol, and tobacco. **Method:** The number of 352 subjects was selected through convenience sampling method from among the 18-to-60-year-old population of Tehran and were assessed by means of UPPS-P Impulsive Behavior Scale, Difficulties in Emotion Regulation Scale, and a researcher-constructed questionnaires on substance use. The data were analyzed through correlation tests and structural equation modeling (SEM) in SPSS and Mplus software. **Results:** The results of this study showed that impulsivity dimensions and emotional dysregulation had a significant correlation with consumption & multiple consumption of drugs, alcohol, and tobacco. The proposed model had a good fitness index with the data; however, the effect of emotional dysregulation on substance use was not statistically significant. Sensation seeking ($\beta$=0.42, P<0.01) and lack of premeditation ($\beta$=0.46, P<0.01) had a significant effect on substance use; and lack of premeditation ($\beta$=-0.27, P<0.01), negative urgency ($\beta$=0.83, P<0.01), and lack of perseverance ($\beta$=0.13, P<0.05) had a significant effect on emotional dysregulation. **Conclusion:** Although both impulsivity and emotional dysregulation had a significant correlation with consumption & multiple consumption of drugs, alcohol, and tobacco, when used in one model, the impulsivity dimension had a stranger effect on substance use and played a more prominent role in the anticipation of substance use.

**Keywords:** emotional dysregulation, impulsivity, sensation seeking, substance use, urgency

# Examining the Mediating Role of Emotional Dysregulation in the Relationship between Impulsivity Personality Trait and Consumption & Multiple Consumption of Drugs, Alcohol, and Tobacco

Jabraeli, H.; Moradi, A.; Habibi, M.

**Jabraeli, H.**
Ph.D. Student of Health Psychology, Kharazmi University, Tehran, Iran, Email: h.jebraeili@yahoo.com

**Moradi, A.**
Professor of Clinical Psychology, Kharazmi University, Tehran, Iran

**Habibi, M.**
Assistant Professor of Health Psychology, Iran University of Medical Sciences, Tehran, Iran

**Research on Addiction Quarterly Journal of Drug Abuse**

Presidency of the I. R. of Iran
Drug Control Headquarters
Department for Research and Education

Vol. 11, No. 41, Spring 2017
http://www.etiadpajohi.ir

## Introduction

Drug use is one of the most severe problems with which today's societies are faced, and it is added to the scope of this problematic issue every day. According to statistics, nearly a quarter of US high school students smoke cigarettes (Centers for Disease Control and Prevention, 2013). It is estimated that over six-million smokers under the age of 18 years may lose their life due to the illnesses relating to smoking, such as cardiovascular disease and lung cancer (National Institute on Drug Abuse, 2012). The latest information disseminated by the United Nations Office on Drugs and Crime (2015) suggests that 246 million people have used stimulant drugs only in 2013. Statistics on other substances also indicate the high consumption of drugs and the resulting consequences.

Drug use not only affects the users' health and behavior, but also imposes high social costs and damages social cohesion and development (Ouzir & Errami, 2016). From among the social costs of drug use, one can refer to the illnesses caused by drug use and the imposition of heavy costs on the health care system, increased crime and high costs of the judicial system, and the effects of drug use on academic achievement and occupational productivity (Zohrabian & Philipson, 2010). The individual and social problems caused by drug use make it necessary to identify the risk factors that predict different patterns of consumption in order to make better preventative and therapeutic efforts. Although several factors may be associated with the onset and preservation of substance use, emotional dysregulation and impulsivity are among the variables that have accounted for a large volume of research in recent years and their role in various types of hazardous and high-risk behaviors has been examined (Pivarunas & Conner, 2015; Dir, Banks, Zapolski, McIntyre, & Hulvershorn, 2016; Garofalo & Wright, 2017).

Impulsivity is a concept which is defined as an attempt to conduct behaviors without thought and to provide untimely responses to the stimulus that often has adverse consequences (Moeller, Barratt, Dougherty, Schmitz, & Swann, 2001). Research has shown that impulsivity is not a single personality dimension, but has been formed from a multidimensional construct (Khadka, Stevens, Aslanzadeh, Narayanan, Hawkins, Austad, 2017; Fox & Hammond, 2017). Whiteside & Lynam (2001) examined the multidimensional nature of impulsivity and developed the five-factor impulsivity scale. Lynam et al.'s formulation (Lynam, Smith, Whiteside, & Cyders, 2006) of impulsivity consists of five dimensions, they are as follows: 1) Sensation seeking, or tendency to search for new and exciting experiences; 2) Lack of premeditation; or tendency to act without thought; 3) Lack of perseverance, or the inability to concentrate on a job; 4) Positive urgency; or the tendency to take hasty actions when experiencing a highly positive emotion; and 5) Negative urgency, or tendency to take hasty actions in response to emotional distress.

The studies already carried out on the five-factor impulsivity model have indicated the link between impulsivity dimensions and various variables related to drug use, alcohol, and tobacco, including alcohol drinking (Kaiser, Bonsu, Charnigo, Milich, & Lynam, 2016), overdose of alcohol (Bo, Billieux, & Landro, 2016), daily alcohol drinking (Stevens, Littlefield, Talley, & Brown, 2017), smoking (Boothby, Kim, Romanow, Hodgins, & McGrath, 2017), drug abuse (Vest, Reynolds, & Tragesser, 2016), marijuana use and its negative consequences (VanderVeen, Hershberger, & Cyders, 2016), consequences of drug use in adolescents (Tomko, Prisciandaro, Falls, & Magid, 2016), and the results of addiction treatment (Littlefield, Stevens, Cunningham, Jones, King, & Schumacher, 2015). The examination of the impulsivity dimensions separately, also shows that some dimensions of impulsivity have a stronger connection with the risk of substance use disorders than other dimensions (Vest, Reynolds, & Tragesser, 2016). In this regard, in a study conducted by Verdejo-Garcia, Bechara, Recknor, & Perez-Garcia (2007), the healthy individuals in a control group were compared with drug dependent people and the results showed that urgency from among the dimensions of impulsivity was the strongest predictor of the problems associated with alcohol drinking, drug use problems, health, family, employment, and legal issues. In another study, Lee, Peters, Adams, Milich, & Lynam (2015) placed 18-to-24-year-old individuals into three groups, i.e. non-smokers, non-daily smokers, and daily smokers where the results showed that negative urgency increased the risk of membership in the daily users' group. Lack of premeditation also predicted an increased risk of membership in the non-daily smokers' group. In addition, sensation seeking was revealed to have a significant link with alcohol-related problems. For example, Coskunpinar, Dir, & Cyders (2013) concluded that urgency was associated with the problematic alcohol drinking and alcohol dependence, while sensation seeking was associated with the overdose of alcohol.

Conceptual models that have been applied to recognize the role of impulsivity in substance abuse disorders are often based on Acquired Preparedness Model (Smith & Anderson, 2001), in which it is assumed that impulsivity forms the learning process by making individuals susceptible to acquire positive experiences from substances and drugs and, then, it increases the risk of entanglement in drug use (McCarthy, Kroll, & Smith, 2001). According to this model, individuals with impulsivity are more likely to form positive experiences for substance use behaviors because of the learning biases towards the reinforcing consequences of behaviors rather than the punishment of such negative behaviors (Smith & Anderson, 2001). For example, the Acquired Preparedness Model suggests that people with high impulsivity are more likely to learn from a specific event that cigarette smoking is associated with reinforcing effects. Therefore, it is more likely to develop strong beliefs that smoking can reduce negative emotions or increase social experiences, which will lead to the increased likelihood of smoking (Brandon & Baker, 2011, as cited in

Dir et al., 2016). This holds true particularly when one does not enjoy efficient emotional control mechanisms to control his/her emotions (Dir et al., 2016).

Emotion regulation refers to the strategies that can influence the amount and time of increased emotions, the duration of the emotions, and the way they are experienced and expressed (Gross, 2014). Emotion regulation is an issue in substance use and recently substance abuse has received increasing attention. A wealth of research has been conducted on emotion regulation in recent years, it is also being added to the scope of these studies day by day (Wills, Simons, & Gibbons, 2015). The degree of emotion regulation is correlated with the risk of the early onset of drug use and its related problems in adolescents (Wills, Pokhrel, Morehouse, & Fenster, 2011), the risk of substance use in people with symptoms of posttraumatic stress disorder (Tull, Bardeen, DiLillo, Messman-Moore, & Gratz, 2015), the risk of substance dependence (Wills, Simons, Sussman, & Knight, 2016), and the maintenance of the effects of substance abuse treatment (Hopwood, Schade, Matusiewicz, Daughters, & Lejuez, 2015). Longitudinal studies have shown that the early observations of emotion regulation in substance use significantly predict mental and physical health outcomes over time (Moffitt, Arseneault, Belsky, Dickson, Hancox, & Harrington, 2011). Nervous imaging studies are also indicative of the functional and structural brain abnormalities that suggest deficiencies in emotion regulation of the individuals with substance use disorder (Ersche, Williams, Robbins, & Bullmore, 2013).

Studies have shown that prefrontal bilateral brain regions, including medial prefrontal cortex and anterior cingulate cortex are initially responsible for emotion regulation through the regulation of the limbic system, and they concurrently get insured that current strategies are in line with regulatory objectives (Etkin, Egner, & Kalisch, 2011). When this system attempts to regulate emotions, it makes use of various regulatory strategies where in addition to having some shared neural networks with other strategies, each strategy has its own neural networks (Tang, Tang, & Posner, 2016). The prefrontal cortex and amygdala (a part of the limbic system) are the brain regions that are involved not only in emotion regulation but are also engaged in impulsivity (Ray & Zald, 2012). Although there are subtle differences between the varieties of control strategies, the anterior cingulate cortex and medial prefrontal cortex are concurrently involved in the regulation and inhibition of responses (Tang, Posner, Rothbart, & Volkow, 2015). Therefore, in spite of the difference in the mechanisms and structures of the nervous system, it seems that emotion regulation and impulsivity are inextricably linked to each other. In addition, the effect of impulsivity on patterns of drug use may be mediated by some disorder in emotion regulation. Therefore, to test this hypothesis, the present study aimed at determining the mediating role of emotional dysregulation in the relationship between the personality trait of impulsivity and consumption and multiple consumption of drugs, alcohol, and tobacco.

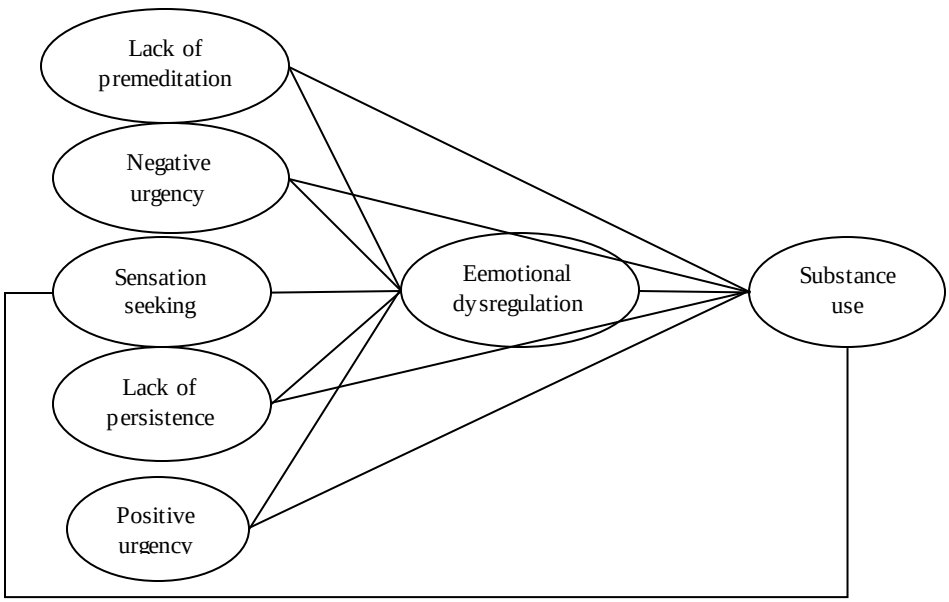


**Fig. 1: Theoretical framework of the present research**

## Method

### Population, sample, and sampling method

An analytical cross-sectional study was employed to conduct the study that belongs to the correlation research designs in terms of data collection and analysis. The statistical population of this study consisted of the 18-to-60-year-old residents of Tehran. In this study, convenience sampling method was used to collect data. Due to the uncertainty about the sample size and the values of Morgan table for a population of 100,000 people and above, the sample size was of 384 units was considered. However, in the end, 352 questionnaires were soundly returned and used in the final analysis. Using correlation and structural equation modeling tests in SPSS version 24 and Mplus software version 7, Data was analyzed.

### Instrument

Five-Factor UPPS-P Impulsive Behavior Scale: This scale is a self-report questionnaire with 59 items that has been designed to measure five distinct personality traits associated with impulsivity. These traits include sensation seeking, lack of persistence, lack of premeditation, negative and positive urgency. The first four dimensions constitute the dimensions of the original version of Impulsive Behavior Scale (Whiteside & Lynam, 2001), and the fifth dimension has been added to the initial scale based on recent research (Cyders, Smith, Spillane, Fischer, Annus, & Peterson, 2007). Sensation seeking contains 12 items and two dimensions, i.e. thrill and adventure seeking and risk and

novelty seeking. The lack of persistence that contains 10 items and refers to one's inability to focus on a task that may be difficult and tedious. The lack of premeditation contains 11 items and refers to one's inability to think and reflect on the results of an act before it is performed. Urgency, which consists of a total of 26 items, is divided into two aspects of negative urgency or the desire to experience strong impulses under conditions of negative affect; and positive urgency or tendency to perform impulsive actions under the conditions of positive affect. Negative and positive urgency contain 12 and 14 items in the questionnaire, respectively. The items of the total scale are scored based on a 4-point Likert scale from 1 to 4 (strongly disagree, somewhat disagree, somewhat agree, and strongly agree). It is noteworthy that the items numbered 1, 4, 6, 11, 14, 16, 19, 21, 24, 27, 28, 32, 33, 37, 38, 42, 48, 53, and 55 are scored in reverse and, thereby, the lower scores represent higher degrees of impulsivity. The reliability of the dimensions of this questionnaire has been reported using Cronbach's alpha to lie between 0.82 and 0.94. Factor analysis has been used to assess the validity of this scale where the obtained results confirm the factor structure of this scale (Whiteside & Lynam, 2001, Cyders et al., 2007). In a research conducted in Iran, the internal consistency reliability of this scale has been calculated and the Cronbach's alpha coefficients of 0.83, 0.81, 0.74, 0.75, 0.86, and 0.90 have been obtained for the subscales of lack of premeditation, negative urgency, sensation seeking, lack of persistence, positive urgency, and the total scale, respectively. The criterion validity of Impulsive Behavior Scale was reported by calculating the correlation coefficients between the dimensions of this scale and the "difficulty in impulse control" subscale in Emotion Regulation Scale. The results of exploratory factor analysis also confirmed the factor structure of this scale (Jabra'eali, Moradi, & Habibi, in Press). The retest reliability of this scale has also been reported to be appropriate within a four-to-eight week interval. Heidari, Ehteshamzadeh, & Halajaj (2009) have assessed the reliability and validity of this scale in Iran. The reliability of this scale has been reported to be 0.84 and 0.76 by Cronbach's alpha and split-half test. The concurrent validity of this scale was also assessed using Zuckerman's Sensation Seeking and the results indicated a significant positive correlation.

Drug, Alcohol, and Tobacco Consumption: To investigate the use of substances, alcohol and tobacco, the subjects were asked to answer this question: "Have you experienced the use of each of the substances, i.e. cigarette, hookah, opium, cannabis, crystal, alcohol, the non-medical use of prescription drugs or other substances? It should be answered with yes or no; and each of the substances will be ticked if used by the respondent. In the case of reporting the use of each substance by the respondents, that substance will be assigned 1 point and if no report of the use of each substance is issued, the point zero will be allocated to the substance. Respondents were considered as users if they had consumed at least one of the substances in the last month; and they were

considered as multiple users if they had used at least three of the mentioned substances in the last month.

## Results

Demographic information indicated that, among 352 participants, there were 294 (83.5%) men and 58 (16.5%) women, 284 ones (80.7%) were single and 68 ones (19.3%) were married. The mean value of the participants' age was 28.33 years with the standard deviation of 8.76 years. The number of 178 subjects (51.4%) had experienced the use of at least one substance and 48 ones (14.1%) had experienced the use of at least three substances (cigarette, hookah, opium, cannabis, crystal, alcohol, non-medical use of prescription drugs or other substances) in the last month, while 178 ones (51.4%) had not experienced any of the mentioned substances in the last month. The descriptive statistics and correlation coefficients of the research variables are presented in Table 1.

**Table 1: Descriptive statistics and correlation coefficients of research variables**

| *Variables* | *Mean* | *SD* | *1* | *2* | *3* | *4* | *5* | *6* | *7* |
|---|---|---|---|---|---|---|---|---|---|
| **1. Substance use** | - | - | - | - | - | - | - | - | - |
| **2. Multiple use of drugs** | - | - | **0.43 | - | - | - | - | - | - |
| **3. Sensation seeking** | 2.88 | 0.54 | **0.17 | **0.20 | - | - | - | - | - |
| **4. Lack of premeditation** | 1.83 | 0.51 | **0.27 | **0.31 | -0.05 | - | - | - | - |
| **5. Lack of persistence** | 1.87 | 0.46 | 0.04 | *0.14 | -0.03 | **0.61 | - | - | - |
| **6. Negative urgency** | 2.35 | 0.57 | **0.22 | **0.15 | *0.13 | **0.39 | **0.36 | - | - |
| **7. Positive urgency** | 2.15 | 0.58 | **0.18 | **0.23 | **0.21 | **0.45 | **0.32 | **0.74 | - |
| **8. Emotional dysregulation** | 91.81 | 23.01 | *0.14 | *0.13 | 0.06 | **0.33 | **0.40 | **0.59 | **0.54 |

*P<0.05; **P<0.01

After examining the correlation coefficients between the variables, we used structural equation modeling to investigate the mediating role of emotional dysregulation in the relationship between the dimensions of personality trait of impulsive behavior and substance use. The results of structural equation modeling suggested that the proposed model fits well with the data [RMSEA = 0.07, CFI = 0.96, TLI = 0.95, and $\chi 2$ = 206.19, (df = 83, P <0.001)]. The examination of the significant path coefficients in Figure 2 shows that the direct path coefficient from the emotional dysregulation to substance use is not significant (P> 0.05, $\beta$ = 0.05).

As a result, the indirect paths through emotional dysregulation are not significant. Taking a look at the significant coefficients in Figure 2, one can

notice that sensation seeking (β = 0.42, P<0.01) and lack of premeditation (P <0.01, β = 0.46) have a significant effect on substance use and lack of premeditation (P <0.01, β = -0.27), negative urgency (P <0.01, β = 0.83), and lack of persistence (β = 0.13, P <0.05) have a significant effect on emotional dysregulation.

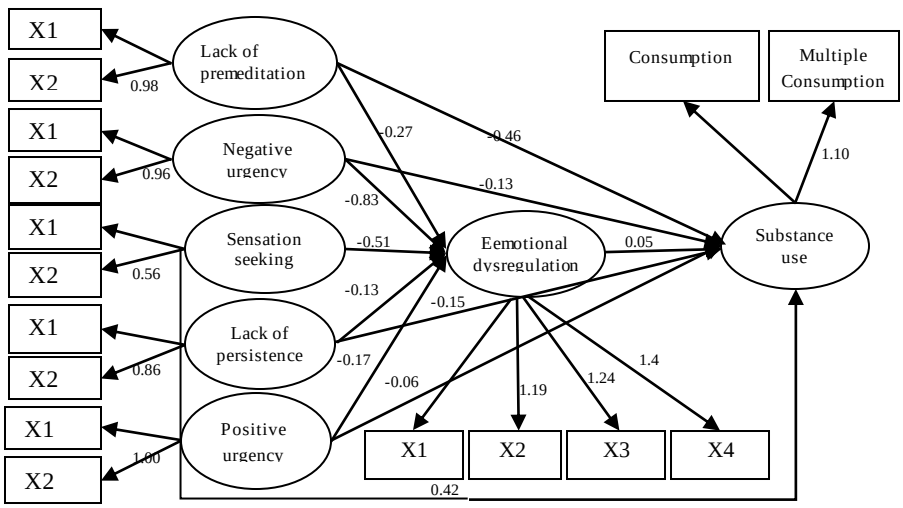


**Fig. 2: Structural equation modeling and path coefficients**

## Discussion and Conclusion

The aim of this study was to investigate the mediating role of emotional dysregulation in the relationship between the dimensions of impulsivity and the consumption and multiple consumption of drugs, alcohol, and tobacco. In order to investigate the role of impulsivity dimensions and emotional dysregulation in the consumption and multiple consumption of substances, the relationship between these variables was analyzed using point-biserial correlation coefficient. Then, to investigate the mediating role of emotional dysregulation in the relationship between impulsivity and substance use, the fitness of the proposed model with real data was studied using structural equation modeling. The results of these analyses indicated that lack of premeditation and sensation seeking not only have a significant link with the consumption and multiple consumption of substances but also have a direct effect on these variables.

Lack of premeditation refers to the reluctance to think about and contemplate the consequences of an action before doing it. People with low scores in this dimension act deliberately and thoughtfully, while those with high scores in this dimension act impulsively regardless of the possible consequences (Whiteside & Lynam, 2001), and this characteristic makes them prone to substance use. For example, in line with the results of this study, various studies have focused on the role of lack of premeditation in various variables related to alcohol drinking,

drug use, and tobacco smoking, especially alcohol drinking (Kaiser et al., 2016), marijuana use and its negative consequences (VanderVeen et al., 2016), the increased risk of smoking (Lee et al., 2015), and the results of addiction treatment (Littlefield et al., 2015).

Sensation seeking, which is correlated with the excitement seeking trait of the neo-personality questionnaire, measures impulsive-like behavioral tendencies (Whiteside & Lynam, 2001). Whiteside & Lynam's conceptualization (2001) has two aspects from the perspective of sensation seeking dimension: 1) The desire to take pleasure and pursue exciting activities; and 2) The openness to feeling new experiences that may be dangerous. Individuals with low scores in this dimension avoid risk and danger, while people with high scores enjoy risk taking and engage in pleasurable activities. This tendency to engage in new and exciting experiences may expose people to different substances. Consistent with the results of this study, various studies have also highlighted the role of sensation seeking in various variables related to the consumption of substances, especially alcohol drinking (Kaiser et al., 2016; Coskunpinar et al., 2013), marijuana use and its negative consequences (VanderVeen et al., 2016), the risk of substance use disorders (Vest, Reynolds, & Tragesser, 2016).

In addition, the results of the analyses indicated that lack of premeditation, negative urgency, and lack of persistence not only have a significant effect on emotional dysregulation, but also the correlation of all other dimensions of impulsivity other than sensation seeking with emotional dysregulation was significant. These correlations were in a range of medium to strong and they were all significant at the level of 1%, which indicates a close relationship between impulsivity and emotional dysregulation. Indeed, studies have shown that prefrontal bilateral brain regions, including medial prefrontal cortex and anterior cingulate cortex are initially responsible for emotion regulation through the regulation of the limbic system, and they concurrently get insured that current strategies are in line with regulatory objectives (Etkin, Egner, & Kalisch, 2011). When this system attempts to regulate emotions, it makes use of various regulatory strategies where each strategy has its own neural networks in addition to having some shared neural networks with other strategies (Tang, Tang, & Posner, 2016). The prefrontal cortex and amygdala (a part of the limbic system) are the brain regions that are involved not only in emotion regulation but are also engaged in impulsivity (Ray & Zald, 2012). Although there are subtle differences between the varieties of control strategies, the anterior cingulate cortex and medial prefrontal cortex are concurrently involved in the regulation and inhibition of responses (Tang, Posner, Rothbart, & Volkow, 2015).

Despite the close relationship between impulsivity and emotional dysregulation, the findings suggest that emotional dysregulation has a lower correlation with the consumption and multiple consumption of substances compared to impulsivity dimensions, and when emotional dysregulation is placed in a model along with impulsivity dimensions, it has no significant effect

on drug use. These findings may have originated from two reasons, and both are related to the characteristics of the sample and the nature of emotional dysregulation. On the one hand, it can be argued that since the current study was conducted on the ordinary people who ultimately consumed soft substances, such as cigarettes and hookahs, it should not be expected that they experience severe emotional dysregulation. On the other hand, these findings may be attributed to the weakness of emotional dysregulation in the prediction of drug use compared to impulsivity. Emotional regulation is defined as the strategies that can influence the amount and time of increased emotions, the duration of the emotions, and the way these emotions are experienced and expressed (Gross, 2014). Indeed, its role in disorders associated with substance use is undeniable; however, it can be said that this role may be due to the common variances between this construct and impulsivity. When these two constructs work together, their predictive power is considerably reduced.

Impulsivity is a concept that had been conceptualized differently and researchers had provided several definitions for it despite its importance and wide range of application. Then, Whiteside & Lynam (2001) responded to these different conceptualizations, conducted factor analysis on different measurement instruments of impulsivity, and identified five independent factors, namely lack of premeditation, negative urgency, sensation seeking, and persistence that cover the most important dimensions of various impulsive concepts and are correlated with a wide range of drug-related problems (Boothby et al., 2017; Kaiser et al., 2016; Vest et al, 2016).

The findings of the present study were indicative of the significant correlation of impulsivity dimensions and emotional dysregulation with the consumption and multiple consumption of substances, alcohol, and tobacco; however, the results of model fitness did not support the mediating role of emotional dysregulation in the relationship between impulsivity dimensions and substance consumption. Even the direct effect of emotional dysregulation on substance use was not significant in the proposed model. Therefore, considering the significant correlations between emotional dysregulation and impulsivity dimensions, it can be concluded that the correlation between emotional dysregulation and the consumption and multiple consumption of substances, alcohol, and tobacco is due to a common variance between impulsivity and emotional dysregulation. Here, the impulsivity trait plays a more prominent role in substance use than emotional dysregulation.

## Reference

Bo, R., Billieux, J., & Landro, N. I. (2016). Which facets of impulsivity predict binge drinking? *Addictive Behaviors Reports, 3*, 43-47. DOI:10.1016/j.abrep.2016.03.001.

Boothby, C. A., Kim, H. S., Romanow, N. K., Hodgins, D. C., & McGrath, D. S. (2017). Assessing the role of impulsivity in smoking & non-smoking disordered gamblers. *Addictive Behaviors, 70*, 35-41. DOI:10.1016/j.addbeh.2017.02.002.

Centers for Disease Control and Prevention (2013). *Behavioral Risk Factor Surveillance System Prevalence and Trends Data: 2012*. Retrieved from Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health.

Coskunpinar, A., Dir, A. L., & Cyders, M. A. (2013). Multidimensionality in impulsivity and alcohol use: a meta-analysis using the UPPS model of impulsivity. *Alcohol Clinical and Experimental Research, 37*(9), 1441-1450. DOI:10.1111/acer.12131.

Cyders, M. A., Smith, G. T., Spillane, N. S., Fischer, S., Annus, A. M., & Peterson, C. (2007). Integration of impulsivity and positive mood to predict risky behavior: development and validation of a measure of positive urgency. *Psychological Assessment, 19*(1), 107-118. DOI:10.1037/1040-3590.19.1.107.

Dir, A. L., Banks, D. E., Zapolski, T. C. B., McIntyre, E., & Hulvershorn, L. A. (2016). Negative urgency and emotion regulation predict positive smoking expectancies in non-smoking youth. *Addictive Behaviors, 58*, 47-52, DOI:10.1016/j.addbeh.2016.02.014.

Ersche, K. D., Williams, G. B., Robbins, T. W., & Bullmore, E. T. (2013). Meta-analysis of structural brain abnormalities associated with stimulant drug dependence and neuroimaging of addiction vulnerability and resilience. *Current Opinion in Neurobiology, 23*(4), 615-624. DOI:10.1016/j.conb.2013.02.017.

Etkin, A., Egner, T., & Kalisch, R. (2011). Emotional processing in anterior cingulate and medial prefrontal cortex. *Trends in Cognitive Sciences, 15*(2), 85-93. DOI:10.1016/j.tics.2010.11.004.

Fox, S., & Hammond, S. (2017). Investigating the multivariate relationship between impulsivity and psychopathy using canonical correlation analysis. *Personality and Individual Differences, 111*, 187-192. DOI:10.1016/j.paid.2017.02.025.

Garofalo, C., & Wright, A. G. C. (2017). Alcohol abuse, personality disorders, and aggression: The quest for a common underlying mechanism. *Aggression and Violent Behavior, 34*, 1-8. DOI:10.1016/j.avb.2017.03.002.

Gratz, K. L., & Roemer, L. (2004). Multidimensional Assessment of Emotion Regulation and Dysregulation: Development, Factor Structure, and Initial Validation of the Difficulties in Emotion Regulation Scale. *Journal of Psychopathology and Behavioral Assessment, 26*(1), 41-54.

Gross, J. J. (2014). *Handbook of Emotion Regulation* (2nd Ed.). New York/ London: Guildford Press.

Heidari, A., Ehteshamzadeh, P., & Hallaji, F. (2009). Relationship of emotional regulation, metacognition and optimism with students test anxiety. *New findings in psychology, 4*(11), 7-19.

Hopwood, C. J., Schade, N., Matusiewicz, A., Daughters, S. B., & Lejuez, C. W. (2015). Emotion regulation promotes persistence in a residential substance abuse treatment. *Substance Use and Misuse, 50*(2), 251-256. DOI:10.3109/10826084.2014.977393.

Kaiser, A., Bonsu, J. A., Charnigo, R. J., Milich, R., & Lynam, D. R. (2016). Impulsive Personality and Alcohol Use: Bidirectional Relations Over One Year. *Journal of Studies on Alcohol and Drugs, 77*(3), 473-482.

Khadka, S., Stevens, M. C., Aslanzadeh, F., Narayanan, B., Hawkins, K. A., Austad, C. S., . . . Pearlson, G. D. (2017). Composite impulsivity-related domains in college

students. *Journal of Psychiatric Research, 90*, 118-125. DOI:10.1016/j.jpsychires.2017.02.016.

Lee, D. C., Peters, J. R., Adams, Z. W., Milich, R., & Lynam, D. R. (2015). Specific dimensions of impulsivity are differentially associated with daily and non-daily cigarette smoking in young adults. *Addictive Behaviors, 46*, 82-85. DOI:10.1016/j.addbeh.2015.03.009.

Littlefield, A. K., Stevens, A. K., Cunningham, S., Jones, R. E., King, K. M., Schumacher, J. A., & Coffey, S. F. (2015). Stability and change in multi-method measures of impulsivity across residential addictions treatment. *Addictive Behaviors, 42*, 126-129. DOI:10.1016/j.addbeh.2014.11.002.

Lynam, D., Smith, G., Whiteside, S., & Cyders, M. (2006). *The UPPS-P: Assessing five personality pathways to impulsive behavior (Technical Report)*. West Lafayette: Purdue University.

McCarthy, D. M., Kroll, L. S., & Smith, G. T. (2001). Integrating disinhibition and learning risk for alcohol use. *Experimental and Clinical Psychopharmacology, 9*(4), 389-398.

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*(11), 1783-1793. DOI:10.1176/appi.ajp.158.11.1783.

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., . . . Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences of the United States of America, 108*(7), 2693-2698. DOI:10.1073/pnas.1010076108.

National-Institute-on-Drug-Abuse. (2012). *Research report series: Tobacco/nicotine*. Retrieved from: https://www.drugabuse.gov/drugs-abuse/tobacco-nicotine.

Ouzir, M., & Errami, M. (2016). Etiological theories of addiction: A comprehensive update on neurobiological, genetic and behavioral vulnerability. *Pharmacology Biochemistry and Behavior, 148*, 59-68. DOI:10.1016/j.pbb.2016.06.005.

Pivarunas, B., & Conner, B. T. (2015). Impulsivity and emotion dysregulation as predictors of food addiction. *Eating Behaviors, 19*, 9-14. DOI:10.1016/j.eatbeh.2015.06.007.

Ray, R. D., & Zald, D. H. (2012). Anatomical insights into the interaction of emotion and cognition in the prefrontal cortex. *Neuroscience & Biobehavioral Reviews, 36*(1), 479-501. DOI:10.1016/j.neubiorev.2011.08.005.

Smith, G. T., & Anderson, K. G. (2001). *Personality and learning factors combine to create risk for adolescent problem drinking: A model and suggestions for intervention*. New York: Guilford Press.

Stevens, A. K., Littlefield, A. K., Talley, A. E., & Brown, J. L. (2017). Do individuals higher in impulsivity drink more impulsively? A pilot study within a high risk sample of young adults. *Addictive Behaviors, 65*, 147-153. DOI:10.1016/j.addbeh.2016.10.026.

Tang, Y. Y., Posner, M. I., Rothbart, M. K., & Volkow, N. D. (2015). Circuitry of self-control and its role in reducing addiction. *Trends in Cognitive Sciences, 19*(8), 439-444. DOI:10.1016/j.tics.2015.06.007.

Tang, Y. Y., Tang, R., & Posner, M. I. (2016). Mindfulness meditation improves emotion regulation and reduces drug abuse. *Drug Alcohol Depend, 163, Supplement 1*, S13-S18. DOI:10.1016/j.drugalcdep.2015.11.041.

Tomko, R. L., Prisciandaro, J. J., Falls, S. K., & Magid, V. (2016). The structure of the UPPS-R-Child impulsivity scale and its relations with substance use outcomes among treatment-seeking adolescents. *Drug Alcohol Depend, 161*, 276-283. DOI:10.1016/j.drugalcdep.2016.02.010.

Tull, M. T., Bardeen, J. R., DiLillo, D., Messman-Moore, T., & Gratz, K. L. (2015). A prospective investigation of emotion dysregulation as a moderator of the relation between posttraumatic stress symptoms and substance use severity. *Journal of Anxiety Disorders, 29*, 52-60. DOI:10.1016/j.janxdis.2014.11.003.

United Nations Office on Drugs and Crime. (2015). *World Drug Report 2015*. Retrieved from: https://www.unodc.org/documents/wdr2015/ World_Drug_Report_2015.pdf.

VanderVeen, J. D., Hershberger, A. R., & Cyders, M. A. (2016). UPPS-P model impulsivity and marijuana use behaviors in adolescents: A meta-analysis. *Drug and Alcohol Dependence, 168*, 181-190. DOI:10.1016/j.drugalcdep.2016.09.016.

Verdejo-Garcia, A., Bechara, A., Recknor, E. C., & Perez-Garcia, M. (2007). Negative emotion-driven impulsivity predicts substance dependence problems. *Drug and Alcohol Dependence, 91*(2-3), 213-219. DOI:10.1016/j.drugalcdep.2007.05.025.

Vest, N., Reynolds, C. J., & Tragesser, S. L. (2016). Impulsivity and risk for prescription opioid misuse in a chronic pain patient sample. *Addictive Behaviors, 60*, 184-190. DOI:10.1016/j.addbeh.2016.04.015.

Whiteside, S. P., & Lynam, D. R. (2001). The Five Factor Model and impulsivity: using a structural model of personality to understand impulsivity. *Personality and Individual Differences, 30*(4), 669-689. DOI: 10.1016/S0191-8869(00)00064-7.

Wills, T. A., Pokhrel, P., Morehouse, E., & Fenster, B. (2011). Behavioral and emotional regulation and adolescent substance use problems: a test of moderation effects in a dual-process model. *Psychology of addictive behaviors: journal of the Society of Psychologists in Addictive Behaviors, 25*(2), 279-292. DOI: 10.1037/a0022870.

Wills, T. A., Simons, J. S., & Gibbons, F. X. (2015). *Self-control and substance use prevention*. Washington, DC: American Psychological Association.

Wills, T. A., Simons, J. S., Sussman, S., & Knight, R. (2016). Emotional self-control and dysregulation: A dual-process analysis of pathways to externalizing/internalizing symptomatology and positive well-being in younger adolescents. *Drug Alcohol Dependency, 163, Supplement 1*, S37-S45. DOI:10.1016/j.drugalcdep.2015.08.039.

Zohrabian, A., & Philipson, T. J. (2010). External costs of risky health behaviors associated with leading actual causes of death in the U.S.: a review of the evidence and implications for future research. *International Journal of Environmental Research Public Health, 7*(6), 2460-2472. DOI: 10.3390/ijerph7062460.